Freight Logistics and Transport Systems in Europe

Executive Summary

European Council of
Applied Sciences and Engineering

Euro-CASE

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Preface

In 1996 Euro-CASE published the report "Mobility, Transport and Traffic - in the perspective of growth, competitiveness and employment in Europe". The report was the outcome of a study seeking to understand the dynamic process underlying the growth in transport demand, and evaluation of the long-term implications of alternative strategies for managing and accommodating the growth.

Besides the findings, the study also suggested recommendations for policy initiatives and proposals for further research and studies. One of those areas was freight transport and logistics.

The European Commission, which contributed both financially and professionally to the study and subsequently made use of the findings, also found a need for further studies into freight transport.

Awareness has grown that freight transport is entwined with the location and logistics organisation of manufacturing industry. Efficient logistics requires strong and visible connectivity made possible through the elimination of as many friction areas as possible. What is further appreciated is that efficient and competitive freight transport is an integral part of the elements that promote economic growth and quality of life. Therefore it is important to understand better what constitutes efficient and competitive logistics and freight transport systems.

Finding the report on "Mobility, Transport and Traffic" of high quality and of value to the Commission as well as to national governments, the European Commission in March 1999 entrusted Euro-CASE to undertake a study on "Freight Logistics and Transport Systems".

The study principally addresses trends in location of European manufacturing industry and related services and their interaction with logistics and freight transport.

The study aims at a better understanding of the opportunities for improving freight logistics and transport in Europe, identifying obstacles to change, and recommending to the European Commission and national governments those measures which lie within their competence which would enhance the competitiveness of European industry and services in an environmentally sustainable way.

In order to ensure the broadest knowledge being available for the study, the Commission suggested that, besides representation from industry, freight transport operators/logistics providers, government authorities and academia; the European Logistics Association would also be represented throughout the study.

Many individuals with expert knowledge and experience from the above sectors have contributed to the study, including representatives from the European Commission, and Euro-CASE wants to extend its appreciation and thanks for the expertise, time and efforts that those people have devoted to the study.

The report of the study documents experiences and views at European level on the subject, supported by literature studies. It also provides recommendations for policy as well as practical initiatives that the European Commission and national governments may take to promote a seamless freight transport system and related logistics services. The reporting is documented in two editions: a full and comprehensive report (218 pages) printed in 300 copies, and the present Executive Summary, printed in 800 copies. Both reports are available from Euro-CASE.

Copies of the Executive Summary and the main report are available from Euro-CASE.

Ivar Schacke
Chairman, Euro-CASE "Freight" Steering Group

Paris, 29.03.2001

1. Objectives and General Approach

The purpose of this study is to improve understanding of the opportunities for improving freight logistics and transport in Europe, identify obstacles to change, and recommend to the European Commission and national governments those measures which lie within their competence which would enhance the competitiveness of European industry and services in an environmentally sustainable way.

Throughout the report Europe is to be limited in understanding to the EU and EFTA countries. Reference to Central and Eastern countries are given specifically when appropriate.

The study concentrates on one specific aspect of freight logistics and transport - their relationship with industrial location decisions - asking three key questions:

- what are the main driving forces behind changes in the location of economic activities in Europe?
- how, and to what extent, are these decisions influenced by supply chain management considerations?
- what public policy initiatives would improve the efficiency of European freight logistics and transport?

The study has addressed these questions through a combination of desk research and a series of workshops involving senior managers of large European companies operating in three sectors – retailing, pharmaceuticals and automotive. These workshops have also provided useful feedback on industrialists' perceptions of European transport problems. The conclusions derived from the workshops have been discussed by an Expert Panel of logistics specialists which has advised on the extent to which they are applicable to other economic activities.

The three sectors studied are relatively large, accounting for around 15% of European GDP. Their logistics and transport systems share many common features, but also show some surprising differences in relation to mobility and location trends, organisational control of the supply chain, the changes in supply chain management which have taken place over the last 5-10 years, and the use of IT to improve supply chain integration.

2. Sector Study Findings

2.1. The Changing Nature of the Supply Chain

The general trend in European logistics has been from manufacturer-led to retailer-led supply chains (from "push" to "pull" supply chain economics). This is occurring in all three of the sectors studied, but at different speeds. It is leading to slightly different supply chain structures for each sector, and to regional variations in logistics practices. Some industries now think of Western Europe in terms of five or six distinct distribution regions - Scandinavia /Nordic, North West Europe, UK/Ireland, Central-Southern Europe, Iberia, Eastern Mediterranean - whose economic geography, industrial structure and business environment have resulted in significant differences in location and logistics patterns.

The three sectors studied are at different stages of development. Retailing is undergoing a period of consolidation, with the emphasis on continuous small improvements to existing location and distribution patterns. The highly regulated pharmaceuticals industry will see major changes in its

European distribution network as national markets are merged; these will affect the location of large distribution depots but will have relatively little effect on the location of establishments at the ends of the supply chain (primary manufacturing and pharmacies). In contrast the automotive industry, which has serious overcapacity problems, is expected to undergo many significant changes over the next 5-10 years in the location of manufacturing and the format of retailing and post-sales servicing.

In retailing, control of the supply chain has passed to the large supermarket and non-food retail chains. This led to a reduction in the number and size of manufacturer/wholesalers' warehouses, and the consolidation of a reduced level of stocks at small number of very large Regional Distribution Centres (RDCs), controlled by the retailer but often operated on his behalf by a Third Party Logistics Manager (TPLM).

In pharmaceuticals, the regulatory regime has divided Europe into a series of distinct national markets. The active ingredients of drugs are manufactured at a small number of sites by large international companies, but normally require further processing at plants closer to the market, from which drugs are distributed by national wholesalers.

The larger wholesalers have recently merged to form three pan-European groups which control over 60% of the European market, and these are trying to consolidate their supply chains in the face of two serious threats :

- direct supply of drugs by manufacturers to large organisations and private consumers able to order by Internet;
- the displacement of individual pharmacies by supermarkets and large drug store chains.

The liberalisation of dispensing, the standardisation of national drugs regulations, and the growth in sales of over-the-counter drugs will eventually create a single European market for pharmaceuticals, which will have a significant impact on the industry's transport and logistics needs.

In the automotive sector the supply chain is controlled by the large car and the truck manufacturers. These are beginning to transfer their "upstream" responsibilities for the manufacture and assembly of components to large first tier components suppliers (integrators) whilst playing a more active role in the reorganisation of the "downstream" supply chain (dealerships).

There has been a large reduction in the number of components suppliers, which has resulted in the "upstream" supply chain developing a more hierarchical structure. Progress towards rationalising the "downstream" supply chain has been much slower but is now being affected by the growth in E-commerce.

The sections which follow summarise the main impacts of the supply chain changes on location, logistics and transport.

2.2. Retailing

Location

The popularity of "one stop" shopping and the desire of retailers to offer a wider range of products has increased the average size of retail outlets. Combined with urban traffic congestion, weak planning policies, and a deterioration in the quality of town centres in the more depressed areas of Europe, this has led to the growth of out-of-town shopping centres. This trend has been most pronounced in France and the UK, but is also appearing in Spain and Portugal.

However the growth in out-of town shopping appears to be slowing down due to:

- the spread of the “German“ model - small-medium size discount stores in pedestrianised city centres offering a high quality shopping environment and good public transport access;
- the increased proportion of working women, which is increasing the demand for “routine“ shopping centres close to the workplace;
- market segmentation by large retailers, who are developing a portfolio of different store types ranging from small city centre “express“ stores through conventional suburban stores to extra-large regional shopping centres, in order to attract different types of customers;
- planning restrictions on the use of out-of-town sites, particularly in the Netherlands, UK and Denmark; and
- government protection of small shopkeepers, particularly in Southern Europe.

Changes in store location are mirrored further back down the supply chain in the location of warehouses and distribution depots. In the 1980s there was massive investment in retailer-controlled Regional Distribution Centres (RDCs), which replaced small warehouses operated by manufacturers and wholesalers. In the 1990s RDCs were consolidated as inventories were reduced, improvements in vehicle design and road infrastructure allowed distribution vehicles to cover longer distances, and more products reached the critical mass needed to justify direct full truckload delivery to the RDCs without consolidation at an intermediate depot. Cross-border retailing became fashionable, and steps were taken to establish Pan-European supply networks based on European Distribution Centres (EDCs).

There is now a move away from further RDC development, at least in Northern Europe, because of planning controls and escalating land and labour costs in the areas where they have become concentrated (greenfield sites close to major motorway intersections). Changes in logistics practices are also favouring the development of distribution centres based on cross-docking, with only small amounts of warehousing. Large warehousing developments in future will be predominantly in Southern Europe, where the retailing system is still undergoing extensive modernisation, and the Benelux countries, which are favoured by companies building pan-European distribution networks or sourcing a high proportion of their products from overseas.

Logistics

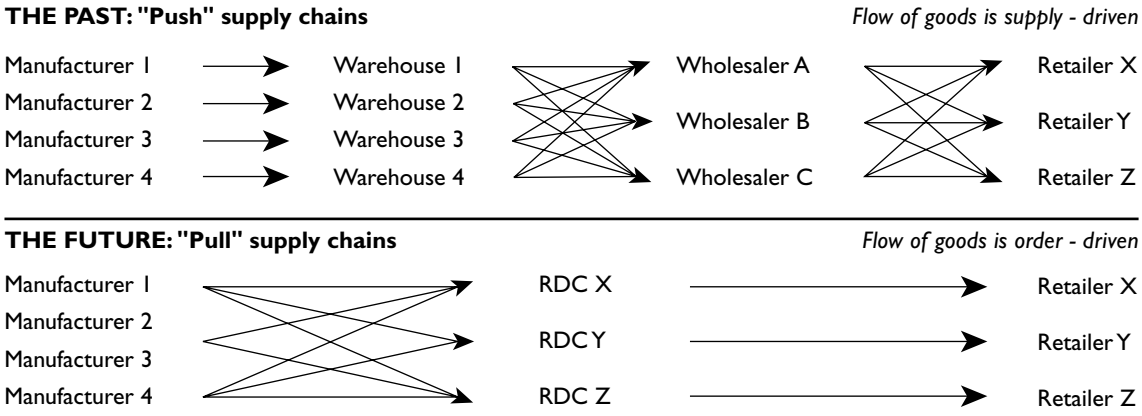
The main changes taking place in retailing logistics are:

- smaller, more frequent deliveries to stores, combined with longer shop opening hours, which is increasing vehicle movements faster than retail turnover or GDP;
- extensive use of IT to minimise stocks and optimise delivery patterns;
- use of different logistics systems for products with different physical characteristics or shelf lives;
- exploitation of synergies between supply chains for quite different products, leading to the

sharing of warehouses, vehicles and transport services with other companies, often direct competitors, in order to reduce costs;

- widespread outsourcing of logistics, which provides access to specialist management skills, flexibility in the use of resources, and cost reductions though bulk purchasing. But although the retail sector has led the way in outsourcing, its growth is now slowing down as some companies take back in-house control over "strategic" logistics functions linked to purchasing and marketing.

Figure 1. The Effect of Changes in Supply Chain Control



E-commerce may cause a revolution in retailing logistics, but it is still too early to predict its effects. Although there is a widespread belief that it will increase the total number of vehicle movements:

- it may eliminate some journeys by allowing certain products (book, music, home entertainment) to be downloaded electronically;
- it may replace some passenger trips (for shopping) by freight trips;
- it may lead to the rationalisation of home delivery services as common-carrier express parcels firms undertake multiple drops in the same area on behalf of many different customers;
- it may lead to the development of local collection/delivery points (for example in post offices, petrol stations or local shopping centres) avoiding the need for door-to-door deliveries.

E-commerce is based on the use of centralised warehouses which can be located anywhere accessible to the motorway network. However there may also be a need for smaller distribution centres closer to customers, where goods can be inspected prior to purchase or returned if they fail to meet customer expectations. This suggests that there will be a convergence of conventional and electronic retailing, as conventional stores provide home delivery services based on electronic ordering and E-commerce traders set up display showrooms in major shopping centres.

Transport

Retail distribution is a significant contributor to road congestion costs, which are seriously underestimated because they include only the costs arising from the delays, not the costs incurred in avoiding them (longer scheduled journey times, spare vehicles, more local depots).

Retailers are already making changes to reduce some the most adverse environmental impacts. These steps include:

- use of smaller, quieter vehicles for distribution in urban areas;
- cross-docking and sharing of vehicles with competitors to improve vehicle utilisation and reduce the number of trips;
- redesign of vehicles to increase their volume: weight ratio, reducing road damage;
- use of the vehicles delivering goods to the stores for the backhaul of products from local manufacturers to RDCs, and the disposal of waste materials.

Freight brokerage services which use the Internet to match vehicles to loads have not been very successful because retail logistics involves stable long-tem relationships with transport providers which emphasise service quality rather than costs. Driving schedules include no time for diversion to pick up unpredictable one-off cargoes, whilst the administrative costs of arranging single trip contracts are high in relation to the savings in vehicle operating costs.

Attempts to divert retail traffic from road to rail have been unsuccessful because of:

- the inability of railway operators to guarantee collection and delivery times;
- the difficulty of assembling full trainloads when the demand is for small, frequent deliveries;
- shortages of suitable rolling stock for special categories of goods (frozen, chilled, high volume, fragile);
- the paucity of well-designed road-rail interchange points;
- high prices; and
- the need for double handling of the goods before they can be finally delivered to the shops.

The retailing sector will be one of the most difficult ones for rail to break into. Rail transport may be feasible in a few small, highly specific segments of the market – such as the long-haul transport of slow-moving, low value non-food items on routes with good opportunities for the consolidation of flows – but require the railways to rethink the types of service offered to retailers.

Public policy initiatives should therefore concentrate on providing incentives for retailers to use road transport more efficiently, in a way which mitigates environmental damage and reduces external costs.

2.3. Pharmaceuticals

Pharmaceuticals stands out as a sector in need of supply chain reform. Europe is split by national regulations on drug authorisation, packaging and labelling into a series of small national markets, whilst wholesalers offer “gold-plated” distribution services with high delivery frequencies and large inventories unsupported by any scientific analysis of the costs or risks.

The high level of concentration in the industry, combined with negotiated prices for highly differentiated products, has restricted competition and led to high margins which have supported relatively inefficient distribution practices. Logistics accounts for a relatively small proportion of the delivered cost of drugs (around 2%) and has received little senior management attention as the industry focuses on more urgent issues such as the discovery of new block-buster drugs or mergers and acquisitions.

This is now changing:

- government concerns about escalating health care costs have led to a series a purchasing reforms which have required manufacturers to lower their prices, transferred more of the costs to consumers, and encouraged the use of self-medication and cheaper Over The Counter (OTC) drugs, which now account for around 23% of the European pharmaceuticals market;
- the lifting of restrictions on the ownership of pharmacies in some North European countries has led to the growth of drug store chains and the sale of OTC drugs in supermarkets and other retail outlets.

  Some of the news outlets are sufficiently large to accept direct deliveries from the manufacturers, by-passing the wholesaler, whilst drugs such as VIAGRA are being sold direct to the consumer via the Internet, by-passing national regulations on the sale of drugs;

- EU action to create a single European market will eventually lead to the development of pan-European distribution networks, although there is still a long way to go in unifying national markets. Large price differences are likely to remain for some time, perpetuating parallel imports of products back into their country of origin from other countries in which they are sold more cheaply.

Location

Location is not an important issue in pharmaceuticals manufacturing. Although the different stages (R&D, clinical trials, manufacturing of active ingredients, product preparation to national standards) have slightly different locational requirements, the most important criteria are access to skilled labour and financial/fiscal incentives. The industry has a substantial amount of over-capacity, and established companies are strongly influenced by the location of their existing plants when making new investments. New entrants, particularly from the USA, have shown a recent preference for Spain and Ireland, whilst continuing to invest in the larger markets of Germany, France and the UK.

Wholesalers' choice of location is constrained by their need to make twice a day deliveries to pharmacies, with a maximum journey time of around three hours. Although delivery frequencies to some larger pharmacies may fall as they begin to hold stocks of the more common drugs, most of the consolidation taking place in this sector is the result of mergers between wholesalers with duplicate sets of warehouses at broadly similar locations.

Three large wholesaling groups now control over 60% of the European market. Although they have been considering pan-European distribution networks, the concept is still in its infancy, as national differences in product specification and high delivery frequencies limit the benefits to be obtained from centralised stock holding.

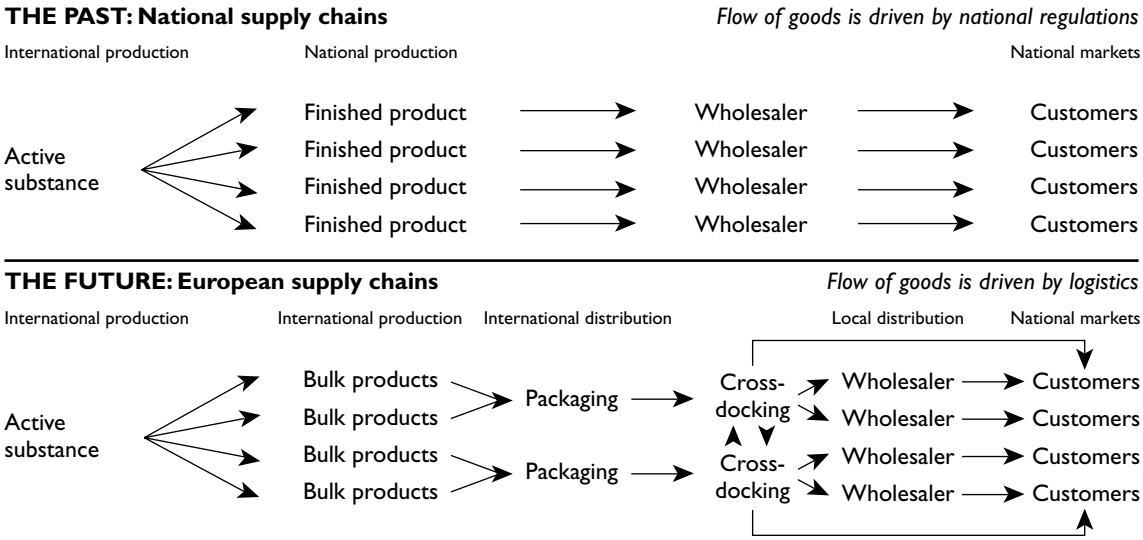
There are big national differences in the density of pharmacies, which serve on average 17,900 people in Denmark but only 1,150 people in Greece, but there are no significant differences in their location, which is generally close to medical facilities or popular shopping areas.

Logistics

In spite of its wealth and sophistication, the pharmaceuticals sector is not very advanced in terms of logistics management, although interest in logistics is increasing.

Simple transport contracts are being replaced by logistics management contracts which include tasks such as order handling and the withdrawal/destruction of date-expired stock. Companies are consolidating materials flows, seeking greater transparency in logistics costs, and making more use of third party logistics managers.

Figure 2. Changes in the Organisational Structure of the Pharmaceuticals Industry



Source: B. Secrétan *Euro-CASE Expert Panel Meeting, Copenhagen, December 1999*

Faced with competition from direct deliveries, and the growing importance of express parcels carriers, wholesalers are seeking closer partnership arrangements with manufacturers, based on the sharing of information, marketing expertise and risks. Wholesalers are also having to broaden their product ranges to include non-pharmaceutical items, which may affect future decisions on distribution networks. With direct deliveries creaming-off the high volume flows, there is a danger that wholesalers will be left with the high cost end of the business – deliveries to small, dispersed customers – forcing them to examine opportunities for collaboration with other organisations in the same position, such as the express parcels carriers and deregulated postal services.

Transport

Road congestion has been less of a problem for pharmaceuticals than for many other sectors because of the high stock levels the industry is obliged to carry. Urban traffic congestion is increasing the cost of local deliveries, but the full impact has not been felt because it has occurred in parallel with other changes which have reduced local distribution costs, such as post-merger warehouse consolidations, the relocation of warehouses from city centre to suburban sites, and reductions in delivery frequencies for non-urgent products.

Rail is used only when there is no alternative (for example for Alpine transits) because of small consignment sizes, lack of reliability, and the need for special, temperature-controlled wagons.

As in the retail sectors, the industry view is that public policy initiatives should provide incentives for more efficient use of road transport rather than seeking to divert traffic to rail. However there is also scope for reducing the number of trips, primarily through the harmonisation and liberalisation of national drug regulations.

2.4. Automotive

Logistics is important in the automotive sector as it accounts for a relatively high proportion of the delivered cost of the product (around 10% compared with 7% for all manufacturing and only 2% for pharmaceuticals). It is also a sector which makes significant use of rail transport.

Manufacturers exercise a high degree of control over the supply chain, both upstream (to components suppliers) and downstream (to dealers). But although some steps have been taken to streamline the upstream end, these have rarely extended beyond Tier 1 suppliers. Flows of materials from second and third tier suppliers are poorly co-ordinated, and attempts to use IT to integrate movements throughout the supply chain are only just beginning. Downstream logistics have received much less attention, in part because of the regulatory framework which limits competition between dealers, and practical difficulties of reshaping dealer networks.

Location

Vehicle manufacturers take location decisions at four different levels – global, national, regional and local – and different factors are important at each stage.

At **global** level the most important factors are market size and growth potential, and the company's world-wide production strategy.

At **national** level (choice of country) market size and growth are still important, but labour issues (cost, productivity, flexibility) and the level of government support come to the fore.

At **regional** level the critical decision is whether to locate in an area where the motor industry is already established, perhaps by expanding an existing plant, or move to a greenfield site where new working practices can be introduced more easily. Manufacturers' attitudes vary but are generally rather conservative, with a preference for remaining close to existing plants. Many opt for modifying an existing factory because of the high costs of labour redundancies, capital write-offs for past investments with long cost recovery periods, and the cleaning up of abandoned sites. They are also under strong government pressure to maintain existing employment patterns, in spite of the cost savings which can usually be obtained from moving to a new area.

At **local** level (choice of site) decisions are influenced by two main factors: space and accessibility. Manufacturers require more space per unit of output than they did 20 years ago because of automated production techniques and the practice of delivering components in trailers or containers which are parked immediately next to the assembly line. In addition, manufacturers like Tier 1 suppliers to locate nearby, and often play an active role in the creation of supplier parks adjacent to their factories.

The number of components suppliers has been falling sharply, and there is a clear tendency for those which remain to migrate towards the large assembly plants. The creation of "suppliers parks" adjacent to the assembly line has been an important feature of several new car plants.

The number of car dealers is also falling as a result of low margins, direct sales to large car fleets, and the development of a more hierarchical dealership structure. Dealers are pooling stocks and "backroom" activities, and in some cases separating sales from servicing. The result is a growing polarisation between large display showrooms located on the outskirts of towns, and smaller, more specialist facilities close to consumers' homes and workplaces.

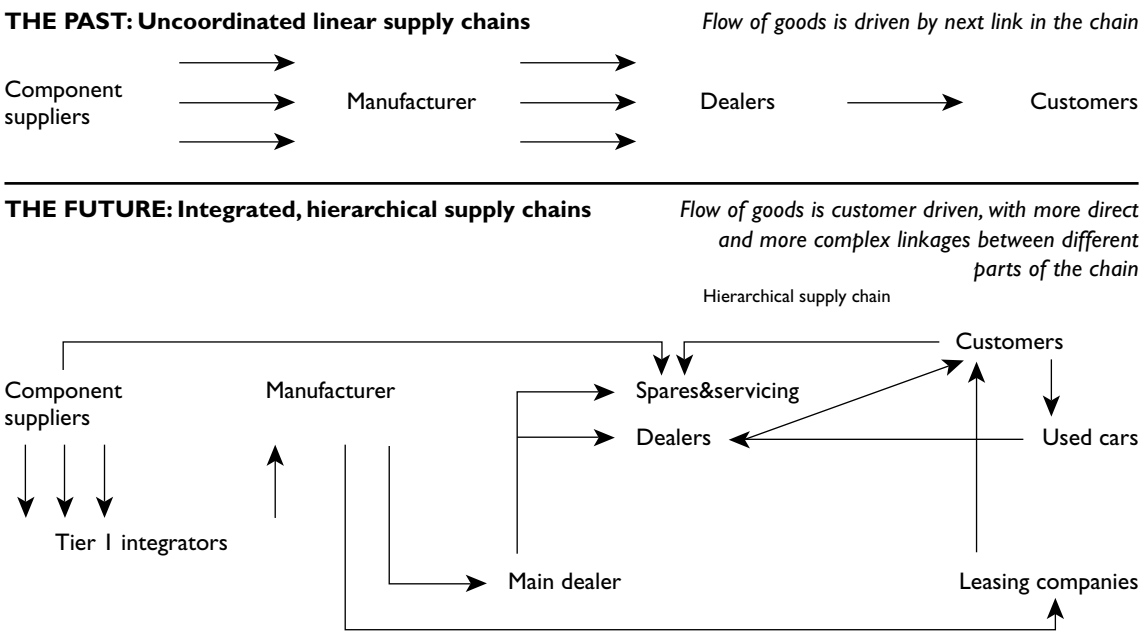
Logistics

Automotive logistics costs are said to be around 2% higher in Europe than in the US, mainly due to less efficient business processes. European car manufacturers are trying to reduce this difference by exerting more effective control over their supply chains, but still lag behind the US in terms of:

- the proportion of freight movements controlled by the manufacturers, particularly at the far ends of the supply chain (individual dealers and third tier components suppliers);
- the outsourcing of logistics to professional third party managers, who can integrate the movement of automotive products with those of other industries. At present only 25% of the €130bn European market in automotive logistics is outsourced; and
- the use of IT for improving supply chain efficiency.

The automotive industry has been in the forefront of EDI development with its own protocol (ODETTE), but this is not always used – particularly by small suppliers – and may be replaced by more user-friendly Internet-based supply chain management systems.

Figure 3. The Automotive Supply Chain



Transport

The automotive industry makes more use of rail than the other two sectors, and would transfer more traffic to rail if the quality of service were improved. However this is likely to require large scale investment and a culture change in the management of European railways.

3. General Conclusions: Locations

3.1. Primary Activities

Transport and logistics have relatively little effect on the global location of primary activities such as the manufacture and sale of final products. This is determined primarily by markets, labour conditions, financial incentives, and the social or cultural preferences of senior management. The size of a plant's hinterland is determined by two main factors – value per ton and product shelf life – but is often below the maximum because of the need for a physical presence in local markets in order to secure contracts. Transport and logistics influence regional and local location decisions where site accessibility is a significant factor, but they have relatively little effect on the national or global investment decisions which determine the level and distribution of economic activity within Europe.

The drift of primary activities towards Southern Europe has taken place in spite of transport and logistics considerations, rather than because of them. Southern Europe is separated from Northern Europe by four large logistics barriers – the Alps, the former republic of Yugoslavia, France and Germany.

Restrictions on road transport in the Alps are forcing goods to use more expensive inter-modal transport or travel longer distances through France. Political turmoil in the Balkans has further increased the industrial isolation of Greece. France, like other European countries, has unreliable rail freight services whilst in Germany the principal barrier is high rail track charges. In addition, several countries used by transit traffic impose restrictions on weekend or night time driving. As markets in Southern Europe mature, and slow down, these barriers will become an increasing obstacle to European integration and economic convergence.

Within Northern Europe the Benelux countries are often the preferred location for inward investment, as well as for activities which require a single European site. This is partly a result of their good transport and communications links, but also reflects the good business environment (flexible, multi-lingual labour, absence of regulations, willingness of the public sector to negotiate, incentives for large companies to locate there). The UK and Ireland are also favoured locations for linguistic, legal and tax reasons, particularly for US and Japanese companies.

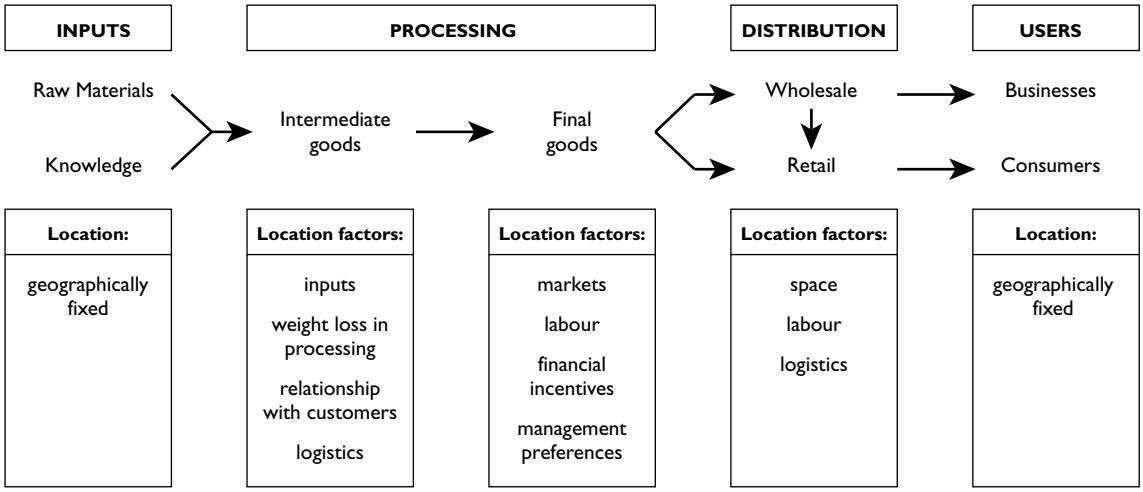
Non-European companies entering the European market for the first time are more likely than their European competitors to choose greenfield sites with good pan-European transport connections. This is because they see Europe as a single market which can be served from a single site, whereas most European firms still regard Europe as a series of loosely-linked national markets to be served from multiple sites. Non-European firms also have the advantage of starting with a clean sheet paper, and do not have to take into account the high levels of investment already committed to existing plants, sunk costs which would have to be written off in the event of a major relocation.

In addition, large foreign investors often bring with them their own suppliers, who are prepared to locate nearby. They also have sophisticated logistics systems capable of managing supply chains across several different markets. And because they have no past commitments to particular locations they are more likely to consult governments about their location decisions, especially if government grants are available.

3.2. Secondary Activities

Transport and logistics play a more important role in location of secondary industries – "upstream" and "downstream" activities such as components manufacture, wholesaling and distribution, and industries in the service sector. The importance of transport and logistics in location decisions varies according to the level of competition within the industry, the bulkiness of the products and their weight loss during manufacturing, the premium attached to quality/technological leadership, and the location of the activity within the supply chain.

Figure 4. Factors Influencing Location Decisions at Different Points in the Supply Chain



The value added by secondary activities is increasing relative to that of primary activities as more intermediary companies join the supply chain. One cause is the increased use of outsourcing, which allows supply chain functions to be unbundled and re-allocated through competitive tendering. Another is the move towards market segmentation, which supports smaller, more dispersed production units relying on bought-in services. However governments and local authorities still focus on attracting primary activities rather than assisting the development of secondary activities. This is partly because the structure of secondary activities – and the identities of the main players – are much less well known.

A significant factor in the spread of secondary activities is the use of postponement technology, in particular the stage at which companies customise standard products to meet the needs of individual consumers. Some manufacturers (for example in the automotive sector) find it more economic/convenient to do this at their main plants, but others (for example in pharmaceuticals) prefer to do it closer to the market, often outsourcing product customisation and installation to the companies responsible for product distribution.

The relationship between the location of primary and secondary activities is an important factor in the generation of transport demand. Secondary activities are frequently unable to locate as close to primary activities as they would like because of:

- land use planning controls;
- economies of scale, which make it more cost effective to have a single plant serving multiple clients rather than several smaller plants dedicated to the needs of individual clients;
- high relocation costs, particularly when existing staff have to be paid off;
- unwillingness to become dependent on a single large client at a time when inter-firm relationships are changing rapidly;
- government reluctance (central and local) to let established companies move to more cost effective or transport efficient locations outside of their own area.

For industry as a whole the separation of primary and secondary activities probably increases direct costs by no more than 0,5% although the figure will be higher for products which have a high volume:value ratio or are handled by several intermediaries.

There are undoubtedly some companies which would find it economic to relocate their operations closer to their customers, thereby reducing transport demand, but who are deterred from moving by financial costs, commercial risks, or political opposition at their previous or future location. These problems can only be resolved at local level, on a case-by-case basis. Local authorities should therefore take a more flexible and pro-active approach to industrial location issues, assisting moves in which the benefits of reduced transport demand outweigh other direct and indirect costs. This can be done by removing obstacles to industrial relocation or actively promoting the clustering of related activities.

4. General Conclusions: Logistics

The most important recent trends in logistics are towards:

- shorter order cycles;
- smaller, more frequent, more reliable deliveries;
- more varied delivery patterns related to product shelf life, product customisation, production/retailing strategy, and the reliability of short-term forecasting;
- closer relationships with fewer suppliers;
- outsourcing of logistics to third party logistics managers (TPLMs), which allows companies to share distribution facilities;
- more use of recycling, which has resulted in additional back-haul cargoes.

There is still considerable uncertainty about the future of E-commerce, and the impact which this will have on logistics.

With the trend towards smaller, more frequent deliveries the number of freight journeys should have increased faster than the volume of goods sold. This has not happened to the predicted extent because of steps taken by industry to keep transport costs under control. These include:

- development of sophisticated software to optimise vehicle routing, removing many of the inefficiencies associated with past journey patterns;
- increased use of cross-docking to maintain vehicle load factors;

- use of a smaller vehicles designed for urban driving conditions in the final stage of distribution. This is creating a demand for transhipment depots on the edge of towns, which are sometimes opposed because of their adverse local impact;
- trip spreading throughout the day, which reduces peak-hour goods vehicles movements;
- more vehicle sharing as TPLMs consolidate the flows of different clients. Even competitors now share transport, which is perceived as reducing costs without affecting market share;
- improvements in vehicle design to use the space within the vehicle more effectively (twin decks, pallet racking, high cube box frames, etc.)

The need for fast, frequent deliveries of small consignments has been one of the factors behind the explosive growth of express parcels carriers. This seems likely to continue, and will have three effects:
- an increase in transport efficiency, as it allows small and irregular flows to use shared facilities;
- a reduction in the importance of location as transport costs and quality of service become more uniform throughout Europe; and
- acceleration of the trend towards E-commerce.

Improving delivery reliability is expensive, as it involves the over-provision of transport capacity (longer scheduled journey times, spare vehicles, use of buffer storage space close to the final destination, provision of new transport infrastructure in advance of demand). So far improvements have been achieved mainly by the private sector acting on its own. But there are several things the public sector can do to improve the reliability of freight transport. These include:
- increasing the priority given to freight on congested road and rail routes (for example by allowing heavy good vehicles to use reserved lanes on motorways close to urban areas, or assigning more train paths to freight);
- enforcing parking restrictions (and perhaps reducing other traffic flows) in areas which are in regular use for goods delivery;
- providing common-user facilities at accessible locations for freight vehicle parking transhipment/cross-docking, and short-term storage.

Closer co-operation between industry and local authorities in developing urban freight plans could make a substantial contribution towards industrial efficiency whilst safeguarding environmental standards.

More varied delivery patterns are likely to result in a mixture of different warehousing and stock-holding strategies. Some standardised, low cost products with fairly long shelf lives will continue to be delivered in large batches, whilst customised or fast-moving items will require local buffer stocks to be held close to the point of use or sale, so that a carefully synchronised flow of products can be maintained, overcoming the supply problems caused by road congestion.

The move towards longer-term customer-supplier relationship should help to regularise freight movements, encourage investment in more efficient vehicles and rolling stock and make it easier to consolidate individual flows. It also allows logistics considerations to be incorporated into product design and marketing strategies.

The outsourcing of logistics to third party suppliers brings in professional management techniques and promotes the sharing of facilities, both of which increase transport efficiency. But the growth in outsourcing appears to be slowing down – in spite of the scope for productivity gains – because of fears about loss of control over the supply chain, the need for regular but informal contacts with customers and suppliers, and the high fees charged by high quality logistics managers.

Supply chain management does not have to be outsourced to be efficient, but there must be a single company somewhere in the supply chain which has the authority, information and incentive to take overall responsibility. This does not have to be a manufacturer – large retailers, shipping lines, freight forwarders, and components suppliers as well as TPLMs are amongst the many types of agent who believe they can fulfil this role.

However there still are many supply chains – particularly those involving small and medium size enterprises (SMEs) – which have no-one in charge, and are inefficiently organised as a result. There is a need for a mixed programme of research/consultation/advice to increase these companies' awareness of the opportunities for cost savings, to design fairly simply supply chain improvements which would be of immediate value to them , and to promote the use of best practice. Shippers organisations like the European Shippers Council (ESC) and the Association des Utilisateurs de Transport de Fret (AUTF) have an important role to play in increasing SMEs' awareness of the potential of logistics, by disseminating information about new developments and bringing together potential partners.

5. General Conclusions: Transport

Over 70% per cent of goods transport by land is by road. Traffic congestion is growing, but its costs are underestimated because official statistics do not take into account the "unseen" costs of the remedial measures used to maintain supply chain reliability – more dense depot networks, longer scheduled journey times, investment in reserve vehicles. In a world in which service reliability has become more important than cost, the key parameter for measuring road congestion is the cost of avoiding potential delays, rather than the costs incurred as a result of actual delays.

Concern about congestion, and the environmental effects of continued growth in road transport, has resulted in an aspiration to move more freight by rail. However there is a large gap between the transport service characteristics required by industry and the quality of service provided by European railways. Industry's requirements are for:

- uninterrupted international services;
- ability to handle small consignments (generally less than trainload and sometimes less than wagonload);
- frequent point-to-point services at scheduled times;
- guaranteed delivery times;
- conveniently located and easily accessible road-rail interchanges, and/or door-to-door delivery by intermodal transport;
- specialist wagons designed to meet the needs of individual cargo flows;
- automatic cargo tracking and monitoring;
- a faster response to queries and problems;
- support for the development of private sidings.

European railways fall far short of meeting these needs, and there is no perception within industry that the gap is closing. There are several explanations as to why this situation has arisen:

- national railways pay too much attention to costs and not enough to quality of service;
- railway networks are congested – at least in Northern Europe – with key bottlenecks restricting flows over much wider areas, so they do not have sufficient train paths available at the right time and place to accommodate more freight;

- priority is usually given to passenger services;
- it has been difficult to develop an entrepreneurial and customer-oriented culture within large public sector organisations;
- railways have not sought to expand the range services they provide to customers, for example door-to-door collection and delivery, consolidation and groupage, warehousing, IT-based order processing and Just-In-Time delivery;
- high charges for the use of rail infrastructure make it difficult for the railways to compete with road;
- most long-distance traffic (for which rail has a natural competitive advantage) crosses frontiers, which present obstacles to guaranteed high quality services.

However where railways have restructured their services to meet industry's need, the market response has been positive. EWS, the main provider of rail freight services in the UK, has significantly increased its market share of UK freight since its 1994 privatisation, through the introduction of a more commercial culture and new types of service. So we believe that it is right for the Council of Ministers to continue to promote rail transport, and support the steps which are currently being taken to develop a Trans-European Railways Freight Network.

There are some myths about the economics of rail transport which are being invalidated by modern logistics:

- rail transport is not necessarily uneconomic for short distances. Experience in the car industry has shown that regular high volume flows using dedicated facilities can support rail services at distances as low as 100km;
- the barrier imposed by national frontiers are not insuperable. Alliances between European railways for short haul cross-border shuttle services have shown that these barriers can be overcome through strong leadership and/or new institutional structures;
- the use of scheduled train services for less-than-trainload freight is not necessarily uneconomic, although start-up costs and commercial risks are fairly high until the critical mass of traffic has been acquired.

Conclusions such as these demonstrate the need to consider rail freight opportunities on a case-by-case basis – at company or plant level – and to adopt a wider and more imaginative approach towards the design and costing of rail services.

In road transport, there is a conflict between the steps which industry would like to see taken to make it more efficient – authorisation of larger vehicles, relaxation of restrictions on driving hours, construction of more motorways, limits on the growth of car traffic in towns – and the arguments for limiting the growth of road freight put forward by environmentalists, motorists and local residents. Road user charging has an important role to play in achieving the optimum distribution of traffic between modes, reassigning road space between passengers and freight, and restraining the total level of transport demand.

However, the demand for road transport of freight is fairly inelastic, as the alternatives (rail, air, sea and inland waterways) are regarded as unsuitable by many companies. Higher road user charges (vehicle and fuel taxes, vignettes and tolls) will therefore have very little effect on the modal split of freight unless they are combined with structural reforms to make other modes of transport (particularly railways) more acceptable. Otherwise user charges may have to be set at levels which would have a detrimental effect on economic growth in order to have a significant effect on modal split.

Air and sea transport have been more successful than the railways in attracting freight away from road. The main reasons for this appear to be:

- the availability of scheduled services;
- the provision of intermodal door-to-door transport, either directly or through agent/forwarders;
- a commercial, customer-oriented culture with (in the case of shipping) a large element of competition;
- services which are reliable (air) or can be easily monitored (sea).

Inland waterways have experienced little overall traffic growth because of the decline in the bulk trades, but have performed well in niche markets (for example the Rhine container trades) with similar characteristics to air and short sea shipping.

The industrialists taking part in the study were unanimous in their demand for efficient door-to-door transport, and saw the various modes as complementary rather than competitive. There was a general willingness to consider multi-modal solutions to their requirements, but a cautious approach was taken to making any commitments until quality, reliability and cost-effectiveness of such solutions had been clearly demonstrated.

6. Recommendations

6.1 Location

Recommendation 1: Investment Incentives

The European Commission should promote the harmonisation of national and regional investment incentives, as these have a significant effect on location, particularly for investment coming from outside of the EU. It could also seek ensure that transport and logistics considerations are taken into account in the design of projects receiving direct EU assistance, for example through the Structural Funds.

Recommendation 2: Removal of Barriers to International Logistics and Trade

The European Commission should continue to work towards the removal of logistics barriers which affect international trade, such as high rail track charges or restrictions on weekend driving, to reduce the locational disadvantages of peripheral areas and increase the cohesiveness of the Single European Market.

Recommendation 3: Better Planning Guidelines

National governments should develop guidelines for local authority planning regulations which take into account the social and environmental impact of industrial location decisions, including their implications for long-distance as well as local transport. There is a clear need for stronger linkages between transport and land use planning, and a need to develop evaluation methodologies for land use plans which take into account their overall economic efficiency and sustainability.

Recommendation 4: Industrial Clusters

The European Commission should – in association with national governments – sponsor pilot projects aimed at the promotion of industrial clustering, where this can be shown to reduce transport needs or make a significant contribution to the success of urban freight plans.

6.2 Logistics

Recommendation 5: Assistance to Small and Medium size Enterprises

Improvements in supply chain management bring benefits to both their sponsors (cost savings) and the wider community (lower prices for goods and slower growth in goods vehicle movements). Because many small and medium sized companies (SMEs) are unaware of these benefits, the European Commission should encourage national governments to make some assistance available to encourage SMEs to move faster in adopting modern logistics techniques. This could take the form of:

- direct financial assistance to individual SMEs for a professional diagnostic review of their logistics systems. This would be fairly short – with external paid assistance restricted to a maximum of (say) 20 man-days – and would perhaps be restricted to SMEs trading internationally;
- education, training and publicity programmes
- support for a small number of demonstration projects.

Recommendation 6: Urban Freight Plans

Many local authorities still need technical assistance for the development of urban freight plans. Some EC-sponsored research projects have already begun, but a "Communications Plan" is needed to disseminate best practice, perhaps involving study visits and the exchange of experience between local politicians and industrialists.

Urban transport planning has traditionally been dominated by the management of passenger flows, and most public authorities' knowledge of freight requirements is sparse. Few planners working in the public sector have any basic skills in logistics, which makes it difficult for them to evaluate alternative solutions to freight transport problems. To redress this imbalance the development and testing of new techniques for the evaluation of freight strategies should be given strong support within the EC's transport research programme.

The TEN-T programme for freight terminals, which already covers multi-modal platforms, should be extended to cover road-road transfer points on the outskirts of large cities, even though this could result in a large increase in the number of terminals eligible for EU funding.

Recommendation 7: E-Commerce

There is an urgent need for more research into the logistics and transport requirement of E-commerce, covering issues such as the additional growth in transport demand which it will generate, the location and ownership of collection and delivery hubs, the role of Post Offices and express parcels carriers, the scope for using intermodal transport, and the impact on city centres and out-of-town shopping areas.

Because E-commerce is moving so quickly, and will have a very large (if uncertain) impact, its research need cannot be handled through traditional research contracts. We recommend that the European Commission should set up a special monitoring unit with high level reporting lines, to produce fast and effective policy responses to a rapidly changing situation.

6.3 Transport

The most important single issue in freight transport is how to achieve a better balance between road and other modes of transport, taking into account differences in cost, quality of service, safety and environmental impact, and the need to build additional infrastructure.

An appropriate modal split will depend on:

- the availability of cargo which can be consolidated into flows suitable for intermodal transport;
- the scope for improvement in the quality of service offered on European railways;
- the pricing policies adopted for road and rail infrastructure, which in most countries will remain in the public domain or under fairly strict regulatory control;
- the capacity available for freight on existing road and rail networks; and
- other public policy measures designed to support the growth of intermodalism, including the harmonisation and updating of regulations relating to carrier liability.

Our recommendations address each of these points in turn.

Recommendation 8: Survey of Shipper Requirements

In order to improve the planning of the European transport system it is important to know more about shippers' requirements, particularly for shippers who have a genuine choice between different routes and modes.

There is a reasonable amount of freight traffic which could use non-road transport for at least a part of its journey, but it is widely dispersed and very little is known about its service requirements or responsiveness to different service offerings (price/frequency/transit time reliability). It needs to be identified at the level of the individual company, plant or materials flow – the ranking of potential markets by industrial sector does not go far enough – and in depth interviews should be used to ascertain the circumstances in which specific cargoes would be transferred from road transport to other modes.

Whilst it is unrealistic to do this for all companies which could switch modes (except as part of the carriers' normal marketing efforts) an EC-sponsored study to identify the 500 largest European freight flows which could be transferred from road to other modes, and the conditions which would allow this to occur, would add a lot to our general understanding of the potential for intermodal transport.

Recommendation 9: Monitoring Transport Performance

One of the most important conclusions of this study is that it is quality of service, rather than price, which underlies many transport decisions. Financial incentives for the use of rail or changes to road taxation and user charges to provide a "level playing field" will have very little effect unless the quality of alternative modes can be improved. We therefore recommend that the European Commission becomes more closely involved in the monitoring of transport service quality on order to keep up the pressure for continuous performance improvements.

The quality of transport services can be defined in terms of specific criteria such as:

- frequency, minimum consignment size, door-to-door collection and delivery times, security and reliability;
- the use of vehicles and rolling stock which satisfy the technical requirements of the cargo flows they are intended to handle;
- response times to customer queries and changes in shipping instructions;
- provision of information about cargo status and the use of cargo tracking systems;
- willingness to accept liability, and offer compensation, when things to wrong;
- a commercial and flexible approach to the negotiation of price and quality of service;
- willingness to provide freight consolidation services, or work closely with other companies in this area;
- resolution of problems relating to the movement of goods across national frontiers.

The improvements in these areas required to attract a substantial increase in rail freight are large, and will almost certainly involve a culture change within national railways, leadership from outside of the railway industry, or the creation of new rail freight service providers. Achieving this magnitude of change lies outside of DG TREN's direct responsibility, yet it can create substantial pressure for change by introducing a Europe-wide system for benchmarking performance in terms which are demand-led rather than supply-led.

Resources should therefore be assigned to developing new types of transport statistics which reflect shipper requirements more closely. Initially performance benchmarking – over time and between countries – should be confined to the railways, but with provision to extend it to other modes of transport once experience has been gained. Once objective performance indicators are available, the Council of Ministers should agree with the European railways' managements a series of targets for performance improvement, particularly in relation to international traffic.

Recommendation 10: Infrastructure Pricing Policies

The incorrect pricing of transport has been one of the causes of sub-optimal industrial location patterns. Supply chains will only be shortened if transport prices become more closely related to transport costs, and an appropriate modal split will only be achieved if road and rail infrastructure are priced on a comparable basis.

However the pricing of road and rail transport is moving in opposite directions, as rail freight pricing becomes more market-based and road infrastructure pricing (tolls, vignettes and motoring-related taxes) becomes more oriented toward full cost recovery.

Within the past three years a great deal of useful work has been done (separately) on road and rail infrastructure pricing. This should now be integrated to provide a common approach to infrastructure pricing. Although it will be very difficult to find a formula which establishes fair competition between modes whilst satisfying other policy objectives, this does not mean that the attempt should not be made. The study of infrastructure capacity constraints (recommendation 11) would provide a unified policy framework for a study, and may help to resolve the methodological disputes which have affected previous pricing studies.

Recommendation 11: Capacity Constraints in Transport Infrastructure

There are serious capacity constraints affecting road and rail infrastructure, especially in Northern Europe. Failure to secure sufficient, suitably-timed train paths has been one of the main reasons why rail freight services are so poor and unreliable, whilst road congestion is significantly increasing logistics costs.

There are five possible solutions to this dilemma:

- develop transport management techniques which will allow more capacity to be squeezed out of the existing networks;
- transfer some train paths from passengers freight;
- move cars off the roads to make space for good vehicles, by suppressing passenger travel demand or transferring it to rail;
- invest to increase the capacity of road or rail infrastructure (or both)
- price transport so as to reduce passenger or freight demand, by road or rail, where this can be done without adverse consequences on economic growth.

The European Commission, through its transport research programme, should take the lead in developing an economic evaluation methodology which can determine the most appropriate balance between these strategies. This should consider:

- the comparative costs and benefits of alternative transport service patterns (including externalities);
- the financial, institutional and regulatory changes which would allow better use to be made of existing transport infrastructure (for example lower prices for services prepared to accept longer, less heavily utilised routes, reservation of road space for specific types of vehicles, and new types of transport service);
- the costs and benefits of removing key bottlenecks within each networks;
- the political acceptability of the mechanisms which would be required to channel transport demand into the most economically desirable service patterns; and
- the impact of the proposed changes on economic growth, particularly at regional level.

Recommendation 12: Institutional Changes

EU support for intermodalism has so far concentrated on the technical and physical aspects. But for intermodalism to be really successful there is a need for complementary action to create the legal/organisational framework which will allow new types of service provider to emerge.

It is already clear that intermodalism will require:

- more reliable, improved services by non-road modes of transport;
- accessible, low cost interchange facilities;
- high quality support services for logistics, including consolidation, documentation, cargo tracking and consignment re-routing when circumstances change or things go wrong;
- consistency of regulation throughout and between the various transport networks.

However the organisational structures required to implement these changes are much less obvious. Some experimentation may be required in pilot schemes involving new types of service provider, and EC support may be necessary to share the financial risks associated with the start-up costs of such schemes.

There is also a need to ensure that the present legal framework does not impede the growth of large, vertically integrated logistics provider (for example the Deutsche Bundespost group), whilst providing for them to be properly regulated. The Energy and Transport Directorate should have a watching brief over organisations, and should be prepared to act swiftly with the Competition Directorate if there is any abuse of market power.

Finally, the European Commission should encourage national governments to allocate capital expenditure intermodally, on a corridor "problem" basis, rather than by mode.

Recommendation 13: Clarification of Carrier Liabilities

The management of transport services is becoming more complex as different parts of the operation are outsourced, and inputs are brought together from all over Europe or even – in some cases – from outside of Europe. It is quite common for road haulage in one country to be provided by a company registered in another member state, using vehicles or sub-contractors registered in third countries, and drivers of yet another nationality. Legal liability for accidents or non-compliance with national regulations or standards can become very blurred and difficult to enforce, and provides no incentives for better behaviour in future. The situation becomes even more confused when the journey involves more than one mode of transport.

The European Commission should sponsor a study of carrier liabilities throughout Europe, with the objective of clarifying and harmonising legal procedures, improving communications between the regulatory authorities in different member states, and raising minimum acceptable quality standard for vehicles, drivers, and the organisations managing freight transport.

The recommendations 1-12 listed above are most urgently required in the congested areas of North West Europe (West Germany, the Benelux countries, SE England and the Ile de France). In the more peripheral areas transit rights through other countries to key European markets and the under-development of local transport services are more important issues than achieving a more balanced modal split.

Recommendation 14 : Transit Corridors

Much of Europe now has a "7 day" economy, whose efficient working is hindered by weekend and night time driving restrictions in certain transit countries. The European Commission should therefore take the lead in negotiating waiving of these restrictions in multimodal transit corridors to Southern and Eastern Europe and Scandinavia, without necessarily requiring any change in national transport policies in the surrounding territory. Each Member State can grant its own derogations or waivers from these restrictions (although in some cases these powers have been delegated to regional authorities) and may be prepared to do so in return for similar concessions from other Member States, or financial assistance from the EU for multi-modal investment projects which help to overcome the problems the driving restrictions were originally intended to address.

Recommendation 15: Extension of Structural Funds Assistance from Transport Infrastructure to Transport Services

The development of logistics and transport services in Western Europe has been patchy. Financial support from the EU Structural Fund and the Cohesion Fund has brought about large improvements in transport infrastructure, but these now need to be matched by service improvements. Although the problems of funding investments other than fixed assets are well known, the use of EU funds for the "soft" investments in transport services – cargo consolidation facilities, cargo tracking, communications, training – should therefore be investigated. It would be useful for DG TREN to list the criteria which could be used by the Regional Development Directorate to identify the types of transport service improvements which might be funded on an experimental basis.

Annexe A. Glossary of Terms

Active ingredient: the chemical within a pharmaceutical product that produces the desired medical response in consumers.

Benchmarking: comparison of the physical and financial performance of one undertaking with that of others producing similar goods and services, in particular the undertaking regarded as "best of class" AND/OR comparison of the actual performance of an undertaking with precisely defined targets.

Carrier: a company accepting responsibility for the transport of goods for all or part of the door-to-door journey.

Combined transport: the movement of goods on more than one mode of transport under a single transport contract.

Common transport policy: a statement of policy published by the European Union in 1992 and updated in 1998 as The Common Transport Policy. Sustainable Mobility: Perspectives for the Future (COM (1998) 716 Final/2). This emphasises the free movement of people and goods, the development of integrated, sustainable transport systems, the use of transport to reduce regional disparities, improvements in safety, better working conditions in transport, and the improvement of links to countries outside of the EU.

Cross-border moves: the establishment of a manufacturing or sales outlet in one country by a company registered in another country.

Cross-docking: the transfer of goods between vehicles without intermediate storage.

Dealerships: companies which sell manufactured products AND a range of associated services.

Discount stores: self-service grocery stores that sell a limited range of products at below-normal prices.

Distribution: the process of moving goods from the manufacturer to the final consumer.

Foreign direct investment: the purchase of fixed assets or shares by a company registered in another country.

Freight forwarder: a company which arranges goods transport on behalf of other companies.

Goal: an ideal situation, stage or quality to which activities are directed, but which cannot necessarily be fully achieved.

Hypermarket: a supermarket with a floor area of over 2,500m2 (in Sweden 1,500m2).

Interchange: the location at which goods are transferred between vehicles or modes of transport.

Intermediate goods: goods which require further processing before sale to the consumer.

Inter-modal: the use of more than one mode of transport during a single door-to-door journey.

Logistics: management of flows of materials, information and money in a way which allows raw materials to be transformed into finished products.

Multi-modal: the use of more than one mode of transport during a single door-to-door journey.

Output: the gross value of goods and services, at market prices.

Out-of-town shopping centre: groups of large shops on the outskirts of towns, with shared access and car parking arrangements.

Over-the-counter (OTC) drugs: drugs which can be purchased without a doctor's prescription.

Pharmacy: an establishment that employs professionally qualified staff licensed to sell all types of drug.

Primary activities: the manufacture and sale of consumer products.

Regional distribution centre (RDC): large warehouses providing short-medium term storage and associated logistics services for goods which will move directly into the shops without any further storage.

Retailing: the sale of goods to individual consumers.

Secondary activities: the manufacture of capital and intermediate goods, inputs into the production, distribution and sale of consumer goods, and activities associated with post sales maintenance and servicing.

Shopping mall: a group of shops at one location, built by a single company but occupied by many retailers offering different types of product.

Short-sea shipping: the movement of goods by sea between ports in Western Europe.

Small and medium enterprises (SMEs): companies with fewer than 250 employees.

Supermarket: a self-service store with a floor area of over 500m2, selling food and drink and other household items.

Sustainability: a situation in which the use of renewable resources does not exceed their rate of regeneration, the use of non-renewable resources does not exceed the rate of development of sustainable alternatives, and the emission of pollutants does not exceed the capacity of the environment to absorb them.

Third party logistics manager/provider/supplier (3PLs or TPMLs): a company which manages on behalf of others the flow of materials, information and money associated with the manufacturing and distribution of goods.

Tier 1 suppliers: companies which supply intermediate goods directly to manufacturers of finished products.

Tier 2 and 3 suppliers: companies which supply intermediate goods to other manufacturers of intermediate goods.

Train path: the right to use specified railway infrastructure between two locations at a specified point in time.

Transport infrastructure: the immobile fixed assets involved in the production of transport services.

Transport policy: the process of defining measures within the transport sector to achieve goals within any sector of society.

Transport services: the movement of passengers or goods from one location to another.

Transport system: the combination of infrastructure, vehicles and services required to move people or goods from one location to another.

Value added: the difference between the sale price of a good or service (net of tax) and the price paid for purchased inputs other than labour and capital.

Western Europe: member states of the European Union plus Norway and Switzerland.

Wholesaling: the sale of goods by companies other than the manufacturer to companies intending to sell the goods to consumers without any further processing.

Annexe B. Bibliography

General Economic Trends

EC Directorate for Economic and Financial Affairs *Report on Structural and Economic Reform in the European Union* 1999
EC Directorate for Economic and Financial Affairs *Mergers and Acquisitions* 1997
Eurostat Yearbook 1997
Eurostat *Panorama of European Industry* 1997
OECD *Main Economic Indicators* 1998
OECD *Industrial Structure Statistics* 1998
European Commission *Regional Growth and Convergence* 1997

Location

NEI/Ernst & Young *New Location Factors for Mobile Investment in Europe* 1993, European Commission (DG XVI) Regional Development Studies (6)
Ernst & Young *Regions of the New Europe* 1995
A. Silberston and C.P Raymond *The Changing Industrial Map of Europe* 1996
UK Department of Trade and Industry *Invest in Britain* 1999
OECD *International Direct Investment Statistics Yearbooks (various)*

Logistics

European Logistics Association *European Logistics Forum* 1998
European Logistics Association *European Logistics Conference* 1997
European Logistics Association *Towards the 21st Century: Trends and Strategies in European Logistics* 1997
European Logistics Association/A.T Kearney *Insight to Impact: Results of the Fourth Quinquennial European Logistics Study* 1999
A.T Kearney *Logistics Excellence in Europe* 1993
Anderson Consulting/Cranfield School of Management *Reconfiguring European Logistics Systems* 1993
TRILOG European Task Force *Progress Reports* 1999
J. Cooper *Logistics and Distribution Planning* 1988
Carrick Holmes *Supply Chain Management* (undated)
R.H Balou *Basic Business Logistics* 1987
A Ruston and J.Oxley *Handbook of Logistics and Distribution*
European Logistics Consultants *Logistics in Europe – The Vision and the Reality* 1996
PE Consulting *The Changing Role of Third Party Logistics* 1996
Containerisation International *Third Parties Consolidate* April 1999
Containerisation International *CI Poll Shows Shipper Priorities* November 1999
M Bedeman *Setting the Standards for the European Logistics Industry: A Unilever Initiative* 1995
M. Pellew (Financial Times) *Pam European Logistics* 1998
European Logistics Forum, Genoa 23-25 September 1999

Transport

EC (DG VII) *The Common Transport Policy (COM (92) 494 final)* 1992
EC (DG VII) *The Common Transport Policy. Sustainable Mobility: Perspectives for the Future (COM (1998) 716 Final/2)* 1998
EC (DG VII) *Transport in Figures* 1998
ECMT Round Table 101 *Express Delivery Services* 1996
ECMT Round Table 109 *Freight Transport and the City* 1999
ENO Transportation Foundation *Intermodal Freight Transport in Europe and the United States* 1998
European Commission (DG VII) COST 321 *Urban Goods Transport* 1998
European Commission (DG VII) COST 314 *Express Delivery Services* 1997
Freight Transport Association *Review of Research on Freight Transport and Logistics* 1999
D. Charles, R. Richardson (University of Newcastle) *The Convergence of Transport and Communications* 1993
Symonds Group Ltd *Study of the Magnitude of Network* Effects in the Trans European Railway Network1999
F. Worsford & K. Mitchell *The European Road Freight Industry* 1998

Retailing

Eurostat *Retailing in the Single European Market* 1993
Institute of Grocery Distribution (UK) *Grocery Wholesaling* 1998
Institute of Grocery Distribution (UK) *Grocery Retailing* 1999
Institute of Grocery Distribution (UK) *Retail Distribution* 1998
SMI Group *Supply Chain Management in Food & Drink* Conference 13-14 September 1999, London
Hillier Parker *Retail Warehouse Parks in the Pipeline* 1998
British Retail Consortium *Take a Look into the Future of Retailing 2003* 1999
Corporate Intelligence on Retailing *The European Retail Handbook* 1998
T. Burke, J. R. Shackleton (IEA Hobart Paper 130) *Trouble in Store: UK Retailing in the 1990s* 1996
Oxford Institute of Retail Management/Jones Lang Wooton *Shopping for New Markets: Retailers' Expansion Across Europe's Borders* 1997

Pharmaceuticals

Groupement International de la Répartition Pharmaceutique Européenne Database 1999
Economist Intelligence Unit *Over the Counter Pharmaceuticals in the European Union* 1995
Healthcase Delivery Services *Issues in the Healthcare Industry* (Various papers, 1995 onwards)
Euromonitor *Pharmaceuticals*: A World Survey 1997

Automotive

Society of Motor Manufacturers and Traders *World Automotive Statistics* 1998
IBC UK Conferences Ltd Global Automotive *Trades & Logistics* 1999
C. Wright, H. Hunston, A. Lewis (Financial Times) *Automotive Logistics* 1998
A.T Kearney (Financial Times) *The Future of Automotive Distribution* 1998
KPMG Europe on the Move: *The KPMG Review of Automotive Retail and Manufacturing 1998*
P. Capella *World Commercial Vehicle Forecasts* 1996
M. Harbour *Winning Tomorrow's Customers: Future Directions in Car Retailing and Servicing in the UK* 1997
D. Wilson, Automotive Strategies Group *The Global Automotive Components Report* 1998

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