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DETERMINING THE PROSPECT FOR A SHIFT IN MODAL SPLIT IN FREIGHT TRANSPORT

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SUMMARY

A research project was commissioned by the Dutch Government to identify the factors which determine modal choice in freight transport and to assess the potentials for a shift from road to rail and water transport. The research findings can be used to assist the formulation of strategies to influence modal split.

1. INTRODUCTION

In the Netherlands, the expected growth in road traffic generated by passenger travel and goods transport by road go hand in hand with the problem of worsening congestion and deteriorating environment. These related developments cause grave concerns. The Dutch Government has, in diverse policy documents such as the Second Transport Structure Plan (SVV-II) and the National Environmental Policy Plan (NMP), set out its policy aims to alleviate congestion and to mitigate the damages to the environment caused by road traffic. The difficulty is to achieve these aims without slowing down the predicted growth in the national economy.

For the protection of the environment, the problem rests not so much with the number of freight vehicles on the road, but rather the number of vehicle kilometres that road freight generates. It is estimated that the share of road haulage in inland transport in 1988 amounted to 80% of total ton kilometres transported. Moreover, the expectation is that goods traffic on the road on the basis of unchanged policy will grow stronger than passenger road traffic.

The most recent estimate in volume terms is a growth by 80% to the year 2010. If the consequences of these underlying trends have to be overcome without restraining economic growth, there are 3 action areas:
- development and application of clean diesel engine;
- improving the efficiency of road transport;
- shift from road transport to rail and inland waterway.

The subject matter of this paper concentrates on the third action area.

Section 2 describes the background and the objectives of the research study. Section 3 outlines the method and approach being used. Section 4 presents the results and gives a brief account of the main findings. Section 5 presents the general conclusion which raises several points for policy considerations.

2. BACKGROUND AND OBJECTIVES OF THE STUDY

The underlying philosophy of the Second Transport Structure Plan is: accessibility, managed mobility and environmental amenity. The aim is to develop an integrated transport system with a right balance. Research study has indicated that motor vehicles are responsible for 18% of acid rains in the Netherlands while some 50% of photochemical smog is due to vehicle emissions. As such, road transport is a major contributary factor to environmental deteriorations. At the same time, it is widely recognized that parts of the traffic are economically valuable and are wealth generating. Thus, they provide the necessary earnings to support the efforts to improve the environment. The policy goal is, therefore, to design a correct mix of measures in a comprehensive strategy such that emissions by motor vehicles of the oxides of nitrogen (NOx) and unburned hydrocarbons will be significantly lower in 2010 than in 1986.

Arising from this background, the Netherlands Ministry of Transport and Public Works (V&W) together with the Ministry of Housing, Physical Planning and the Environment (VROM) have commissioned a research project to study the choice of modes in freight transport with a particular aim to explore the possibilities to stimulate the transfer of goods transport by road to rail and waterway. There are 3 important study objectives:

I : To examine the decision-making process in order to identify the factors that influence the modal choice.
II : To determine the bottlenecks, constraints and impediments which can hinder a transfer from road to rail and water transport.
III : To identify the potential areas which offer opportunities for transfers.

It is designed to be an orientation study to gather information on the existing state of affairs and to learn from empirical studies how transport organisers and shippers reach their decisions on modal choice in circumstances where alternative means of transport are options. In doing so, the researchers working together with the policy makers are seeking
- to define the action areas
- to explore the opportunities that exist (and)
- to assist the formulation of strategies.

3. METHOD OF STUDY

The study was carried out over a period of 10 months by two consultants, namely: Netherlands Economic Institute (NEI) and the Netherlands Centre for Transportation Research, Training and Consultancy Services (NEA). The research was organised in 3 phases.

Phase I	:	literature study and analysis of available data; the focus was facts finding and forming of working hypotheses.
Phase II	:	a meeting with experts from the shippers and transport organisers to consolidate the knowledge accumulated, to test the hypotheses formed in phase I and to select market segments and companies for the field research.
Phase III	:	field work in two parts: in-depth interviews with transport and logistic managers and the use of the Stated Preference technique (computer game to simulate alternative choice situations) to assess the willingness of shippers to switch from road to rail or water transport.

The focus of the analysis was to find ways and means to stimulate competition between the different transport modes in a free market. Because the Government policy in the Netherlands is to maintain free choice of transport modes by shippers, it is decided at the early stage of the study to concentrate on the price/quality relationship and to examine how policy measures can be formulated to change the balance of advantages (or to remove barriers). The result of analysing existing statistical sources and data collected from a survey of shippers carried out nationwide in 1988 suggested that it would be useful to distinguish the freight flows between 2 major groups.

Conventional transport:
This is the traditional form of transport, mainly point-to-point, transporting the products in limited number of O/D relations, often in large volume with fairly stable regularity; distribution transport is also included in this group.

Standardized (combined and intermodal) transport:
This is freight transport with standard loading units such as containers or swap bodies. More than one transport mode will be used. Combined transport is primarily based on land terminals and intermodal transport on seaports.

4. RESULTS AND FINDINGS OF THE STUDY

4.1. Factors Affecting the Choice of Modes

A comprehensive literature survey identified a wide range of factors that can play a role in the modal choice. In the present study, a special effort is devoted to examine those factors that can be measured such that the extent of the influence on modal choice can be quantified and ranked. A list of the criteria and their ranking orders for road transport, railway and inland waterway are given in table 1; they are the results from the 1988 shippers survey. The shippers were being asked to rate the criteria with a points-rating system which has a value range between 1-6.

Table 4.1. Average Value and Ranking Order of Criteria for choosing Road Transport, Railway and Inland Waterway

Criteria	Road transport		Railway		Inland waterway	
Punctuality	4.68	3	3.43	5	3.66	3
Price	4.83	1	4.08	2	6.18	1
Availablity	3.65	5	3.60	4	3.60	4
Reliability	4.81	2	4.72	1	4.48	2
Speed	4.48	4	3.37	6	2.81	6
Demand by other party	2.97	6	3.98	3	2.91	5

4.2. The Decision-making Process

From the experts meeting and the in-deph interviews, it was found that, in practice, the decision-makers only take a handful of factors in account. They often operate in a "captive" market or this is (at least) the perception of their own position in the short run. Generally speaking, speed and price were listed by the transport manager as the two foremost factors which influence their choice of transport modes.

The actual decision on which transport mode to use is strongly influenced by the individual circumstances confronting the decision-maker. He is likely to (re)consider his position after a bad experience, when introducing a new form of packaging, anticipating new developments in government policy or seeing commercial opportunity. He tries to weigh up the costs and benefits in general terms even though he is often confronted with the difficulty to weigh up costs with other considerations which cannot be expressed in monetary units.

In the simulation game, it was found that according to some managers there would be no real alternative to the existing practice of using road transport. However, in the course of playing the simulation game, they discovered that if the balance of advantages were changed and certain required conditions were met by the competitor, they would actually consider a shift in mode. This suggests that decision-makers often have preconceived ideas of the cost/quality of the alternatives available and the negative images play a part in affecting their search for alternatives. Secondly, when they genuinely look for alternatives on the basis of economic costs, they are willing to accept relatively lower quality in the alternative mode of transport if substantial cost advantage (30-50%) is offered as monetary compensation.

4.3. Background Trends and Recent Developments

In the last decade, there was a gradual but steady shift in favour of road transport. Several factors are responsible for this development. Firstly, the demand for flexibility in the production process and the application of the just-in-time concept give rise to changes in the structure of production, storage and distribution. There is a demand for fast and punctual physical distribution of urgently-required materials in small quantity, a trend which favours road transport.

Secondly, railway and inland waterway tend to be in a historically stronger position in areas such as low value goods transport carried in bulk (e.g. building materials such as sand and gravel) and in fixed flows with a known volume on well-established O/D relations (e.g. chlorine between Rotterdam and Delfzijl or oil between Schoonebeek and Rotterdam). The concept of zero or minimal stock means frequent individual shipments in smaller quantity. Rail and water transport have not responded adequately to these new developments. The products they offer remain, by and large, unchanged. This is in big contrast to what has been achieved in road transport which has made many innovative efforts to cut costs and to offer more attractive terms. In many cases, road hauliers join in with their clients to find innovative solution to their problem of organizing physical distribution.

Thirdly, there are structural handicaps for the railways and waterways. In the Netherlands, where there is an important passenger rail-network, priority has to be given to passenger transport and goods transport by rail comes as a filled-in activity. Investment in infrastructure for rail freight transport has been neglected with closing of loading und unloading facilities, winding up of terminals or discontinuing rail connections to transport organisers. Withering infrastructure and neglect in new investments deter many potential customers. The inlands waterways have not awakened to the new challenge either and the over capacity situation does not stimulate the operators to invest in system improvement.

In the last years, there was a gradual awakening; but, the lost trades in practice are particularly difficult to recapture whilst new customers are difficult to attract. To move goods by rail and waterways requires certain investments in facilities which are costly and take long term operation to recover the initial cost outlays.

4.4. Thoughts for the future

From the experts meeting and the in-depth interviews it is found that many shippers are conscious of the following:
- the adverse effects of road traffic on the evironment is an important public issue; many shippers are wary of negative publicity e.g. in chemical industry;
- worsening congestion would affect their operating efficiency e.g. unplanned variability in transport time is a threat to punctuality;
- new policy measures e.g. toll, extra excise duties on diesel would increase the transport costs by road.

The willingness to think about alternative ways of transport exists and the readiness to find an appropriate solution together with the authorities is growing. It is also recognised that many of the problems cannot be resolved at a national level and efforts should be made in an endeavour to find common solutions at an international level.

4.5. The Problems and Impediments to Modal Switch

4.5.1. Underlying strength of road transport

The strong points are their competitive prices, their flexibility and the market-instinct of many operators (to think along with the transport organisers or shippers to find the best solution for the clients). Furthermore, many producers have cited the value of knowing the operators as an important factor; many have grown up together with the firms over the years. The driver of the lorry is often responsible for the delivery and the handling. The personal relationship e.g. the knowledge that the same person(s) are always in charge give confidence regarding the quality of service that can be expected.

4.5.2. Lack of infrastructure

Part of the rail freight network and specific sections of the inland waterways do not have the necessary capacity to handle the growth in traffic should the shippers decide to switch over from road. Infrastructural investment is needed to cope with the increased volume. At the operating company level, adequate rolling stock has to be made available to convince the shippers that they are capable of meeting the demand in a switch over situation. An important finding of the study is that improvement in infrastructure is a necessary but on its own not a sufficient condition to bring about the hoped for shift in mode choice.

4.5.3. Lagging behind in technical innovation

A direct consequence of relative neglect in the past years is the failure to pursue technical improvement and to invest in new facilities. From the shippers survey, it is shown that they put high value on the risk of damage. To minimize the risk, they have to spend extra on additional packaging. To reduce this risk, the railways and inland water transport operators could invest in modern handling equipments at the terminals for transshipment which are not only faster but also less prone to damage the transported goods. Another area for improvement is in the administrative process. The wider implementation of information technology such as EDI would speed up the process of handling and clearance as well as for the monitoring of freight movements.

4.5.4. More positive and commercially orientated approach

Rail freight operation tends to take a lay-back approach. The railway has rarely taken the initiative to attract new customers. Only occasional contacts are made with large clients to strengthen existing contacts. Potential customers, often small companies with growth potential, feel neglected. Inland waterway operators have a similar image problem. For internal transport, the inland waterway carriers wait at the Shipping Exchange for customers to come to them. For international transport, they occasionally approach potential customers for business. The in-depth interviews and the simulation game indicate that, when shippers try to obtain information, enormous efforts are required to assemble the correct information. In a few cases, this put off the would be customers. It is, therefore, advisable that both the rail and water transport operators should adopt a positive marketing strategy to inform potential clients and (in suitable cases) to work out transport plans and bring them to the notice of the customers as a signal that viable alternatives exist.

4.5.5. Clear line of responsibility within the organisation

The existing organisation of rail freight is functional, along the line of a transport operating company. The division of responsibility means that each department has its own function and responsibility. It is difficult for the shippers to have direct access to the right person to reach binding agreements. In case of complaints, one has to go through many departments. Streamlining and reorganising rail freight as a transport organiser (rather than as a transport operator) with an account manager directly responsible for particular groups of shippers would appeal to many customers. Because many goods flows are international in nature involving more than one railway operator, it would be attractive to the shipper if the same account manager would take the task to negotiate the price and finalize the service agreements for international goods transport on particular rail lines.

For the inland waterway, there are many different operators. To obtain full information about the price and the services they can provide for international transport is time consuming and labour intensive for the would-be clients. The existence of a coordinator who would act as a direct contact point to provide the information is recommended. The coordinator will be responsible for specific product-market combinations; this would simplify the negotiation process and make the use of inland waterways more attractive.

4.5.6. Consequences for shippers

Apart from comparing the quality of service in the reappraisal process, the shippers that wish to switch mode themselves are confronted with the need to have fundamental changes in their operating logistics before they can substitute rail and water for road. They need to invest in loading and unloading facilities and would require connections to the rail and waterway network both at the sending and receiving ends. Very often the storage facilities have to be adopted to suit the new logistics patterns. To allow for variability in supply conditions, the shippers may have to adjust the stock in reserve. In short, the shippers have to overcome many hurdles in order to place their transport order by rail and inland waterway instead of by road. If the railway and water transport operators are willing and able to think together with the shipper to devise appropriate transport plans within a total logistic framework, the prospects for switching mode will increase.

5. GENERAL CONCLUSIONS AND PERSPECTIVE FOR THE FUTURE

The primary aim of the research study is to identify the areas which could offer opportunities for transfer from road to rail or to inland waterway. Although the findings are only indicative in nature, owing to the limited extent of the field work and the complexity of the freight market, an estimate has been made regarding the potentials for transfer for two broad categories: conventional transport and combined/intermodal transport.

For conventional transport, the possibilities for transfer under a free market situation is almost negligible. The study indicates that if possibilities exist it already has happened in practice. The decisive reason why rail or water transport were being used is because the tranport costs are lower.

For combined/intermodal transport, there are more possibilities and these fall mainly on long distance transport. But they can be converted into reality only if substantial improvements in organisation, marketing and infrastructure are being realized.

However, given the expected growth of the road freight market, the contributions to resolve the environmental and capacity problems in the Netherlands would be very limited even if rail and water transport are successful in attracting standardized transport from the road sector. Preliminary estimates suggest that in inland transport the shift will be about 1% and in international transport about 5% from the total road freight transport.

The above mentioned pull actions to attract freight to the relatively weaker modes will probably be insufficient in future years to cope with the likely environmental and capacity problems caused by the road sector. From the society point of view it can be argued that, demand management and push actions might be required to bring about the modal shift that is called for to ensure a more efficient use of scarce resources in general and the introduction of combined transport and the introduction of new combi-lines and combi-methods in particular. Three main lines of action can be distinguished:
- restrictions on the use of infrastructure;
- pricing and shadow pricing of external costs;
- restrictions on the use of road transport.

It is important to point out that they are no policy measures under active consideration at present. These are areas of "anticipating" research which have been offered as **food for thought**. They are options in developing alternative strategies should the community wish to pursue a push-and-pull strategy as advocated in the McKinsey report "Afrekenen met files".

5.1. Restrictions on Use of Infrastructure

Typical examples of this measure are the Transalpine restrictions on road transport which have successfully forced the road tranport companies to look for alternative solutions e.g. combi-transport. Due to the impact of heavy road transport on the environment and capacity difficulties in the infrastructure, night and/or weekend bans on certain parts of the road network e.g. urban areas should not be excluded from policy consideration in the future.

5.2. Pricing and Shadow-pricing

The Stated Preference exercise indicates that the prices of the (relatively) weaker modes have to be reduced very substantially before it will induce significant shifts. In order to be effective, changes in the pricing structure have to be effected at both ends.

It can be argued that, from the society point of view, higher prices in road transport may be considered as possible options in policy planning. There are two strains of argument.

A. Present day contribution of road freight transport to the infrastructure cost is too low. This applies not only with regard to construction costs but also a substantial part of the fast growing maintenance costs to sustain the national infrastructure. A high proportion can be attributed to the traffic associated with heavy freight (axle load) vehicles. The effect of a fair allocation of infrastructure costs would mean a change in the charges on road use to reflect the financial costs to the society in a proper way. Those changes might be different for domestic and international transport due to differences in the cost composition.
B. Road transport should pay more for generating negative external effects e.g. noise, emissions. Quality environment can be achieved by investing in better environmental technology and from raising relative prices of products which impose heavy environmental burdens. Road transport is such an intermediate product; therefore, the relative price in this sector should be increased considerably compared with today's prices per unit of freight kilometer.

5.3. Restrictions on Mode-use

The most far reaching intervention would be restrictions on the use of road transport. Present day examples are the restrictions on the transport of particular kinds of dangerous goods. However, from the economic point of view, several objections can be made against this type of intervention. Firstly, it is a real and very substantial intervention in the free market. Shippers and transport operators would have to deal with additional rules, regulations and adminstrative procedures. Secondly, it is likely to promote some form of malpractices and encourage less legal type of transport activities which in themselves can cause more severe difficulties for the environment.

In conclusion, in order to cope with environmental and capacity problems caused by road transport, a comprehensive and integrated strategy for different transport modes based on a combination of push- and pull actions is an important policy option for strategic planning which should not be excluded from consideration. But before its effectiveness can be gauged, it is advisable to undertake extensive studies to establish their effects on economic growth and their cost effectiveness in enhancing the quality of the environment. Existing research findings indicate that stand-alone actions such as promoting combined transport, development of clean diesel engine and the implementation of road transport informatics will most likely to be limited in their impacts to bring about the ultimate goal of sustainable economic growth in a quality environment.

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