

Integrated Services in the Intermodal Chain: Will it improve freight mobility in Europe?

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Background

Transport of goods in Europe has increasingly been carried out by road transport in the past decades. The market share of rail has decreased, whereas the total transport market has increased significantly. A further growth of road transport with more than 50 % in the next 5 to 10 years is likely, particularly because of the extension of the internal market and the decrease of transport costs caused by emergence of low-cost transport companies. Although a cheap and efficient road transport system is helping the growth of the economy in Europe, the negative external impacts do require policy intervention by all levels of government. Congestion, emission of greenhouse gases, noise and traffic accidents are the most important negative impacts of road transport. Stimulation and promotion of intermodal (road-rail and road-water) transport is an important option for improvement of the efficient use of transport infrastructure.

To support the organising of intermodal freight transport the European Commission defined a number of actions to:

- Foster the emergence of actors (“freight integrators”) that offer integrated services;
- Improve the inter-operability of equipment and infrastructures;
- Improve the knowledge and experience in the management of intermodal transport chains.

This study, called Integrated Services in the Intermodal Chain (ISIC) provides all necessary information for the Commission to successfully prepare and implement these actions. The project provides a roadmap for implementation of the actions and policy recommendations are given with respect to the effectiveness and impacts of the actions.

The actions that have been included in the project have been clustered within a number of specific tasks:

- Task A: Management and co-ordination;
- Task B: Improving intermodal liability and documentation;
- Task C: Harmonising technical requirements for intermodal transport equipment;
- Task D: Improving the quality of intermodal terminals;
- Task E: Certification and training for intermodal transport;
- Task F: Promotion of intermodal transport;
- Task G: Socio-economic cost-benefit analysis for all ISIC actions.

The project organisation has been organised around these tasks, which can be seen as different sub-projects.

Objectives

The main objective of the ISIC-project is to *provide all necessary information for the Commission to successfully prepare and implement the actions that have been described in the Freight Integrator Action Plan.* This study must prepare the roadmap for implementation of the actions distinguished.

The derived objectives on the different elements of the actions are:

- To propose practical ways to set up a uniform system of intermodal liability rules and to consider the consequences for intermodal transport documentation;
- Undertake all background research necessary in order to advise the Commission on policy options related to harmonising technical requirements for semi-trailers in the EU;
- To develop quality indicators, a quality label and benchmark system for terminal operations and standardisation of terminal practices, equipment and systems;
- Propose suitable quality standards and modules for training;
- Investigate the introduction of Intermodal Development Centres in the EU;
- Provide cost-benefit analyses of the different actions studied in the tasks.

Results per Task

Below, the main results per Task are presented, in order of the ISIC project

Task B on Intermodal liability

The work in Task B on intermodal liability and documentation has been carried out by an independent panel of legal experts¹, and was aimed at drafting a set of uniform intermodal liability rules which “concentrate the transit risk on one party and which provide for strict and full liability of the contracting carrier (the intermodal operator) for all types of losses (damage, loss, delay) irrespective of the modal stage where a loss occurs and of the causes of such a loss”.

The key provisions of the Draft Regime can be summarised as follows:

- ‘Transport Integrator’ is defined as any person who concludes a contract for the international carriage of goods which involves at least two different modes of transport and who assumes responsibility for the performance of the contract of transport (Art.1);
- The Regime applies to all such international carriage contracts, if the goods are taken in charge in a State member of the EU, or delivery of the goods is to be made in a member State (Art. 2);
- The parties to the contract may agree to opt out of the Regime. Agreement that the contract shall not be governed by the Regime may be in any form (Art.2);
- Under the Regime transport documents may be, at the option of the consignor, in either negotiable or non-negotiable form (Art. 3);
- As far as the transport document is concerned, this has to contain, in addition to the usual particulars, a statement that the contract is subject to the Regime (art.4(a));
- The regime provides for the Transport Integrator’s strict and full liability for total or partial loss of the goods or damage to the goods occurring between the time in which it takes over the goods to the time of delivery, as well as for any delay in delivery (Art. 8);
- However, the Transport Integrator shall not be liable for any total or partial loss of the goods, or damage to the goods, or delay in delivery of the goods to the extent that such loss, damage or delay was caused by circumstances beyond its control (art. 8);
- When the Transport Integrator is liable for loss resulting from loss of or damage to the goods, his liability shall be limited to an amount not exceeding 17 units of account per kilogram of gross weight of

¹ Prof. Malcolm Clarke, Cambridge University, Prof. Rolf Herber, University of Hamburg, Dr. Filippo Lorenzon, University of Southampton and Prof. Jan Ramberg, University of Stockholm.

the goods lost or damaged. The liability for loss resulting from delay in delivery does not exceed twice the amount of the charge payable under the contract of transport (Art. 9);

- The Transport Integrator and the consignor may agree on limits of liability exceeding those provided (Art. 9.4);
- For the sake of certainty and predictability, the limits provided for in this Regime are virtually unbreakable. To break the limits, it has to be proved that the loss, damage or delay in delivery resulted from a personal act or omission of the Transport Integrator done with the intent to cause such loss, damage or delay or recklessly and with knowledge that such loss, damage or delay would probably result (art. 10);
- Any action relating to a contract of transport subject to this Regime will be time-barred if judicial or arbitral proceedings have not been instituted within nine months from the day after the day of delivery was made or should have been made (Art. 14).

The need for a European liability approach and the proposed draft regime has been discussed with external reviewers and the members of the ISIC Advisory Board. One of the conclusions of this discussion is that co-operation and maybe even integration with the UNCITRAL development in this field is required.

Task C on Semi-trailer harmonisation

The need for a better harmonisation of intermodal transport equipment for inland transport has been recognised already for some years. The ISO maritime container is widely used in intercontinental (deepsea) transport, including pre- and endhaulage to the final destination. Intermodal transport within Europe uses different transport units: the semi-trailer, swap bodies and ISO and non-ISO containers. From a logistics point of view, the semi-trailer offers in many cases the best solution: it can be used in a flexible way, provides the best capacity and is used throughout Europe in door-to-door road transport. In total, more than 2 million semi-trailers are in use on the European roads. The use of the semi-trailer in intermodal transport however is still very limited. There are a number of reasons for this, amongst others:

1. only few semi-trailers are craneable (app. 30.000), which is required for transshipment on trains (and barges)
2. there is a limited number of railway wagons for semi-trailer transport (pocket wagons)
3. the accessibility on the railway network for trains with semi-trailers is limited

The rationale of making more semi-trailers craneable is that they will be used more often in Intermodal transport solutions. When semi's are used more often, the intermodal transport operators will provide more wagon capacity. The issue of railway accessibility is particular eminent in France, the UK, some Central and East European countries and the southern part of Europe (Italy, Spain and Portugal). The figure below presents the profiles for central Europe, and the red, light blue and grey lines are not accessible for semi-trailer trains.



Specific solutions (for instance the Modalohr wagons in France) and extension of (tunnel) capacity in the Alpine countries will improve the accessibility problem, but it will remain a serious bottleneck for some specific relations.

From a technical point of view it is relatively easy to make semi-trailers craneable in a standardised manner. The costs however are quite substantial, particularly when only limited numbers of trailers are adapted. A rough estimation is that the extra costs are between 2000 and 4000 Euro per semi-trailer. Besides the extra costs, making semi's craneable will also lead to extra weight: approximately 400 kg. In some countries however exemptions on weight restrictions apply for semi-trailers that are used in intermodal transport.

Task C has identified different policy options for the European Commission. Shortly the following options exist:

- Subsidies for companies that purchase semi-trailers can be provided
- Intermodal services using semi-trailers can be subsidised, e/g in the Marco Polo programme
- Craneability can be made obligatory in the standardisation requirements

The cost-benefit analysis of Task G will show to what extent these policy options will be feasible.

Task D on improving the quality of intermodal terminals

Intermodal terminals and transfer points are important interfaces within intermodal transport chains. The quality of services at terminals and the efficiency of terminal processes have a considerable influence on the quality and costs of the whole transport chain. Task D deals with measures and instruments improving the quality and performance of intermodal terminals.

This Task has started with an identification of terminals of 'European importance'. Indicators for this have been developed and tested. A total number of 725 terminals were selected, of which 111 inland waterway terminals and 469 road-rail terminals (besides port and trimodal terminals). All these terminals have been put in database and mapped in a GIS application.

The next step in Task D is the development of a set of quality indicators and a benchmark system. The following quality indicators have been identified:

- Cut-of, waiting and turnaround times, opening hours
- Accessibility, hinterland connection
- Damage frequency, security
- Terminal and labour productivity

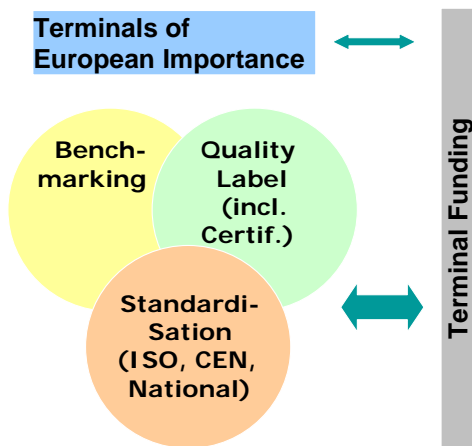
An assessment of these indicators has been made for each terminal of European importance. The data have been added to the terminal database.

The need and potentials for a quality label for terminals were examined, based on the quality indicators that have been developed in this Task. The quality label proposed could consist of two elements: an internal quality system for terminal processes and procedures, based on existing ISO 9000/14000 systems, and an external quality label, which has to be developed, based on indicators studied and the benchmark system proposed.

The fourth element of this Task is related to the needs for standardisation. Different elements can be standardised: terminal planning and design, equipment and terminal processes and services. Proposals for standardisation of each of these elements have been made in ISIC, including proposals for the establishment of new Technical Committees in ISO and CEN.

The final part of Task D focused on the options and requirements for the (public) funding of terminals. The quality label offers good opportunities for governments for the selection and prioritisation of terminal funding. **The effectiveness of a subsidising system that is based on the quality label and benchmark system will be substantially higher.**

The figure below presents the relationship between the 4 different elements of this Task and the terminal funding issue.



Task E on Intermodal training and certification

The lack of an appropriate European training and education infrastructure in the field of intermodal transport was recognised for some time already. Task E of ISIC focused on the development of such training system, combined with an acknowledged certification system.

The Task first started with an analysis of the training demand. A large survey, using an extended questionnaire, was carried out amongst shippers and operators. There appeared to be significant gaps on skills required, a/o in marketing, information and communication technology, business economics and logistics. Large companies seem to be less satisfied with the existing training programmes than small and medium-sized companies (SMEs).

The second part of the work in this Task consisted of an analysis of the existing training and education supply. Information on programmes and courses of 174 European education and training institutes has been analysed. Of those 174 institutes there were 138 institutes that have logistics as separate course, but only 19 have specific intermodal courses. Confrontation of demand and supply proved that specific competences required by freight integrators are poorly covered. There is thus a clear need for intermodal training programmes in Europe.

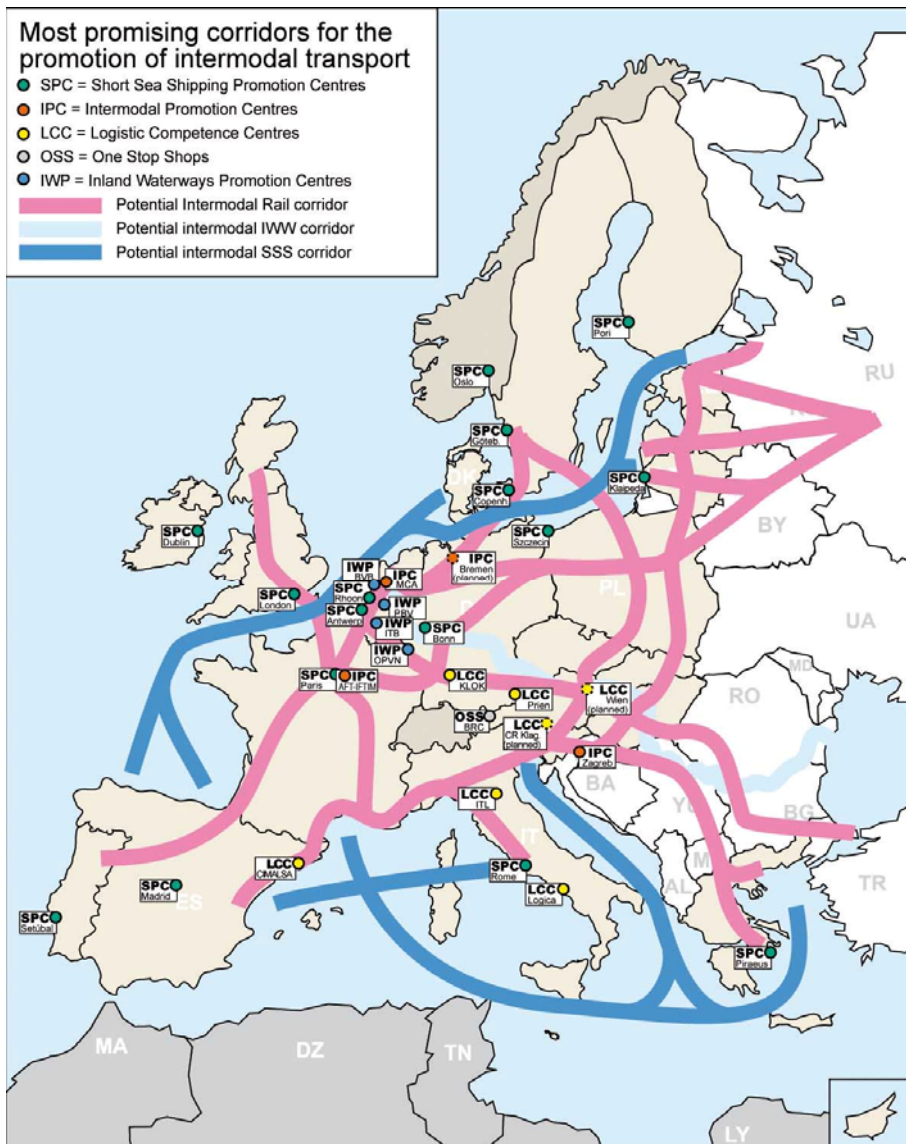
Task F on Intermodal promotion

Task F on intermodal promotion brings the concept of intermodal development centres (IDCs) into focus. An IDC is defined as a neutral non-profit organisation acting as a catalyst to develop intermodal freight solutions along European corridors showing high intermodal potential. IDCs shall bridge the knowledge gap between transport supply and demand, help overcome barriers to intermodal solutions, and generally improve communication between stakeholders on the demand side (shippers, forwarders) the supply side (transport operators, infrastructure providers, ancillary services) and the policy side (authorities and regulators).

The first step in this Task was to identify pan-European corridors with most intermodal potential (where the demand for intermodal transport exceeds the supply). In total, 14 corridors were identified:

- 9 road/rail
- 1 road/inland waterway transport
- 4 road/shortsea

The next figure shows these corridors. The existing promotion centres are also presented in this figure.



A survey on already existing intermodal promotion centres was also part of the work in this Task. Best practices were identified from the existing centres on the distinguished modes (IWT, SSS, Rail, Intermodal transport) and logistics centres.

IDCs (either new ones or some of the existing centres) can carry out two types of services:

1. **Institutional services**, to be offered to all stakeholders on a non-discriminatory basis
2. **Revenue-generating services** (notably intermodal consulting, training, and research activities) offered to individual actors or groups of actors. Revenues exceeding costs must be re-invested in improving the quality of services.

An IDC should be a neutral, non-profit organisation acting as catalyst to develop intermodal solutions. The institutional services that are carried out can consist of platform activities, market analyses, awareness and promotion campaigns, knowledge base, information transparency activities etc.

Two models for an IDC have been distinguished:

1. hosted IDC: the IDC is accommodated at an existing organisation (e/g transport or shippers organisation) and uses some of the services from its host
2. stand-alone IDC: it has its own housing, services etc.

The option to combine or integrate a new IDS with existing intermodal transport or logistics centres is also relevant in situations where this is possible.

A business plan has been developed for the two different IDC models. Finally, Task F examined the need for an umbrella organisation of IDCs, which would definitely help the implementation of new centres and can provide a level playing field with respect to funding practices for the different centres throughout Europe.

Task G on Cost-Benefit Analysis

The last Task of ISIC focused on the societal costs and benefits of the actions examined and proposed in the previous Tasks. All actions aim at removing 'barriers' that currently avoid certain transport users of choosing intermodal transport solutions. Since the size of the modal shift of each action provides an important input for the quantification of a range of other impacts included in a CBA, like generalised transport cost differences and external impacts on air emissions, transport safety, noise emission, and the marginal costs of congestion and infrastructure, it was decided to use one macro-model in order to estimate the size of the total modal shift impact of the ISIC actions. For the purpose of this study, the NEAC model, developed within the TEN-STAC project appeared to be a good model to estimate the modal shift impact of policy options like ISIC.

The model runs estimate for the year 2020 the impact of the ISIC actions on the transport system, by comparing forecasts with and without parameter adjustments for the ISIC actions. This leads to the following outcomes, presented in the next table:

Mode	ISIC impact in million tonne km
Road transport	- 6.25
Rail transport	5.72
Inland waterway transport	1.86
Shortsea shipping	2.51

This means, that we can shift about 0.3% from the total road transport to other modes, which leads to an increase of rail transport of 0.9% and an increase of inland waterway transport of 0.8%. This presumption is crucial but also very debatable, which will be discussed later on.

These ISIC modal shift results are also presented on national level showing the absolute and relative impact for rail transport and inland waterway transport.

A first conclusion from these top-down estimates is that the shift results in an increase in the number of tonne kilometres (TKM). In order to realise a decrease of 6.25 billion TKM from road transport, the traffic performance of the other modes increases by 8.14 billion TKM. That means that each shifted ton is moved over a longer distance to reach its destination. On average, this 'detour factor' equals approximately 30%, for rail transport it is 25%, for inland waterway transport 60% and for shortsea shipping transport 20%. This in turn will have its consequences for the quantification of external impacts like air emissions.

It has later on been established, that most likely the detour factor for especially rail is much too high, leading to a fairly bad result for the project concerning semi-trailer harmonisation. The UIRR organisation have pointed to an average detour factor for rail in the range of 5 to max. 10 %.

In the MCA, each action was ranked against each other on different dimensions and for the different transport modes. By putting weights on each dimension, normalised scores for each action were obtained, resulting in the following distribution table.

Action	Rail	Inland waterway	Shortsea
Intermodal Liability (B)	17,0%	19,7%	19,7%
Semi-trailer harmonisation (C)	13,5%	0,0%	0,0%
Intermodal Terminals (D)	20,6%	23,8%	23,8%
Intermodal Training (E)	22,0%	25,4%	25,4%
Intermodal Development Centres (F)	27,0%	31,1%	31,1%

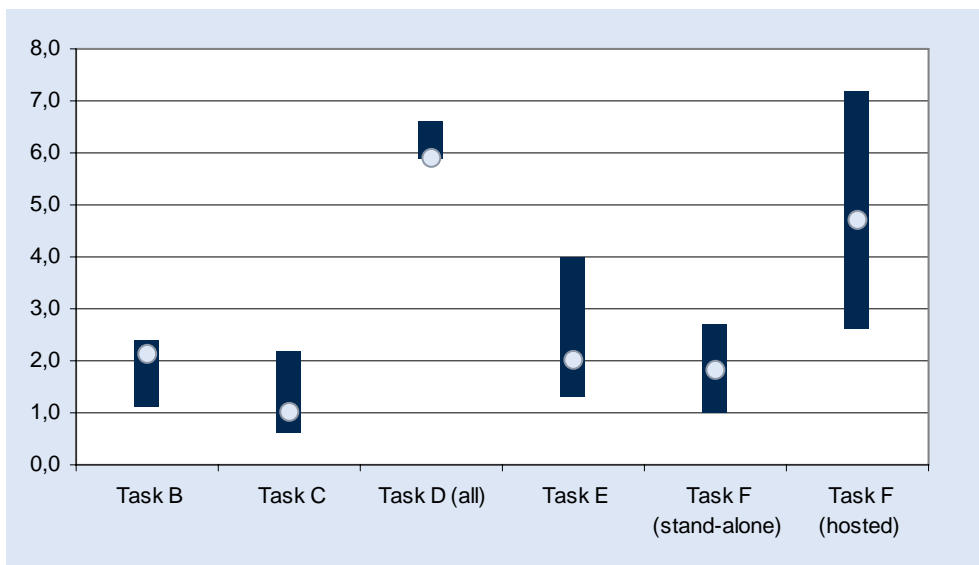
This led to the following modal shift potential per action in 2020:

(in million TKM)	Road	Rail	Inland shipping	Shortsea shipping
Intermodal Liability (B)	-1.136	754	362	368
Semi-trailer harmonisation (C)	-477	597	0	0
Intermodal Terminals (D)	-1.372	911	438	444
Intermodal Training (E)	-1.467	974	468	475
Intermodal Development Centres (F)	-1.798	1.194	574	582
Total	-6.251	4.429	1.841	1.869

These outcomes have been validated by the experts involved in the corresponding tasks. The validation coming from a bottom up approach was mainly based on a scenario or corridor approach. In some situations, this has led to a correction of the size of the modal shift in the CBA.

In order to make a quantitative estimate of the costs and benefits of each action, several assumptions have been made. This means that the CBA outcomes have to be treated with care. There is a significant level of uncertainty in the outcomes. Since the approach of distributing the total modal shift over the different actions includes quite some uncertainties, the sensitivity analysis of the CBA includes extensive scenarios with different magnitudes of the modal shift per action. The sensitivity analysis has shown how sensitive the model outcomes are for some crucial model assumptions, including the size of the modal shift.

The figure below presents an overview of the B/C-ratio's of the different actions as well as the bandwidth on the market adoption of the measures.



The actions on Quality of Intermodal Terminals (D) and (hosted) Intermodal Development Centres (F) show very attractive benefit-cost ratios as outcome, meaning that the net present value of all societal benefits is greater than the net present value of the costs involved. The B/C ratio's for these actions are respectively 5.9 for task D and 4.7 for task F (hosted IDC). At the same time these tasks require a limited investment, the net present value of all costs equals €29 million for task D and only €4 million for task F (due to a short time horizon of 5 years).

The positive ratio outcomes for these actions are mainly caused by the following type of benefits:

- Generalised transport cost advantages for transport users that shift due to former unawareness of already existing cost effective intermodal transport solutions or due to the removal of resistance factors that avoid them from using intermodal solutions nowadays (like reliability and perceived quality on transshipment points in the intermodal transport chain).
- Decrease of the marginal costs of congestion and infrastructure due to modal shift
- Improvement of the transport safety due to modal shift
- Reduction of noise emissions due to modal shift

The actions on Intermodal Training (E) and Intermodal Liability (B) offer clear benefits for society, but the costs involved in realising these actions are significant. The Net Present Value (NPV) of the benefits is twice as big as the costs, but it requires significant investments to implement the measures. The NPV of the costs is €66 million for task B and €189 million for task E, which is mainly caused by the valuation of the time investment in the training curriculum.

The realisation of Stand-alone IDC's also shows a B/C ratio of almost 2, which is clearly lower than the hosted IDC option, and has a NPV of the costs of €10 million.

The B/C ratio for the action on harmonising semi trailers equals 1, which means that the NPV of all benefits equal the NPV of all costs. Since external benefits are not priced in the market, the costs for the transport sector are higher than the benefits. This means that this action requires subsidisation or strict regulation in order to influence the market to adjust the semi trailers for intermodal purposes. But as mentioned earlier, the presumptions leading to these conclusions are surely very questionable, and the harmonisation process should be given more interest. Also the discussion on 45 feet containers should be taken into consideration

her, as there is a major gap in the understanding of the use of these units comparing the shippers on one side and the Commission on the other.

Main conclusions

The aggregate of ISIC-actions will contribute to a modal shift in Europe...

The actions that have been identified in the Freight Integrator Action Plan and that have been elaborated in this ISIC project will lead to a substantial shift from road to intermodal transport. The model calculations in Task G indicate that a maximum shift of app. 6 billion tonne-kilometres is likely. In comparison, the potential of the Marco Polo programme, that focuses on the actual implementation of new services, is estimated to amount up to 144 billion tonne kilometres in 2015². However, the costs per tonne kilometre shifted from road to rail and water due to the ISIC-actions are relatively low. The actions of ISIC cover a wide variety of potentially very relevant legal, organisational, technical and practical issues in intermodal transport. It is this variety that provides a potential for improvement of the sustainability of the transport system in Europe.

There is a clear need for actions on a European level...

All actions of ISIC have a clear European dimension and perspective. Intermodal transport is by its nature in many cases an international activity, whereas the increase of the European internal market and the globalisation of trade and transport will further lead to an increased importance of international flows. National policies in transport have too long hindered the development of efficient and competitive transport systems. In particular the protective policies in the railway sector in a number of important countries in Europe (a/o France, Germany, Italy, Spain, Belgium) have been in the way of an increase of the use this transport mode.

The issues of harmonisation, standardisation and certification in the field of semi-trailers, intermodal terminals and training programmes need to be addressed at a European level. The liability question is of supra-European importance and needs to be elaborated in co-operation with international organisations like the UN and OECD.

but the market parties will have to do most.

In a liberalised economy like the EU, it will be the market forces that have the highest impact on the development of the transport system. Only if shippers and transport operators will see the benefits for their companies, they will shift from road to other transport modes. The adaptation of the new liability regime, the choice to use the train for semi-trailer transport, a specific terminal or the services or an IDC will be made by market parties. They will be the main clients for the intermodal training programme as well. A close consultation with the market is therefore a prerequisite for the successful implementation of the actions defined in ISIC. The ISIC actions can not be seen apart from other policy measures that influence the transport market.

The corridor approach is interesting for some actions.

The concept of intermodal transport corridors is seen by many as an interesting way of improving the use of rail and water transport in Europe. In ISIC, this approach has been selected for the allocation of intermodal development centres. In general, interoperability and efficiency of intermodal transport can be stimulated more effectively when the efforts are focussed on a certain corridor, covering different countries and modes. This corridor dimension can also be applied (to some extent) to the actions in the other ISIC tasks. New

² Ex-ante evaluation Marco-Polo 2 (2007-2013), ECORYS 2004

road-rail services of semi-trailers will only be cost-effective on specific transport corridors. Certification and labelling of terminals could also be applied on specific corridors first, whereas training programmes could be introduced corridor-wise too. However, in some cases a national approach might be more effective, whereas the pan-European introduction of a/o harmonisation issues will most likely be more relevant.

The maritime container is expected to increase its market share in inland transport.

The growth of (intercontinental) maritime container transport is likely to continue for the next decades too. The rise of new economies in Asia (a/o China, India), South America (Brazil, Argentina) and (South) Africa will lead to a further shift of production and consumption locations worldwide. Ports are becoming increasingly important links in global logistics networks. Transport flows to and from the ports are likely to become more intense. This will lead to a strong growth of intermodal transport, as these flows are generally condensed and focussed on specific corridors. This growth will probably be based to a large extent on maritime container transport by rail, inland waterways and shortsea. The potential for intermodal transport of semi-trailers and swap bodies will not grow, due to the increased market share of the maritime container. On the contrary, the rise of the container might endanger the market position of other intermodal transport units used in inland transport. The low costs of handling and transport of standard ISO containers makes intermodal transport on distances of 100 to 250 km in many cases profitable, whereas other intermodal systems have much higher break-even distances.

but internalisation of external costs will be the core challenge.

It is widely recognised among transport economists that a sustainable transport system can only be realised when there are no market imperfections. External costs are the best example of the imperfective nature of the transport market. The users of the system do not pay for all costs they cause. For instance the costs for congestion, injuries, deaths, noise and air pollution, space consumption, loss of nature etc. are not paid for entirely by the transport users. Throughout Europe attempts for internalisation of all external costs are being made, a/o by introducing road pricing systems, railway user charges, etc. Until this moment, a coherent system covering all transport modes does not exist. The discussion on the values of the external impacts is likely to continue for some time, as it is by its nature a very difficult one.

Recommendations

Involve the right market parties

The support of the market parties in transport (transport and terminal operators, shippers, logistics service providers, freight forwarders) is crucial for the success of the implementation of the ISIC actions. In particular with respect to the liability regime, where it is recommended to start an extensive stakeholder consultation. But also for the other actions proposed it can be recommended to co-operate with market parties as much as possible, in order to obtain a solid basis for new policy measures

Focus on the right policy objectives

Intermodal transport can help to improve the sustainability of the transport system, but it is not a goal in itself. In cases where unimodal transport is more efficient and environmental friendly, a shift to rail or water should not be aimed at.

It can also be effective to intensify the efforts on the reduction of emission of locomotives barges and vessels. Measures to support the reduction of transport demand and to establish a pricing system that includes the external costs of all modes are likely to be the most effective.

Prioritise the actions

A prioritisation of the measures is needed, as the resources available at the level of the European Commission are limited. Some actions can be introduced stepwise, for instance the establishment of IDCs, whereas other actions require a more substantial effort during the initial stage. This applies to the training and education programme development, the terminal certification and the standardisation and harmonisation activities.

Work on harmonisation and standardisation, but limit the amount of Regulations

Harmonisation and standardisation of intermodal transport equipment and terminals will help the intermodal transport sector. However, it must be taken into account that the transport market should not be confronted with an overload of new regulations. Companies in general and small and medium-sized enterprises in particular complain about the increase in rules and regulations they have to live with. Rationalisation of the regulatory framework will help to increase the efficiency in intermodal transport.