INNOVATION PROCESSES IN SURFACE TRANSPORT

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Authors and contributors

Initials	Author	Organisation
ML	Michael Lloyd	LCA Europe

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1. Introduction

This task has two main objectives, as related to the subsequent tasks, which will each elaborate a consultation event, as referred to in the project DoW:

- testing the framework of analysis of the different modal and intermodal solutions that have been developed.
- assessing the innovation cases that have been selected and have undergone a preliminary analysis in this task;

The first of these points should particularly be borne in mind when reading this Preliminary Innovation Report. The testing and assessment framework (the methodology) is itself, at this stage of the project, 'work in progress'. This may mean that there will be, necessarily, some contradictory aspects of the analysis of the cases presented. For instance, deliberately, no attempt has been made at this stage to reach overall agreement, within the consortium, on the rankings in the individual cases, prior to the first Consultation meeting. There may also be disagreements – to be resolved at the Consultation Meeting – on the set of innovation cases to be taken forward and their attribution in relation to the typology of innovation (e.g. policy or organisational, etc). The intention is that the presentation of the methodology and the individual cases at the Consultation Meeting should enable a clear view to be attained of how to proceed with the subsequent detailed analysis and to have achieved a consistent, validated methodological approach.

2. Approach and innovation analysis framework

2.1 Definition of innovation in InnoSuTra

2.1.1 Innovation in general

A key question to be answered is what is classified in this project to be an innovation. A general definition found in literature is the following:

> *Innovation is change that creates a new dimension of performance and to innovate is to turn change into opportunity (**Dictionary definition**).*

Elaborating this broad definition, the **consortium agreed** on following definition, as applied to transportation and logistics and the work to be done in this project:

> *A technological or organisational (including cultural, including marketing, as a separate sub-set) change to the product (or service) or production process that either lowers the cost of product (or service) or production process or increases the quality of the product (or service) to the consumer'*

Following this definition, a quantification may be made for both a welfare-economic and an industrial-economic setting, where product improvements and/or efficiency gains, as termed in the definition, can be valued.

2.1.2 Industrial-economic point of view

From an industrial-economic point of view, an innovation occurs when

$(\Delta R- \Delta C) > 0$, where:

R = Private revenues
C = Private cost

Efficiency gains will then show up on the cost side, whereas product improvements for the customer will impact positively on the revenue side.

2.1.3 Welfare-economic point of view

On the welfare-economic side, obviously an innovation happens when
$(\Delta B- \Delta C) > 0$, where:

B = Social benefit
C = Social cost

Again, efficiency gains will have a cost impact, whereas product improvements will feature an increase on the benefit side.

2.1.4 Derived definition of innovation

An innovation may then be defined as an action where either one or both of the following happen

Industrial-economic performance:
$(\Delta R- \Delta C) > 0$

and / or

Welfare-economic performance:
$(\Delta B- \Delta C) > 0$

2.2 Types of innovation considered

2.2.1 Setting

Different types of innovations can be distinguished, according to their characteristics. Largely, characteristics can be technological, organizational/managerial, cultural (including marketing), and policy-related. Depending on the main nature of the innovation, it may be classified as *either technological, organizational/managerial, cultural (including marketing), or policy-related*. It is identified that the first three do have a private commercial and a 'bottom-up' nature, whereas the last, governmental in origin, features a top-down implementation path, and is applicable to the sector as a whole from the outset. Hence, as the scope of policy-related innovations is much wider, and the processes of implementation are different, they will be dealt with as a separate category.

2.2.2 Modes covered

The modes, including intermodal as a separate category, that are covered are:

- Road

- Rail
- Inland navigation
- Maritime transport
- Intermodal

2.3 Defining successful innovations – preliminary approach

2.3.1 Rationale

A framework is needed for assessing what is to be considered a successful innovation, and what a failure. It has been agreed by the consortium that the principal subject of our work will be the examination of *incremental* innovations. However, it was also agree that we may, none the less, learn something from a review of radical innovations such as containerization.

2.3.2 Minimum level

The first task under the preliminary approach is to determine a minimal level of increment of technological, organisational, or cultural change that will be considered as the subject matter of the project. (We have already decided that policy 'innovation/initiatives will be separately considered as applying to the whole of the surface transport sector, and where the processes to be considered are *substantively different* from those that are generated by privately sponsored innovations from *within* the sector).

2.3.3 Preliminary success/failure assessment

In setting a common minimal increment to be achieved by each of the innovations considered we are then able to provide a *preliminary* assessment of success or failure by examining other factors, e.g. the amount of 'spread' of the innovation across the sector. The successful innovations so determined can then be ranked in terms of relative success using a) the extent and rate of progress of the 'embeddedness/take up' within the sector , and b) the nature and intensity of the various 'impacts' (private market and socio-economic) of the innovation. This activity will provide either separate indices or one combined index of innovations. This process may indicate those innovations that may not yet be judged a 'failure', but may with appropriate sectoral (e.g. via networking) and/or public policy support achieve a higher degree of success. In other words all the selected innovations, assuming they achieve a minimum level of organizational change, will be assessed in terms of their success along a spectrum. The spectrum will be time dependent in that the innovations considered will be assessed from inception to the current time period, unless the innovation may be considered to have been abandoned as a failure. The various 'support processes' associated with each of the innovations will also be considered and particular attention will be paid to the support or lack of support given to the 'failures'.

2.3.4 Ex-ante judgement

The above *ex ante* judgements, expressed in general as having a ranking on the spectrum of 'spread' of more than 2/10 to be regarded as a success (to a greater or lesser degree), will be based on the expert, but subjective, judgements of the InnoSuTra partners; to be confirmed or otherwise at the first expert Consultation Meeting in mid-April. Failure to achieve the minimum level of organizational change (3/10 or more) will categorize the innovation as a failure. (The Consultation Meeting experts will not be informed of the preliminary InnoSuTra success and failure assessments).

2.3.5 Cases

In total, 59 cases were examined. Of these some 29 *private commercial* innovations have been classified, and ranked as *successes* via the preliminary analysis, and 14 other private commercial innovation cases examined, classified, and ranked as failures. (The term failure implies perhaps too rigid a categorization. It may be preferable to regard the 'failures, in a number of cases, as, 'not-yet-a-success'). In the case of *policy* initiatives/innovations some 9 cases each have been examined and classified as successes and as failures.

2.3.6 Time Limits

These 59 cases across all surface transport modes include technological, organizational/managerial, cultural innovations, and, separately, policy-related innovations. For the *selection* of the cases, a time limit towards the past was not set, i.e. consideration was given to the introduction of the ISO container from the 1970s. It is considered that the process of take up of innovations across the sector may take a number of years before there is a major sector-wide impact. Lessons may still be learned from such a long innovation process for innovations that may still be adopted in the future. Equally, it might be that an innovation which until now, for some reason, was not successfully spread across the sector might become successful under *new* conditions or stimuli. Hence, it may be that the *pace* of innovation spread may vary considerably.

2.3.7 Structural Approach to Preliminary Analysis

The structural approach of this preliminary analysis, made in preparation for the first consultation event, is indicated in Annex 1 to this deliverable (see outline Template).

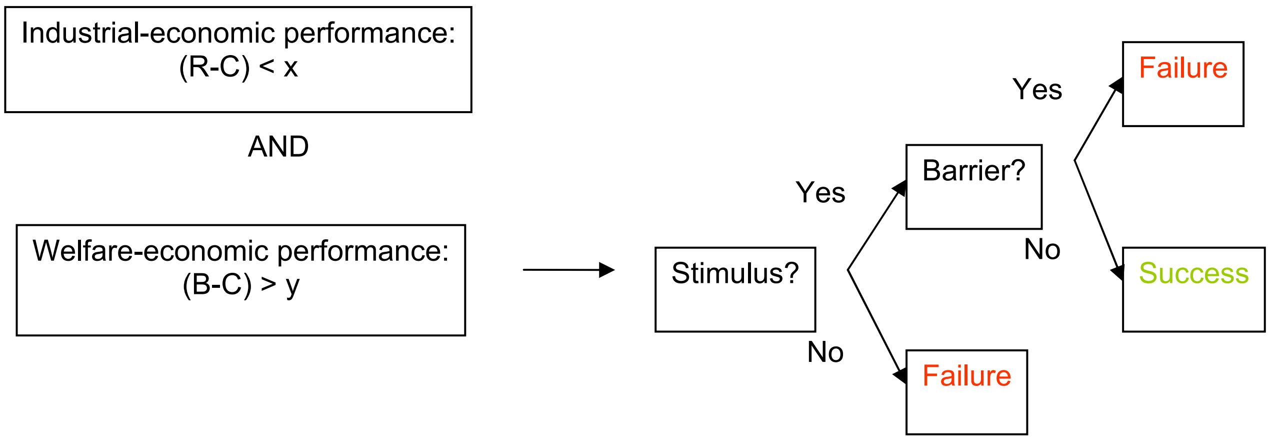
2.4 Defining successful innovations – Consultation meeting follow-up and more detailed analysis

2.4.1 Framework

The framework for the more detailed analysis, to be made subsequent to the first Consultation Meeting, will be developed by combining both the welfare-economic and the industrial-economic analysis mentioned above (see 2.1) when defining an innovation. It will also be based on the structural approach of the preliminary analysis as tested during this first phase of the project. One element to be added, already identified and examined in the preliminary analysis, is the presence or absence, and precise identification, of substantial barriers. A number of situations may then be distinguished.

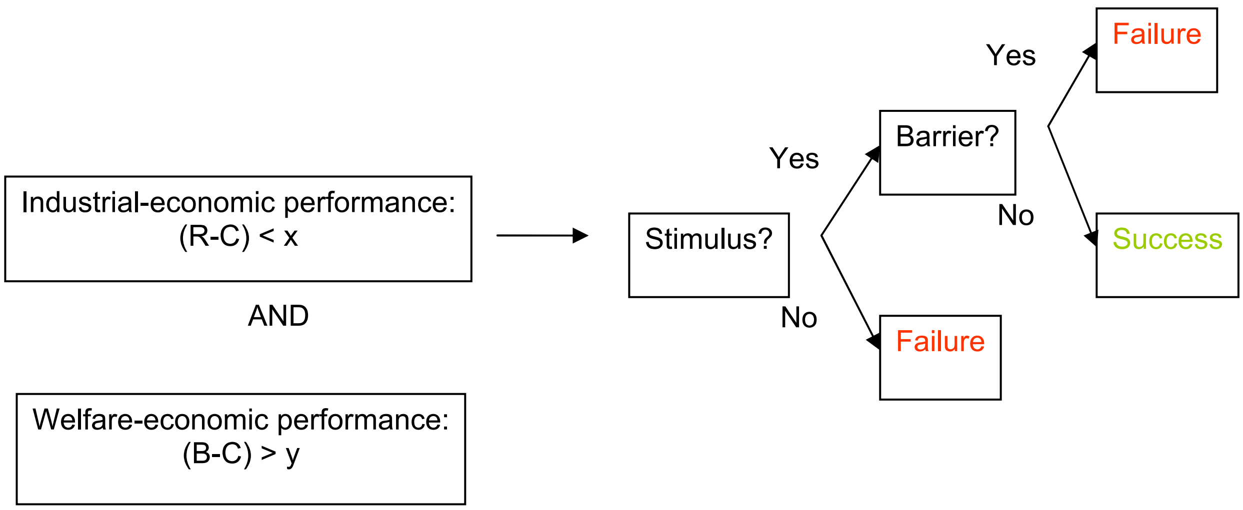
2.4.2 Scenario 1

A first situation features both industrial-economic profits which stay below a certain threshold, and welfare-economic surpluses which exceed a specific threshold. In this case, for overcoming insufficient private losses, a stimulus may be given by another actor (e.g. the government), which makes the private profit exceed the threshold value. If no such stimulus is present, one can assume that the innovative action will not go through, and therefore will be a 'failure'. In the case where the stimulus occurs, but the innovation is still hampered, one has to verify the presence of substantial non-financial barriers or at least of barriers that appear not to be overcome by a public stimulus. (It may of course be that the affordable stimulus is simply insufficient to overcome the barrier). Only when such other barriers are overcome, by whatever means will the initiative move forward. The reasoning can be summarized graphically as below.



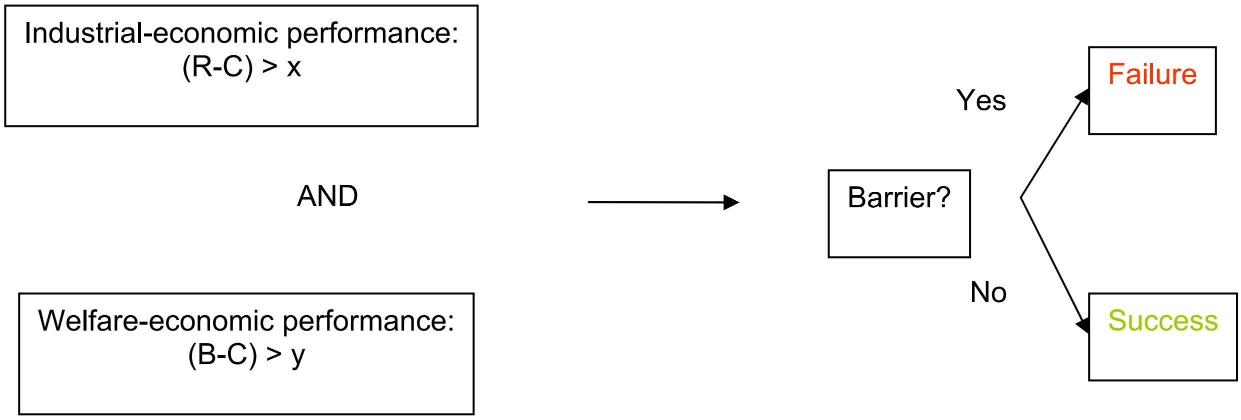
2.4.3 Scenario 2

In a second situation, industrial-economic profits exceed a certain threshold, and welfare-economic surpluses stay below a specific threshold. In this case, one might observe a stimulus given by the producer and/or immediate users of the innovative action. Such stimulus could for instance consist of a payment to offset welfare-economic losses that are incurred. If such stimulus is not present in a sufficiently substantial way that it brings the welfare-economic surplus over the threshold, the innovation will turn into a failure. If the type of stimulus is present, one again has to verify the presence of barriers. If sufficiently strong barriers are present, the innovation will again turn into a failure. If not, a successful innovation will result, as indicated in the graph below.



2.4.4 Scenario 3

In the third and final situation, industrial-economic profits and welfare-economic surpluses both exceed their imposed thresholds. In such case, no stimulus is needed for making the innovation's success materialize. The only obstacle that could prevent this could be another identifiable barrier, which will make the innovation become either a failure or a success. (It should be noted that this definition of barriers includes calculations of net benefits).



2.5 Details of the preliminary analysis

Having now described in outline the procedures that will be adopted in the detailed analysis to be conducted, subsequent to the Consultation Meeting, we may now move to set out in more detail the results of the preliminary analysis and assessment of the *initial* set of the 59 private commercial innovations and public policy innovations/initiatives in the project. The selected innovation cases are summarized below in Sections 3, 4, and 5. Section 3 deals with the private sector innovations under the various headings. This is followed in Section 4 by a preliminary assessment of the ways in which success and failure were achieved, including the role of various support measures employed. This assessment is structured with reference to the Template attached at Annex 1 and which has been used in this preliminary analysis. Section 5 deals in an analogous, but not identical, manner with the public policy innovations/initiatives. The case numbering relates to a sequence of 12 in each transport mode considered (11 in the case of Intermodal). Hence there will be five number 6s; one on each of the five modes. The rankings indicated are made subjectively during the consideration/assessment of the various innovations and are indicated as scores out of 10. In some cases, where no *impacts* (usually negative) have been identified in the preliminary assessment this is indicated; the ranking in these cases will be zero.

It was considered that, in preparing the templates for each of the innovations, it would be valuable to provide an *indicative*, *quantitative* estimate in relation to the various aspects/properties of the innovations examined during the preliminary assessment. The quantitative estimates, indicated as scores out of 10, are made *subjectively* during the consideration/assessment of the various innovations. This does not imply that they are arbitrary as not only are the estimates made with the application of the expertise of the Consortium partners, but they are also based on discussions with the innovation participants or written evidence (e.g. technical articles) encountered during the preliminary assessment. Clearly this does not imply that these preliminary estimateswill be regarded as unchallengeable and they will be subject to revision, both by the external modal experts and in the more detailed examination to follow in the project. They provide *provisional subjective* estimates of the effects of the variables selected as important to the innovation process.. In some cases, where *impacts* (usually the negative impacts) have not been identified in the preliminary assessment this is indicated; the ranking of the negative impacts in these cases will be zero. The net benefit scores are produced simply by summation of the scores attributed to the positive and the negative impacts.

3. Case Assessments

3.1 Innovation Successes

This section contains information on the various innovations and their preliminary assessments as successes. The information is derived from the first part of the Assessment Template (see Annex 1). The innovations selected and their assessments and rankings may be altered as a result of the outcomes of the first Consultation Meeting on April 13th.

3.1.1 Road

3.1.1.1 Technological

3.1.1.1.1 <u>Method of electronic toll collection (case 3)</u>

Electronic Toll Collection (ETC) is a fairly mature technological innovation that allows electronic payment for use of motorways and expressways. An ETC system is able to determine if a car is registered in a toll payment program, alerts enforcers of toll payment violations, and debits the participating account. ETC is fast becoming a globally accepted method of toll collection, a trend greatly aided by the growth of interoperable ETC technologies. Some of the benefits of ETC include:
–fuel savings;
–reduced mobile emissions by reducing or eliminating deceleration, waiting times, and acceleration;
–reduced operation costs.
Source: Nowacki et al. (2008)

For example, for ETC system operated in Germany, LKW Maut, system operating costs for 2009 were equivalent to 11% of toll income.
Source: Toll Collect (2010)

According to Directive 2004/52/EC of the European Parliament and of the Council of the 29th of April, 2004 on the interoperability of electronic road toll systems in the Community, all new toll collection systems brought into service in the EU after 1 January 2007 should use one or more of the following technologies: satellite positioning, mobile communications using the GSM-GPRS standard (reference GSM TS 03.60/23.060) and 5,8 GHz microwave technology.

Specialist literature study (Nowacki et al. (2008)) demonstrates that Europe already has a poor record on the interoperability of ETC services between different countries. Each nation has hitherto developed its own system for toll collection, with at present only one example of cross-border co-operation. A future single contract and invoice system would have to take into account the split between public and private toll operators and the national differences in areas such as tariffs, sales tax and legislation.

Impacts
<u>Positive</u>

Some of the benefits of ETC include:
- fuel savings;
- reduced mobile emissions by reducing or eliminating deceleration, waiting times, and acceleration;
- reduced operation costs.

<u>Negative</u>
There are some privacy concerns

Net Benefit Score = **+ 8/10**

N.B. The above net benefit score is the resultant of the combined ranking (scored out of ten) of the positive and negative impacts as assessed by the partners when considering the selected innovations by transport mode and by innovation type, and reported in the templates produced for each innovation case..

3.1.1.1.2 Introduction of LHVs (long and heavy vehicles) (case 6)

The current regulation permits trucks of maximum 16.5 m (1 point of articulation) or 18.75 m (1 or 2 points) in length, 40 tonnes in weight and 4 m in height to circulate across European borders. For intermodal traffic, 44 t is the current maximum.

It is proposed to increase the limits allowed by the legislation in order to allow the use of bigger and/or heavier vehicles in and between adjacent and consenting Member States.

The concept, with limits of 25.25 m and 60 t, has been in use for years in Sweden and Finland. Many countries have set their maximum load at 44 t instead of 40 t.

In a study of De Ceuster et al. (2008) an overall positive effect on society is suggested. LHV vehicles seem to be more cost-effective than current HGVs (heavy goods vehicles). They transport more tonne-km (+1 %) with less vehicle-km (-12.9 %).

Additionally, positive effects were predicted for safety and emissions, both mainly due to a reduction in road vehicle-km (-12.9 %), despite the fact that the individual LHV is more unsafe and more polluting than a regular truck. The only negative impact is the high costs to road infrastructure. Higher investments in maintenance and bridges will be needed, though these investment costs are lower than the savings in the transport sector, and in society (emissions and safety).

Positive

The main arguments cited as favourable to an increase of dimensions include:

- Decrease of operational costs due to greater loads.
- Decrease of emissions (CO_2, NO_x, PM).
- Positive impact on safety as less trucks are needed for the same amount of goods transported.
- Driver shortage is alleviated.

Negative

Opponents to the system have an extensive list of objections, of which the most important are:

- Changes in competitive position (price) will push other modes out of contention, causing a domino effect (entire lines being lost), or at least will induce a transfer from less polluting and CO_2 emitting modes to the road, and thus have negative impact on environment.
- Reduced cost will generate more demand, causing increased emissions and congestion.
- Road, tunnel, bridge infrastructure could suffer greatly.
- If accidents occur, damage will be higher, and in numerous sections of the infrastructure, longer vehicles may induce unsafe situations for the other road users.

Net Benefit Score = **+ 3/10**

3.1.1.1.3 European Vehicle Emission Standards (case 9)

European Directives have been used for reducing the emissions for heavy goods vehicles. These include carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HCs) and particulate matter less than 10 microns in size (PM10).

Heavy goods vehicle emissions have originally been regulated by Directive 88/77/EC (heavy-duty vehicles) and amendments to it. A whole series of amendments have been issued to stepwise tighten the limit values. The Auto-Oil Programme focused on the emissions of carbon monoxide (CO), Volatile Organic Compounds (VOC), nitrogen oxides (NOx) and particles. It resulted in Euro III and IV standards for heavy duty vehicles (Directive 1999/96/EC, now repealed), as well as the fuel quality Directive 98/70/EC.

The legislation currently in force for heavy-duty vehicles is Directive 2005/55/EC (agreed in co-decision) and Directive 2005/78/EC (implementing provisions). This legislation defines the emission standard currently in force, Euro IV, as well as the next stage (Euro V) which will enter into force in October 2008. In addition, it defines a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV).

In Europe, the standard limit value proposals are developed in the Working Party for Pollution and Energy (GRPE), a subsection of the UN Economic Commission for Europe (ECE). The procedure is managed by a committee with participants from countries both inside and outside of Europe, so that the outline and effects of new regulation are discussed beyond the European perspective. A completed GRPE proposal is then developed into an EC Directive, making it mandatory for EU member states.

The Commission's proposal for a regulation on a new norm called Euro VI, aimed at reducing emissions of nitrogen oxides and particulate matters from trucks and buses as of 2012, was adopted in June 2009. At the same time, work is ongoing on the implementing measures for this act, which should be adopted by April 2010.

Impacts

Positive

- Harmonised emission limit values throughout the European Union have a positive impact on the competition in the internal market by sustaining a ‘level playing field’ for all automotive businesses.

- This policy results in improvement in air quality through reducing the levels of pollution produced by road transport, in particular by heavy-duty vehicles, and would therefore be an essential part of the regulatory measures necessary to meet the air quality

- Tighter emission limits could have both direct and indirect effects on fuel consumption and greenhouse gas emissions.

- Better air quality improves public health by decreasing morbidity rates and increasing life expectancy of the population, which in turn results in lower mortality. The impacts will grow in proportion to the penetration of newer low emission vehicles onto the market while older more polluting vehicles are retired.

Negative

- Cost of the technology that adds to the cost of the vehicles, as well as the increased fuel consumption that the technology involves. In practical operation the vehicles can emit more than the set limits.

Net Benefit Score = **+6/10**

3.1.1.2 Organisational

3.1.1.2.1 Road Pricing in Germany: LKW-Maut (case 2)

Germany has started working towards full application of “Eurovignette” directive that allows implementation of distance based charging schemes for heavy goods vehicles (HGV). It includes the implementation of “user pays” and “polluter pays” principles. Germany implemented HGV pricing scheme in 2003 after a 30 year debate, based on a law adopted by the German parliament in 2002.

The new tolling system was planned to come into operation at the beginning of August 2003. However due to very serious technical difficulties the system could not start until January 2005.

The level of the toll is based on the emissions class and number of axles on the truck and on the distance travelled on the toll route. The new German Heavy Goods Vehicle Toll Level Ordinance, that came into force on 1st January 2009, assigns each vehicle to one of four categories, A to D, based on its emissions class.

Technically the system is based on GPS/GSM technology. An onboard unit installed records the geographical location of the vehicle. Data is then communicated to the toll operator over an encrypted GSM link. A range of payment options is available, including LogPay plan which allows once a month payments.

The German HGV pricing scheme is operated by a private consortium Toll Collect, but it is supervised by the Federal Office for Goods Transport. The consortium is also responsible for enforcement which is done with help of microwave technology (DSRC).

Impacts

Positive

The modal shift effect, that is one of the aims of the policy, is limited. Much higher fees would be needed to shift traffic. Rothengatter and Doll (2001) estimate that an average charge of 20 ct/km as well as a surcharge of 5 Ct/km for vehicles over 18t would bring a modal shift of 3 %. In a further scenario, they calculated that modal shifts of 15 % correspond to a price level of 1.05 € per km combined with a 69 Ct per km charge for smaller vehicles.(Martino et al. (2008))

There was no reduction of kilometres observed, although a change in kilometres travelled according to emission standards – more environmentally friendly lorries are used since the introduction of the toll. However it is also possible that this is caused by natural process of replacing older vehicles with newer ones.

The LKW-Maut has an effect on the choice of vehicle emission class. It must be mentioned that other instruments that influence this choice are in force as well like vehicle tax and financial incentives for purchase of new vehicles.

Negative

A traffic increase on secondary road network was observed. For example, Ministry of the Environment reported an average increase of traffic in the secondary network at 7.6 % (about 57 lorries per day) of which 6.6% (49 lorries per day) is due to the toll (Martino et al. (2008)).

Net Benefit Score = **+ 2/10**

3.1.1.2.2 Off-peak Deliveries (PIEK programme, Netherlands) (case 8)

The problems of congestion and air pollution are caused throughout the city streets as delivery trucks share the precious road space with private vehicles. A solution to this can be utilising that road space in off-peak times, such as before 07.00 and after 19.00. It involves an advantage for the carrier since fresh products can be transported when it is less busy on the roads. People living in the area, however, may be disturbed by these activities since stocking shops could lead to noise nuisance.

At the end of 1998 in the Netherlands the renewed “Decree Retail Trade Environmental Protection” came into effect. This Dutch decree sets down that the noise emission level must remain within the noise emission standard. It requires that the noise emission generated when loading and unloading goods, in particular with trucks, between 19:00 and 07:00 must comply with strict peak noise standards.

Given the equipment currently used, industry and commerce cannot comply with the stricter standards. These noise emission standards are forcing shops and the transport sector to come up with innovative measures. At the same time, however, it must be possible to implement these innovations both technically and economically within a few years. The Ministry of Housing, Spatial Planning and Environment, the Ministry for Economic Affairs and the Ministry for Transport, Public Works and Water Management introduced a long-term PIEK (peak noise) programme in 1999 in order to bring about the necessary technical adjustments, by tackling the source, to the means of transport, the materials used when loading and unloading goods and the loading-unloading locations. The long-term PIEK programme includes 10 main projects ranging from technical development of equipment to transfer of knowledge for reaching the desired goals. With the exception of the truck and the shopping troley, all solutions meet the 60 dB(A) requirement. Trucks and shopping trolleys meet the 65 dB(A) requirement.

Impacts

Positive

None identified, but anticipated to be strong

Negative

None identified, but anticipated to be weak

Net Benefit Score = **+8/10**

3.1.1.3 Cultural (including Marketing)

3.1.1.3.1 Trucks-on-train: Switzerland (case 1)

A trucks-on-train service, sometimes also called piggyback or motorail service, involves carrying involves carrying the complete truck or semitrailer by train. The driver during the journey stays in a separate passenger cart. The close-coupled, low-floor wagons have a small wheel diameter (360/335 mm), a loading height of just 140 mm and loading tracks throughout to make it easy for road vehicles to drive on and off. The particular advantage of the piggyback service is that the road haulier is not required to satisfy any special demands or make any special investments. In addition, piggyback services through Switzerland offer the advantage of being exempt from such restrictions as the ban on night-time and Sunday travel and the limitation on gross vehicle weight. As a result, trucks with gross vehicle weights of 40 and 42 tonnes can be carried at any time of the day or night.

The trucks-on-train services in Switzerland are offered by Hupac AG in Chiasso and its subsidiary RAlpin AGin Berne (Freiburg im Breisgau to Novara route).

The economic viability of the project is ensured by strong political support and high tolls for the truck transport passing through Switzerland.

Impacts

Positive

There are positive changes in the road haulage sector. The trend towards an ever growing number of lorries on the roads has been broken and the negative effect on the environment shows a significant decrease. The rail sector's share of freight remained steady.

Negative

In the Swiss implementation negative environmental effects are observed. To evade the necessity of using the truck-on-train service the trucks have to take alternative routes through France or Austria which adds 300-450 km to a single journey. This is a way of exporting the environmental problems to the neighbouring countries.

Net Benefit Score = **0/10**

3.1.1.3.2 Environmental Zones (case 10)

In 2006, the Dutch Government and the road haulage organisations in the Netherlands signed the agreement "Promoting clean lorries and the introduction of environmental zones", in order to tackle air quality issues and to fight environmental noise in Dutch inner cities. The introduction of so-called environmental zones was intended to reduce air and noise pollution caused by transport. Currently, environmental zones for lorries have been established in ten cities in the Netherlands. A city can establish an Environmental zone by joining the agreement.

Only clean lorries may enter environmental zones. To be clean, diesel lorries weighing over 3,500 kg must comply with the Euro 3 emission standard. Lorries with diesel engines that comply with the Euro 3 standard must be fitted with a particle filter. Lorries with Euro 4 or Euro 5 engines may enter environmental zones without having to be modified. There is a penalty for non-compliance with the admission criteria.

Impacts

Positive

- The introduction of Environmental zones in the cities has a positive impact on air quality.
- It also appears that an average truck in the Environmental zone is "cleaner" than a truck outside the zone: the proportion of new trucks (Euro 4 or Euro 5) is clearly much higher and relatively more trucks have a particulate filter.

Negative

- Due to lack of enforcement still a high proportion of vehicles that do not meet the standards are operating.
- Extra investment is required from companies that wish to continue operations in city centres.

Net Benefit Score = **+4/10**

3.1.2 Rail

3.1.2.1 Technological

3.1.2.1.1 <u>European Rail Traffic Management (ERTMS) (case 3)</u>

At present time, European rail network is fragmented into several national networks that are incompatible between them. To promote continuous and efficient railways in the European area, the European Union has supported since the 1990s a program of research on a new tool: the ERTMS.

ERTMS (European Rail Traffic Management) is a system of monitoring of rail traffic destined to replace the 27 rail signaling systems in service in Europe.

ERTMS is based on two components:
- GSM - R: radio system developed from the GSM technology to exchange information between the track and the train.
- ETCS (European Rail signaling system) consisting of two "modules" (track – train), allows transmission from the cab of the data on the rail signaling system, and their processing by the board computer. The transmitted data inform on the maximum permitted speed and provoke the automatic braking of the train in case of excess or non-respect of priorities.

There are three levels of ETCS:
- Level 1: data transmission is made from the ground to “eurobalises” (which are positioned on the tracks). Board computer receives simple information about speed and priorities.
- Level 2: transmission is made by GSM - R radio. The “eurobalises” become useless; that permits substantial savings in terms of investment and maintenance.
- Level 3: trains send themselves their information, allowing to ensure their tracing in real time on the track and to increase the capacity of a line. This last issue should be facilitated by the commissioning of Galileo.

The purpose of this new European standard ERTMS/ECTS is therefore to increase the competitiveness of the rail sector and provide an efficient service in safety, punctuality and reliability by:
- Making interoperable networks
- Improving the capacity of the most congested European axes by a better traffic management
- Improving the average speed of transport

However, the ERTMS/ECTS is just a standard. The developments of these systems depend on free competition of the European railway industries. Currently, priority is given to new lines equipment (essentially the LGV) and to the creation of six European rail freight corridors defined in the Ten - T program.

Impacts

<u>Positive</u>

If installation of ERTMS on European network is very expensive initially, in theory, the savings generated by this new system, on the long term, should “a posteriori” compensate the realized investments. ERTMS has several virtues:
- The system itself allows savings in terms of maintenance and operating.
- Indirect savings can be made by better management of infrastructures and their traffics. Optimizing some axes should prevent from building new lines.

At the present time, this system, despite its failings, seems to be the only way to improve performance and reduce costs of European rail transport. The shortest period of migration will definitely benefit to EU competitiveness.
However, if the ERTMS is not introduced enough during the 2007-2013 period, it is possible to foresee that the European rail lost its competitiveness. This result would be unacceptable to economic, social and environmental points of view.

Negative

The most important negative effects in the sector due to the installation of the ERTMS will take place in the transition period and take different forms:
- The ERTMS installation induces new important costs of adaptability and modernization of networks in Europe.
- The juxtaposition of the ERTMS network on the old system might increase the costs to obtain a real ERTMS network.
- Railway operators won't assume alone the costs of transition.
- Finally, there is an industrial risk to see subsystems to appear that will question again the interoperability of the networks. Manufacturers are currently required to have a specification in conformity with ERTMS. However, to ensure a reliable interoperability, the simple conformity won't to be enough.

The transition period is therefore a delicate topic for the economical balance of the European rail system, hence the necessity for the EU to subsidize investments and push managers to develop their ERTMS network. How long the transition, how heavy the cost to bear is difficult to estimate..

Net Benefit Score = **-1/10**

3.1.2.2 Organisational

3.1.2.2.1 Eurotunnel Shuttle (case 7)

Eurotunnel : particularities : both transport operator and infrastructure manager : unique in Europe !

Eurotunnel shuttle is a shuttle service for HGV and cars between Calais / Coquelles and Folkestone (UK) managed by the private French-British Company Eurotunnel which has the concession of the use of the tunnel infrastructure for 99 years. It goes through the Channel Tunnel with a "ferroutage service" with HGV and passenger cars between carried in closed wagons (HGV are carried on semi open wagons with a separate passengers carriage (Club car) for the drivers.

Modal split of Trucks crossing the Tunnel : 32 % in 2009 (Objectives Eurotunnel 2010 : 38 %), source : les Echos, 10.03.2010.
2008 – 2009 : - 40 % Eurotunnel HGV Shuttle (Source : les Echos, 29.01.2010).

Competition is starting since 2009 : first 'open access' freight train through the Channel Tunnel in april 2009 (from Colas Rail ordered by Fret SNCF and Haulage through the Channel Tunnel has been contracted to Eurotunnel's rail freight subsidiary Europorte 2, following Rail Gazette International).

"With an average of less than four trains/day, rail freight is still the worst-performing element in the Channel Tunnel's traffic mix. According to Eurotunnel's 2008 results announced on March 4 2009, the top performer was Eurostar, exploiting its first full year of High Speed 1. After adjustment for exchange rate fluctuations, Eurostar and DB Schenker Rail together paid €260m in access charges, 7% up on the year before.

Despite the fire last September, which seriously disrupted its shuttle business but was substantially mitigated by insurance, Eurotunnel increased its operating margin to €421m, even though its total revenue of €704m was 2% down on 2007 on a restated basis. A further reduction of 2% in financial charges helped to produce a consolidated net profit of €40m, allowing the company to pay its first dividend since equity was issued to the public in 1987".

(Source : Railway Gazette International)

Impacts

Positive

Since 2001, Eurotunnel shuttle service carries each year around 18 million tons goods and 15 million passengers.

Negative

Impact on the ferries; competition with ferries and indirectly with maritime companies and FRET SNCF / EWS freight trains.

1996 : a fire in a lorry (HGV) disturbed the functioning of the tunnel.
2008 – 2009 : - 40 % Eurotunnel HGV Shuttle (Source : les Echos, 29.01.2010).

Sept. 2008 : fire in the tunnel. The Newspaper "Les Echos" is writing that Eurotunnel did not get back all its customers (Source : les Echos, 29.01.2010).

Net Benefit Score = **+6/10**

3.1.2.2.2 Froidcombi (case 6)

Froidcombi is a combined rail operator. It operates five times per week the refrigerated transport of goods (mainly fruits and vegetables) between Avignon and Valenton (in the Paris region) at an average speed of 140 km/h. The proposed service is essentially dedicated to road hauliers and freight forwarders who need fast services, transportation at night, etc.
The concerned lines are:

- Avignon – Valenton
- Avignon – Dourges

The innovation brought by this combined operator is its "CO2 approach" developed in 2009 in partnership with ADEME (French Agency for Environment and Energy Management).
The idea of the operator is to take advantage of the media surge around the "Grenelle of Environment" by communicating on the environmental advantages of rail compared to road.
The operator is therefore committed to provide monthly to each of its clients:

- The number of carried cases
- The consumption of CO2 by iron
- The consumption of CO2 avoided compared to the road
- The achieved fuel economy
- The economic value of C02

The calculation of the CO2 consumption by rail and road is concerning the journey between the site of departure and arrival.

Impacts

Positive

The clients are generally satisfied by this approach.

The operator was cited by ADEME as an example for other rail operators.

Negative
None identified

Net Benefit Score= **+7/10**

3.1.2.2.3 Trans-Siberian Railway Freight (case 5)

In view of the growth of freight traffic during the last two decades between Asia and Europe, the Trans-Siberian has recently been experiencing a new interest from rail operators. Faster than shipping and cheaper than air, it presents a large number of advantages despite the technical and organizational difficulties that may occur.

In 2008, Deutsche Bahn launched its first container train between Beijing and Hamburg, as a sign of a political and economical goodwill to develop this axis. The convoy travelled the entire 10 000 km in 17 days (half the time of the sea journey) permitting the delivery of 100 containers loaded with Fujitsu Siemens hardware.

This first test was considered as a success. A project to develop a Trans Eurasia Express weekly service of 120 TEUs, provided by DB Schenker, has been running since February 2009.

Impacts

Positive

The anticipated benefits are numerous:

For economic actors, such as Fujitsu:

- Cargo in half the time compared with the sea transport (via the road from the south).
- A secure cargo (preventing potential piracy in the South Seas)
- Less expensive than air and less polluting

Russia expects to revitalize the port activities of its Maritime Territory (Far East) and more generally in the northern part of Siberia, linked to the project to create a technology park in Vladivostok (a Russian “Silicon Valley”).

Finally, China considers the Trans-Siberian as a good way to develop its hinterland and to relieve its Pacific coastline.

The positive economic effects will be even stronger when the upgrading of the line will have been completed and when the connection between the two continents will not require more than 7 days.

Negative

None identified

Net Benefit Score = **+8/10**

3.1.2.2.4 Betuwe Line (case 9)

On June 16, 2007, 160 kilometers of dedicated freight lines (double tracks freight railway) were opened between The Netherlands (Rotterdam Harbour) and the Germany. The speed is around 120 km/h.

The cost of this project was 4,7 billions euro, twice the original budget of 2.3 bilion euro and four times the initial 1.1 billion euro estimate in 1990. This infrastructure was finished in mid 2007. Forecasts were for around 160 trains by day which means 37 millions tones of freight each year

After 10 months of operation (June 2007-april 2008), only 1000 freight trains were operated on this infrastructure, i.e. 3 trains/week.

Since December 2007, an increase of traffic to around 100 trains a week has been observed. Full capacity is 10 trains per hour in each direction if the German safety gear and other infrastructure is updated

Travel time between Rotterdam and Ruhr will be reduced from 4h.30mins. to less than 3 hours. This freight line is expected to capture 60% of the freight traffic between NL and Germany. underpinning this line, there is also a project of modal shift from road to rail: this project is expected to transfer, in the medium term, 50 millions freight tones from road to rail.

Impact

Positive

Integrated framework of sustainable development and modal transfer from trucks towards railway transport.

On the issue of modal split truck/waterway/train :

1995 : exit from Rotterdam harbour : road (53%), rail (14%) and waterway (33%).
2000 : road (44%), waterway (41%) and rail (15%)
The Betuwe line aims at changing this modal split because of large congestion on road access to Rotterdam harbour.

Considerable infrastructure was built or reconstructed to get the trains rolling : for instance :
- container terminals in Rotterdam ; Rail service center in Maasvlakte and Waalhaven
- Stations, tunnels, bridges,…

The railroad freight line Betuwe line is part of a large railroad freight network between Genova and Rotterdam : forecasts show 26 % increase in reliability, 52 % increase in capacity allocation and 20 % reduction in time spend on transport.

Negative

Difficult to know the impact on inland waterway and trucking transport (modal transfer issues), but negative effects are anticipated.

Net benefit Score = **+6/10**

3.1.2.2.5 Tri-Modal Plateform Delta 3 in Dourges (NorthFrance nr Channel Tunnel) (case 10)

Started the 15th, December 2003, the Dourges Platefrome is the only dedicated tri-modal logistic continental platform in Europe : road, rail, and waterway.

It is considered as a door to maritime ports in North Europe with terminal of combined transport and logistic warehouse from the last generation (Yamaha Motors, Fnac Eveil et Jeux, Leroy-Merlin and Kiabi are the main logisticians in 2006).

.
The idea was to transfer the activity of Inner-City logistic center Lille Saint-Sauveur to a larger area

(Study done in 1991 by the Region Nord Pas-de-Calais).

Population around the platform accounts by 800 000 people.

Impacts

Positive

Expected significant reduction in CO² emissions

Success in intermodal cooperation and intermodal management. (This has to be further investigated because more than 90% of the « *caisses mobiles* » or containers operated by waterway need to be reconditioned).

In the future, transbording will only be possible in 2- 4 min at European ports due to the size of boats: so the Dourges platform has a key role to play now.

Negative

None identified

Net Benefit Score = **+6/10**

3.1.2.2.6 Direct rail freight line between France and Russia (GEFCO) (case 11)

Managed by Naviland (belonging to FRET SNCF in France), then Captrain Deutschland / ITL in Germany (belonging to FRET SNCF) and Poland till the Bielorussian boundary then transfer of containers (due to difference of gauge of tracks between Poland and Russia) on Russian trains RGB till Kaluga.

GEFCO is currently looking for a client for empty return traffic (70 % empty and 30 % used by PSA by recycling materials).

The first train between Vesoul (France, PSA large plant) and started the 5th of March 2010.
It arrived 5 days later in Kaluga, around 100 km south West from Moscow where is located the joint venture with Mitsubishi.

Already 3 trains operated by GEFCO on this line since the beginning the traffic is impressive: 1 200 containers on a 6000 km long track and return (400 dedicated wagons), it means a reduction of 576 trucks a year or 36 trucks every day !

Impact

Positive

Expectation of reduction in CO² emissions
Success in international cooperation and intercultural management

(M. Yves Fargues, Chairman at GEFCO, indicated three reasons for the success of GEFCO: regularity, large volume involved, and few carbon emission ("bilan carbone" is now an obligation for large companies in France, in the same way than a "social bilan").

Negative

None identified

Net Benefit Score = **+6/10**

3.1.2.2 7 Proximity freight train operator : TPCF (Train du pays cathare et du Fenouillèdes) (case 12)

A new freight train operator is accepted for freight operation starting April 20, 2010.
Since 2001, this company is operating a touristic train on 61 km RFF tracks between Rivesaltes (Pyrénées-Orientales) and Saint-Martin Lys (Aude)

Freight transport in this region was abandoned by Fret SNCF since 4–5 years. Last Fret SNCF train was operated in December 2009.

Objectives: "**feldspath"** coming from Imerys, which were before transferred to the road !
-> between 80 000 et 100 000 tons / year : it means - 8 160 trucks every year ! ! !

Impact

Positive

Expected reduction in CO² emissions
- Success in short- term perspective (medium-term has to be investigated further)
- New dynamism for railway activity far away from monopolistic behavior

Negative

Impacts on the trucking sector

Net benefit Score = **+6/10**

3.1.2.3 Cultural (including Marketing)

3.1.2.3.1 MODALOHR (case 8)

Modalohr has the particularity to be at the same time a technical innovation and an organizational one, but it may also be regarded, for this exercise, as a cultural/marketing innovation .

On a technical aspect, R. Lohr created in 1992 a low-floor articulated railway wagon, adapted for transhipment of standard semi-trailers from road to the rail.
It is characterized by:
- Maintenance costs comparable to those of a conventional wagon thanks to the standard bogies and wheels.
- Horizontal loading of trucks directly carried out with the roadway tractor (no handling equipment).
- Lateral « herring-bone » loading of trucks makes possible the simultaneous, rapid transhipment of the trucks.

- A fully mechanical and very simple system, for articulation and "opening" the wagons, that significantly reduces maintenance.
- A simple and low cost transhipment terminal made of an asphalt space and a railroad (no quays).
- The very low loading platform enables 4 meter-high trucks to be loaded within the limits of existing railway gauges (UIC GB1).

MODALOHR is not only able to carry on complete trucks but also simple semi-trailers without any specific condition. The driver loads on his truck by himself in about 40 minutes in theory.

On an organizational aspect, the purpose is to propose to the road hauliers a rail service comparable in terms of cost, lead times and accessibility with a motorway as an alternative to the road.
The classical combined transport offers this alternative only to a few numbers of trucks from the congested ways because of restrictive technical duties of access (remorques préhensibles par pinces, swap body). Thanks to a lateral loading, Modalhor doesn't suffer from restrictions and deals with all types of vehicles.

The high number of trucks potentially concerned by the system permits to build a regular shuttle service between the terminal (for example one train every two hours or one per hour). This rate enables a great flexibility to road hauliers. The availability of the rail service is almost 24 hours and without booking.

A restaurant and couchette wagon offers to the drivers an adapted space to have a rest. Those trains do run on the same principle as shuttle-trucks under the Manche, but on longer distances. Intermediary stops can be proposed to improve the filling rate and traffic.
The minimal interesting distance for hauliers between two terminals is about 350 km (meaning 4h30 of driving). This minimal gap can be reduced in case of natural obstacles (Alpes mountains, La Manche…)
This system has been approved in 2003 and is already working between Aiton (St Jean-de-Maurienne) and Orbassano (Turino) on a 175 km way and between Le Boulou (Perpignan) and Bettembourg (Luxembourg) on 1000 km.

Impacts

Positive
- The Perpignan axis project that has just been launched is leading other projects in its way (Bordeaux - Lille).
- 60% is the percentage (fuel, tolls), of cost savings on the cost when a business leader chooses rail.
- A system in the continuity of the land transport without special equipment for trucks.
- Easier handling means to cross-dock rail / road (terminals, equipment)
- Relieve the traffic congestion on the major motorway axis from a part of the transit flow.

Negative

- 80% of road transport of goods is carried on distances of less than 150 km.
- Railway highways are pertinent and economically viable on distances over 650 km except in the case of major natural obstacles (mountainous Highlands, Straits etc.).
- The system still has difficulty to find its audience in France among road operators:
  - Dimension of trucks which tend to gain volume. This phenomenon is underestimated by platforms.
  - Still too low frequency of trains and undercapacity (one departure per day in both directions on Bettembourg - Perpignan with only 40 semi-trailers in capacity).

Total cost of the trip without subsidy still too close to the road option to be really competitive.

The combination of these data demonstrate that rail may never replace the road for the transportation of goods over the shorter distances.

Net Benefit Score = **+2/10**

3.1.3 Maritime

Under the heading of maritime freight transport, five cases of success dealing with innovation processes have been identified, at both global and at European level. The attribution of each case to the type of innovation, e.g. technological, is purely indicative as each innovation could be linked to different categories. The successful cases proposed have been identified primarily on the basis of academic and scientific literature review in maritime economics and logistics, and also on the basis of documents from the European Project EIRAC.

3.1.3.1 Technological

Under this heading there are two innovative cases: reefer containerisation and mega containerships.

3.1.3.1.1 Reefer Containerisation (case 10)

Reefer containerisation refers to the growing percentage of perishable cargo moved in reefer containers (positioned both in containerships and in specialised reefer vessels) and to the growing containerships' capacity dedicated to reefer containers.

This innovation can be classified as incremental as the number of reefer containers and of containership fitted with electrical slots for carrying reefer boxes has increased continuingly in recent years. And it is technological innovation because of investments in innovative technologies that have been applied both to reefer vessels and to containers. Now there is a wide range of reefer container typology according to the variety of refrigerated cargo.

The volumes of reefer trade have shown a strong increase during the latest ten years, growing from 90 million tonnes in 1998 to the actual 156 million tonnes transferred to importing countries (Drewry 2009). As a consequence, shipments of perishable commodities via sea have expanded and changed: the volumes of reefer cargo carried by the specialised reefer fleet have been gradually eroded by the competition from containerships. In 2002, an estimated 1200 billion dollars worth of food was transported by a fleet of 400 000 refrigerated containers (Gac 2002). Today the containership fleet has more reefer container capacity than the whole fleet of bulk refrigerated ships.

Impacts

The main impacts generated by reefer containerisation are

Positive

- Economic: the competitive advantage of a reefer container moved at a lower cost than the equivalent capacity in a specialised reefer.
- Logistical: the decrease in risk of cargo loss and deterioration (and consequently minor insurance costs) due to the constant monitoring of the temperature and humidity of the shipments, both at the terminals and on board the vessels.

- Social: better quality of food products consigned to the final consumers.

Negative

- Logistical: longer lead times due to routes based on transhipment.

- Logistical: difficulties in balancing the shipments (containers not repositioned in the export areas).

Net Benefit Score = **+ 5/10**

3.1.3.1.2 Mega containerships (case 2)

Mega containerships are classified in literature as the containerships yielding with more than eight thousand containers or twenty-foot equivalent unit (TEU). The market of container vessels has been continuously growing from the early 1980's.

In 1985, a trend of gradual increase led to the 4 000 TEU Panamax vessels ordered in the early 1990's. After the mid-1990's, an untypical rapid growth in size took place, as a consequence of the post-Panamax concept (pioneered by American President Lines Ltd. (APL) in 1989), as long as more than 7 000 TEU ships appeared on the market.

In recent years, the major shipping lines have employed ships over 8 000. From 2005 to 2006, there was a strong increase in size due to the construction of Emma Maersk, the largest in service since 2006, with the maximum capacity of 14 500 TEU (even if its official capacity is 11 000 TEU). Since then until now, the market has observed vessels with less or equal capacity like the other seven vessels with the same characteristics as the Emma Maersk (called PS Series).

Impacts

The main impacts generated by the mega containerships are:

Positive

- Economies of scale related to sea transportation (higher profits for shipping lines), and
- Revenues that ports may receive from the tariffs for accommodating them.

Negative

- Logistical: longer lead times due to hub and spoke structure.

Net Benefit Score = **+2/10**

3.1.3.2 Organisational

Two innovative cases have been considered under this typology: Hub & Spoke (Transhipment) and Strategic Alliances.

3.1.3.2.1 Hub & Spoke (Transhipment) (case 4)

The hub-and-spoke system concentrates maritime traffic at a relatively small number of port terminals, called hubs. The use of hub facilities and the routing of consolidated flows through inter-hub links allow the centralization of commodity handling and the transportation cost per unit of flow to be less expensive than directly shipping via a non-hub network structure.

The adoption of hub-and-spoke networks was one of the most significant innovations occurred in the air transport industry, following the US airline deregulation in 1978. The hub-and-spoke structure has characterized the re-organization of transportation networks for the past 20 years, not only for air, but also for rail and maritime freight transportation. The emergence of major offshore hubs favoured a concentration of large vessels along long distance high capacity routes while lesser ports can be serviced with lower capacity ships. Consequently, the emergence of offshore hubs has permitted liner services that would otherwise be economically unfeasible.

Impacts
The main impacts generated by the hub-and-spoke network systems are:

Positive

- Economic: economies of scope to compete in global markets.
- Technical: higher load factor of the containerised fleet.
- Logistical: rationalisation of demand fluctuations on different routes.

Negative

- Environmental problems at hubs, such as noise, air pollution and traffic congestion.
- Logistical: the reliability of global networks depends only on few hubs.

Net Benefit Score = **+2/10**

3.1.3.2.2 Strategic Alliances (case 3)

These arrangements are mainly composed of liner operator's co-operation on rates and other forms of operating agreements among global carriers in the maritime industry, e.g. liner conferences.

These alliances can be classified as an organisational innovation as they aim to enlarge the range of services provided by each member, through a geographical complementarity where respective networks and markets are brought together.

The literature has analysed this topic both through theoretical and practical studies, pointing out the effects of different forms of co-operation on the single firm, the maritime transport industry as a whole, the logistics industry, and on the supply chain. The results generally show that co-operation may be necessary to pursue competition inside the shipping and logistics market.

Impacts
Positive

- Economic: economies of scope to compete in global markets (profits for each partner).
- Technical: higher load factor of the containerised fleet.
- Social: higher range of liner services and capacity offered.

Negative

- Economic: supply controlled by few container operators (and consequent concentration among stevedoring companies)

Net Benefit Score = **+2/10**

3.1.3.3 Cultural (including Marketing)

3.1.3.3.1 Port State Control (PSC) (case 5)

Port State Control (PSC) is the inspection of foreign ships in national ports by PSC officers (inspectors) in order to verify that the competency of the master and officers onboard, the condition of the ship and its equipment comply with the requirements of international regulations and conventions (e.g. SOLAS, MARPOL, STCW, etc.) and that the vessel is manned and operated in compliance with applicable international law.

Every PSC inspection generates an inspection report which contains detailed information on the deficiencies noted together with relevant vessel particulars such as the flag of registry, IMO vessel number, vessel type, year built, and date of inspection.

PSC represents an incremental innovation as it resulted from a historical sequence of international safety regulatory regimes for the prevention of accidents at sea.

Impacts
The principle impacts generated by this Port State Control are:

Positive

- Environmental: Reduction in pollution.
- Social: Prevention of maritime accidents and enforcement of international standards of vessels' security.

Negative

None identified

Net Benefit Score = **+7/10**

3.1.4 Inland navigation

3.1.4.1 Technological

3.1.4.1.1 Shore Power (case 9)

On a large amount of locations in the Netherlands the limits of air quality are exceeded. Especially the limits in Nitrogen (NOx, enforced in 2010) and the amount of days that exceed the daily limit particular matter (PM) emission. The province Zuid-Holland in the Netherlands wants to contribute in improving the air quality. They are convinced that the inland shipping industry can contribute by using shore power instead of onboard generators. For this reason they started a project "Walstroom Zuid-Holland", this project is divided in three subprojects; Walstroom binnenvaart Rotterdam, Provinciale vaarwegen and Drechtsteden. Improving the air quality is the first goal of using shore power. The second goal is the noise reduction for the crew and the environment.

Feasibility studies concluded that utilizing the shore power could significantly reduce the emissions, installing the required installation to supply shore power is technical feasible and the cost efficiency of the investment is hard to determine. The cost efficiency of the investment is not the most important conclusion, other incentives to use shore power are more important (green image, sustainability and environmental friendliness).

Walstroom binnenvaart Rotterdam (shore power inland shipping Rotterdam) started a pilot project in November 2007 called "walstroom maashaven", after these successful feasibility studies. The goal of the pilot project was to determine if shore power could be supplied in a modern and user friendly way. Before the start of the project there was a possibility to receive shore power by means of a shore power case. Coins had to be inserted in these cases to receive the electricity, most of the time the power supplied was not sufficient for the barge. This method proved to be an unsuccessful method. The modern and user friendly method meant that the port of Rotterdam wanted an online payment and a user registration. In cooperation with other participants in the project this goals are achieved.

The development of one homogenous system in the Netherlands is a crucial factor for the implementation of shore power.

Impacts

Positive

The most important effect when supplying shore power is to improve the air quality, by reduction of emissions. A positive side effect is the noise reduction for crew and environment. By improving the air quality of existing industries environmental space is created for new industries to develop. Shore power used by the inland shipping industry will strengthen the position of the inland shipping industry.

When ship owners have to invest in just one system they are willing to contribute to a more environmentally friendly industry. For this reason a uniform system of shore power is required. This uniform system is developed and formulated in a guideline for the technical installation of shore power. These technical guidelines are spreading in the Netherlands.

The shore power will only contribute to the reduction of emissions when it will actually be used by ship owners. For this reason the province of Zuid-Holland in the Netherlands will enforce a generator prohibition. If all ship owners are obligated to stop the generators when moored the air quality will improve even further.

When the Netherlands can proof that a national system of shore power is favorable over using generators when barges are moored they will get a broader support in Europe. Other countries are able to install the system as well, they will save study and pilot project costs. For this reason the European Union funded part of the project.

Negative

The shore power will only contribute to the reduction of emissions when it actually will be used by ship owners. For this reason the province of Zuid-Holland in the Netherlands will enforce a generator prohibition. The prohibition of using a generator will force the ship owners to use shore power, for this reason he is obligated to invest in the installation on board of the barge.

The technical guidelines determined by port authorities obligate ports that if they would use shore power they have to install the prescribed installations. If a port is already using shore power by means of older systems, they are obligated to invest in new systems.

There are points of improvement in using the shore power while it is already prohibited in some parts of the Netherlands to use the generator to raise electricity. Using the onboard generator results in risking a penalty. The electricity tariffs are high compared to raise electricity on board of a barge by means of a generator. The ship owners think that the cables on deck are dangerous for the crew. Barges are moored next to each other while they wait for cargo. If the barge moored next to the quay is requested to load her cargo the other ship owner have to shift their barge, this results in uncoupling and coupling of the shore power connection.

Net Benefit Score = **+2/10**

3.1.4.1.2 Advising Tempomaat (case 2)

In the inland shipping there is a continuous search for possibilities to reduce the fuel consumption. Less fuel consumption will increase the efficiency of the company. Less fuel consumption will reduce the impact on the environment of the inland shipping industry. In relation to less fuel consumption "Techno Fysica" developed the so called "Tempomaat". The Tempomaat is an instrument to influence the fuel consumption of the barge, taken into account constrains determined by the crew of the barge, by adjusting the position of the governor. Automatic adjustment of the position of the governor is not desirable in all circumstances because of traffic intensity, speed of transport, etc. To overcome the problem of an automatic adjustment of the governors' position a new device is developed, the "advising Tempomaat".

The "advising Tempomaat" advices the captain about the desirable position of the governor taken into account constrains that he determined. These constrains are; the place of departure, destination, and the desired time of arrival. The "advising Tempomaat" calculates the most economical efficient sailing plan. The advice carried out by the Tempomaat takes into account the resistance of the hull and the resistance of environmental factors (like shallow water draft, current and narrow navigation water). The input used by the system is a Global Positioning System (GPS), inland Electronic Chart Display Information System (inland ECDIS) and a fuel consumption measuring system on board of the vessel. In case of calamity and congestion the system automatically adjust the planning and time of arrival. The information of the navigational waters required (like calamity and congestion) will be delivered by the River Information System (RIS), when this system is available.

A pilot project A-Tempomaat was started by Bureau Innovatie Binnenvaart (Innovation office inland shipping) in the Netherlands in 2002. The pilot project showed a decrease of fuel consumption in case of the tanker barge Vopak Lorentz of 15% and in case of the push tug Veerhaven of 10%.

Impact

<u>Positive</u>

The advising Tempomaat is suitable for a just in time strategy of the ship owner. Using a just in time strategy strengthens the reliability of the inland shipping industry.

The advising Tempomaat makes it possible to reduce the fuel consumption and emission of the barge. The operational costs of the ship owner decrease and the environmental impact of the inland shipping industry decreases. This strengthens the competitive position of the inland shipping industry compared to road and rail transport.

<u>Negative</u>

The advising Tempomaat requires some input of other devices; GPS, inland ECDIS and engine performance. These systems should be implemented when the Tempomaat is implemented, for this reason the investments are significant. The ship owner is depending on these instruments to perform a good sailing plan.

<u>Net Benefit Score</u> = **+5/10**

3.1.4.1.3 Y-shaped hull, Scheldehuid (case 12)

For a long time watertight bulkheads are being installed in the construction of the vessel to reduce the leakage volume of the vessel and prevent the vessel from perish in case of hull damage. Comparable solution are the requirements of a double hull tanker instead of a single hull tanker. The reason of installing watertight bulkheads is mostly performed to safe passengers, crew and vessel. The double hull requirements are mostly performed to save the environment in case of an incident onboard of a tanker. In the Netherlands and other countries a lot of studies are conducted in the last two decades to get a view on the consequences of a collision to the construction during the process of the collision. Behavior of the construction in case of a collision in the Netherlands is studied by means of a crash test. TNO Netherlands (Toegepast Natuurwetenschappelijk Onderzoek, Applied Science Research) commissioned by a Japanese consortium, German consortium and shipyard de Schelde carried out these crash tests. Participation in this study and a literature study of de Schelde shipyard resulted in obtaining the required knowledge to develop a new method of stiffening the vessels' hull. This construction is developed to ensure that in case of an impact the hull deforms without losing its water tightness.

This new construction is known as the Scheldehuid or Y-shaped hull. The name Y-shaped hull indicates the new design of the stiffeners inside the hull. This new construction is tested in crash tests. The results of these crash tests were positive, an increase in energy intake and a increased resistance against cracks. A second real scale test, risk analysis and calculations were required by the ADNR (covenant for international transport of dangerous goods on the Rhine) to convince them of the quality of the new stiffened hull. Finally the ADNR was convinced about the quality of the construction and decided that the inland shipping tankers using a Scheldehuid could increase their tank capacity from 380m³ to 1000m³.

The first inland tanker barge with the Scheldehuid is the "Chemgas 20", this vessel is a gas tank lighter build in 2002. After this first barge with a Scheldehuid was operational, the second barge followed not long after the building of the first one.

Impacts

Positive

Tanker barges installed with a Scheldehuid are approved to install larger tanks by ADNR. In a conventional tanker barge tanks of maximum 380m³ and in a tanker barge with Scheldehuid tanks of 1000m³ are allowed. The required amount of tanks is decreased, this saves a lot of material, to install an Y-shaped hull extra material is required. Less material due to the amount of tanks and more material due to the hull construction are more or less equal. For this reason the extra investment to use this type of hull is insignificant. A side effect is the reduction in pumps, measure equipment and other tank measures. This results in a cost saving compensated by the license costs of the new hull.

A smaller amount of tanks reduces the required handlings during the loading and discharging process. The risks for not being able to survey the processes anymore are smaller. These two reasons decrease the risk of spillage caused by human failure during cargo operations.

The strength of the hull when using an Y-shaped hull is tested in real scale crash tests. In these tests the Scheldehuid was proven to be safer than the conventional single and double hull. The hull will be deformed in case of an impact instead of being penetrated, the risk of spillage is reduced.

Negative

Some literature indicated a higher lightweight and steel price of the vessel because the construction is 2.5% heavier than the conventional hull. Other literature mentioned that the conventional hull and Scheldehuid hull will have the same weight. It is hard to tell which allegation is right. Do they take the steel weight decrease of tanks into account?

Net Benefit Score = **+7/10**

3.1.4.2 Organisational

3.1.4.2.1 River Information Services (case 6)

Despite the enormous network of canals and rivers in Europe the inland waterways are still not fully utilized. The European Commission is convinced about the potential of these inland waterways, shifting freight from rail and road transport to the inland shipping industry could be profitable. Shifting the freight transport is required because of the fact that in the near future the problems with capacity and environment in the land transport, especially road transport, will be tremendous. Reliability, efficiency and accessibility are the factors that have to be improved to make the inland shipping industry more competitive with the other land transport modes.

Extensive information exchange between all the actors in the supply chain is required these days. This information is needed to perform accurate planning and optimize the resource allocation. Using communication and information technologies nowadays is a crucial success factor in increasing the operational efficiency and safety in the logistic chain. River Information Service (RIS) can provide this required information.

RIS is able to streamline information exchange between all the actors in the inland shipping industry. RIS uses the modern information technology and telecommunication networks. A lot of innovations in the last years are related to RIS, combining these innovations results in RIS;
1.The first innovation used is the Fairway Information Service (FIS).
2.Traffic Information Service is a system to assist the master of the barge in taken navigational decisions by providing the required navigational information.
3.Traffic Management (TM) is performed by waterway administrations with the objective to optimal utilize the waterways and guarantee a safe navigation.
4.Calamity Abatement service (CA) registers transport data about barges (data like dangerous cargo), this information is continuously updated.
5.Information for transport logistics, this system is beyond the scope of navigation in the inland shipping industry.
6.Information for Law-Enforcement (ILE), contains the law of that specific jurisdiction.
7.Statistics about all the freight data are of interest for waterway authorities, international organizations and logistical service providers.
8.Waterway Charges and Harbour Dues (CHD), can be calculated automatically when using RIS.

Implementing all these innovations in phases will result in a combined harmonization River Information Sevice.

Studies to identify the possibilities of a system like RIS are conducted since 1990. In 1998 the EU officially identifies RIS with her potential to improve reliability of the inland shipping industry. In 2001 the first calls for implementing the system are received. In 2002 official guidelines for RIS are published. In 2006 the guidelines for RIS are adopted by the European Commission. In 2005 the first RIS is implemented on the Austrian part of the Donau. In a lot of European Countries there are systems that seem like RIS, harmonization of all these systems in Europe will bring a lot of advantages.

Impacts

Positive

The main advantage of RIS in the European waterways is transparency of the industry towards all the actors utilizing the inland shipping industry. This transparency improves the competitiveness, use of public infrastructure and funds, safety and environmental performance.

Just in time transportation requires a fast document turnaround. RIS makes a fast document turnaround possible by means of the transparency of the information about the fleet and the inland waterways. Using just in time strategies enables to save time and allocate the resources in an optimal way. Real time monitoring of the inland shipping fleet increases the competitiveness of the inland shipping industry. Real time information about the supply chain enables the transport operators to plan logistic processes, increase the overall transparency of the transport and reduce the cost of multimodal transport. The transport manager is able to reduce the cost because of the fact that he can plan more accurate, resulting in time savings and an optimal resource allocation.

Real time monitoring of the inland shipping fleet includes the monitoring of carriage of dangerous goods to avoid incidents. In case of any default the information required by emergency services is present, this could be information about the barge, dangerous goods, location etc.

Communication between masters, lock operators, bridge operators and terminal operators enables the possibility to communicate about an accurate planning. The master is able to adjust the cruising speed of the vessel in order to arrive at the terminal, lock or bridge just in time. This will decrease the fuel consumption and emissions of the barges.

Barges operating on the same inland waterway can request information about each other, information about; the cargo, sailing plan, dangerous goods, desired speed to arrive in time etc. For this reason the captains of the barges can take each other into account, resulting in a safer industry.

Negative

A negative effect of the RIS according to the ship owners is the decrease of privacy. The transparency caused by the system results in available information about the barge, sailing plan, goods etc.

River Information System requires information of; inland Electronic Chart Display Information (Inland ECDIS), Notice to skippers, Electronic ship reporting systems, Automatic Identification System (AIS), RADAR system with ENC, route and voyage planning applications and applications for optimizing fuel consumptions. For this reason the investment of implementing RIS on land and on the barge will be high. Ship owners identify this as the greatest barrier of implementation. While some of the measures are subsidized by the local governments.

Net Benefit Score = **+7/10**

3.1.4.2.2 Introduction of Container Transport in the Inland Shipping Industry (case 7)

In the sixties of the last century a revolution started, the introduction of the ISO container. This is a standardized container developed for the intercontinental transport of goods. The handling of containers is less intensive than handling individual goods. A spectacular increase of efficiency in the merchant shipping industry is realized. In 1966 the first container arrived in Rotterdam, the Netherlands. In the beginning of this introduction there was no hinterland transport of containers with barges. Efficient hinterland transport of containerized goods was still developing. Containers were transported by road and rail. In 1974 the first inland waterway container liner was realized between Rotterdam and Mannheim, Germany. From this day on the market share of the inland shipping industry in the hinterland transport of containers is increasing. In 1980 60.000 TEU (twenty feet equivalent unit) were transported with barges, this was a market share of 15%. In 2007 this market share increased until 30%, and in the future 45% market share is expected in 2033. A

45 % market share of hinterland transport from Rotterdam into Europe will equal 8 million TEU at that time.

Container terminals transformed into a link in the logistic chain after the introduction of containers. Competition moved from competition between the ports to competition between logistic chains. For this reason coordination and cooperation between different actors in the logistic chain was required. The most profitable way of transporting containers to the hinterland should be found, to be a competitive transport mode. Possibilities of transporting these containers to the hinterland are road, rail and inland waterways. A combination of these transport modes is required to meet a profitable logistic chain.

Advantages of the inland shipping industry in container transport were not identified for a long time, this was caused by the relative low speed of barges. Many times this slowness of the barge transport is exaggerated, while the transport of containers form Rotterdam to Duisburg will take 20 hours, the return journey will take only 14 hours (caused by the current). Advantages notified by others were; scale advantages and the reliability of the inland shipping industry. A barge can carry more containers than road transport, while operating with a small crew and relative low fixed costs.

Impacts

<u>Positive</u>

Container barge had the potential for a frequent, reliable and profitable transport mode. Due to the scale effects, low fixed cost and small amount of personnel in this industry it is possible to transport with lower cost than transportation with road or rail transport. At the start of this innovation the container transport by a barge was more profitable than road transport in long distance transport. At this moment due to low cost the competitiveness of the industry has increased on short distances.

Cooperation of all the actors in the logistic chain is required. They needed to develop the logistical chain in a new way. Operational cooperation between these companies ensures an efficient utilization of the barges and a high service level to customers.

The inland shipping industry is characterized as a clean, sustainable and safe mode of transportation. Shifting goods from road and rail to the inland shipping industry decreases the environmental impact of transportation. Cause of the fact that the inland shipping industry is safer than the road transport less incidents will occur.

<u>Negative</u>

Transport of containers in large volumes decreases the flexibility of the transport. Transport times increase caused by the fact that the transport mode has to load the containers at different terminals, sailing time is increased compared to the time a truck needs for transportation and the containers have to be discharged at different terminals.

Small scale and low volume terminals limit the ability of the terminal to operate on a profitable way. Cooperation between inland terminals is required, but difficult due to competition, lack of trust and low volumes.

Container inland shipping and container merchant shipping is handled at the same quay at the container terminal. Unlike the container inland shipping industry agreements between the merchant shipping company and the terminal are created. When the terminal is fully utilized the merchant shipping vessels are handled before the inland barges are handled. This results in barges waiting at the terminal for container loading, the turnover time of the barges increase for this reason. This effect is strengthened by the fact that a barge has to load at different terminals. Delays in the container barge transport weakens the competitive position of the inland shipping industry.

Transportation of containers in the inland shipping industry requires cooperation between all the different actors in the industry. An increased complexity is realized related to the planning of hinterland transport when it is performed by means of barges instead of trucks.

Net Benefit Score = **+4/10**

3.1.4.2.3 Project Waterslag (case 11)

The current situation on the inland waterways is not ideal. Companies nearby small inland waterways are obligated to transport their freight to ports by means of road transport. Lack of economies of scale in the inland shipping industry on the small inland waterways makes the inland shipping industry not attractive. Rail transport is not an option because of a lack in infrastructure, small volumes and small transport distances. For this reason the problem with congestion of the road nearby the ports of Rotterdam and Antwerp is increasing.

The capacity of small inland waterways in the Southern part of the Netherlands and Flanders could be used more intensively. Because of the low loading capacity of these small inland waterways the inland waterways could be utilized more optimal. The project Waterslag wants to utilize the capacity on the small inland waterways and create a higher freight potential without expanding the inland waterways. At this moment the project has come to the phase to communicate and spread the results of the project. The pilot phase has come to an end and has proven to be successful. Utilization of the small inland waterways can be an incentive for companies to choose company locations nearby small inland waterways.

Project Waterslag developed a dedicated barge. Barges can transport twice as much cargo if they use pushed barges that comply with all applicable technical requirements and can pass through locks on their own. The pushed barges have to pass the locks on their own because of small locks in those waterways, this is possible by designing pushed barges with low powered propulsion and a bow thruster.

Impact

Positive

Implementation of the Waterslag barge will have a positive effect on different areas. Employment will increase, the accessibility of the studied areas will increase (Flanders and Southern Netherlands) and demand for water bounded industries will increase. For this reason the area nearby small inland waterways studied by the project will be an interesting region to locate companies. A side effect of the use of the barges will be a reduction in emissions compared to road transport.

Using the developed pushed barges in the Waterslag project will decrease the transport costs of the inland shipping industry on small waterways. This will increase the interest of freighters located nearby these small inland waterways. For this reason the project is able to contribute to the desired modal shift between road and rail transport to the inland shipping industry.

This project is Dutch/Belgium project while the innovation can be used in other European countries as well; Germany, France and United Kingdom.

Negative

The investments for conversion of the pushed barge are high compared to the value of the barge.

Net Benefit Score = **+3/10**

3.1.4.3 Cultural (including Marketing)

3.1.5 Intermodal

3.1.5.1 Technological

3.1.5.1.1 ISO standard container (case 1)

Containers were first introduced in commercial shipping in the US in the mid to late 1950s. For the first 10 to 15 years a multiplicity of sizes were used, but increasingly the growing demands of international trade produced a growing consensus among international shipping companies and trucking and rail companies that standardization was required and the necessary compromises were reached. The ISO standards covering external and internal dimensions, corner fittings, and identification markings were introduced between 1968 and 1970.

Containers are generally either 40 foot or 45 foot long and increasingly are high cube 2.9 metres. Containers are often stowed with pallets for the carriage of some goods, though a car can fit into a 20 foot container. Pallet sizes vary and there is no international standard size of pallets. The prevalence of 40 foot containers has led to the amount of goods carried being measured in TEUs, i.e. 40 foot equivalent units.

In 2005, it was estimated that some 18 million containers made over 200 million trips. The Emma Maersk vessel, launched in 2006 can carry 14500 TEUs. Over 90% of global non-bulk cargo is carried in shipping containers. One of the benefits of containers has been improved security with far lower levels of theft of goods. However, more sophisticated criminal activity and terrorist activity since 2001 have led to even greater security measure, linked to the need for logistics companies to track containers from loading to unloading at final destinations.

ISO standards continue to be improved and new detailed standards published. The last handbook of freight container standards was issued by the ISO in January 2007. It contained new standards for 20 foot, 40 foot, and 45 foot containers as well as for other special purpose standards. One of the new standards covered container equipment data exchange (CEDEX)

Impacts

Positive

Enables efficient global maritime transport of goods

Negative

Possible implications for regional/national internal freight container standards that may be required

Net Benefit Score = **+ 8/10**

3.1.5.2 Organisational

3.1.5.2.1 Bi-polar short sea regular services for the transport of unaccompanied semi-trailers (case 10)

The need to reduce external (social) costs derived from transport activity has become an important pillar of transport policy developments. This can effectively be achieved by making a shift happen from road to intermodal (rail-road, SSS or combination) transport. This key policy target consists in creating favourable conditions for a sufficient number of decision-makers (shippers, forwarders etc) to change their transport chain structure and convert from door-to-door road to door-to-door intermodal chains. It is actually very complicated to achieve spectacular shifts from door-to-door road to SSS and other intermodal transport patterns. A number of constraints, both form the demand and the supply side, have been identified. In particular on the demand side, few corridors present enough massive flows in order to ensure competitive pricing and viability of SSS and rail-road services of high frequency (in order to achieve high performance in flexibility).

Bi-polar SSS regular services for transport of unaccompanied semi-trailers is an advanced concept of intermodal service characterised by two ports (bi-polar: port of origin and port of destination) and 3 sub-legs. These include:
a. road leg from point of origin to port of origin
b. sea leg from port of origin to port of destination
c. road leg from the port of destination to the final destination of goods
Depending on the available infrastructure and conditions of economic development legs a and c may include road and/or rail.

Boarding and disembarking operations are carried out by the terminal personnel. Drivers leave their semi-trailers at the origin port and other drivers receive them at the port of destination.

The service answers successfully to main issues of introducing SSS in door-to-door road:
1. Critical transport flows are achieved
2. Port services are ensured
3. Interoperability between networks and interconnectivity between modes is secured.
4. Reduction in administrative lag times as documents may be sent beforehand to the port of destination.

Critical transport flows are ensured through the cooperation of shippers and operators through various forms of business cooperation.

Successful applications are the Ro-Ro Inc Group service between Turkey and Europe and the Hellenic Seaways line Korinth - Venice.

Impact

Positive

Dedicated terminals
-Savings in time and costs
-Benefits for the drivers
-Lower insurance costs
-Promotion of Short Sea Shipping
-Reduction in road traffic and external costs
-just in time services
-Reliability
-High quality
-High security

Negative

- The service is usually conducted through smaller ports, so there may be a negative impact on the environment.
- The service usually dominates the (small) port and therefore monopolistic behaviour may be observed

Net Benefit Score = **+ 5/10**

3.1.5.2.2 Integrated management of port operations, within ports (case 11)

Ports are extremely heterogeneous systems composed from a wide variety of industries directly dealing with ship operations, others providing support services and also some using the function of ports as transport nodes to manufacture their goods within the port area. In ports also exist community administrations, governmental and regional administration services such as customs, immigration and health services. Such complex systems require the involvement of different expertise and a good level of management to ensure communication and co-operation across disciplines (vertical) and industries (horizontal).

Integrated management of port operations creates a common platform of understanding that contributes to the effective allocation of port activities in a holistic and consistent way. Meeting this challenging objective is important for the development of modern ports.

Impact

Positive

The most important positive effects of the innovation are:

- Complex port operations become more transparent
- Application of integrated management makes the development of interoperability solutions calculable thus minimising costs and risks.
- Better environmental control through a holistic approach of port operations and the development of ICT solutions
- Greater port operational cohesion through the development of port process maps and tools
- Better energy and CO2 performance through integrated energy management.

Negative

None identified

Net Benefit Score = Not assessed

3.1.5.3 Cultural (including Marketing)

3.1.5.3.1 Integrated intermodal companies (case 2)

This Danish conglomerate company, launched as the Maersk Group in 1951, though it was founded as a shipping company in 1904, owns aircraft, trucks, and (its initial sector) ships. It also owns 50 terminals around the world and runs a logistics and freight forwarding company. The Group, until its phasing out in 2009, also included shipbuilding as a vertically integrated activity as well as having horizontal integration across the three transport modes, or four, if we include intermodal itself. The Group also has interests in oil and gas drilling and is a shareholder in a Scandinavian bank.

The company's main business, and where it is a dominant force, is container shipping (it has a fleet of 500 vessels and is the largest container shipping company in the world) and associted busineses, e.g. terminal operations and logistics. However, specifically in relation to innovation, its shipbuilding interests hitherto enabled it to develop new vessel concepts and tyo implement these across its own very large fleet. The size of the Group and its integrated nature also means that it can engage in transfer pricing across markets to respond to individual market conditions. The market reach of the company enables it to be a market leader in a number of markets.

The Group has an annual turnover in 2009 of $48.5 billion and employs 110,000 across 125 countries. The turnover for 2009 suffered from the global recession that adversely affected freight rates and volumes and fell by 21% from 2008.

Its success mens that it is beng emulated as other conglomerates seek to encompass business activity in a number of transport and associated markets, e.g DHL.

Impacts

Positive

- The integrated nature of the company enables it to offer customers a door-to-door service with considerable flexibility'
- The size and range of companies operating within the Maersk group mean that it is able to develop and implement innovations in its business areas.

Negative

The increasing dominance of Maersk in the container and the terminal markets could be considered a negative effect insofar as it distorts competition

Net Benefit Score = **+ 3/10**

3.2 Innovation Failures

This section contains information on the various innovations and their preliminary assessments as 'failures', i.e. partial successes. The information is derived from the first part of the Assessment Template (see Annex 1). The innovations selected and their assessments and rankings may be altered as a result of the outcomes of the first Consultation Meeting on April 13th.

3.2.1 Road

3.2.1.1 Technological

3.2.1.1.1 ITS: Intelligent Truck Parking (case 11)

EU regulations oblige truck drivers to take regular breaks. In order to do that there is need for adequate res areas and parking spaces. In practice there is lack of parking infrastructure on most of the European road network. The uneven distribution of the trucks over the capacities of the parking facilities adds to the problem with lack of capacities at one place and underutilization elsewhere.

In this situation, intelligent parking management systems for freight transport contribute to a more balanced and efficient use of truck parking and service areas by supporting the optimal use of free parking spaces. The European Core Service on ITP (Intelligent Truck Parking) describes a uniform classification of service levels, a common functional architecture, standardised messages and data base structures able to provide easy access to the same multilingual information across Europe thereby supporting haulers and drivers pre-trip as well as on-trip.

There are several projects being developed according to this technology, mainly in Germany, France, Italy, Hungary and Sweden. French and German projects focus primarily on information provision via VMS (variable-message signs) on motorways and testing of new detections systems. In France and Sweden a further objective of the projects is to improve secured HGV parking areas.

Impacts

Positive
Several positive impacts are reported for the first implementation cases, like increase of safety both for the goods and the crew of the vehicles, reduction of environmental impacts, reduction of overall investments in parking capacities and others. Considerable synergies are expected with the wide-range implementation of the concept.

Negative
None reported for the first implementation cases

Net Benefit Score = **+7/10**

3.2.1.1.2 ITS: Variable Speed Limits in Sweden (case 12)

In 2003 the Swedish Road Administration initiated work for implementing variable speed limits (VSL) on motorways, rural highways and at intersections as part of the VIKING programme. Variable speed limit means that the speed limit is temporarily lowered by means of road signs when certain conditions occur. Currently VSLs are implemented in twenty places in Sweden. The speed limits are based on traffic and/or weather conditions.

The overall problem behind the VSL initiative is the very poor compliance with speed limits in Sweden, and the negative effect this has on road safety. Speed limits that are perceived as well measured, with regard to road standard and road weather and traffic conditions, have a higher likelihood of being met with appliance than limits that seems overly cautious. With VSL there is a possibility to prescribe speed limits that adapt to weather conditions, with decreasing speed limits in poor conditions while still maintaining higher allowed speeds when conditions are good.

The speed adaptation is improved. The most evident impacts occur at low speed limits. The average speed is then 15-20 km/h below the level that the drivers choose during corresponding adverse conditions with traditional fixed signs.

The introduction of VSL offers opportunities for increasing the highest permissible speed limit under good road conditions (basically dry summer road conditions) with a maximum of 10 km/h above the normal speed level that the stretch of road should have according to general valuation.

Impacts

Positive
The speed adaptation is clearly improved by the VSL system, however other positive effects like reduction of emissions and reduction of travel time consumption is minor.

Negative
The cost-benefit ratio of introduction of VSL systems did not always turn out to be beneficial.

Net Benefit Score = **+2/10**

3.2.2 Rail

3.2.2.1 Technological

3.2.2.1.1 Rigid freight train (Rames indéformables) (case 1)

The rigid freight train is a freight train fixed managed by two locomotives, one at the front and one at the end which allows to stop and restart easily without having to handle the reverse the locomotive or coupling a new one.

Impact

Positive

Rapid start and stop sequencing that saves time.

Negative

Very difficult to get up-to-date information as this system has been removed from main exploitation in Europe and been transferred to dedicated exploitation in car manufacturing

-
- Costly (two locomotives at the front and at the end) ; no flexibility, difficult to load and unload
- Fixed and lock-in system. No compatibility with other rolling stock materials

Net Benefit Score = **+6/10**

3.2.2 1.2 COMMUTOR (case 2)

From the three projects of the SNCF (since the beginning of the Millennium), only one, Commutor, is a failure. If the success of the two others (railway highways and TGV freight) isn't still unanimously recognized, they are still relevant today and seem to be on a good way.
Commutor is a project of robotization of selection function. Goods wagons unhitching and sorting them still remain often a long and expensive operation. To avoid all these maneuvers, the SNCF engineers have imagined, by the 1980s, a system in which cars but not containers are to be moved. The idea is to ungroup the chassis of the containers. We don't move wagons with locomotives to form trains but we move automatically the boxes (containers, mobile caisses etc.) of a train to another by a system of vertical move par pince. Such technical progress ought to reduce proceeding times and develop competitive marshalling yards.
The project had vocation to increase the capacity of the network rail freight by allowing rapid transhipment in some sorting offices strategically distributed on the territory (hub and spoke system). The issue was particularly important for the future of rail and isolated wagon system in France and French ports productivity.
A marshalling yard project test happened in Noisy-le-sec in the suburbs of Paris. Its characteristics are: 145 m wide and approximately 800 m long rectangle with two areas corresponding to different functions provided: loading and unloading of trains, transit and storage box in waiting for connections. Above of this space, perpendicular to the track, automatics trucks equipped with two pairs de pinces move on spans. These trucks operate transhipments between a train and connections or box storage if the connection wagon is not available.
Important detail of the project, Commutor requires the use of unique size wagons, specially designed for automatic handling of box. It was one of breaches of the project due to the prohibitive cost of wagons.
Finally, in addition to his technical aspect, this system represented a tremendous challenge in managing. Commutor could receive a train about every five minutes on a beam of 9 transhipment tracks. Barely transhipment operations had been carried out and the train went back, the storage operations could begin again.
The Commutor project was both a revolutionary and ambitious project: it has been forgotten by SNCF, mainly for financial reasons.

Impact

Positive
Desite its failure Les Echos (14th November 1996) noted that this project had still had a positive effect on other innovations.

"The" nodal point "(rail hub) responsible for doping current containers new company (CNC SNCF) occurs from research related to Commutor. It is the same with automatic handling which will be implementated on rail terminal of Dijon-Gevrey; with the gantry autonomous handling that Framatome studied for the autonomous port of Marseille; or with retractable catenary system that SNCF hopes sell to other networks.

Finally, Deutsche Bahn (German railways) is strongly interested in automating selection; all of these projects are based on Commutor."

The idea of automatic sorting boxes rather than wagons has also been adopted in many other areas and particularly to the road-rail and rail-port interfaces.

Negative

Unknown because the system has not been marketed

Net Benefit Score = **+6/10**

3.2.3 Maritime

The innovations considered here have been identified, both at global and at European level, as partial successes and are therefore classified, on a tentative basis, as 'failures'. They have been proposed in literature as having a high chance of being adopted, but in practice have not changed, significantly, the existent patterns of maritime markets. This is because either they have generated negative effects or there have been many barriers to their application. Other innovations may have showed a discouraging slow adoption period.

3.2.3.1 Technological

3.2.3.1.1 LASH carrier (lighter aboard ship carriers) (case 7)

In literature, the carrier ships known variously as LASH (lighter aboard ship carriers), barge carriers, kangaroo ships or lighter transport ships refer to a system of loading barges (lighters) aboard a larger vessel for transport. It was developed in response to a need to transport lighters, a type of unpowered barge, between inland waterways separated by open seas.

At the time of its invention, by the 1960s, this system was evaluated as an advancement in shipping technology. The dimensions and shapes of cargo pieces varied widely, and the ISO standard cargo container had only slowly begun to be adopted during the 1960s. The LASH system was developed as an alternative and supplement to the developing container system. But, with the rise of containerisation, LASH operations worldwide have taken a beating.

The lighters, which may be characterized as floating cargo containers, served dual purposes: transportation over water, and the establishment of a modular, standardized shape for loading and unloading cargo. The lighters, also known as swimming normed cargo containers, are loaded onto a LASH carrier at the port of embarkation and unloaded from the ship at the port of destination.

Impacts
The main positive and negative impacts expected by the lash carriers, ranked on the basis of the initial assessments, are as follows:

Positive
Economies of scale related to sea transportation and economies of scale at ports.

Negative
Economic: sunk costs for this type of vessels.

Net Benefit Score = **-1/10**

3.2.3.1.2 Green Ports (case 9)

The concept of green port is difficult to define, but in general it uses the applicable laws and regulations as a baseline for its environmental performance. Further, it is considered a port that not only meets all the environmental standards in its daily operations, but also has a long-term plan for continuously improving its environmental performance.

There are emerging methodologies to address these issues from American Association of Port Authorities, the European Seaports Organization and other international organization.

One way for developing a green port is to implement an environmental management system (EMS), formulated so that effective decisions can be made to represent the environmental objectives of the wide range of stakeholders that constitute the green ports.

Impacts

Positive
Social: higher quality of life as a consequence of prevention and reduction of air pollution from port facilities, of noise and habitat loss (due to dredging and port expansion).

Negative
None identified, but estimated to be very weak

Net Benefit Score = **+ 9/10**

3.2.3.2 Organisational

3.2.3.2.1 The indented berth (case 10)

In literature, the indented berth is a revolutionary concept among container terminal facilities: it is a particular berth capable of serving ships from both sides. As many as nine cranes can operate on the ship in the slip at one time. Operating cranes on both sides of the ship introduces the potential of collision of cranes and boxes over the ship. This requires a reliable collision avoidance system.

The Ceres Paragon Terminal in Amsterdam, realized as a joint-project of Ceres Terminal and the Amsterdam Port Authority, is the first terminal in the world to have an indented berth, which enables post-Panamax vessels to be serviced by a maximum of nine gantry cranes, having a reach up to twenty-two containers across deck from both sides of the vessel.

Impacts
The main positive and negative impacts expected by the indented berth, ranked on the basis of the initial assessments, are, as follows:

Positive

- Economic: turnaround times and costs could be reduced in the range of 30%-50%, and economies of scale at ports (due to higher berth productivity).

- Technical: productivity could be enhanced to a high standard. The total berth time of the indented berth is accepted to be within 15 minutes. Theoretically, the productivity of Ceres should be at least 250-300 movements per hour.

Negative

- Logistical: longer lockage times (waiting times) at passing.
- Technical: the optimal productivity is reached only when the indented berth is fully serviced by nine cranes, otherwise productivity levels become lower than other terminals.

Net Benefit Score = **+2/10**

3.2.4 Inland navigation

3.2.4.1 Technological

3.2.4.1.1 Whale Tail Propulsion (case 1)

Increasing propulsion efficiency is an important measure to reduce the fuel consumption. Less fuel consumption reduces the impact on the environment and increases the efficiency of the company. The whale tail seems like a suitable solution to increase the propulsion efficiency. The whale tail system can best be described as two wheels with a number of horizontal foils in between. It works by two forms of rotation, the wheels itself and the individual foils. As the wheels go through their cycles, the foils also rotate to achieve the optimum angle of incidence with the incoming waterflow. This type of propulsion can be installed at vessels with a shallow draft requirement.

The first implementation of the whale tail is performed on a barge, mv. Lidwina. The required technique on board of the vessel was insufficient to sail with this system. The pilot project was terminated and the project failed. In 2004 the project is restarted, in march 2006 a feasibility study was finalized, this study proved an high open water efficiency compared to the conventional propeller. IHC Merwede designed the construction for the whale tail propulsion. This design and the feasibility study were presented to Lloyd register with a request to perform a failure rate study and a request to certify the concept. The failure rate study proved, under normal operational conditions, that the whale tail should run 25.000 hours without any problems. The Dutch authorities certified the whale tail as well, so legally there was no objection to the implementation of the whale tail.

At this moment walvisstaart exploitative BV. is developing the whale tail system again based on former results. They have started the pilot project with a barge. The first phase of this project is successfully finalized. This phase included the development of the whale tail with 1000kW and the design of the barge. In 2009 there was a technical and operational feasible design for the whale tail, this design is finalized with assistance of MARIN. Phase two of the project includes the final design of the barge, building of the barge and certifying by Dutch authorities and Lloyd's. Phase two has been started. Phase three includes testing and commissioning of the barge. The testing of the barge should prove a reliable and more efficient barge than the current barges.

Impacts

Positive

The whale tail system can be constructed on the full width of the aft ship. Cause of the large trust area less power is required. A conventional propeller requires a shaft, this is not required, the whale tail is driven by a chain. The design of the aft ship in case of a whale tail is less complex as the design when using a conventional propeller. All these requirements achieve a decreasing steel weight, when sailing with the same draft more goods can be transported. Less required power results in a fuel consumption decrease of the barge, calculations of MARIN proof that the system results in 33 % reduction of fuel consumption.

A smaller demand for fuel results in a decrease of emissions. The achieved trust is divided over a larger area than the area of a conventional propeller, resulting in less turbulence of the water. The riverbed and riverbanks are less affected.

A whale tail system is characterized by a decrease in RPM (rotations per minute) in comparison to the RPM of a conventional propeller. When an object reaches the whale tail the impact of the object against the whale tail foils will be smaller. The foils on this system are much easier to replace than the blades on a conventional propeller in case of damage of the foils.

Negative

Cause of the low rotation rate of the whale tail and the big width of the whale tail the pressure of the displaced water is decreased. Decreasing of the pressure against the rudder blade causes a less maneuverable vessel. An increased size of the rudder blades is required in this kind of vessel (or the whale tail should be mounted in a POD).

When using a conventional propeller the crew is able to stern the aft body fast when giving a lot of thrust. The crew is not able to do this anymore so most of the time a bow thruster is required (currently almost any barge uses a bow thruster).

The system requires higher investment cost than a conventional propeller. So interest and pay off will increase.

Net Benefit Score = **+6/10**

3.2.4.1.2 Air Lubrication of Ships (case 2)

The fuel consumption of vessels is, to a great degree, dedicated by the frictional resistance of the ship through the water. Reducing the frictional resistance of ships by injecting gas or air (air lubrication) in the boundary layer of the flow around a ship hull is an attractive option for enhancing economic efficiency in shipping operations. Three projects related to air lubrication have been started; PELS 1 (the Netherlands), PELS 2 (the Netherlands) and SMOOTH (European Union).

Project Energy saving air Lubrication Ships I (PELS I) was started in 2001, the goal of this project was to obtain technical and scientific knowledge about air lubrication. This knowledge is required to adopt air lubrication of ships in the following 5-10 years on a safe and efficient manner. The project ended 3,5 years after the start, in 2004. The Maritime Research Institute of the Netherlands (MARIN) has indicated a significant potential for micro-bubbles and air cavities to reduce fuel consumption on ships. For inland navigation a reduction of 20% in fuel consumption was expected, in the meantime the emissions of the vessel will decrease.

The outcomes of PELS 1 were the fundamentals for the start of a new project PELS 2 (2005-2007). In this project the aim is to cover the knowledge gaps that block the implementation of air lubrication on full scale vessels. Knowledge gaps to be covered are; stability of air films, scale effects, behaviour of air films in seas and/or when manoeuvring and how the mechanism should be working when air is injected nearby the vessel. The main question of this project is; “Which manner increases the ability to keep the air bubbles as long as possible underneath the vessel?”. Three methods will be studied; air cavities, micro bubbles and hydrophobic paint. PELS II will focus on the development of air cavities. MARIN is involved in the SMOOTH project to keep informed in the developments in that project.

Sustainable Methods for Optimal design and Operation of Ships with air lubricaTed Hulls (SMOOTH) is a European project started in 2006 and will last until 2009. The objective of this research project is to cover all the necessary research and assessment steps to implement air lubrication in coastal and inland shipping. This project is based on the findings of the former PELS I study.

Barges installed with air lubrication have been tested relating to the studies mentioned and proved to be more efficient compared to the conventional barges. Air lubrication is implemented in some barges, river-sea vessels and merchant shipping vessels (e.g. test tanker barge Damen shipyard, Futura carrier, DK Group test coater and Filia Ariea).

Impacts

Positive

A barge with air lubrication has proven to be more efficient and in some methods more safe than the conventional barges. A decrease in fuel consumption and with this a decrease in emissions will be achieved. The operational cost of the barge will decrease and the green reputation of the inland shipping industry will be strengthened.

The payback time of the system is small (depending on the vessel in the order of two years), for this reason this will be solid investment for ship owners.

When a barge is operating with air cavities, the draft of the vessel will be smaller while the same amount of goods are transported.

Negative

In some of the methods when the air lubrication system fails the resistance will increase, resulting in an increase of fuel consumption.

If the air bubbles are able to arrive at the propeller the trust will decrease, more power will be required to sail at the same speed. This will result in an increase of fuel consumption. Methods are developed to make sure the air bubbles will not reach the propeller.

The research for developing the method has required a lot of time and a great investment. Implementation of the system in an existing barge will require an investment. Implementation of this system in a new-building barge will increase the cost of the barge compared to a barge without air lubrication.

Net Benefit Score = **+5/10**

3.2.4.2 Organisational

3.2.4.2.1 Distrishipping (case 3)

Between the producers and the regional distribution centres of retailers transport of high amount of goods (fast moving) is often necessary. Transportation of these goods is performed by means of trucks. It could be profitable to transport the stable and predictable amount of goods by means of a larger transport mode, a barge. Switching from road transport to inland water transport can have advantages like economies of scale and no congestion. Toegepast Natuurwetenschappelijk

Onderzoek (TNO) Netherlands is a research company that can proof a possible profit. They started studying the palletized transport of goods.

In the Netherlands and other countries many initiatives were taken for transportation of palletized goods on inland waterways. In 1993 Unilever studied possibilities to transport their dairy products by barges, in Germany around 1995 Coca-Cola tried the same. These initiatives all failed to be implemented because of cold feet, no realization of economies of scale and no payback of the investment (the dedicated barge). In the Netherlands around 2000 a study called “kansrijke binnenvaart netwerken” was started. The conducted study concluded that palletized transport on inland waterways could be profitable, the partners in the study continued with a new study called Distrivaart. The most important question in this project was; “where are the potential producers and retailers that would use the inland shipping industry?”. The second question was; ”From conducted studies it was clear that the load factor of the transport mode and occupancy of the cargo operation gear were crucial factors to create a successful innovation, are we able to optimize the load factor and occupancy?”.

In 2004 this innovation went into the commercial phase of the innovation process. Tests before this period proved that this means of transport could be successfully operated and profitable. In a pilot project beer breweries and supermarkets were willing to implement this innovation. A dedicated barge was produced named “Riverhopper”. The “Riverhopper” transported palletized goods from September 2002 until June 2003 between Dutch beer brewers and distribution centres. The main goal of the Riverhopper was the ability to perform warehouse activities during the transport of the goods. At forehand it was clear that this test was not going to be profitable and that the participants should invest in the system. During the test trials many small failures have been observed and solutions were found.

Economies of scale should be increased after the test phase of the innovation to get a profitable system. For this reason freighters should be attracted to invest in the innovation and transport their goods on inland waterways. Unfortunately no freighters were willing to invest in Distrivaart and to use Distrivaart for transportation, so Distrivaart could not be profitable. The project was terminated and the barge was rebuilt for “normal” inland shipping. Reasons for terminating the project were; no shippers were willing to invest, the distance of the producer to the barge and of the barge to the distribution centres was too long, and loading and discharging was taking too much time.

Impacts

<u>Positive</u>

Future problems in road transport (congestion) were not yet an incentive for participants to join the Distrivaart project. Developing a barge transport with palletized goods can cover future problems with congestions.

Obtaining larger flows of goods on the inland waterways will obtain economies of scale. Cooperation in the transportation of goods with competitors in the same industry can obtain a decrease in transportation costs. This was the incentive for the participants to join the project.

The inland shipping industry is more environmental friendly than road transport. Less emissions are damaging the environment.

<u>Negative</u>

The logistical organization will be more complex when using trucks for the hinterland transport and barges for the inland waterways. Planning will be more difficult for this reason.

Transportation of goods by water requires a much more accurate planning of the distribution centers of the retailers. By means of a truck goods can be received at the same day as they were ordered, using a barge will take more transportation time. The flexibility of transportation of palletized goods has decreased compared to road transport.

The idea of transportation of palletized goods has been tried to implement many times. For this reason companies will be less willing to join an innovation in this area. In future projects this is something that should be taken into account.

Net Benefit Score = **+4/10**

3.2.4.2.2 Ro-Ro shipping in the Western part of the Netherlands (case 2)

In the Western part of the Netherlands congestion of the roads is increasing. The congestion of the roads is expected to increase in the future. For this reason it will be necessary to use other transport modes. Transportation of freight on the inland waterways can slow down the increase of the road transport. Roll on Roll off (Ro-Ro) transport seems like a sustainable environmentally friendly alternative for road transport. According to the Dutch government there are great advantages in using Ro-Ro transport. The freighter could safe 1-2 lost hours each transportation leg. Trucks will be available for other transport when they have delivered the trailer to the loading terminal. This could bring great financial advantages compared to road transport.

Initiatives by the Dutch government have lead to a pilot project of Ro-Ro transport between Rotterdam-Tiel-Hoorn. This route was chosen by the government because of the new building locations nearby the waterways. Products required for these new building are produced in the Eastern and the Southern part of the Netherlands, for this reason the road transport will increase. This pilot project is performed by Rhine Ro-Ro services. Sunday 19th of April 2009 the project was started and lasted until Thursday 24th of April 2009. In this pilot project the ms. Vera transported trailers without the trucks. At the moment of initiating this pilot project, this kind of transport was new to the national waterways in the Netherlands. The Ro-Ro transportation as transport mode was not new, but using this transport mode on such a short distance is a new concept. Trucks transported the trailers to the loading terminal, the trucks were uncoupled and were available for other transport. A terminal truck would place the trailer on the barge. The barge sailed to the discharge terminal and placed the trailers on the quay, trucks could be coupled and they delivered the trailer at the desired location. Engineering office DHV managed this pilot project assigned by the Dutch government. Results of the pilot project were promising, a decrease of 3800 km road transport, noise reduction, decrease of CO2 emissions and NOx emissions. Transportation by barge will reduce the transportation speed compared to road transport, for this reason transportation was performed at night. Cost of Ro-Ro transport was competitive compared to road transport in 2008. Caused by the low freight rates in road transport due to the economic crisis the rates are less competitive now than they were in 2008. At this moment a profitable exploitation of this transport mode does not seem realistic because of these freight rates.

The Dutch government studies other possibilities to use Ro-Ro transport on the occasion of the evaluation of the pilot project. Evaluation of the projects and studies indicated that this kind of transportation is attractive for freight that could be on the road for longer periods, like building materials. Freighters and logistical service providers are enthusiastic about the test results. The industry is enthusiastic because of the reliability, easy techniques and easy logistical adaptability.

At the end of 2009 Rhine Ro-Ro Service takes the initiative to start a permanent service between Rotterdam and Tiel. Freighters are informed about the project and should be convinced to take part in this transportation mode. Until now there is no Ro-Ro service in the Netherlands.

Impacts

Positive

Shifting transportation of freight from the road to the inland waterways brings great advantages. These advantages are especially aimed at sustainability for the future. Transportation by barge is more environmentally friendly than transportation by road. The congestion on the roads is being decreased.

Transport rates at the inland shipping industry are in general lower than transport rates in the road transport. In the economic crisis the road freight rates are rather low, but when economically stability returns these freight rates will increase. In an economic stable environment the Ro-Ro transport will give financial advantages for the industry. Financial advantages are also realized by the fact that trucks transport much more freight per day and that lost hours of trucks are decreased.

Negative

A negative effect of shifting transportation of freight from the road to the inland waterways is that the transportation will take more time. Transportation by road is more flexible than transportation by waterway, for this reason a planning should be accurate and more in advance.

Net Benefit Score = **+6/10**

3.2.5 Intermodal

3.2.5.1 Technological

3.2.5.1.1 Failed attempts to provide a comprehensive, integrated ICT architecture covering intermodal freight transport (case 3)

Freight transport is dominated by road a fact that causes severe problems, like congestion, high number of casualties, and air pollution. Increased use of intermodal transport will restore the balance between the transport modes, add to the efficiency of the transport system and will improve the situation.

Intermodal transport chains involve several stakeholders, and the establishment and management of such chains usually require a considerable amount of coordination and information exchange. Coordination and information exchange, as well as deviation and incident detection, can be automated or supported by means of ICT. Delays in one part of a chain may for example be detected and reported in time to enable corrective actions in the remaining chain. Openness and interoperability between ICT solutions are prerequisites. A system framework architecture for the transport domain would ideally arrange for such solutions and create benefits for the transport business by promoting safety and increasing management efficiency. However, most of the attempts to develop a framework architecture, tailor-cut to the needs of intermodal transport, have failed so far.

The main reasons responsible for that failure are summarized below:

1. Incomprehensiveness: The intermodal transport domain is very wide and encompasses a large number of stakeholders with quite different roles, interests and objectives. The stakeholders also

represent different transport modes. Thus, the architecture has to capture a diversity of user needs not always rational when informal strategies come into play.

2. Lack of harmonization: A framework architecture should be harmonised across transport modes as well as across the supply chain which also involves industrial stakeholders. Even though the similarities are most conspicuous, a system as such has to cope with differences with respect to cultures, terminologies and working procedures.

3. User resistance to change: The need for an integrated system has to be communicated to many stakeholders in a convincing way, but the stakeholders are not always willing to participate. Preferably, the stakeholders would like to contribute if they could gain an advantage on the ownership to the results.

4. Insufficient level of details: Although a framework architecture is for the domain and not for a specific system of intermodal transport, details about the inner parts of the systems are still of interest. Such information is very difficult to obtain considering the diversity of the domain.

5. Conceptual model: Despite of the focus on interoperability, technical specifications of interfaces are not enough. A common understanding of the intermodal transport domain with respect to roles, overall functionality, information, organisation and relations is also hard to obtain.

Impact

Positive

None specified

Negative

None specified

Net Benefit Score = Not attributed

3.2.5.2 Organisational

3.2.5.3 Cultural (including Marketing)

3.2.5.3.1 Failed Initiatives to improve the (poor) image of Short Sea Shipping as far as Service quality Performance is concerned (case 4)

Short Sea Shipping plays an important role in Europe's transport system individually and in combination with other modes of transport. The White Paper on European transport policy for 2010 highlights the role that Short Sea Shipping can play in curbing the growth of heavy goods vehicle traffic, rebalancing the modal split and bypassing land bottlenecks. The development of Short Sea Shipping can also help to reduce the growth of road transport, restore the balance between modes of transport, bypass bottlenecks and contribute to sustainable development and safety. The Commission presented a program in 2003, which contained a set of 14 actions subdivided into measures, and mentioned the actors responsible and the timetable (2003-2010) for each measure. The program described legislative, technical and operational initiatives which were aimed at developing Short Sea Shipping at EU, national, regional and industry levels.

Despite this effort and the existence of a few success stories, short sea shipping usage is far below expectations and is still lagging behind road transport as highlighted by EUROSTAT data. The market players appear to focus constantly on numerous issues already addressed in several EU communications on transport and short sea shipping which have proven not to provide a solution.

Impacts

Positive

The Shortsea Promotion Centres and their European Shortsea Network have contributed considerably to the promotion of Short Sea Shipping and its growth. Although its growth rate is relatively low, it has some positive effects both in the society, through the creation of new work positions and in the enviroment, through the substitution of a number of road trips. Specifficaly, in 2007, freight SSS totalled around 1.9 billion tonnes, some 61% of total EU-27 maritime goods transport, although the share of SSS in total maritime transport varied widely from one country to another. Moreover, all countries for which data were available registered positive annual average growth in SSS during the period 2000-2006, ranging between +7.5% in Spain and +0.5% in France, the annual average rate for the EU-15 being +3.0%.

Negative

The low growth rate of SSS has been rather negative in envormental terms, since most of the freight transport is being conducted through road modes.

Net Benefit Score = **+ 3/10**

4. Achieving Success and Avoiding Failure: Barriers and Support Measures

4.1 General

The information in this section of the report is derived from the second part of the Assessment Templates. The various selected innovations, described in Section 3 and to which are attributed success or failure at the preliminary assessment stage, have been initially assessed, and individually ranked, from the viewpoint of the minimum organizational change involved; the spread of the innovation across the sector, and the net impacts/benefits attributed. The rankings attributed on these three aspects have been indicated in Section 3.

The individual, preliminary assessments in each of the innovation cases are detailed in a Schedule of Assessment Templates that is separately held and will be used, both for the Consultation Meeting and for the subsequent detailed examination of the selected innovation cases. A specimen of the Templates used is provided at Annex 1.

In this section, there is provided a discussion of the various types of barriers to the innovations that have been identified; the support processes involved, and the impacts identified. The analysis is provided across the various modes and types of innovation to give a ‘broad brush’ summation of the *classes* of *barriers, support processes, and impacts.*

It is important to recognize that seeking to extract some generalized lessons from the many and varied innovation cases selected for preliminary investigation will inevitably imply a loss of some specific lessons identified in particular cases. However, the effort is worthwhile as for policy purposes it is the generalisable issues that may lead to significant gains, even though the derived policy actions – at private sector (and at public policy) level – may neglect some key aspects in certain situations.

The InnoSuTra Consortium is conscious of earlier work that has been done in EU projects in identifying, particularly, the barriers, to innovation. However, the approach of InnoSuTra combines, across a wide range of types of innovation and sectors, examination of the organizational change involved; the adoption and spread of the innovations across the sector; the nature of the barriers faced; the support processes employed, and the net benefits attributed. This eclectic approach will provide a comprehensive identification of the complex processes involved in successful innovations and innovative processes. These aspects of the innovations will be examined in more detail and quantified in the detailed examination to be undertaken after the preliminary assessments have been considered at the first Consultation Meeting in April 2010.

4.2 Barriers

The barriers in the private sector innovation process, as indicated above, vary across both sectors and types of innovation. They are relevant to both successes and failures. The former are able show how barriers may be overcome and the latter to indicate how barriers may have prevented innovations from being adopted and spread across the sector. Some of these barriers are common to most if not all innovations. These frequently found barriers may be classified as follows, and are listed in order of frequency derived from the preliminary assessments:

- Financial constraints and high investment costs; risk/reward issues
- Lobbying opposition
- Problems of competition and collaboration
- Conceptualisation and Comprehensiveness problems

The *financial* and investment barriers may be because of high rates on return and too short payback periods being set, particularly within large companies, and a lack of finance for SMEs. In some cases, therefore, there may be a case for an element of subsidy – in the form of either grants or loans – to be provided by the public sector, on the basis of the benefits accruing to society as a whole. This issue is one to be explored in the detailed analysis that follows in the project.

The issue of *lobbying* opposition is complex. In essence there is nothing wrong with lobbying by interests groups, be they companies, industrial confederations at EU level, or special interest groups such as the WWF (World Wildlife Fund). Indeed, such lobbying may be regarded as part of the democratic process.

The lobbying has different aims. Often the lobbying, in the context of private sector innovation, it is aimed at stopping the innovations because it will affect adversely the interests of the protesting group, e.g. an environmental group or a local citizens group. Equally, it can sometimes by another industrial interest group whose revenue generation may be adversely affected. Or it may be a trade union whose members' jobs may be threatened by the innovation in question. The lobbying may request public authority intervention to halt the innovation.

The attitude towards and response to the lobbying by the public authorities at either local, regional, national, or European levels will depend on the coverage of the innovation and who are the lobbyists and the strength of their support. For instance, if the lobbying is an industrial interest group opposing the innovative approach by another interest group it may be that the public authorities involved will take a neutral stance and wait for some accommodation to be reached by the two opposing industrial groups.

In other cases the lobbying is, in effect, requesting a comparison of costs and benefits to be made (e.g. on a port expansion to provide n more efficient access and egress). Often such a cost-benefit analysis will be called for under planning procedures, but even when this is not the case, some calculation of the net benefits or disbenefits is required to be made by the public authority in question, to determine their attitude and response. Again these issues will be examined in the detailed innovations analysis later in the project.

The problems of *competition and collaboration* are similar to those encountered in the case of lobbying pressures, but the responses may be different. *Competition* is a means to achieve commercial products that meet the needs of the consumer of the products. Principally, the majority of products in an economy are consumed by firms and not by the final consumer, i.e. they are intermediate products. Hence, providing there is evidence of a degree of competition in the market in question then innovation should not be hindered by competition. However, it may be that when an innovation is introduced by a company for a period competition should not prevent the innovative process or product from securing a position in the market. To achieve this may require a degree of public subsidy for a short period, allowing an adequate return on the investment to be achieved. This again will be investigated during the detailed innovations examination in the project

Collaboration may be required to enable an innovation to be successful. This may interfere with competition in the market, but the benefits may accrue to society and so should be permitted and even encouraged by the public authorities. As indicated above competition is a means to an end, i.e. consumer appreciation, not an end in itself. Collaboration of a different kind may be required in the situation where there is a need to set common standards at either European or international levels (e.g. the ISO container standard). The process of achieving standardization involves industrial companies, including competing companies, working together in a formal manner. Clearly this is a beneficial form of collaboration.

Conceptualization and comprehensiveness problems tend to occur in areas of innovation where the innovation involves a considerable part of the freight transport process and where a clear conceptualisation and a comprehensive view is required and a number of commercial organisations are involved, including public authorities) (e.g. Motorways of the Sea). In these situations, the barriers may well be insurmountable. This problem will be studied in depth in subsequent work in the project.

More specific barriers include:

- Complex administration procedures
- Lack of spatial planning
- ICT difficulties

Complex administration procedures relate to applications for grant aid EU and National schemes (e.g. Marco Polo) or loans from the EIB (European Investment Bank). Though it would be desirable for such application procedures to be less bureaucratic it is probably asking too much for them to be improved. Except marginally; it is after all public money that is being invested. *Spatial planning* procedures are also cumbersome and difficult to negotiate. These procedures could be improved, but gain any improvement is likely to be marginal. Hence, these two types of barriers are likely to remain. *ICT difficulties* relate to attempts to achieve a comprehensive, integrated ICT architecture covering intermodal freight transport. Numerous attempts have been made over the years, frequently supported by EU Research funding. All have failed. Given that the freight logistics market is now dominated by a small number of large companies with proprietary ICT systems, plus a large number of much smaller niche market companies, it seems unlikely that, even if a more intelligent approach (e.g. concentrating on a process rather than a data approach) were tried that it would succeed. A better approach would seem to be to avoid the 'grand design' and look at efficient interfacing solutions between proprietary systems.

Having discussed the types of barriers presented to the innovation process it may be useful to indicate the level of barriers assessed in the preliminary examination of the innovation cases' These are indicated in the table below against each of the innovations: successes and 'failures. The level indicated is that of the *implementation* barrier as, for private commercial innovations it is this barrier rather than the adoption barrier that is more relevant (the opposite is the case for policy innovations/initiatives).

SUCCESSES

Road.1 Success: Barrier = 2/10 (Cultural) – Trucks on Trains (Switzerland)

Road.2 Success: Barrier = 7/10 (Organisational) – German Road Pricing (LKW-Maut)

Road. 3 Success: Barrier = 1/10 (Tech.) – Electronic Toll Collection

Road.10 Success: Barrier = 3/10 (Cultural) – Environmental Poad Zones

Rail. 8 Success: Barrier = 7/10 (Cultural)) – Modalohr

Rail. 3. Success: Barrier = 8/10 (Organisational) – ERTMS

Rail. 5 Success: Barrier = 7/10 (Organisational) – Trans-Siberial Rail Freight

Rail. 6 Success: Barrier = 3/10 (Organisational) – Froidcombi

Rail. 7 Success: Barrier = 7/10 (Organisational) – Eurotunnel Shuttle

Rail. 9 Success: Barrier = 4/10 (Organisational) – Betuwe Long |Freight Train

Rail. 10 Success: Barrier = 4/10 (Organisational) – Trimodal Plateform

Rail. 11 Success: Barrier = 9/10 (Organisational) – GEFCO Train (France to Russia)

Inland Navig. 6 Success: Barrier = 8/10 (Organisational) – River Information Services

Inland Navig. 7 Success: Barrier = 7/10 (Organisational) – Container Traffic Introduction

Inland Navig. 9 Success: Barrier = 5/10 (Tech.) – Shore Power

Inland Navig. 10 Success: Barrier = 7/10 (Tech.) – Advisory Tempomaat

Inland Navig. 11 Success: Barrier = 8/10 (Organisational) – Project Waterslag

Inland Navig. 12 Success: Barrier = 2/10 (Tech.) – Y-shaped Hull

Maritime.1 Success: Barrier = 7/10 (Tech.) – Reefer Containerisation

Maritime.2 Success: Barrier = 7/10 (Tech.) – Mega-Container Ships

Maritime.3 Success: Barrier = 3/10 (Organisational) – Strategic Alliances

Maritime.4 Success: Barrier = 7/10 (Organisational) – Hub and Spoke Transhipment

Inter.M.1 Success: Barrier = 2/10 (Tech.) – Intermodal Container Standard

Inter.M. 2 Success: Barrier = 3/10 (Cultural) – Integrated Intermodal Companies

Inter.M.10 Success: Barrier = 2/10 (Organisational) – SSS Semi-Trailer Transport

Inter.M. 11 Success: Barrier = Not Assessed (Tech.) – Integrated Port Operations

Total = 27 (Category of Innovation, e.g. Technological)

FAILURES

Road. 11 Failure: Barrier = 5/10 (Tech.) – Intelligent Truck Parking

Road. 12 Failure: Barrier = 1/10 (Tech.) – Variable Vehicle Speed Limits

Rail. 1 Failure: Barrier = 7/10 (Tech.) – Rigid Freight Train

Rail. 2 Failure: Barrier = 10/10 (Tech.) – Commutor

Maritime.9 Failure: Barrier = 6/10 (Organisational) – Green Ports

Maritime.8 Failure: Barrier = 8/10 (Tech.) – Cold Ironing

Maritime.10 Failure: Barrier = 8/10 (Organisational) – Indented berth

Maritime.7 Failure: Barrier = 8/10 (Tech.) – Lash Carrier
Inland Navig. 1 Failure: Barrier = 7/10 (Tech.) – Whaletail Proposal
Inland Navig. 2 Failure: Barrier = 7/10 (Tech.) – Air Lubrication of ships
Inland Navig. 3 Failure: Barrier = 8/10 (Organisational) – Distribution of Shipping
Inland Navig. 5 Failure: Barrier = 6/10 (Organisational) – Ro-Ro Inland Shipping
Inter.M. 4 Failure: Barrier = 6/10 (Cultural) – Failed SSS Marketing Initiatives
Inter.M. 3 Failure: Barrier = Not Assessed (Tech.) – Integrated Intermodal ICT Architecture
Total = 14 (Category of Innovation, e.g. Tecnological)

The table compares the barrier level scores attributed to the innovations considered, listed by category of success and failure. It should be recalled (see Para 2.5) that the success or failure categorization is an overall subjective judgement made by the Consortium partners on an individual basis. It is therefore a preliminary and indicative ranking only. It will be subject to outside expert scrutiny during the Consultation meeting and subsequently in the detailed analysis. Hence, as far as the comparison of the scoring of the barriers is concerned, the intention is to make a *preliminary* analytical judgement of the role that the level of the barriers may be seen to play in relation to the degrees of success (or failure). A further comparison is made of the net benefit scores in Para 4.4 below.

It may be observed that the mean score for the perceived implementation barriers for successful innovations is 5.4 out of ten (the median score is also 5.4): for the failures the mean score is 6.7 (for the failures the median score is 6.9).. It does appear therefore that successful innovations face less severe barriers than 'failures'. However, as the sample size is small it is preferable to regard this as only a preliminary finding, though it is in accord with *a priori* reasoning. Also, in the case of some of the successful innovations, barriers are found that are as high as the average barriers facing the 'failed' innovations. It may be therefore that a full explanation for the 'failure' of innovations is not always to be found in the *level* of the barriers set to be overcome, as implied by their preliminary ranking. (It is possible that the *nature* of the barriers may be a factor). This is clearly an issue to be explored in the detailed analysis of the innovation cases later in the project.

4.3 Support processes

A number of support processes may be involved, dependent of factors relating to nature of the innovation, the company(ies) introducing them, and the market structures involved. However, so far in the examination of the innovation cases in the private sector the support processes always include some coming together of the interested parties to form a type of association. The association may be formal or informal. Obviously these associations are only in evidence where the innovation involves a number of companies or organisations. Many innovations simply involve one company and here it is the internal business structural relationships that are of interest, e.g. in the Maersk company. These structures and relationships will be part of the detailed examination in the remaining part of the project.

4.4 Impacts

There are in any innovation case sets of both positive and negative impacts leading to benefits and disbenefits. The initial assessments of the private innovation cases considered in this preliminary innovation report (PIR) have indicated a range of net benefits, These scores have been indicated in the summary descriptions and preliminary impact assessments. In the tables below, the cases are ranked according to the net benefit scores, for both failures and successes.

SUCCESSES
Road.1 Success: NBS = 0/10 (Cultural) – Trucks on Trains (Switzerland)
Road.2 Success: NBS = +2/10 (Organisational) – German Road Pricing (LKW-Maut)
Road.3 Success: NBS = +8/10 (Tech.) – Electronic Toll Collection
Road.10 Success: NBS = +4/10 (Cultural) – Environmental Road Zones
Rail. 3 Success: NBS = -1/10 (Organisational) – ERTMS
Rail. 5 Success: NBS = +8/10 (Organisational) – Trans-Siberian Rail Freight
Rail.6 Success: NBS = 7 (Organisational) – Froidcombi
Rail. 9 Success: NBS = +6/10 (Organisational) – Betuwe Long Freight Train
Rail. 10 Success: NBS = +6/10 (Organisational) – Trimodal Platform
Rail. 11 Success: NBS = +6/10 (Organisational) – GEFCO Train between France and Russia
Rail. 12 Success: NBS = +6/10 (Organisational) – TPCF Proximity Freight Train Link
Rail. 7 Success: NBS = +6/10 (Organisational) – Eurotunnel Shuttle
Rail. 8 Success: NBS = +2/10 (Cultural) – Modalohr

Inland Navig. 6 Success: NBS = +7/10 (Organisational) – River Information Service

Inland Navig. 7 Success NBS = +4/10 (Organisational) – Container Traffic Introduction

Inland Navig. 9 Success: NBS = +2 (Tech.) – Shore Power

Inland Navig. 10 Success NBS = +5/10 (Tech.) – Advisory Tempomaat

Inland Navig. 11 Success NBS = +3/10 (Organisational) – Project Waterslag

Inland Navig. 12 Success NBS = +7/10 (Tech.) – Y-shaped Hull

Maritime.1 Success: NBS = +5/10 (Tech.) – Reefer Containerisation

Maritime.2 Success: NBS = +2/10 (Tech.) – Mega-Container Ships

Maritime.3 Success: NBS = +2/10 (Organisational) – Strategic Alliances

Maritime.4 Success: NBS = +2/10 (Organisational) – Hub and Spoke Transhipment

Inter.M.1 Success: NBS = +9/10 (Tech.) – International Container Standard (ISO)

Inter.M. 2. Success: NBS = +3/10 (Cultural) – Integrated Intermodal Companies

Inter.M.10 Success: NBS = +5/10 (Organisational) – SSS Semi-trailer Transport

Inter.M.11 Success: NBS = Not Assessed (Tech.) – Integrated Port Operations

Total = 27 **(*NBS = Net Benefit Score)***

(Category of Innovation, e.g. Technological)

FAILURES

Road. 11 Failure: NBS = +7/10 (Tech.) – Intelligent Truck Parking

Road. 12 Failure: NBS = +2/10 (Tech.) – Variable Vehicle Speed Limits

Rail.1 Failure: NBS = +6/10 (Tech.) – Rigid Freight Train

Rail. 2 Failure: NBS = +6/10 (Tech.) – Commutor

Inland Navig. 1 Failure: NBS = +6/10 (Tech.) – Whaletail Proposal

Inland Navig. 2 Failure: NBS = +5/10 (Tech.) – Air Lubrication of Ships

Inland Navig. 3 Failure: NBS = +4/10 (Organisational) – Distribution of Shipping

Inland Navig. 5 Failure: NBS +6/10 (Organizational) – Ro-Ro Inland Shipping

Maritime.9 Failure: NBS = +9/10 (Organisational) – Green Ports

Maritime.8 Failure: NBS = +3/10 (Tech.) – Cold Ironing

Maritime.10 Failure: NBS = +2/10 (Organisational) – Indented Berth

Maritime.7 Failure: NBS = -1/10 (Tech.) – Lash Carrier

Inter.M.4 Failure: NBS = -3/10 (Cultural) – Failed SSS Marketing Initiatives

Inter.M.3 Failure: NBS = Not Assessed (Tech.) – Integrated Intermodal ICT Architecture

Total = 14 **(*NBS = Net Benefit Score)***

(Category of Innovation. e.g. *Technological*)

It may be observed that the net benefits are positive in most cases, including many ‘failures’. However, it should be noted that ‘failures’, as they have been defined in the project, are partial successes’ in the sense that there may be barriers that hamper the progress of the innovation, but could be removed by private or public action. Alternatively, the progress of the spread of the innovation may simply be slow. It is therefore not surprising that many ‘failures’ still represent innovations where there will be significant net benefits if they are (or were) to be proceeded with.

Returning to the net benefit ispecific scores, there are some successes where the net benefit appears to be small, i.e. where the Net Benefit Score is below 3, or even negative. (This may be due to the InnoSuTra *preliminary* assessment being in error in either under-estimating the positive benefits or over-estimating the negative disbenefits). However, it may also be that some innovations are rapidly spread, even though their impacts are not particular positive overall. Again this issue of the success of some innovations that apparently have only a small benefit will need to be explored subsequently.

The average net benefit scores for successes and for failures are very similar. The mean and median scores for the successes are identical at 4.5 and 4.5. The mean score for the failures is 4.0 and the median score is 4.3. This is perhaps not so surprising. For private commercial innovations one might expect that calculations of positive net outcomes would be similar and other explanations may be likely to be found for success or failure.

Other than these observations, there appears to be no other significant patterns that emerge from this preliminary examination of the impacts of the innovations considered thus far. The nature and quantification of benefits and disbenefits, both from a market and a societal viewpoint, will be part of the subsequent detailed examination of these cases and additional cases.

5. Public policy innovations/initiatives

5.1 The social and market contexts

It is important when considering the introduction of what may be described as 'policy innovations', but are perhaps better designated as 'policy initiatives', to take account of the prevailing social and market contexts. Policy initiatives are not innovative in the same sense as private technological, organizational, or cultural innovations. They are new, but their intended spread from the outset is to the sector as a whole and with intended socio-economic welfare impacts. The barriers to the spread of public policy initiatives are obviously different from those facing private industrial innovations. However, the net benefit of public policy action in relation to surface transport should produce overall societal benefits, even though they may, at least initially, have cost implications for some sectors or sub-sectors of the transport industry.

For instance, there are a number of 'barriers' which nowadays have to be overcome by the European Commission when considering policy initiatives which require legislative action. (The Commission may of course introduce action short of a Directive or a Regulation, or it may use a Recommendation or simply a Code of Practice). The Commission must carry out an evaluation of the need for legislation, including an independent cost-benefit analysis, including evidence of 'market failure'. The assumption – by no means unchallengeable in economic theory or practice – is that markets work efficiently and the burden of proof for any intervention rests with the European Commission.

Hence, the prevailing orthodoxy is that policy-makers should demonstrate that 'market failure' exist, or has existed. In theory and in practice, the burden of proof *should* be the other way round. Markets rarely, if ever, work perfectly; the key issue is whether the departure from 'perfection' is sufficient to warrant intervention and, then, whether the intervention is itself efficient in rectifying the market failure. This formulation does not, however, alter the need for the appropriate evaluation to be carried out and that the evaluationwill be performed in the same way and will come to the same result.

5.2 Public policy innovations/initiatives across the modes

5.2.1 Successes

5.2.1.1 Roads

5.2.1.1.1 <u>Eurovignette directive (case 4)</u>

The Directive harmonises levy systems - vehicle taxes, tolls and charges relating to the use of road infrastructure - and establishes fair mechanisms for charging infrastructure costs to hauliers.

The Directive covers vehicle taxes, tolls and user charges imposed on vehicles intended for the carriage of goods by road and having a maximum permissible gross laden weight of not less than

12 tonnes. From 2012 onwards Directive 2006/38/EC will apply to vehicles weighing between 3.5 and 12 tonnes.

Member States may maintain or introduce tolls and/or user charges on the trans-European road network, or on parts of that network, only under the conditions set:
- only to vehicles having a maximum permissible laden weight of not less than 12 tonnes
- to all vehicles (used for carriage of goods and having a maximum permissible laden weight of over 3,5 tonnes) from 2012

Tolls and user charges may not discriminate. Member States may provide for reduced toll rates or user charges for exemptions from the obligation to pay tolls or user charges for vehicles exempted from the requirement to install and use recording equipment under Council Regulation (EEC) No 3821/85.

User-charge rates shall be in proportion to the duration of the use made of the infrastructure. A Member State may apply only annual rates for vehicles registered in that State.

Toll rates may be varied according to:
— EURO emission class, provided that no toll is more than 100 % above the toll charged for equivalent vehicles meeting the strictest emission standards; and/or
— the time of day, type of day or season.

Impacts

Positive
The Eurovignette directive prevents discrimination and ensures equal competition. It stops Member States from imposing a charge on foreign hauliers without imposing the same charge on domestic hauliers. It also prevents Member States imposing a time-based charge of more than 11 euros a day.

Negative
The costs are transferred to customers by companies. It is unfavourable to customers who are in areas where use of alternative transport modes is not an option.

Net Benefit Score = **+ 4/10**

5.2.1.1.2 EU international road transport market liberalization: cabotage (case 5)

Road cabotage transport is governed by Council Regulation No 3118/93 which lays down the conditions under which non-resident carriers may operate national road haulage services within a Member State. With the aim of increasing transport efficiency and reducing the number of empty journeys, cabotage transport was gradually introduced from 1990 onwards. Quantitative restrictions (quotas) were imposed on cabotage transport from the outset through a system of granting authorizations. Intra-Benelux cabotage was completely liberalised in 1992. The cabotage regime was extended to the EFTA countries on 1 July 1994 with the exception of Austria, which joined on 1 January 1997, and Switzerland.

The process towards a definite system for cabotage operations was preceded by a progressive cabotage quota system in the period 1 January 1994 - 30 June 1998. Community cabotage in that period was restricted to a maximum number of cabotage authorizations per country. Each authorization was valid for 2 months. Member states could however request for the conversion of one cabotage authorization into 2 short duration authorizations each valid for 1 month. A Commission report on the application of this scheme (COM/98/0047) showed that, although the number of quotas increased yearly, these quotas were largely underused and had not attracted ‘unscrupulous’ operators into specific national markets.

Abolition of the quota system. In accordance with article 12 of Council Regulation No 3118/93 of 25 October 1993, most cabotage restrictions have been lifted since 1 July 1998 in the 15 Member States of the European Union. From that date onwards Regulation No 3118/93 on freight transport cabotage stipulates that any non-resident carrier who is holder of the Community authorisation is entitled to operate, on a temporary basis and without quantitative restrictions, national road haulage in another Member State without having a registered office or other establishment in that state. Following their accession to the EU on 1 May 2004 restrictions have been lifted for hauliers from Cyprus, Malta and Slovenia as well. (ECORYS Nederland and Ernst&Young Italy, 2006)

A new Regulation of European Parliament and of the Council Nr. 1072/2009 on common rules for access to the international road haulage market came into force on 4 December 2009. Articles 8 and 9 set the rules for performing cabotage on the territory of European Community. A limit of up to three cabotage operations and a time limit of 7 days following a previous international carriage is set. Member states can enforce new regulation from 4 December 2009, but it has to be enforced starting from 15 May 2010.

Impacts

<u>Positive</u>
To allow for a more efficient use of resources (less empty mileage), transport companies are allowed to perform cabotage transport activities (in effect opening up the national transport market under certain conditions), with the limitation that it must be temporary.

<u>Negative</u>
Negligible

<u>Net Benefit Score</u> = **+ 6/10**

5.2.1.1.3 <u>European Vehicle Emission Standards (case 9)</u>

European directives have been used for reducing the emissions for heavy goods vehicles. These include carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HCs) and particulate matter less than 10 microns in size (PM10).

Heavy goods vehicle emissions have originally been regulated by Directive 88/77/EC (heavy-duty vehicles) and amendments to it. A whole series of amendments have been issued to stepwise tighten the limit values. The Auto-Oil Programme focused on the emissions of carbon monoxide (CO), Volatile Organic Compounds (VOC), nitrogen oxides (NOx) and particles. It resulted in Euro III and IV standards for heavy duty vehicles (Directive 1999/96/EC, now repealed), as well as the fuel quality Directive 98/70/EC.

The legislation currently in force for heavy-duty vehicles is Directive 2005/55/EC (agreed in co-decision) and Directive 2005/78/EC (implementing provisions). This legislation defines the emission standard currently in force, Euro IV, as well as the next stage (Euro V) which will enter into force in October 2008. In addition, it defines a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV).

In Europe, the standard limit value proposals are developed in the Working Party for Pollution and Energy (GRPE), a subsection of the UN Economic Commission for Europe (ECE). The procedure is managed by a committee with participants from countries both inside and outside of Europe, so that the outline and effects of new regulation are discussed beyond the European perspective. A completed GRPE proposal is then developed into an EC Directive, making it mandatory for EU member states.

The Commission's proposal for a regulation on a new norm called Euro VI, aimed at reducing emissions of nitrogen oxides and particulate matters from trucks and buses as of 2012, was adopted in June 2009. At the same time, work is ongoing on the implementing measures for this act, which should be adopted by April 2010.

Impacts

Positive

- Harmonised emission limit values throughout the European Union have a positive impact on the competition in the internal market by sustaining a 'level playing field' for all automotive businesses.
- This policy results in improvement in air quality through reducing the levels of pollution produced by road transport, in particular by heavy-duty vehicles, and would therefore be an essential part of the regulatory measures necessary to meet the air quality
- Tighter emission limits could have both direct and indirect effects on fuel consumption and greenhouse gas emissions.
- Better air quality improves public health by decreasing morbidity rates and increasing life expectancy of the population, which in turn results in lower mortality. The impacts will grow in proportion to the penetration of newer low emission vehicles onto the market while older more polluting vehicles are retired.

Negative

- Cost of the technology that adds to the cost of the vehicles, as well as the increased fuel consumption that the technology involves.
- In practical operation the vehicles can emit more than the set limits.

Net Benefit Score = **+ 6/10**

5.2.1.2 Rail

***5.2.1.2.1* Plan for the Revitalization of European Rail Freight (case 4)**

To stop the decline of rail freight in Europe at the end of the 1980s, the European commission decided, in the beginning of the 1990s, to help this sector and revitalize it by European directives. The main objectives followed by the Commission were to create an integrated European railway area, enforce the idea of free movement of goods by all modes, and rebalance rail compared with road. To reach these goals, the European Commission chose to liberalize rail transport, put in competition the operators and support the investments in infrastructure (subsidies).

This policy revolutionized the European rail world even if its implementation has been difficult.
Its execution comprises two aspects: a general side for rail (freight and passenger) and a specific side dedicated to the revival of the freight.

General Plan for modernization and standardization of European railway systems:
-1991: policy launched to be "in phase" with the great market. The principle of separation between the operator and the railway infrastructure manager is enacted.
-1998, first 'railway package': it reminds the principles of 1991; liberalization of freight is planned to 2008.
-2002, the European commission decides to accelerate reforms and suggests to anticipate the opening dates at the competition of 2008 in 2006 (second 'railway package'). After a debate with the European Parliament, an agreement is concluded on the European rail freight opening January 1st 2006 for international freight and January 1st 2007 for national freight.
-March 2004, third 'railway package' proposed by the European commission and considered as the final step in the establishment of an integrated European railway network (harmonization

Community rules of certification of train crews, suggestion of a Community regulation on the rights and obligations of passengers, etc.).

The revitalization plan of freight: the creation of dedicated freight corridors

The Commission's target is to enable rail to regain a large part of the European market where it can be competitive (long distance international journeys).
The challenge was to integrate national infrastructures through a strengthened cooperation between infrastructure managers, meet the needs of rail freight operators, improve the freight infrastructure management and promote intermodality.

Definition of the corridor: priority freight for the railway lines that link strategic terminals between them (ports or industrial areas) and promote the intermodality.
6 freight corridors were recognized as priorities by the European commission in 2006.

Special measures have been taken to ensure their operations:

-Creation of mini-managing groups for each freight corridors: governance groups composed of different infrastructure managers implicated into the corridor project. They are designed to ensure the management of traffic and distribute investments and slots ("unique office" per corridor). They would be supervised by an Economic Interest European Group (EIEG).
- Accelerated development of ERTMS technology required to the good functioning of the corridors: interoperability.

Thus, thanks to these Directives to the rail world, the European Commission hopes to revive the rail activity in Europe and restore the lost balance with road. However, this process has been difficult to implement and its effects start only to be perceived.

Finally, many States and historical operators have not supported to see their historical monopoly and their competences in the area taken into reconsideration. This situation has been translated by strong resistances and significant tensions between the different actors of the sector (States, operators, European authorities etc.).

Impacts
<u>Positive</u>
Transported volumes increased in countries where the sector has been liberalized since 1995:
- + 13% between 2003 and 2004 in the UK;
- + 8% between 2003 and 2004 in Germany;
- - 3.7% over the same period in France.

o In general, The decline trend of the European rail freight reversed after 2003: strict business effect or consequences of the European Directives?
According to the commission, liberalization should permit:
- A cost reduction in rail transportation and a transfer from the road to this mode.
- The increase of goods volume on the railways should contribute to the decline of European CO2 emissions.

Finally, this policy in support of the railway has produced a double impact on mentalities:
- Revival of public opinion interest for the rail mode abandoned since a long time to prefer the car.
- Logisticians mentality change in relation to the rail: trust gains.

<u>Negative</u>
The economic crisis has confused the issue: Is the current stagnation of European freight only due to the economic crisis? Or did the Brussels Directives applied by the States also have a negative impact?
Currently, negative effects seem to be more speculation on possible consequences that might occur than real ones.

Net Benefit Score = **+2/10**

5.2.1.3 Maritime

5.2.1.3.1 Italian International Ship Register (case 6)

The Italian International Ship Register has been introduced by Decree-Law No. 457 of December 30, 1997, as converted into Law and modified by Law No. 30 dated February 27, 1998 (Law No. 30/1998), with the objective to place Italian ships employed in international traffic on a more even footing with those of other nations.

Impacts

Positive

- Environmental: Reduction in pollution.
- Social: Safety and security in the maritime industry due to the conformity to the international standards of vessels' security.

Negative
None evident

Net Benefit Score = **+7/10**

5.2.1.4 Inland navigation

5.2.1.5 Intermodal

5.2.1.5.1 Public-Private Partnership (PPP) schemes for the development of intermodal Freight Villages (case 6)

The establishment of Sogaris, in Rungis, France was the first FV. It begun with only a truck terminal and a goal of supporting business. Roissy-SOGARIS is now a 133-acre air freight Logistics Center Freight Village (LCFV) with a truck-rail intermodal facility, and access to several nearby highways (A86 and A6), and nearby Orly Airport. The LCFV accommodates almost 100 transportation, warehousing, and distribution related companies, and a variety of worker support services (e.g. customs office, post office, health centre, public transport, restaurant, gas station).

The example was soon followed by the development of a number of similar facilities in several other European countries, including Denmark, France, Germany, Greece, Italy, and the Netherlands. EUROPLATFORMS, a European association of over 60 managing companies from nine countries (Denmark, France, Greece, Hungary, Italy, Luxembourg, Portugal, Spain, and Ukraine), provides a medium for exchanging experiences and ideas on the development, management, and operations of FVs and other types of freight facilities.

Interporto Bologna S.p.A. is considered an examplary case for the following reasons:

- A strong local/regional partnership initiated the project
- The shareholding managing company structure represents a strong public/private partnership
- It includes all the typical functions and supporting services of a European freight village
- Tenants cover a wide spectrum of logistic service providers (LSP) from small local/regional parcel service companies to global 3PL (e.g. DHL)
- Its function and tenants' group structure evolved over the years

- Facilities include all kinds of dedicated and common use warehouses (road/road and road/rail)
- Over the last 30+ years, Interporto Bologna has been expanding and results about the evolution of the size and functions of the logistics facilities can be drawn
- Interporto Bologna has a strong intermodal component with two rail terminals (one for containers and one for “intermodal units”, i.e. semi-trailers and swap bodies
- It represents a best-practice case for the relationship with the neighbouring communities

Interporto Bologna S.p.A., originally named Autoporto Bologna S.p.A., was established in June 1971 with the purpose of relieving the city of the heavy truck traffic and promoting road rail intermodality, economic development and environmental sustainability. At that time, truck traffic presented a serious problem for the medieval city of Bologna.

The Private Public Partnership (PPP) is the most widespread and efficient organizational structure for companies managing Freight Villages. Share capital is owned by public and private partners in different percentages. In most cases however Public Authorities constitute a company’s main shareholder. The choice of the PPP model as well as the involvement of Public Authorities is linked to financial, infrastructure and planning reasons.

Impacts

Positive

- Development and support to intermodality
- Effectiveness
- City freight transport decongestion
- Holistic approach to regional, industrial and transport planning

Negative

- Concentration which may lead to over-concentration

Net Benefit Score = **+ 4/10**

5.2.2 Failures

5.2.2.1 Road

5.2.2.1.1 Introduction of three loaded trips limit in ECMT multilateral road transport permit system (case 7)

In order to perform international road haulage operations in addition to Community Authorisation and bilateral permits, hauliers can use ECMT multilateral permit scheme. ECMT permits may be used for laden or empty bilateral, transit and third-country journeys between 43 member countries of the scheme.

Introduction of 3 loaded trips limit: thanks to strong lobbying of big Western-European countries, limitations on the use of ECMT licences were introduced since 1 January 2006. Now, ECMT licences can only be used for transport operations after a laden trip between the country of registration and another ECMT member country and then vehicles can only make three laden trips before they must return to the country of registration, either laden or unladen. The driver is obliged to record the transport operations performed in a logbook (by hand) to show in chronological order each loaded journey between the point of loading and the point of unloading and also for each unladen trip, with a border crossing. The logbook is used for control of the use of licences.

There were strong objections at the time from the peripheral countries (like Portugal, Estonia, Latvia and others) on the proposal and substantial arguments were presented against it.

The reasoning of supporters of these restrictions is clear as it theoretically allows protecting the intra-European "cabotage" market (domestic cabotage is not meant here).

In the impacts of the measure were not hard to predict. To determine the real impacts, statistical monitoring was performed by all the ECMT member countries and gathered by the ECMT secretariat. The results showed a substantial decrease of the efficiency of road transport operations. During 2004-2008 the share of empty trips in the total number of trips during this period increased from 21.5 percent to 28.8 percent. An additional unpredicted impact was that the transport companies started making false logbook records in order to evade unladen trips back to registration countries and save costs. In practice, proving those cases turned out to be impossible, since the logbook is a declaration of the driver.

Impacts

<u>Positive</u>

- ECMT secretariat reports that 23% of the total traffic in 2008 with ECMT licences is intra EU/EEA/CH traffic, which is more than 4 percentage points lower compared to the average levels of 2004 and 2005 (about 27%).
  (Source: ITF/TMB/TR(2009)2)

<u>Negative</u>

- Negative effects include a substantial decrease of the efficiency of road transport operations (from 21.5 percent to 28.8 percent increase of empty trips) and misstatement of performed trips.

<u>Net Benefit Score</u> = **+5/10**

5.2.2.2 Rail

None reported

5.2.2.3 Maritime

5.2.2.3.1 <u>Double-hulled tankers (case 11)</u>

A double hull is a ship hull design and construction method where the bottom and sides of the ship have two complete layers of watertight hull surface: one outer layer forming the normal hull of the ship, and a second inner hull which is somewhat further into the ship, perhaps a few feet, which forms a redundant barrier to seawater in case the outer hull is damaged and leaks.

This double hull has been constructed for tankers ships in order to prevent losses of oil, according to the International Convention for the Prevention of Pollution from Ships or MARPOL Convention.

Impacts

<u>Positive</u>

- Environmental: Reduction in pollution in case of oil spill. Safety in low impact collisions and groundings.

<u>Negative</u>

- Economic: high costs for maintenance and operation.
- Logistical: national regulations are not homogenous.

Net Benefit Score = **+3/10**

5.2.2.3.2 Cold ironing (case 6)

Cold Ironing refers to the process of providing shore-side electrical power to a ship at berth while its main and auxiliary engines are turned off. Cold ironing permits emergency equipment, refrigeration, cooling, heating, lighting, and other equipment to receive continuous electrical power while the ship loads or unloads its cargo.

The term “cold-ironing” comes from the act of dry-docking a vessel, which involves shutting down all on-board combustion, resulting in the vessel going “cold.” Without cold-ironing, auxiliary engines run continuously while a ship is docked, or “hotelled,” at a berth to power lighting, ventilation, pumps, communication, and other onboard equipment. Ships can hotel for several hours or several days.

According to this concept, ships visiting ports are hooked on to local grid power, or other power sources which are already regulated by local pollution norms. This shore sourced power serves the ship’s cargo handling machinery and hotelling requirements.

Impacts

Positive

- Environmental: Reduction in pollution from shipboard emissions (because ships shutting off their engines). It is estimated that cold ironing could eliminate over 454 kg of nitrogen oxides emissions, 32 kg of sulphur oxides and 7 kg of particulate matter in a single 24 hour port call for a typical container ship.

Negative

- Economic: there are cases when cold ironing may not be cost effective. Ships like tankers and bulk cargo ships, characterised by infrequent and irregular visits to a port, and by lower power so that they need shorter berthing times.

Net Benefit Score = **+3/10**

5.2.2.3.3 European Register of Shipping (EUROS) (case 12)

A first attempt of European Register offered privileged access to aid cargoes and a variety of potential tax concessions in exchange for flying a second (European) register which came with restrictions on manning (Smith, 1993). As an attempt to counter the growth of flags of convenience by offering a European registry with higher standards but with options to reduce the strict manning requirements of state flags, it failed miserably falling between the economic advantages of flags of convenience and the standards which were ensured (at some cost) by conventional registries (Roe, 2009).

New proposals had first emerged during February 2006 with suggestions that the Commission had plans for a European registry leaked into newspapers and led to a fierce denial of any such idea (Lloyds List, 2006a). Stemming from ideas of European flag state control and a single line in notes accompanying the Erika 3 package of legislation, referring to the ‘development of a European flag’, the Commission stated that they did ‘not foresee the adoption of a European flag state’.

Impacts

Positive

- Environmental: Reduction in pollution.
- Social: safety and security in the maritime industry.

Negative

A failure of trust across jurisdictions and between governance authorities.

Net Benefit Score = **+3/10**

5.2.2.4 Inland navigation

5.2.2.4.1 Proportional Freight Partitioning (case 4)

During the early part of the last century it became clear that transport by lorry would be a huge competitor of the inland shipping industry and rail transport. The competition battle started. Followed by an economic crisis in the late twenties the role reduction of the inland shipping industry was realized. When the Dutch government noticed that no ship owner was able to earn any revenue the Dutch government interfered. On the 5th of May 1933 an act of freight partitioning was enforced (Wet Evenredige Vrachtverdeling). This act obligated the industry that the little freight that was transported by inland waters should be divided between the ship owners in an honest manner. For this reason the so called “exchange force” was enforced. Freighters and ship owners were not able to negotiate. The freighter was obligated to offer his cargo to the skipper association and the ship owner had to wait until the freight commission offered the cargo to the ship owner. The negotiated freight rate and transport conditions had to be approved by the freight commission. Using this system the government divided the poverty over the entire inland shipping industry instead of being forced to reorganize the industry. Reorganization of the industry would result in large amounts of ship owners who would have to farewell their barge. The regulations enforced in 1933 were temporarily measures for the industry, they were meant to regulate the industry for five years. To manage the competition between different transport modes a lot of parties insisted on permanent regulations.

Opponents of these regulations brought in some very interesting arguments in which they could have been right; “Overcapacity has not shrunken since the enforcement of the regulations, sanitation of the industry is required”, but “overcapacity during a great part of the year was necessary, to meet the demand for transport during the high seasons. Demand for transportation of goods is seasonal”. In 1975 a part of the Dutch government wanted to end the regulation cause of the negative side effects of these regulations. Angry ship owners blocked the most important inland shipping routes to stop the termination of these regulations. They were fortunate with these demonstrations, the regulations were not terminated.

Arguments against the regulations; violation of free transport choice, restriction in negotiation, termination of competition of the inland shipping industry with other transport modes and maintaining the overcapacity of the industry. The fixed freight rates were damaging the industry, freighters would search for other flexible transport modes. Logistical innovation in the industry was stopped by the regulations according to the freighters. Stimulating incentives for the termination of the regulations were liberalization of the inland shipping industry in other countries of the EU. After a lot of resistance of the ship owners the regulations were finally terminated 1st of November 1998.

Impacts

Positive

By regulating the supply and demand (by means of freight rates) the inland shipping industry was able to divide the poverty between the suppliers in the inland shipping industry. Every ship owner is able to earn a little money and is able to pay his debts. In this system less ship owners had to terminate their company.

Negative

The free market is terminated, this termination has negative side effects. Negotiation between freighters and ship owners was not allowed anymore, negotiations after offering the freight by the freight commission were only allowed when they were supervised by the Dutch government. This lack of flexibility drove freighters away from the inland shipping industry searching for other transport modes. For this reason the amount of freight offered to the inland shipping industry shrunk.

The incentive for ship owners to search for freight was removed. The ship owners had to wait until freight is offered to them, so any form of competition was gone. Without any competition ship owners did not need to distinguish themselves by a low freight rate, fast transportation, clean ship or a high reliability. For this reasons innovations (investments) in the industry did not seem necessary to the ship owners. Cause of the fact that the inland shipping industry was not innovative enough it had a lag in innovativeness compared to the road/rail transport. Maybe caused by these regulations the inland shipping industry is a very conservative industry.

Overcapacity in the industry is not managed with the enforcement of these regulations. For this reason ship owners operating in the inland shipping industry stayed at the same economical level. If everyone is able to survive without full utilization of the barge, no barges will be scrapped. In a sense this regulation is stimulating the overcapacity.

Net Benefit Score = **-2/10**

5.2.2.4.2 European Regulations to Rationalise the Inland Shipping Industry (case 8)

In the 1980s there was a structural overcapacity in the inland shipping industry in Europe. Especially the Western European countries with a common waterway infrastructure were suffering from this structural overcapacity (Belgium, Germany, France, Luxembourg and the Netherlands). Structural overcapacity means that even when there is extreme shallow water and there is an increase in the demand the overcapacity still exists. The European Commission estimated a structural overcapacity of 10% in the dry cargo transport and 15% in the liquid cargo transport. This structural overcapacity was realized because of a decline in the demand for transportation in the coal and steel industry. This was the core trade of the inland shipping industry while barges with a long lifespan were launched during the high demand in the years before.

The overcapacity in the inland shipping industry has to be fought to keep the industry alive. Overcapacity in an industry means that the supply is greater than the demand, this results in a decrease of the price of the goods. In the situation of the inland shipping industry a decrease in the freight rates results in a decrease of the profit of the barge. This could result in ship owners who are not able to repay their loan or even their interest.

The European Union (EU) reacted on the problem of overcapacity in the inland shipping industry with new regulation. Two rules were enforced; payment of premiums for the scrapping of vessels to reduce the overcapacity, and to avoid offset of the effects of this first regulation a second rule was enforced; the obligation that the ship owner of the vessel to be brought into service scraps a tonnage of carrying capacity equivalent to the new vessel ('old-for-new' rule), or pays a penalty to a Scrapping Fund. This penalty should be equal to the scrapping premium fixed for the same tonnage as the new vessel. These regulations were enforced in 1989 and were supposed to last for five years. The European Commission concluded after these five years that the ‘old-for-new’ rule was an effective contribution to the capacity policy, for this reason the duration of the regulation was extended for another four years.With a view on liberalization of the inland shipping industry the regulation was terminated 28th of April 1999.

Impacts

Positive

The European Commission was convinced about the ineffective regulations enforced by the members of the European Union on national level. These regulations were ineffective because of two reasons; the effects of the scrapping regulations in one member state could be offset by the overcapacity of other member states without scrapping regulations, and the second reason is that investment in the barge capacity are not slowed down by the enforced national regulations.

The European Commission had chosen to implement scrapping funds in every member state with a barge capacity of 100.000 ton and more. Offset of the effect of a scrapping fund should be fought with additional regulations, ‘old-for-new’ rule. These regulations created a decrease in overcapacity of the inland shipping industry. The effect in the dry cargo transport was the greatest, because of the fact that the liquid cargo industry invested in capacity when the freight rates restored.

The ‘old-for-new’ rule can be adjusted when necessary. The ratio between scrapped tonnage and new building tonnage can be adjusted. After the inland shipping industry has restored the rule was adjusted to a ratio of zero. When the overcapacity on European level increases again the ratio can be easily adjusted. This way the capacity in the inland shipping industry can be regulated.

The implementation of these regulations has the negative effect of contradiction of the free market while on the other hand it harmonized the European inland shipping industry. Resulting in a fair competition between operators in the different member states of the European Union.

Negative

There were some differences in national regulatory systems before the implementation of the European regulations. Some governments had chosen a free market in the inland shipping industry and some were still regulating the inland shipping industry. For this reason some European freighters could benefit from a free market while some had to conclude contracts at the shipper associations (which maintained a minimum freight rate). To ensure a fair competition between the inland shipping industries in the different countries the European Commission would like to introduce a free market in all the countries. A free market ensures that freighters are able to choose the desired ship owner based on price or transport characteristics.

The enforcement of regulations in the inland shipping industry is contradictory to the realization of a free market. Regulating the capacity in the inland shipping industry results in regulating the freight rates in that industry. Regulating freight rates is not a free market. The regulations enforced by the European Commission influences the freight rates, they do not regulate them. The competition between the freighters in the inland shipping industry is not influenced because the regulations went into force in Europe, not on national level. For this reason the full liberalization of the market was delayed until 2000.

Regulating the inland shipping industry will result in an increase in the freight rates. The inland shipping industry will loose competitiveness with other transport modes for this reason.

Net Benefit Score = **+4/10**

5.2.2.5 Intermodal

5.2.2.5.1 European Intermodal Loading Unit (EILU) (case 8)

The EILU was introduced partly to establish a common European standard and partly to encourage the market to develop its own informal standards. The European Commission proposal was first promulgated in the Promotion Programme for Short Sea Shipping (COM/2003/Final published on 7.4.2004. Consultations on the initial proposal led to considerable criticism and confusion about its interaction with the international (ISO) standard for containers. The Commission argued that its proposal was effectively for a standard applying to swap bodies for circulation within the EILU. The subsequent CEN mandate issued and consideration to the suggested standard was given by the appropriate CEN Technical Committee TC 119. In fact there were already two CEN standards for swap bodies, TS 13853 and TS 14993. The aim of these standards was the same as that of the EILU proposed standard, namely to ensure rigid sided, stackable swap bodies to enable rail and short sea shipping transport of them. TC 119 therefore concentrated its discussions on the need for safe handling and operation and the interoperability in all three surface transport modes.

Its conclusions noted that the willingness of the industry (particularly the operators) to contribute to the standardization process “had reduced in recent years”. It further observed that the current situation was that of “container and swap body manufacturers being asked more and more to produce equipment to individual owner specifications”. Hence, “the manufacturers were no longer interested to invest time and money in the preparation of standards” “In addition standard equipment is most likely to be produced outside Europe.” The CEN Committee concluded that without “public support” (money and resources) it was unlikely that an EILU standard would be produced”. Without such a standard the EILU could not be developed and operated.

Impacts

Positive

Enables rigid, stackable swap bodies to be used in European short sea shipping with enhancement of intermodal transport. With accompanying CEN standard would reduce manufacturing costs

Negative

May create problems for feedering at the port interface with the use of ISO standard containers. Industry not interested in working on a CEN standard.

Net Benefit Score = **0/10**

5.2.2.5.2 Marco-Polo (I and II) Programmes (case 8)

The promotion of intermodal transport is one of the main objectives of European Transport Policy, aiming at the reduction of transport externalities and the development of sustainable transport systems. Intermodal transport, to compete with road transport, should be organised on the basis of integrated door-to-door chains, using rail or sea transport for a significant part of the total chain and limiting road transport to the pre-haul and end-haul operations. This principle conducted to the development of the two main pillars of Intermodality: a) the combined Rail-Road transport and b) Short Sea Shipping (SSS). Intermodal chains will be more sustainable, and should be commercially more efficient than road-only transport, providing regular and high-quality alternatives to road transport and permitting a substantial modal shift of freight traffic from congested roads.

Marco Polo I and II Programmes (2002-2006 and 2007-2013) are policy and financial tools developed by the EU in order to support the promotion of intermodal transport; they provide support for transport services. The Commission evaluates the various proposals submitted to Marco Polo Programmes for funding according to the extent of their contribution to the reduction of the road congestion and transport externalities in general. Eligible actions for funding must deal with the following categories:

- "Modal Shift" actions, diverting freight traffic from road transport to other modes, or to a combination of modes thus promoting intermodality.
- "Catalyst Actions", aiming at overcoming structural obstacles that impede the effective functioning of the European freight transport market mainly through the promotion of synergies for a more suitable utilization of the existing infrastructures.
- "Common Learning" actions, focusing on methods and working procedures in order to optimise cooperation between actors involved in the transport chains.
- "Traffic Avoidance" actions, destined to reduce the use of road transport through logistics optimisation techniques, without negative impact on production efficiency or the employment.
- "Motorways of the Sea" actions dealing with a direct transfer of parts of the goods transported on the road specifically to short distance maritime routes, or to a combination of maritime transport of short distance with other transport modes, in which the distance for road is as short as possible.

Marco Polo II, compared to Marco Polo I (2002-2006), Marco Polo II program proposes a wider geographical coverage, either applying to actions referring to the territory of at least two Member States or of at least one Member State and a third neighbouring country.

As far as "Modal shift" action is concerned, the financial aid of the Community is based on the number of tonne-kilometres transferred from road to rail or sea, or, on the number of vehicle-kilometres of road transport avoided. The funding intensity under Marco Polo II for MoS actions can be up to 35% for a maximum of five years. The Commission issues during the period 2007-2013 yearly calls for proposals for all Marco Polo projects; these are scheduled at the beginning of each year. These calls are issued to private undertakings. The candidates, who are enabled to present a bid applying for an aid, should organize a consortium with at least two or more companies established in at least two different Member States or in a Member State and a neighbouring country.

Impact

Positive

Marco Polo program and, more generally, the European Transport Policy on the matter basically consist in interventionist policies that try to remove barriers and legitimate new -intermodal- approaches. Even if techical/administrative conditions provided by Marco Polo are not fully successful, the "cultural" impact of the program is significant.

Negative

The low contribution to intermodal transport, since intermodal transport market share is not substantially increased and most of the freight transport is still beeing conducted through road modes.

Net Benefit Score = **+ 4/10**

5.2.2.5.3 Failed attempts to concretise (and quantify) the concept of "internalisation of external cost" (case 7)

Freight transport continues to grow, with the largest increases occurring in the least energy efficient transport modes — road and air freight. The total volume measured in tonne-kilometres for

EU Member States increased by 35 % between 1996 and 2006. Rail and inland waterway freight recorded increases of 11 % and 17 % respectively but saw their market share decline (EEA, 2008). Estimation and internalisation of external cost of transport have been concerned European Commission for many years. The European Commission has raised the issue of internalisation in several strategy papers, such as the Green Book on fair and efficient pricing (1995), the White Paper on efficient use of Infrastructure, the European Transport Policy 2010 (2001) and the it's midterm review of 2006. Following a number of research projects, the approaches of the Commission are based on the economic theoretical concept of marginal social cost pricing. The EC White book of the overall transport strategy (Time to decide, 2001) and the midterm review (Keep Europe moving, 2006) underline the need of fair and efficient pricing considering external costs. In July 2008, the EU outlined a package of 'Greening Transport' measures to make the freight transport sector more sustainable. The package contains a proposal to reform the EU's Eurovignette Directive (1999/63/EC). The suggested reform would enable Member States to use revenue generated by the road freight toll to reduce the negative impacts of freight transport.

However, studies on the external impacts of transport by different modes are divergent, while the different pricing policies among the EU member states, have not received wide acceptance. Particularly, the implementation of different pricing policies among EU states, as well as the lack of sufficient measures which will internalise costs of CO2 emissions, rail and road noise and congestion, are the main reasons that the concept of internalisation of external cost is considered to be a failure.

Impact

Positive

Internalization of external cost, through transport pricing has a positive impact in the society and the environment, since it promotes the use of cleaner, quieter and more fuel-efficient vehicles.

Negative

The negative implications of the internalization of the external cost is on the society, since the increased prices for the transhipment of goods, due to transport pricing, will be eventually moved to the final customers.

Net benefit Score = **+1/10**

5.2.2.5.4 Motorways of the Sea (case 12)

On 1 October 2003, the European Commission announced the extension of the TEN-T to contribute to the success of enlargement, to reduce congestion, and to encourage intermodality: "A new mechanism for supporting Motorways of the Sea is proposed to encourage joint initiatives by the Member States to launch new regular transnational cargo shipping lines (...). It will give the sea motorways which improve links with island and countries isolated by natural barriers such as the Alps, the Pyrenees and the Baltic Sea the same importance as motorways and railways in the trans-European network." It was made clear that: "freight flows concentrated on sea-based logistical routes"; "increased cohesion" and reducing road congestion" were the essential aims to be incorporated in the MoS concept.

A number of initiatives followed to give operational meaning to the concept of Motorways of the Sea (MoS). These included:

- The Vade Mecum published in 2005
- The Mos Focal Points were established in June 2006
- The launch of joint national calls for proposals for MoS occurred in 2006

- The second Marco Polo programme became active in 2006 and included the possibility of MoS Actions to be funded
- The MOSES RTD project was started in June 2007
- An MoS European Coordinator was appointed in September 2007
- A European Commission Working Document on MoS was published in October 2007
- The launch of the European level calls for MoS under the TEN-T programme was launched in May 2008

During the above period the other EU Institutions and Industrial and Other Stakeholders were supportive of the MoS 'project', though arguing for greater clarification on a number of issues including particularly the need for greater clarification between MoS on the one hand and SSS on the other. This concern was identified by MOSES, though this project was terminated at the end of 2008.

A small number of EU-spronsored bi-national intiatives have been initiated in four designated broad corridors (Baltic. Western Europe, South-West Europe, and South-East Europe) Whether these consitatute genuine MoS is doubtful. The Commission has recognized the problem of confusion referred to above, but little concrete action has been taken to eliminate the definitional problem.

Impacts

Positive

If successful, it may have supported the development of other door-to-door intermodal transport involving a major sea leg.

Negative

None due to the slow introduction of the concept, but would have been low (weak) if successfully introduced.

Net Benefit Score = **+ 6/10**

5.3 Success and Failure Analysis

At this stage of the project analysis, it is problematic to attempt to draw general conclusions/lessons with regard to innovative *policy* initiatives, as we have done with the types of private industrial innovations. The legislative backing for some of the policy initiatives means that *implementation* barriers are unlikely to be barriers at all. Hence, it is the *adoption* barriers that should concern us in those cases where legislation is involved. Other policy initiatives, e.g. Motorways of the Sea, do not have statutory backing and here n both types of barrier will be relevant. It may be useful to compare the net benefits estimated for the policy initiatives as was done for the private industrial innovations and to make some general observations. The tables below for policy initiative successes and failures indicate the ranking of the initiatives by their perceived (in this preliminary assessment) net benefits.

SUCCESSES
Road.8 Success: NBS = +8/10 – Off-Peak Deliveries Programme, PIEK (Netherlands)
UNIGE.6 Success: NBS = +7/10 – International Ship Register (Italy)
Road.4 Success: NBS = +6/10 – Euro-Vignette Directive

Road.5 Success: NBS = + 6/10 – Cabotage

Road.9 Success: NBS = + 6/10 – European Vehicle Emission Standards

Rail. 4 Success: NBS = +2/10 – Revitalisation of European Rail Freight

Inland Navig. 8 Success: NBS = +4/10 – European Regulations for Inland Shipping

Maritime.5 Success: NBS = + 6/10 – Port State Control

Inter.M.6 Success NBS = + 4/10 – PPP for Intermodal Freight Villages

Total = 9 **(NBS = Net Benefit Score)**

FAILURES

Inter.M.12 Failure: NBS = + 6/10 – Motorways of the Sea

Inter.M.5 Failure: NBS = +4/10 – Marco Polo Programme

Road.6 Failure: NBS = +3/10 – Introduction of LHVs

Inland Navig. Failure: NBS = -2/10 – Proportional Freight Partitioning

Maritime.11 Failure: NBS = +3/10 – Double-Hulled tankers

Maritime.12 Failure: NBS = +3/10 – European Register of Shipping

Inter.M.7 Failure: NBS = +1/10 – Internalisation of External Costs

Inter.M.8 Failure: NBS = 0/10 – European Intermodal Loading Unit

Road.7 Failure: NBS = - 5/10 – ECMT Permit System

Total = 9 **(NBS = Net Benefit Score)**

In the case of the perceived (in this preliminary assessment) net benefits the successful policy initiatives have a median score of double that of the 'failures'. The similar assessment of barriers finds a median score for the failures only marginally greater than that for successes. This, very preliminary, finding suggests that the failed policy initiatives are *perceived* as being of considerably less net benefit than the successes. This finding will need to be checked carefully during the detailed examination phase of the study/project to see whether, both in perception and when objectively measured, this is the position. If so it would indicate that as in the case of the private industrial innovations the role of barriers may not always be critical in determining success or failure, but that the *relative* perceived net benefit is of greater relevance to the success of policy initiatives than in the case of private commercial innovations.

5.4 Achieving success in policy initiatives: approaches required

Initiatives taken at EU level, even more so than those taken at national level. face significant barriers both to the gaining of agreement on the proposed measures and on their subsequent implementation. Perhaps the major barriers relate to the attitude and lobbying power of the European-level industrial representative bodies in the transport sector during the consultation process (though this point is not confined to the transport sector, but is a general observation about policy-making in the EU).

Not surprisingly, the European Industrial Federations (actually most are Confederations) tend to view any initiative, however, well-intended, proposed by the European Commission with suspicion, believing that the 'market' works perfectly well and intervention is probably a 'bad thing per se'. It has to be said that sometimes this view may be correct, but it is not necessarily so. Opposition from European Federations in the transport sector will subsequently tend to be reflected in the attitudes taken by both the European Parliament and Member States when discussion of a policy initiative moves on in the EU decision-making process. It is imperative therefore that, if possible a constructive dialogue takes place from the outset.

On occasions the reverse is true. Demands for action may emanate from the transport sectors. The issue then is whether these demands can be accommodated without either unaffordable public expenditure or unacceptable negative impacts on economic performance or market distortion. Other interest groups. e.g. environmental interest groups, may also call for policy actions. The driving force for the internalisation of external costs comes from such groups, though this is also one where a consensus exists between economists (rarely achieved!) from outside and inside the European Commission.

As indicated in Paras 7.1.1 to 7.1.3 above, .the initial 'barrier' to be overcome for policy initiatives is the need to justify, in formal terms, the need for legislative action (the 'adoption' barrier). This has led to a preference within the Commission for non-legislative approaches. This is not necessarily an inappropriate approach to be taken, *if* the desired objective can be reached without the need for legislation. In general a non-legislative approach is to be preferred, but it is not always appropriate. As indicated in the above Paras the issue does perhaps need re-examining rather than accepting, unquestioningly, the prevailing orthodoxy that all markets work efficiently unless *proven* to have failed.

However, it is not only this issue which needs to be addressed. It appears that great care needs to be taken to ensure that the net benefits are reasonably substantial. This begs the question of course as to what constitutes 'reasonably substantial and it may be that some benchmark has to be devised and set, appropriate to the surface transport area of economic activity. This aspect can be explored later in this project.

Finally, it is important that in the case of initiatives such as Motorways of the Sea a clear and consistent conceptualisation is achieved and that the concept is marketed strongly. The same considerations apply in the case of the successive Marco Polo programmes.

6. Conclusions: Preliminary Lessons and Review of Approach

6.1 Lessons for private transport market innovations

At this stage of the project and in the absence of the detailed analysis of the full complement of innovations *preliminary* lessons only may be drawn. Nonetheless, it will be useful to regard these suggested lessons as preliminary hypotheses to be tested as the project progresses.

One general observation that may perhaps be made is that, in respect of private commercial or industrial innovations, there appear to be twice as many successes (27) than failures (14). This may be contrasted with policy initiatives where there are an equal number of successes (9) and failures (9).

It is obviously the case that, as indicated in the preliminary analysis, we are principally concerned with overall lessons that may be applied to *all* types of innovation across *all* surface transport modes. Having said that it will have been noted that there will be certain characteristics that have been indicated, in the above analyses by innovation *type,* as relating to say technological innovations or organisational innovations. In the detailed analysis this area of investigation will be of considerable concern. However, it is also important to recognize the differences in the market structures and cultures that are attached to the various surface transport modes. Hence, in what follows we distinguish certain features of innovation that appear intrinsic to the specific modes.

Overall Lessons across All Modes.

The following is a *preliminary* list of potential lessons, though not in order of importance, as this is an early stage of the project, with a reduced sample size, then all of these preliminary lesson will be subject to further detailed analysis before firm conclusions can be drawn:

- Initial barriers presented within companies are likely to relate to a perceived high investment cost. This is probably the most frequently cited barrier to the spread across the transport sector of private industrial innovations. In the more detailed analysis following this preliminary assessment it will be necessary to address the reasons for this perception. For instance, it may be due to high internal rates of return over short payback periods being set within companies.

- The existence of barriers of various kinds does not seem to be *per se* a sufficient condition to prevent the success of innovations. It appears that the underlying momentum of successful innovations is what enables them to overcome the barriers that are generally as high as those which appear to prevent other innovations from being successful. Exactly how this momentum is achieved is an important task for the subsequent detailed analysis in the project.

- There does not seem any particular *type* of private commercial innovation that is more successful than any other, though in the case of the rail innovations examined there is a significant proportion of organizational innovations..

- The range of perceived net benefits across types of innovations is wide and it does not seem that the level of net benefits is a main causal factor in determining the success of the innovations considered.

Mode-Specific Lessons

The individual transport modes are distinguished by specific market structures and cultural history. These circumstances are reflected in attitudes towards innovation in the various transport sectors. Some of the points made below may be regarded as tendentious, but they are derived from empirical observations and inspection of the literature on specific innovations. It should be recalled that so far in the preliminary analysis the most often quoted barrier to innovation, together with high investment costs, has been the negative influence of lobbying groups.

Road Sector
The lobbying groups, often on opposing sides, both inside and outside this sector are probably some of the most powerful and vociferous affecting any sector, inside transport or outside. These groups may on occasions be helpful to *policy* initiatives, but more often are likely to represent barriers to innovation. The road sector is also the most immediately and widely experienced by the travelling public. However, once legislation is in place, e.g. vehicle emission standards, then the process of innovative compliance is strong and effective. It may be that the early opposition makes for a close engagement once legislation is certain.

Rail Sector
The main obstacle to innovation in this sector is the lack of ability to act across different national rail jurisdictions and the private/public ownership variability among EU countries. Hence, the intermodality of trans-European rail routes is less than optimum. There are signs, however, that this lack of integration is beginning to be overcome. The need to focus on this inter-country aspect of intermodalty probably explains the high proportion of organizational innovations in this sector.

Maritime Sector
This sector has probably the most 'conservative' of industrial sectors in the shipping industry and also one that is truly global in terms of its ownership and operations and the regulatory mechanisms applying to it, e.g. the IMO and ILO. The regulatory action at global level tends to be slow because of the need to gain agreement among a large group of countries and is further slowed by the need for ratification. Sometimes this global regulatory action may be used to delay or obstruct EU regulation. In some cases this position may be appropriate where unilateral action by the EU may prejudice the position of the EU industry, but this is not always the case.

Inland Navigation
This sector is dominated by small and medium-sized enterprises and hence innovation tends to be hampered by the lack of major players willing to innovate. Nonetheless, the development of a river information system has demonstrated a receptiveness to innovation that would be good to be emulated by other transport modes.

Intermodal
The main problem in this sector is that an intermodal transport industry does not exist in the same sense as the four traditional surface transport modes. There is an intermodal equipment sector, but its operation as a transport modal entity requires cooperation among the other four sectors. This need and a general lack of sufficient cooperation, outside the integrated companies such as Maersk, has hampered its development and the ability to promote and accept the necessary innovation. Nonetheless it should be noted that to achieve greater efficiency through intermodal innovations is made difficult because of the need for the whole set of networks and chains to be involved in the overall process innovation.

6.2 Preliminary lessons for public policy initiatives

As indicated in the above analysis the principal lessons so far observed for public policy initiatives, both at EU level in particular, but also at national or regional levels may be summarized as follows.

1. Acceptance that no public policy initiative is likely to please every interest group. Hence, the European Commission, and national and regional governments need to challenge opposition from interest groups rather than conceding too much at an early stage in

discussions of innovative policy initiatives. Nonetheless, the key requirement is to gain strong agreement among the various industrial interest groups (and if possible other interest groups).

2. There is a particular problem at EU level where the need to demonstrate 'market failure' and a positive benefit/cost ratio may be inhibiting some appropriate regulatory action, even though it is likely that regulation may actually stimulate other types of innovation among industrial players.

3. A clear conceptualisation of the initiatives and their impacts is important for their success as is an accurate calculation of the net benefits of the initiatives/measures.

6.3 Summary review of InnoSuTra analysis framework

It has become clear during this preliminary analysis that the framework that the consortium has used at this stage may need to be revised during the subsequent detailed analysis. Nonetheless, the approach has also been validated in a number of respects.

First, the enumeration of the aspects of the innovation process to be explored have proved to capture all the relevant areas to be further delineated and defined. Second, the five transport modal divisions are appropriate, even though there have been occasional uncertainties over the placement over certain of the cases. With more careful assessments then we see no reasons to abandon the five-fold split, including the intermodal category. Third, the need to summarize the descriptions of the innovation cases has assisted in defining the key characteristics of the innovation processes. Fourth, the use of awarding ranking points to the various attributes of the innovations considered does assist, in particular, to define the success of the innovations in terms of their spread and the net benefits to be expected; though in both of these aspects further elaboration will be necessary as indicated below..

There are a number of points on the analytical framework that will need further elaboration. These are as follows:

- Further advice on the placement of the innovations in relation to the five-fold typology needs to be provided; some innovations can be allocated to more than one type of innovation.
- The measure of spread needs to be more carefully defined to provide a more precise assessment of the take up of the innovations.
- The calculations of impacts/benefits will have to be made more precise, as is intended in the detailed examination.
- The definition of adoption and implementation barriers needs to be made less ambiguous for policy innovations/initiatives the adoption barrier is important (though the simple 'promulgation' of an initiative, e.g. the ECMT case, should not qualify as the spread of the innovation) whereas for private commercial innovations it may not always be relevant.
- The support processes involved will need to be elaborated beyond the simple indication of the main 'protagonists'. Again this elaboration was always envisaged in the detailed phase of the project.

These points will be discussed by the Consortium and, following the first Consultation Meeting, and taking account of the results from that meeting, a revised analytical framework will be produced on which the subsequent detailed analysis will be based.

Annex 1

Assessment Template (Specimen)

Template for identification innovative success/failure cases

Partner short name	[select]
Case №.	

Title	
Domain	road ☐, rail ☐, inland navigation ☐, maritime ☐, intermodal ☐, other____________
	success ☐ failure ☐ Why do you consider it a success/failure?
Type of innovation	technological ☐ managerial/organizational ☐ logistical ☐ cultural (*including marketing*) ☐ policy initiative ☐
Degree of development according to product life cycle classification	development ☐, introduction ☐, growth ☐, maturity ☐, saturation/decline ☐

Summary description *(max 1 page)*

Summary of identified issues *(max 250 words per item)*

Issues of success and failure

1. Barriers to adoption [ranking: [please select]**]**
Which are the barriers that have prevented the concept's development / spread in case of failure, or which have hampered the good spread in case of success?

2. Adoption rate and spread [ranking: [please select]**]**
How quickly or how slowly did the concept get accepted? Which market or what part of a market was intended to be reached and was it reached? What time did it take for full adoption of the intended market?

3. Implementation barriers [ranking: [please select]**]**
Indicate the barriers that were present during the implementation of the innovation.

<u>Support processes</u>

4. Incubator
Who was at the origin of the innovation, or who launched and/or spread the concept?

5. Support cluster/network
Was the concept's development and spread embedded in a group of actors?

6. Organizational changes required [ranking: [please select]**]**
Which changes in the existing operating procedures did the concept bring?

<u>Impacts</u>

7. Negative effects [ranking: [please select]**]**
Which implications of the concept turned out to be rather negative in economic, social, environmental, technical or logistical terms, and with a view of the good functioning of the sector?

8. Positive effects [ranking: [please select]**]**
Which implications of the concept turned out to be rather positive in economic, social, environmental, technical or logistical terms, and with a view of the good functioning of the sector?

Detailed description

Bibliographic references