SEVENTH FRAMEWORK PROGRAMME

THEME [7]

Theme Title: Transport (including Aeronautics)

SuperGreen

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List of Abbreviations

ATC	Automatic Train Control
ATM	Air Traffic Management
CCNR	Central Commission for Navigation on the Rhine
CEDEX	Container Equipment Data Exchange
CEN	European Committee for Standardization (Comité Européen de Normalisation)
CIECA	International Commission for driver testing
CO_2	Carbon dioxide
CO_2-eq	All GHG expressed as equivalent units of CO_2 using the global warming potentials of UNFCCC
CT	Combined Transport
DoW	Description of Work
EEDI	Energy Efficiency Design Index
EEOI	Energy Efficiency Operational Indicator
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ELP	Nearby delivery area (Espace de livraison de proximité)
ENP	European Neighbourhood Policy
ERTMS	European Rail Traffic Management System
ERTRAC	European Road Transport Research Advisory Council
FIATA	International Federation of Freight Forwarders Associations
FYROM	Former Yugoslav Republic of Macedonia
GDP	Gross Domestic Product
GEA	Global Express Association
GFP	Global Facilitation Partnership for Transportation and Trade
GHG	Greenhouse gas
GPP	Green Public Procurement
IA	Impact Assessment
ICE	Internal Combustion Engine
ICT	Information and Communication Technologies
IIRSS	Intelligent Integrated Road Safety Systems
ILO	International Labour Organisation
ILU	Intermodal Loading Unit
IM	Infrastructure Manager
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
ITS	Intelligent Transport Systems
IWT	Inland Waterway Transport
KPI	Key Performance Indicator
LCC	Life Cycle Cost
LCFV	Logistics Centre Freight Village
LHV	Long and heavy vehicles
LNG	Liquefied Natural Gas
LPI	Logistics Performance Index
MARPOL	International Convention for the Prevention of Pollution from ships
MBM	Market-based measure

MCR	Maximum Continuous Rating of a ship's main engine
MEPC	The IMO's Marine Environment Protection Committee
MoS	Motorways of the Sea
MoU	Memorandum of Understanding
MS	Member State
MSC	The IMO's Maritime Safety Committee
NAIADES	Navigation and Inland Waterway Action and Development in Europe
NOx	Nitrogen oxides (NO and NO_2)
NRMM	Non-Road Mobile Machinery
OECD	Organisation for Economic Co-operation and Development
PEC	Pilot Exemption Certificate
PM	Particulate matter
PPP	Public Private Partnership
R&D	Research and Development
RIS	River Information Services
Ro-Ro	Roll on - Roll off
RU	Railway Undertaking
SDS	Sustainable Development Strategy
SEA	Strategic Environmental Assessment
SECA	Sulphur Emission Control Area
SESAR	Single European Sky ATM Research
SOLAS	International Convention for the Safety of Lives at Sea
SOx	Sulphur oxides (SO_2 and SO_3)
SSS	Short Sea Shipping
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TEN-T	Trans-European Transport Network
TSE	Finland's Turku School of Economics
UDC	Urban Distribution Centre
UNCLOS	United Nations Convention on the Law of the Sea
UNCITRAL	United Nations Commission on International Trade Law
UNFCCC	United Nations Framework Convention on Climate Change
vkm	vehicle kilometres
WB	The World Bank
WP	Work Package
WTO	World Trade Organisation

0 Executive Summary

This document presents the work done under SuperGreen's Task 2.3, aiming at identifying the changes in the operational and regulatory environment that might promote or hinder the implementation of the green corridor concept. From an initial list of 242 documents, covering the last decade, 59 were selected to be reviewed. An additional one, the 2011 White Paper, was reviewed when preparing the last version of the present report due to the significance of this document, which was meanwhile released. About 450 changes resulted from this review, which were bundled in 77 definite changes after being screened. These changes were grouped in 7 themes (Business environment, Trends in logistics, Public policies, Operations, Infrastructure development, Technology development, and International regulations) and their effects on green corridor development were assessed through the use of the SuperGreen KPIs.

The main conclusions regarding the EU transport policy are:

- All identified barriers to green corridor development have been adequately addressed by EU policies. Of particular importance are the administrative barriers addressed by the Freight Transport Logistics Action Plan. In general, the legal framework is pretty much in place. Special attention should be given to the enforcement of existing legislation.
- The corridor approach is an effective way to address the fragmented nature of European transport networks, especially in the rail sector.
- The effectiveness of transport policy is enhanced by employing packages of complementary instruments. Very important is the role of technology (in particular commercially viable alternative fuels) for the long run, and of ICT applications for the immediate future. The significance of educating, informing and involving the greater public in transport policies is a precondition for their effectiveness.
- The points made above are adequately addressed by the new White Paper, which:
  - Takes on board most of the initiatives of the Freight Transport Logistics Action Plan that have not been completed yet (e.g. e-Freight, ITS, single transport document, standard liability clause, 'end-to-end' security, new legislation on weight and dimension, best practice guidelines for urban freight flows, etc.);
  - foresees a vigilant enforcement of the competition rules across all transport modes;
  - exploits the advantages of the corridor approach through the introduction of the core network concept; and
  - recognises the need for new transport patterns, in fact naming the use of alternative fuels and advanced ICT applications as prominent features of two of the three strands that future developments must rely on; the third one concerns the performance of multimodal logistic chains, which is the main objective of green corridors by definition.
- Over-regulating is an issue that should not be overlooked, since improvements in one aspect might create problems in another. Three such cases were identified, all concerning maritime transport and non-EU institutions. A possibility worth assessing by the European Commission is the amendment of the new Marco Polo programme to include financial instruments aimed at avoiding 'back-shift' from more environmentally-friendly modes to road transport.

The main conclusions regarding the green corridors are:

- Valuable lessons can be drawn from Regulation No 913/2010 that introduced the freight-oriented corridors in relation to:
  - separation of the criteria establishing a freight-oriented corridor from the indicators monitored after its establishment,
  - the definition of a freight-oriented corridor,
  - the detailed governance structure fostering international cooperation among a multiplicity of actors involved, and the introduction of a one-stop-shop for communication with third parties,
  - the implementation measures foreseen, including a market study, an implementation plan, an investment plan, a deployment plan relating to the interoperable systems, a performance monitoring mechanism, and a user satisfaction survey, all updated periodically.
- In relation to the criteria for labelling a particular corridor as "green", it is suggested that the European Commission assesses the possibility of including as prerequisites:
  - the fair and non-discriminatory access requirement of the Freight Transport Logistics Action Plan, and
  - the internalisation of external costs, which for the time being remains voluntary.
- Intermodal terminals and freight villages have a crucial role in the development of green corridors.
- The KPIs on emissions, congestion and accidents should include absolute in addition to relative units.

1 Introduction and objectives

The purpose of this document is to describe the work done in SuperGreen Work Package 2 under Task 2.3 “Effects of changes in operational & regulatory environment.” Task 2.3 is the third task of Work Package 2, following the selection of SuperGreen corridors[1] (Task 2.1) and the definition of benchmarking methodology and Key Performance Indicators – KPIs (Task 2.2).

The target of Task 2.3 is to identify changes that might promote or hinder the implementation of the green corridor concept, providing input to subsequent tasks of the project. The task’s objectives are to review the operational and regulatory environment, identify the most significant changes that take place thereto, and assess their effects on green corridor development through the proposed KPIs[2].

The identified changes need to be analysed and grouped under the following themes:

- Business environment
- Trends in logistics
- Public policies
- Operations
- Infrastructure development
- Technology development
- International regulations

It is noted that the operations theme was not foreseen by the Description of Work (DoW) document but it was added during task execution to cover operational changes that could not be classified in one of the other themes.

Finally, the changes and their effects have undergone the scrutiny of a workshop, especially arranged for this purpose, as a means of evaluation and validation.

An additional objective deriving not from the DoW, but from the initial methodology for benchmarking the SuperGreen corridors, as this has been formulated in Deliverable D2.2, is the presentation of additional references to KPIs and methodological approaches identified during the extensive literature review undertaken in the framework of Task 2.3.

Task 2.3 started on 15 June 2010 as planned and is concluded with this report. It is noted that the contractual completion date was 15 January 2011 (M12 of the project), while the related workshop was foreseen for up until 15 February 2011 (M13). Provided that the workshop was scheduled for 1 February 2011 in Antwerp, Belgium, it was requested and was approved to delay the submission of this report by a month (15 February 2011), in order to incorporate the stakeholders’ feedback resulting from the workshop.

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[1] Salanne et al (2010). Selection of Corridors. SuperGreen project Draft Deliverable D2.1, Document number: 02-21-RD-2010-03-01-5.

[2] Pålsson et al (2010). Definition of benchmark indicators and methodology. SuperGreen project Draft Deliverable D2.2, Document number: 02-22-RD-2010-16-01-4.

There were five partners involved in this task: NTUA (task leader), Sito Ltd., Det norske Veritas (DNV), the Hellenic Shortsea Shipowners Association (HSSA), and the Turkish State Railways (TCDD).

Section 2 of this report describes the methodology applied for Task 2.3.

Sections 3 to 9 present the identified changes and their effects by theme; each theme examined in a separate section. Feedback received by the stakeholders at the Antwerp workshop is presented here under the relevant theme.

The conclusions reached during this stage of the project are presented in Section 10.

In addition to its normal function, Section 11 (References) provides a separate list of the documents that have been reviewed under Task 2.3 and for which a document fiche has been prepared. The same list informs the reader on the Appendix where a particular document fiche can be found. The 9 Appendices accompanying the main body of the report present the document fiches by category; each category presented in a separate Appendix. The categories covered are (in order of presentation): Strategic issues; Policy issues; Infrastructure; Logistics and business environment; Rail transport; Road transport; Maritime transport and ports; Inland waterway transport; and Urban transport.

The last appendix (Appendix X) presents additional references to methodologies and indicators used for benchmarking transport operations, which have been identified in the framework of Task 2.3 and have not been covered in previous project deliverables.

2 The methodology

The method foreseen for Task 2.3 in the DoW document of the project is a survey based on research works and other existing information.

The task leader, NTUA, prepared a preliminary catalogue of 90 recent studies performed on behalf of EU institutions, and 134 research projects funded under the 6th or 7th FP, which appeared to be of relevance to SuperGreen. A list of 18 related works undertaken or commissioned by other than EU institutions (international organisations – United Nations, OECD, IMO – and national agencies) was prepared by the task partner DNV.

These documents were grouped in the following categories in accordance with the division scheme of the official website of the European Commission related to transport issues:

- Strategic issues
- Policy issues
- Infrastructure
- Logistics and business environment
- Rail transport
- Road transport
- Maritime transport and ports
- Inland waterway transport
- Urban transport

Document reviewing was allocated to Task 2.3 partners on the basis of the categorisation mentioned above. The criteria used for work allocation were:

- expertise/specialisation of each partner institution,
- fair distribution of workload in accordance with input foreseen, and
- correlation with work allocated to the partners under other tasks of the project.

In parallel, the task leader designed a form – Document fiche – to be used for reporting the results of the review. The form appears in Figure 1. In addition to document identity, the form covers:

- Objectives
- Main findings / results achieved / summary of measures
- Relevance to green corridor development
- Measures/changes suggested or introduced

The basic output of a document fiche is the list of measures/changes suggested or introduced by the document, their nature (theme) and their expected effects on greening transport corridors.

As next step, task partners screened the documents assigned to them to identify those of real interest to green corridor development. A total of 59 documents were selected for further processing. Following submission of the first draft of this report, the new White Paper was released. Due to its importance, this document was also reviewed and the relevant document fiche appears in the present version.

Task partners reviewed these documents, filled out the relevant document fiches, and reported the changes identified and their effects by theme. About 450 changes were reported altogether.

The task leader collected the reported changes and screened them in order to exclude those repeated and bundle those that were very detailed in nature to something broader. The effort was to come up with a number of definitive changes, which are neither too broad in nature, nor too detailed, allowing a meaningful and yet manageable assessment of their effects. About 80 such changes resulted from this process.

SUPERGREEN Document Fiche		**Number :**		**Partner :**	
Document identity		Field[1] :		Doc.date :	
Doc. number :		Study :		Regulatory act :	
Author :		Research proj. :		- Suggestion :	
On behalf of :		Other doc. :		- In force :	
Title :					
Related doc's :					
Web address :					

Objective(s)

Main findings / results achieved / summary of measures

Relevance to green corridor development

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
			.

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

Figure 1. Task 2.3 Document fiche

The next step was to analyse each change and assess its effects on the KPIs selected under Task 2.2 based on the content of the document and the professional expertise of the reviewer.

In addition to presenting the expected effects of the changes in the text, they are also summarised in tables in the form of Figure 2.

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
Legend: +/- = moderate increase/decrease; ++/– = significant increase/decrease; +++/— = very significant increase/decrease (and combinations thereof)																		

Figure 2. Summary table of expected effects of changes on SuperGreen KPIs

In these tables, the direction and level of significance of the effects of each change are depicted through symbols, which have the following meaning:

+ Moderate increase (in the indicator as defined in Table 1)
++ Significant increase
+++ Very significant increase
- Moderate decrease
-- Significant decrease
--- Very significant decrease
+ / - Two different forces work in opposite directions
(+) Potential effects
+ (-) Moderate increase but potential decrease under specific conditions described per case.

No symbol means that no effects are expected.

In order to avoid confusion, the definition of the KPIs used in the analysis is presented in Table 1. The above symbols should be considered in conjunction with the KPI definitions. It is mentioned as an example that the symbol '+' in the CO_2-eq column signifies a moderate increase in GHG emissions and not a positive development in this respect.

It is also noted that in assessing the effects of a particular change, this change is considered independently from all other factors, which are kept unchanged. As an example it is mentioned that in projecting significant increase ('++') of congestion due to the expected GDP growth, the capacity of transport infrastructure is kept at today's level, which doesn't need to be the case in reality. In most cases this assumption places more emphasis on the short term effects of a change. Significant long term effects not captured by this assessment are presented in the text accompanying the tables.

The summary tables produced in the way described above were presented by theme in the Antwerp workshop and formed the basis for discussions with the stakeholders. In the following sections only the revised tables are presented, which incorporate the feedback received. The modifications made as result of such feedback are clearly mentioned in the accompanying text.

Table 1. The KPIs used in the analysis

Efficiency	Relative unit cost	(€/ton-km)
Service quality	Transport time	(hours)
	Reliability	(% of shipments delivered on time, i.e. within acceptable window)
	Frequency	(Number of shipments per week)
	ICT applications	(% of corridor length, over which cargo tracking and other services are offered)
	Cargo safety	(% of shipments subjected to safety incidents)
	Cargo security	(% of shipments subjected to security incidents)
Environmental Sustainability	CO_2-eq	(mass)*
	SOx	(mass)*
	NOx	(mass)*
	PM	(mass)*
Infrastructural Sufficiency	Congestion	(average delay in hours)**
	Bottlenecks	(qualitative indicator, Scale 1-5)
Social issues	Land use	(% of corridor length in urban areas)
		(% of corridor length in sensitive areas)
	Traffic safety	(fatalities & serious injuries)***
	Noise	(% of corridor length above 50/55 dB)

Notes:

* The SuperGreen KPIs for all emissions are defined in mass/ton-km units.
** The SuperGreen KPI for congestion is defined as average delay over total transport time.
*** The SuperGreen KPI for traffic safety is defined in (fatalities & serious injuries) / ton-km units.

3 Business environment

The section deals with changes in the business environment. A total of 29 changes in this theme have been identified through the document fiches. Their screening and processing has resulted in the 14 definite changes of Table 2 below.

3.1 Demographic changes

One of the main drivers concerning transport and mobility is population. The population of the European Union (EU27) is expected to increase by approximately 2% between 2005 and 2020 (from 488 mio to 496 mio). Between 2020 and 2025 population growth is projected to come to a halt, while it is expected that after 2025 the number of EU27 inhabitants will start to decrease, reaching 472 mio by 2050 (approximately 4% decrease). The countries with the sharpest increase in population are located in the economic heart of Europe (France, Belgium, Netherlands, Spain), while the countries with the sharpest decline are located in Eastern Europe [BE LOGIC (2009)].

The projected decrease of population in the long term will be reflected in reduced demand for transport services. The result will be decreasing transport costs, time and congestion, lower emissions and noise, fewer accidents and bottlenecks, and improved reliability of the transport services. Another effect of decreased population is shortages in the workforce, which will mitigate to a certain extent the declining trend of transport costs.

Not only is the European population expected to decrease but the age structure is also under considerable change. According to Petersen M.S. et al (2009a), in 2050 about 30 % of the European population is expected to be older than 64, while the equivalent figure in 1950 was about 7%. The productive age group (19 – 64) will diminish considerably, and the age group from 0 – 18 will decrease even more quickly. For transport operators this change has important consequences as the average age of the workforce is increasing and it will become more difficult to find well-qualified younger staff, leading to increased transport costs.

The ageing population has two more implications[3]. Firstly, research has shown that aggregate consumption decreases, and consequently savings rate increases, when the share of middle-aged persons (i.e., between 50 and 66 years) in the population increases. It is, thus, expected that the increase in the average age of EU population will have a negative effect on consumption and transport demand [BE LOGIC (2009)]. Secondly, an ageing society will place more emphasis on the provision of safer transport services, and improvements in this regard are expected.

On the other hand, net migration to the EU might add 56 million people to the EU's population in the next five decades, a fact that could play an important role in mitigating the effect of ageing on the labour market. The same effect is expected from increasing mobility of workers within EU due to the gradual removal of administrative and legal barriers and further deepening of the internal market [EC (2009a)].

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[3] Its repercussions on availability of public funds for transport infrastructure projects are covered in Section 7.9.

Table 2. Effects of changes in business environment

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	**Change**	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	**Fiche and measure number**
1	Population size	+ / -	-	+					-	-	-	-	-	-		-	-	2/1, 48/1
2	Ageing population	+ / -														-		2/2, 11/1, 48/2
3	Net migration to the EU	-																11/2
4	Increasing mobility of workers	-																11/3
5	Urbanisation and city sprawl	++ / --	++ / --		++				++ / --	++ / --	++ /--	++ /--	+++	+	+++	+++	+++	2/3, 11/6
6	Increasing individualisation	+	-	+	+	+			+	+	+	+	+			+	+	2/4
7	Proliferation of electronic business	+ / -	-	+	+	+			+ / -	+ / -	+ / -	+ / -	+ / -			+ / -	+ / -	1/5, 2/5
8	Increasing economic activity	++	+		+				++	++	++	++	++	++	++	++	++	2/10, 48/3
9	Globalisation	+						+	+	+	+	+	+	+				2/12, 11/7, 48/4
10	Technological convergence (productivity)	+						+	+	+	+	+	+	+				48/6
11	EU enlargement	++ / --	+	-					++	++	++	++	++	++		++	++	2/13, 48/16
12	EU integration	++	+	-	+				++	++	++	++	++	++		++	++	2/11, 11/8
13	Increasing scarcity of fossil fuels	+++	-		-				-	-	-	-	-	-		-	-	2/14, 11/5, 48/8, 48/9
14	Increasing social and environmental consciousness								--	--	--	--	--	-		--	--	2/6, 11/4, 48/7

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

3.2 Urbanisation and city sprawl

The projected stagnation and subsequent decrease in the population of the EU is coupled with a projected internal migration within Europe towards existing and developing economic centres. Urbanisation has been a clear trend in the past decades and is expected to continue, with the proportion of European population residing in urban areas increasing from 72% in 2007 to 84% in 2050.

The proximity of people and activities is a major source of advantages that drive urbanisation. However, in the past 50 years, the growth of urban areas across Europe was even larger than that of the resident population. This urban sprawl is the main challenge for urban transport, as it brings about greater need for individual transport modes, thereby generating congestion and environmental problems. Furthermore, as most freight transport starts or ends in urban areas, urban congestion also negatively impacts inter-urban freight transportation [EC (2009a)].

The expected effects are significant increases in transport costs, time and emissions, and very significant increases in congestion, noise, accidents and land use.

On the other hand, denser cities are better served by collective modes of transport and significant economies of scale can be achieved on corridors connecting major urban hubs. The role of this factor was emphasized by the stakeholders at the Antwerp workshop, and very significant gains were added in terms of costs, time, frequency and emissions, with a parallel moderate deterioration of bottlenecks along major freight corridors.

3.3 Increasing individualisation and proliferation of electronic business

The European society exhibits an increasing degree of individualisation, as depicted by reduced average household size (2.4 persons per household in 2008 against 2.8 in 1981 and 2.6 in 1991), and increased number of one-member households (an increase of approximately 20% from today's levels is expected for 2025).

This trend results in increased individualisation of economic activity and consumption patterns, which in turn affect the structure and management of supply chains (through increased direct deliveries), as well as the demand intensity in terms of frequency and size of shipments and the organisation of freight transport services [BE LOGIC (2009)].

Thus, the expected effects are gains in terms of frequency, reliability and transport time at the expense of increased costs, emissions, noise, congestion and accidents. The necessity for improved performance of the supply chains is expected to lead to increased use of ICT applications.

The trend towards individualisation of economic activity cannot be seen in isolation from the rapid increase of electronic business (both for individuals and companies). Electronic sourcing for individuals (business-to-consumer) has increased rapidly in the European Union; the percentage of EU citizens who ordered goods or services over the Internet for private use has increased from 15% in 2004 to 25% in 2008 [BE LOGIC (2009)].

The effects of electronic ordering are expected to be similar to those of individualisation through increased direct deliveries (mostly by personalised road transport services) and a geographically wider distribution of goods. The role of the dematerialisation of certain goods (e.g., software, music, books), viewed as a dimension of electronic business leading to decreased quantities transported, was emphasized at the Antwerp workshop, and it was suggested to add an opposite direction influence to the cost, emission, noise, congestion and accident KPIs.

3.4 Increasing economic activity

Economic development, in addition to being related to a number of other drivers, is in itself a driving force for mobility and transport development. There is a well-known feedback between transport improvements and the mobility generated from economic activities: roads create cities as well as cities create roads. As for freight transport, GDP is the single, most important predictor of transport demand.

The outlook on the European economy produced by the EC publication '*Trends to 2030 - update 2007'* indicates an optimistic forecast of growth of the European economy of 2.2 % per annum up to 2030. For freight transport in the EU, the GDP elasticity of activity is projected by the same study to decrease gradually to values lower than one (from 1.45 during the period 2000 to 2005), signifying a gradual decoupling of freight transportation from GDP growth in the EU [Petersen M.S. et al (2009a)].

Despite this gradual decoupling, the expected GDP growth in the long term will lead to significant increases in costs, congestion and other bottlenecks, emissions, noise and accidents, while significant pressures will be exerted to land use. Moderate increases are expected in transport time and frequency of service.

3.5 Globalisation and technological convergence

Globalisation has been a powerful trend of the past decades, enabled by trade liberalisation agreements and by revolutionary developments in transport and communication technologies (from containers to satellite radio-navigation) that have reduced distance and time barriers [EC (2009a)]. As the economic activity is decreasingly inhibited by national boundaries, the companies' outreach increases and their competitive field expands to include wider geographical areas [BE LOGIC (2009)].

As a result, the volume of goods presently traded are more than 15 times greater than in 1950 and the world trade as a percentage of world GDP has tripled over the same period [Petersen M.S. et al (2009a)]. Although the growth rate of globalisation is expected to be lower in the future, basically due to the recent economic crisis and the rising fuel cost that may lead to more regionalised trade patterns, the strong economic growth of many developing countries implies further globalisation. Transport outside Europe will increase much more than inside Europe and EU external trade and transport are likely to keep growing rapidly in the coming years [EC (2009a)].

Moderate increases in transport costs, congestion, emissions and bottlenecks are expected to result from this trend. A side effect of globalisation is a deterioration of security as regional tensions, too, become global.

Economic globalisation is also driven by the movement of knowledge (technology) across borders, a general increase in education and a better use of available resources. Over the last 10-15 years, the average productivity growth in the rest of the world (world excl. EU15 and US) was about 0.5% higher than in the EU. The process of income convergence is likely to continue over the coming decades, underpinned by a persistence of the existing productivity growth rate differentials. As indicated by many growth studies, a country's level of long run income per capita is strongly related to its human capital [Petersen M.S. et al (2009a)].

The effects of technological convergence are expected to be identical to those of globalisation.

3.6 EU enlargement and integration

The European market has witnessed a significant enlargement in the past decade and especially since 2004 with the addition of 10 new member states to the EU15 group and the additional expansion in 2007. This significant trend is expected to continue in the future basically taking into account the current status of countries as recognised candidate countries. In this respect, the inclusion of Turkey, Croatia and the Former Yugoslav Republic of Macedonia (FYROM) may be achieved by 2020 and will significantly increase the common European market in terms of population and consumption. Other potential candidates for future accession accentuate the significance of this driver [BE LOGIC (2009)].

The EU enlargement will induce significant increase in commodity trading and freight transport activity. This, in turn, will result in significant increases in transport costs, congestion, emissions, noise, accidents and bottlenecks, accompanied by a moderate increase in transport time and a decrease in reliability. At the same time, the market will be opened to low cost transport service providers, which can lead to significant efficiency gains through increased competition.

The integration of trade in the European Union through the removal of barriers and constraints to trade and market access has been the pillar of economic reform in the European Union since its inception. In addition, the EU Cohesion policy has been quite active in the provision of transport infrastructure aiming at increased accessibility of peripheral countries and regions, which leads to enhanced transport demand and less transport costs for the periphery but heavier traffic, associated with adverse effects on the environment, at the centre.

Thus, the effects of EU integration are similar to those of EU enlargement. In addition, integration may lead to improvements in the frequency of transport services.

3.7 Increasing scarcity of fossil fuels

The global increase of economic activity and the rise of new countries in the global economic field (e.g., China, India) have led to a significant increase in global petroleum consumption. At the same time, the existing exploitable oil sources and oil reserves cannot cater for the increasing demand for petroleum. This suggests that shortages of petroleum resources may become imminent given the difference between the increasing rate of demand and consumption and the rate of introduction of new resources [BE LOGIC (2009)].

As a result, oil and other fossil fuels are expected to become more expensive in the coming decades, leading to very significant increases in transport costs due to the high dependency of freight transport on fossil fuels (94% dependency in 2005). This in turn will result in reduced demand for transport services, albeit at a moderate level due to the relative low price elasticity of the transport sector. One reason for this is the fact that transport is the one sector of the economy where substitution with other fuels has been negligible [Petersen M.S. et al (2009a)].

On the long term, however, the need to move to a low-carbon economy and the growing concerns about energy security will bring about a greater supply of renewable energy, made much cheaper by technological progress and mass production. The shift in relative prices will make investments in alternative energy sources more attractive, in spite of the high variability of those prices. The immediate consequence of such transformation will be the reduction in the need to transport fossil fuels, which currently represent around half of the volume of international shipping. [EC (2009a)].

3.8 Increasing social and environmental consciousness

The deterioration of the global ecological environment has motivated consumers to acknowledge the dependency of human existence on the natural environment and the need to protect it from the negative impacts of human activity.

The impact of an emerging "environmental consciousness" culture on transport could be important. It may lead to a move away from owning a car being seen as a status symbol and the only provider of "mobility freedom" [Petersen M.S. et al (2009a)]. It may also lead to a preference towards goods that are produced and distributed with environmentally-friendly processes, which in turn may impose special transportation requirements. Environmental consciousness of consumers may generate pressures to companies to decrease their emission footprints and use more environmentally-friendly transport modes (where possible), such as rail, inland waterway transport and short sea shipping [BE LOGIC (2009)].

Significant improvements in terms of congestion, emissions, noise and accidents might result from this emerging trend, while a moderate reduction of bottlenecks is also possible.

4 Trends in logistics

The section deals with changes in the logistics environment. A total of 12 changes in this theme have been identified through the document fiches. Their screening and processing has resulted in the 10 definite changes of Table 3 below.

4.1 Relocation of production and wider sourcing and distribution

The trend of globalisation, identified in the previous section, is leading to new ways of organising production and distribution, relying heavily on efficient supply chains and thus the organisation of the logistic process. Industrial companies have a strong incentive to concentrate production in fewer factories (spatial concentration) through exploitation of economies of scale and monetary (i.e. demand and supply linkages) and non-monetary (i.e. knowledge) conditions in certain geographical regions.

Transportation costs also have an incremental effect on geographical concentration of production. The continuous rise in fuel prices suggests that companies would move towards the spatial concentration of production through relocation closer to the markets they serve (geographical concentration). Thus, in many sectors the focus has moved from nationally based production to single locations producing a particular product for the world market [BE LOGIC (2009)].

Concentration of inventory has been another related logistic trend over the last decades. A reduced number of stockholding points, combined with the subsequent reduction of safety stocks and economies of scale in warehousing, can yield a financial benefit much bigger than the additional transport cost they usually cause due to longer trips [Petersen M.S. et al (2009a)].

Furthermore, through the wider sourcing of supplies, supported by the increased use of ICT applications, companies are able to take advantage of cost differences (e.g. raw materials cost, labour cost, manufacturing cost) among a larger number of regions/countries. This may lead to an increase in the economic activity of the regions in which the cost of said resources is lower. Similarly, ICT applications have enabled companies to expand their customer base to a global level. Products can be purchased electronically by individuals throughout the world, and companies need to cater for the provision of the appropriate transport services to bring their products to these customers [BE LOGIC (2009)].

The impact of these trends is increased demand for freight transport services basically due to longer distances. This would result in significant increases in transport costs, frequency of service, congestion, emissions and bottlenecks along specific corridors. Provided that the modes most affected by these trends are waterborne and rail transport, the effects on accidents, noise and transport time are expected to be moderate. Increased use of ICT applications is also envisioned.

4.2 Supply chain integration and information sharing

While the field of competition for enterprises has expanded across national boundaries, current trends demonstrate a shift from competition among enterprises to competition among supply chains. The business environment is characterised by the requirement for supply chains to optimise their overall performance by removing barriers inhibiting the flow of materials/products, financial resources and information. In order to effectively

Table 3. Effects of trends in logistics

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Spatial concentration of production and inventory	++	+		++	+			++	++	++	++	++	++		+	+	2/20, 48/5
2	Wider sourcing of supplies and wider distribution of goods	++	+		++	+			++	++	++	++	++	++		+	+	2/21
3	Supply chain integration	+ / --	--	++		+++	--		--	--	--	--	--				--	2/22, 9/5
4	Information sharing	+ / -	-	++		+++	--							--				2/25
5	Improving responsiveness to customer requirements (agility/adaptability)	+	-	++	++	++	-		+	+	+	+	+			+	+	2/23
6	Increasing direct deliveries	+	-	+	+	+			+	+	+	+	+			+	+	2/26
7	Increasing transport emissions								++	++	++	++						2/15
8	Reverse logistics	+ / -	+			+			+	+	+	+	+			+	+	2/24
9	Containerisation	---	---	++	++	+++	---	---	+	+	+	+		---		-		42/9
10	Hub & spoke system	--	++		+	++			+ / --	+ / --	+ / --	+ / --		+			+	42/8

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

manage the complex flows among supply chain partners and to improve efficiency and customer responsiveness, integration among the various supply chain partners is required [BE LOGIC (2009)].

This trend is further enhanced by the increasing levels of congestion and transport related emissions, which are expected to place mounting pressure on the service providers to develop comprehensive, integrated service concepts and business models that complement existing ones. Models and service solutions should support innovative business practices, route planning regimes and efficient transhipment of goods between modes and networks. The dominant factor for these developments will be extensive cooperation between the various actors in the chain [ERTRAC (2010)].

Supply chain integration has positive repercussions to all performance indicators basically through better utilisation of infrastructure and vehicles/vessels. Significant improvements in costs, transport time, reliability, safety, congestion, emissions and noise are expected, along with very significant increase in the use of ICT applications. All these gains by far exceed the extra cost of coordination among chain partners.

Information sharing is considered as the basic pillar of supply chain integration. It has a positive effect on demand planning (including collaborative demand forecasting), capacity planning, planning of production activities, performance management, and inventory management and replenishment (among others). Information integration is considered as one of the most prominent future trends in supply chain management [BE LOGIC (2009)].

Information sharing will be beneficial in tackling administrative bottlenecks and lead to significant gains in reliability and safety, and moderate ones in transport time and cost. The very significant increase in the use of ICT applications is self-evident. The inclusion of a cost element directly related to the exchange of information was suggested at the Antwerp workshop.

4.3 Improving responsiveness to customer requirements and direct deliveries

As the focus of market competition is gradually shifted from inter-company competition towards competition among supply chains, the end customer satisfaction becomes the major determinant of supply chain success or failure. In such competitive and increasingly volatile markets, supply chains tend to adopt organisational and management structures that enable them to respond to the emerging market contexts of short response times, high product and service variety, and highly customised product and service offerings. An equally important requirement is agility, defined as “the ability of a supply chain to react quickly to unexpected or rapid shifts in supply and demand” [BE LOGIC (2009)].

The agility/adaptability trend is expected to lead to significant improvements in the reliability and frequency of the services, while moderate gains are expected in terms of transport time and safety. The role of ICT applications is once more significant. On the other hand, the more frequent, flexible and faster services are more tuned to road transport and, therefore, will be associated with higher congestion, emissions, noise, accidents and finally transport costs.

The increasing individualisation and proliferation of electronic business, identified in the previous section, are directly related to increasing direct deliveries of goods. This disintermediation has the benefits of reducing lead times and total costs to customers, while at the same time it provides customers with access to a wide range of products. Direct deliveries are by default small and more frequent and presuppose a move towards smaller size vehicles [BE LOGIC (2009)]. Their effects are very similar to those of the agility/adaptability trend.

4.4 Increasing transport emissions

CO_2 emissions from the transport sector attract the attention of both transport and climate change policymakers because of their share of overall emissions and their persistently strong growth. Over the past three decades, CO_2 emissions from transport have risen faster than those from all other sectors and are projected to rise more rapidly in the future.

Emissions from transport represent a very high share of overall emissions for air pollutants, too. Despite the progress made during the last two decades basically through setting stringent emission standards on vehicles/vessels and fuel quality, air quality in the areas immediately adjacent to transport activity, particularly in urban areas, is still a central problem [Petersen M.S. et al (2009a)].

The emerging social and environmental consciousness culture, mentioned in the previous section, is expected to add to the pressures already exerted by policy makers towards sustainable mobility. A broad range of policy measures at all levels of governance, either in force or in the formulation phase, are expected to lead to improvements which, however, will not be able to reverse the trend basically due to the rising transport demand and the long life of transport infrastructure and means that does not allow for impressive improvements in the short term.

4.5 Reverse logistics

Reverse logistics activities may include the collection of used, damaged, unwanted or outdated products as well as packaging and shipping materials from the end user or reseller and their further manipulation (e.g., resell, refurbish and reuse, salvage, recycle).

The trend towards intensification of reverse logistics activities is becoming more pronounced with the rise of environmental concerns and the tendency for higher commodity prices (e.g., oil, steel, copper) within the last decade. Furthermore, stricter requirements in recycling and remanufacturing, waste management and disposal regulations focusing on safety, as well as ease of disassembly and sorting are predicted to render reverse logistics an inseparable part of supply chain management in the future [BE LOGIC (2009)].

Although this trend is expected to improve the environmental performance of other sectors of the economy, it burdens that of transport as it generates additional demand. Moderate increases are, thus, projected for costs, time, congestion, emissions, noise and accidents, with a parallel increase in the use of ICT applications. On the positive side, improvements in efficiency can be expected through better load factors on the return trips.

4.6 Containerisation and hub & spoke system

Despite being introduced in commercial shipping more than 50 years ago, containerisation is still considered as a trend in logistics, as it keeps gaining shares in the transport of break bulk commodities. In 2005, it was estimated that some 18 million containers made over 200 million trips. Over 90% of global non-bulk cargo is carried in shipping containers.

The ISO standards covering external and internal dimensions, corner fittings, and identification markings were introduced between 1968 and 1970. ISO standards continue to be improved and new detailed standards are being published. The last ISO handbook on freight container standards was issued in January 2007. It contained new standards for 20”, 40”, and 45” containers. One of the new standards covered container equipment data exchange (CEDEX) [Lloyd Michael (2010)].

Containerisation has led to very significant improvements in cargo handling efficiency and therefore costs[4]. Other significant improvements concern time, safety, security and bottlenecks in ports. The management and control of containers and container-related operations has been the subject of a wide range of ICT applications for years. Improvements in reliability, frequency and accidents are also associated with containerisation. On the negative side, containerisation leads to increased fuel consumption and emissions due to the reduced capacity of the vehicles/vessels resulting from the need to transport the container itself along with the freight. Another problem with similar effects relates to the need for container relocation due to unbalanced trade flows.

The negative environmental performance of containers can be alleviated by the hub-and-spoke system. The idea is to concentrate freight traffic at a relatively small number of terminals, called hubs. The use of highly efficient hub facilities and the routing of consolidated flows through inter-hub links allow the exploitation of economies of scale in both commodity handling and transportation, which is performed by larger and more cost- and energy-efficient vehicles/vessels. 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. Since then, the hub-and-spoke structure has characterised the reorganisation of transport networks in all modes.

In addition to gains in efficiency and environmental performance, the hub-and-spoke system brings improvements in frequency and ICT applications, at the expense of transport time, and localised bottleneck, emission and noise problems at the hub areas.

[4] It has been estimated that container cargo is being moved nearly twenty times faster than pre-container break bulk.

5 Public policies

The section deals with changes pursued by EU policies. The review of numerous EU policy documents and related studies resulted in the identification of 255 changes through the document fiches. Their screening and processing has concluded with the 20 definite changes of Table 4 below. One more change (green public procurement) was added following the Antwerp workshop as suggested by the stakeholders.

5.1 Liberalise transport operations

Following the efficiency gains achieved by the market opening in air transport, which have resulted in a significant reduction of user costs, the 2001 White Paper set the liberalisation of road and rail transport operations as one of its main objectives. With the so-called Third Railway Package for rail and Regulation No 1072/2009 for road haulage, the legal framework of market opening is almost complete.

Some issues such as opening up competition in the provision of intermodal terminal services [Kessel+Partner et al (2004)] and port services [Pålsson C. et al (2008)], as well as existing differences in taxation and subsidies [EC (2009a)] still need to be addressed. More effort is needed, however, in enforcing the competition rules [EC (2009a)]. The setting up of a scoreboard for monitoring rail market opening, introduced by the Mid-term review is an attempt in this direction.

It should be noted that the remaining bottlenecks and other barriers in relation to the internal transport market are mentioned by the new White Paper as one of the challenges that transport faces, while the creation of a genuine Single European Transport Area is one of the four tiers of the selected strategy for the next decade [EC (2011)].

The effects of liberalisation are significant reduction of user costs, congestion, transport time, emissions, noise and accidents, and significant increase of reliability and frequency of service. These gains are achieved basically through better utilisation of infrastructure and vehicles/vessels (higher load factors and lower empty trip factors) and more intensive use of ICT applications. It is noted, however, that the lower transport costs will have a positive impact on transport demand, and for most KPIs the above gains will be mitigated but not reversed.

A related issue is the requirement of the Freight Transport Logistics Action Plan [EC (2007b)] for green corridors to offer fair and non-discriminatory access to all types of infrastructure. The relevant extract from the text is the following:

> "Fair and non-discriminatory access to corridors and transhipment facilities is a requirement for co-modality and needs to be addressed. Restrictions of access to the market for terminal operations, *inter alia*, in ports and marshalling yards, can have repercussions to the customers of these facilities. Open and non-discriminatory access for operators and customers of these facilities should be ensured in accordance with the rules of the Treaty."

In the First Regional SuperGreen workshop in Naples, Italy on 19 October 2010, the consortium asked stakeholders whether this requirement should: (a) enter the KPI structure as a YES/NO variable, (b) be ignored, or (c) be kept as a prerequisite outside the KPI structure. Option (c) was the most popular one with 14 out of 25 definite answers received

Table 4. Effects of changes in public policies

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Liberalise transport operations	-- (-)	-- (-)	++ (+)	++	++			-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-		-- (-)	-- (-)	11/20, 24/1, 26/3, 29/4, 40/9, 42/1, 47/8
2	Internalise external costs	++				++			--	--	--	--	--	-			--	2/19, 11/17, 12/8, 12/11, 16/1, 16/2, 16/4, 17/1, 17/2, 18/1, 26/19, 27/16, 29/26, 29/27, 39/16, 42/2, 44/1, 47/7, 48/15, 57/3,
3	Set energy consumption/ emission/noise standards & other regulatory measures	+							--	--	--	--					--	1/2, 2/7, 11/22, 16/3, 18/2, 26/6, 27/6, 39/14, 42/4, 42/5, 53/4
4	Tighten up and harmonise safety standards	+		+			-									---		3/1, 26/13, 29/10, 29/22, 29/25
5	Tighten up security standards	+ / -	+	+		+		--						(+)				12/9, 20/21, 26/14, 26/15, 57/7
6	Standardise transport units and vehicles	+ / --	--	++			-		- (+)		- (+)	- (+)	(+)	-		- (+)	(+)	6/1, 9/3, 20/23, 20/24, 20/25, 29/17, 39/15, 42/7, 42/13, 59/9
7	Harmonise infrastructure (interoperability)	+ / --	--	++		++			--	--	--	--		---				2/17, 11/23, 26/1, 29/5, 29/6, 29/12, 29/23, 48/14, 56/2, 56/3, 59/8
8	Harmonise rules and enforcement	-		+			-		-	-	-	-		-		-	-	24/2, 24/3, 25/2, 25/3, 25/4, 25/5, 27/5, 29/1, 29/13, 29/14, 29/24, 29/29, 32/1, 33/1, 33/2, 35/1, 57/1, 57/2, 57/4,
9	Standardise liability and documentation for multi-modal transport	-							(-)	(-)	(-)	(-)	(-)			(-)	(-)	20/18, 20/19, 20/20, 29/3, 52/2, 59/6
10	Simplify administration	--	--			+++								---				2/16, 11/21, 13/1, 13/2, 13/3, 13/5, 13/6, 13/7, 13/8, 13/9, 20/16, 20/22, 22/3, 27/3, 29/9, 29/11,

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 4. Effects of changes in public policies (cont'd)

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
11	Create freight-oriented corridors	-	---	+++		++	-	-	(--)	(--)	(--)	(--)	(--)	---		(--)	(--)	11/14, 20/28, 21/1, 21/4, 21/5, 26/2, 30/1, 40/4, 42/10
12	Develop green corridors	-		++		++	-	-	--	--	--	--	--	--		--	--	11/11, 20/26, 20/27
13	Employ a spectrum of instruments to fund infrastructure and other actions	-- (-)	-- (-)	++ (+)					-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)	11/15, 12/2, 14/4, 20/29, 20/33, 22/4, 22/5, 23/1, 26/7, 27/1, 27/2, 29/8, 29/15, 29/21, 42/14
14	Bring ICT applications to market (ITS, ERTMS, RIS, e-maritime, e-freight, e-customs)	--	--	++		+++	-		--	--	--	--	--	-		--		26/11, 26/21, 26/22, 27/15, 31/1, 31/2, 31/3, 34/1
15	Enhance education and training	-	-	+		+	-		-	-	-	-		-		-		9/9, 20/9, 22/7, 25/1, 26/10, 27/8, 27/9, 29/2, 29/16, 59/5
16	Ensure satisfactory working conditions	-		+			-		-	-	-	-				-		11/22, 26/9, 29/2, 29/14
17	Support research & development	--	-	+		+++			---	---	---	---	-	-		---	---	9/7, 9/8, 11/19, 26/16, 26/17, 27/7, 37/2
18	Educate, inform and involve the greater public in transport policies (incl. labelling)	-	-	+		++	-	-	-	-	-	-	-	-		--	-	1/3, 11/24, 20/10, 20/13, 20/14, 20/31, 26/12, 27/10, 39/4, 47/2, 47/5, 53/5, 59/1, 59/2, 59/3
19	Monitor and publish service quality indicators	-	--	++		++	-		-	-	-	-	-	-		--	-	20/8, 20/11, 20/12, 20/15, 20/32, 21/2, 27/4, 27/11, 27/12, 59/4
20	Promote international cooperation with EU neighbouring countries	(-)	(-)	(+)										(-)				11/25
21	Green public procurement								-	-	-	-					-	

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

(refer to Deliverable D2.4.1[5] for more details). Based on this opinion, the report concluded that "this is a precondition which is already regulated at the EU level and must be applied by the Member States."

EC (2007b) sees green corridors as a field for experimenting with environmentally-friendly, innovative transport units, and with advanced ITS applications, in a sense rendering green corridors the laboratory for the "core network" concept proposed for the new TEN-T guidelines. Along the same line of thought, the green corridors can become a laboratory for transport policies, too. It is recommended for the Commission to assess the possibility of including the fair and non-discriminatory access requirement as a prerequisite for labelling a particular corridor as "green".

5.2 Internalise external costs

The internalisation of transport related external costs is an issue that was raised in the 1990s (1995 Green Book on fair and efficient pricing); was brought forward by the 2001 White Paper, which included as two separate actions the setting out of the principles, methodology and structure of an infrastructure-charging system and, the uniform taxation for commercial road transport fuel; was reaffirmed by the Mid-term review, which proposed an EU methodology for smart infrastructure charging; and gained momentum in the last three years with numerous studies and policy papers [Kahn Ribeiro et al (2007), Maibach et al (2008), EC (2009a), EC (2009b), Petersen M.S. et al. (2009a), BE LOGIC (2009), Lloyd Michael (2010)]. With the recent release of the new White Paper, the European Commission sets year 2020 as the deadline for the full and mandatory internalisation of external costs for all modes with emphasis on road and rail transport [EC (2011)].

Prices reflecting all costs – internal and external – convey the right signal to economic actors, who have economic incentives to use safer, more silent and environmentally-friendly vehicles or transport modes and, to plan their trips according to expected traffic conditions, leading to efficiency gains (seen from the welfare economics point of view).

The principle applies to all modes. In the road sector, EC (2008c), which forms part of the Commission's "Greening Transport" package, proposes a revision of Directive 1999/62/EC enabling Member States to integrate in tolls levied on heavy goods vehicles an amount which reflects the cost of air pollution and noise pollution caused by traffic. During peak periods, it also allows tolls to be calculated on the basis of the cost of congestion imposed upon other vehicles. In the rail sector, EC (2008d) suggests the introduction of differentiated track access charges, based on noise emissions. In the maritime sector, EC (2009b) suggests the promotion of a European Environmental Management System rewarding efforts towards greener shipping, while for inland navigation, Visser J.A. (2008) suggests the introduction of: (i) a uniform and transparent EU scheme for port dues and canal fees, based on marginal costs pricing principles and, (ii) an EU-wide transparent scheme of low water tariffs.

In all cases, it is suggested that revenues generated by internalisation should be used by Member States for making transport more sustainable through projects such as research and development on cleaner and more energy efficient vehicles, mitigating the effect of

[5] Indrek Ilves et al (2010). *Benchmarking of green corridors (Version 1).* SuperGreen project Deliverable D2.4.1, Document number: 02-40-RD-2010-14-01-0.

transport pollution or providing alternative infrastructure capacity for users [EC (2008b), EC (2008c)].

The expected effects of externality internalisation are significant gains in terms of emissions, noise and congestion, at the expense of increased user costs. The role of ICT applications is crucial in making the internalisation possible and in reducing the operating and management costs of the relevant schemes.

Following the thinking presented in the previous section, it is suggested that the Commission assesses the possibility of including the internalisation of external costs, which for the time being remains voluntary, as a prerequisite for awarding the green label to a particular corridor.

5.3 Set energy consumption/emission/noise standards & other regulatory measures

The internalisation of external costs presented above is a necessary step in itself, but in order to be effective, it should be part of a policy package including various other elements, one of which is setting standards.

The first fuel economy standards were imposed by the U.S. in 1975 on new passenger cars and light trucks (enforced in 1985). They have been effective in slowing the growth of GHG emissions, but so far growth of transport activity has overwhelmed their impact. The policy has been adopted by most developed economies and key developing ones [Kahn Ribeiro et al (2007)].

The EU is already now a major standard setter. EURO emission standards for road vehicles are increasingly being adopted also outside Europe [EC (2009a)]. In addition, EC (2008d) suggests the introduction of noise emission ceilings.

Regulatory measures other than standard setting can be efficient and effective. They include among others:

- introduction of Low Emission (or Environmental) Zones [Allen, J. et al (2007) and Lloyd Michael (2010)]
- restricted access to goods vehicles (per tonnage) in dense urban areas [STRATEC S.A. et al (2005)]
- removal of night-time/weekend driving bans for freight in urban areas under certain conditions [Allen, J. et al (2007)].

Kahn Ribeiro et al (2007) indicate that such measures could contribute to significant emission reductions if applied together with fiscal instruments, and they would work well with adequate monitoring and enforcement systems.

Significant improvements in emissions and noise, accompanied by moderate cost increases are expected to result from this change.

5.4 Tighten up and harmonise safety standards

The establishment of stricter safety standards for all transport modes, and their harmonisation across Member States was an explicit objective of the 2001 White Paper, which also set the target of halving the number of road deaths over the period 2001-2010. The same document suggested the encouragement of independent technical investigations of road accidents.

The Mid-term review recognized the failure of meeting the road safety target of the White Paper and reaffirmed the intention of the Commission to work in this direction, suggesting the strengthening of the function of the European safety agencies for all modes [EC (2006a)].

In 2009, the e-Safety project reported progress made in setting operating requirements and quality of service standards with CEN, towards the development, deployment and use of Intelligent Integrated Road Safety Systems (IIRSS) [Carrota A. (2009)].

With the new White Paper, the EU aims at halving road casualties by 2020, and move close to zero fatalities in road transport by 2050. According to the same document, the EU should become a world leader in safety and security in all modes of transport [EC (2011)].

The effects of enhanced safety standards are expected to be very significant reduction of accidents. Improvements are also projected with regard to cargo safety and reliability, at the expense of increased transport costs to the user.

5.5 Tighten up security standards

The 2001 White Paper did not refer to security, but a security policy was developed after the attacks of 11 September 2001. Nowadays there are EU legislative measures on transport security for most transport modes and for critical infrastructures, while EU naval operations have been launched recently to fight piracy, which is becoming a serious global problem [EC (2009a)]. Secure transport is seen by the new White Paper as an important feature of an efficient and integrated mobility system, and 9 out of the 131 initiatives of the document relate to this issue [EC (2011)].

Enhancing security standards will reduce significantly the relevant risks and improve reliability and ICT applications, at the expense of transport time and cost (although it is possible to have lower insurance premiums). However, as presented in more detail in Section 9.6, due care needs to be given to avoid over-regulation, which can create bottlenecks and have significant adverse effects on transport time and cost.

5.6 Standardise transport units and vehicles

The standardisation of transport units and freight loading techniques is a theme that comes up very frequently in the policy documents of the last decade [EC (2001), ZLU et al (2003), EC (2007b), Lloyd M. (2010)]. The Freight Transport Logistics Action Plan [EC (2007b)] suggests amending the directive on Intermodal Loading Units, so as to facilitate transhipment between modes and reflect technological developments. It also calls for a mandate to be given to the EU standardisation bodies for establishing new loading unit standards.

This change is expected to lead to significant gains in terms of costs, time and reliability, accompanied by moderate improvements regarding bottlenecks, emissions and cargo safety.

The related subject of modifying the standards for vehicle weights and dimensions allowing the introduction of long & heavy vehicles (LHVs) is a rather controversial proposition with strong support and non-negligible opposition [Kahn Ribeiro et al (2007), De Ceuster et al (2008), ERTRAC (2010), Lloyd M. (2010), and EC (2011)]. De Ceuster et al (2008) conclude in favour of LHV introduction, as it would lead to reduced operational costs (due to greater loads), reduced emissions (CO_2, NOx, PM), and improved safety due to the lower number of trucks needed for moving the same amount of goods (despite the fact the safety of the individual LHV is worse than that of a smaller truck), and would alleviate the driver shortage problem. On the negative side, infrastructure investments need to be made (on bridges and pavement) and, there is the potential of rising road shares vis-à-vis the other transport modes with adverse effects on congestion, emissions, noise and accidents.

5.7 Harmonise infrastructure (interoperability)

Infrastructure is a “scarce resource” and will be even more so in the future as demand for transport increases. Interoperability, i.e. the ability to run on any stretch of the network, is a quality characteristic allowing the efficient use of existing infrastructure.

In the road sector, existing problems concern only certain limitations on weights and dimensions which are not uniform for all EU countries [Petersen M.S. et al. (2009a)], the incompatibility of toll systems [EC (2001) and ZLU et al (2003)] and wide divergence with regard to truck parking security standards [Visser Hans et al (2007)].

On the other hand, rail infrastructure has for historical reasons been fragmented even within borders. Although the standard gauge is used in the majority of EU member states, there still exist other gauges, which hampers the easy transfer of trains across borders. Other problems relate to safety systems, signalling, ATC, loading gauges, driver’s education and electric current systems [Petersen M.S. et al. (2009a)]. Although ERTMS has been a significant progress in this direction and is increasingly being adopted also outside Europe [EC (2009a)], there is still a long way to go before a train can be sent across Europe with the same locomotive, the same driver and without unnecessary stops at the borders. This technical harmonisation will cost tens of billions of Euros [EC (2001)].

The expected gains from interoperability are very significant reductions of bottlenecks and significant improvements in costs, time, reliability and emissions. Once again, the extensive use of ICT applications is a prerequisite. At the Antwerp workshop, it was suggested to add a cost increase dimension due to higher investment costs for infrastructure and vehicles.

5.8 Harmonise rules and enforcement

This area of harmonisation concern operational matters such as:

- licensing of operators [EC (2001), EC (2006b), EC (2007f), EC (2007g), Europe Economics (2009), Visser J.A. (2008)]
- setting up EU-wide registers of licensed operators [EC (2007f), EC (2007g)]
- crew composition [EC (2001), EC (2006b), Visser J.A. (2008)]
- working conditions [EC (2001), EC (2006b), Visser J.A. (2008), EC (2011)]
- vehicle/vessel certification [EP&C (2006), EC (2011)]
- rules on the transport of dangerous goods [EP&C (2008b), EC (2011)]
- rules on loading and unloading conditions [Visser J.A. (2008)]
- rules on border procedures [Visser J.A. (2008)]
- rules for inspections and penalties [EC (2001), EC (2007g), EC (2011)]

As the legal framework for market opening is being completed, emphasis should be placed on enforcement issues.

Harmonisation contributes towards creating a level playing field, which in turn leads to improvements in costs, reliability, safety of humans and cargo, and environmental performance, all through reduced administrative barriers and better utilisation of infrastructure and vehicles/vessels.

5.9 Standardise liability and documentation for multimodal transport

Existing transport documents are mode-specific. Multimodal transport documents exist, but they are not sufficiently widely used in electronic format. EC (2007b) suggests establishing a single European transport document that can be used in all transport modes, thereby facilitating multimodal freight transport and enhancing the framework offered by multimodal waybills or multimodal manifests. An electronic format of this document can be developed in the framework of e-Freight [Sjögren Jerker (2010), EC (2011)].

Furthermore, if the work taking place at global level (UNCITRAL) towards creating a multimodal regulatory structure for liability fails, the Commission will assess the need for introduction within the EU of a standard (fall-back) liability clause, meaning that if nothing else is agreed between parties to a transport contract, this standard clause would automatically apply [EC (2007b)].

The direct effect of this change will be improved efficiency of multimodal transport chains. If, in addition, this would result in cargo shifts from road to multimodal solutions, gains in congestion, emissions, noise and accidents should be expected.

5.10 Simplify administration

The Freight Transport Logistics Action Plan [EC (2007b)] is one of the many documents reviewed that find substantial potential for reducing the cost of regulatory requirements through the simplification and decentralisation of freight-related information exchanges, especially when using information and communication technologies. It suggests building on the e-customs initiative [EP&C (2008a)] and developing a framework for the information to be given only once ('single window') and for the goods to be controlled by the authorities at the same time and at the same place ('one stop administrative shop').

The related concept of e-Freight, which happens to be the very first action of the Freight Transport Logistics Action Plan, denotes the vision of a paper-free, electronic flow of information [EC (2007b)]. More specifically, the e-Freight project [Sjögren Jerker (2010), EC (2011)], commissioned in response to this action, aims at:

- a standard freight information framework;
- a single European transport document;
- a single window and one stop shop for administrative procedures;
- simple, harmonised border crossings procedures; and
- secure and efficient transport corridors between Europe, USA, and Asia.

Administrative bottlenecks constitute a significant barrier for integrating short-sea-shipping in the transport chains, and in addition to the abovementioned measures concerning all modes, EC (2009c) proposes actions like: simplification of customs formalities for vessels sailing only between EU ports, drawing up guidelines for speeding up documentary checks related to animal and plant products carried between EU ports, rationalisation of documents requested under different bodies of legislations, simplification of rules on carriage of dangerous goods by sea, and facilitation of Pilot Exemption Certificates (PEC) issuance. Most of these actions have found their way to the new White Paper, too [EC (2011)]. Furthermore, EC (2007b) calls for simplified port access requirements and Visser J.A. (2008) for transforming frequently used documents in inland navigation into an international multilingual database.

Very significant reductions of administrative bottlenecks are expected from these measures, with the assistance of advanced ICT applications. Significant gains in terms of time and costs are also foreseen.

5.11 Create freight-oriented corridors

The development of freight-oriented corridors is of particular importance to the green corridor concept and deserves special attention.

The idea, introduced with the *2001 White Paper – Time to decide* [EC (2001)] as:

"Support the creation of new infrastructure, and in particular rail freight freeways,"

was partly implemented with *Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight* [EP&C (2010)].

The Regulation designates 9 European corridors as initial freight corridors (6 should be established in 3 years, the rest in 5 years), where sufficient priority is given to international freight trains. As shown in Figure 3, there is significant overlap with the SuperGreen corridors. In addition, it makes it mandatory for each Member State (excluding Cyprus and Malta) to participate in the establishment of at least one freight corridor.

In recognition of the multiplicity of entities involved, the Regulation sets up a detailed governance structure (Figure 4), including representatives of the Member State authorities, Infrastructure Managers, Railway Undertakings and terminal owners/managers. To simplify communication with applicants and other interested parties, the establishment of a one-stop-shop is foreseen.

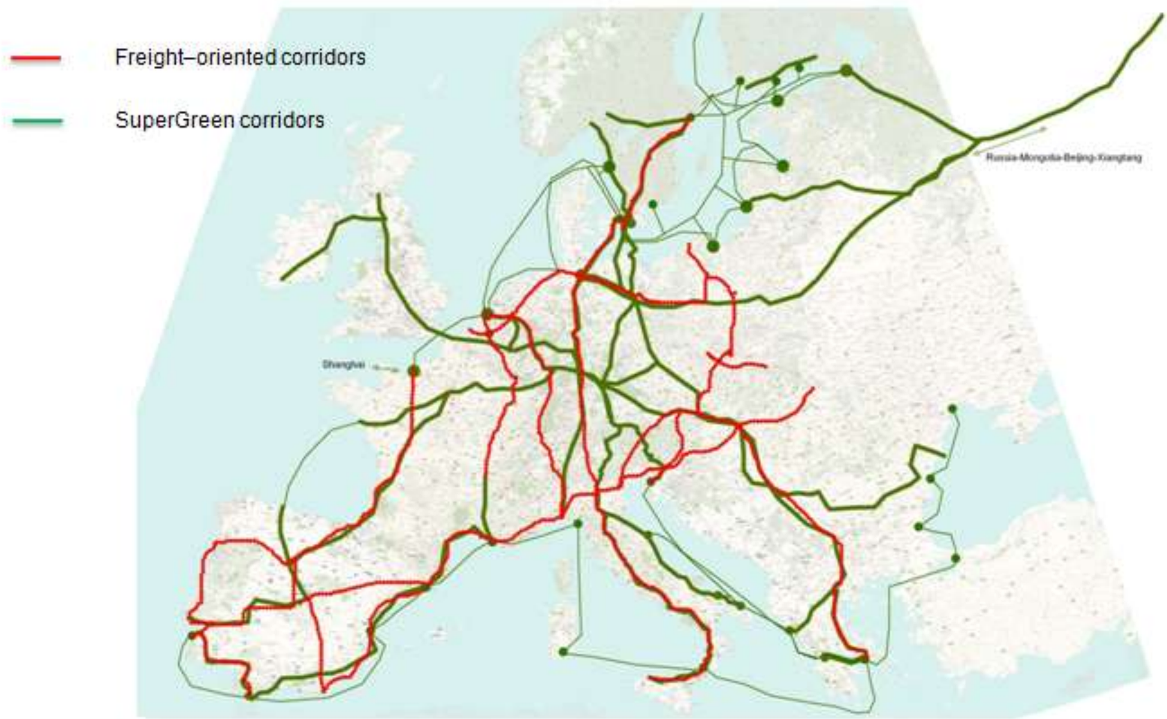

Figure 3. Overlap between Freight-oriented and SuperGreen corridors

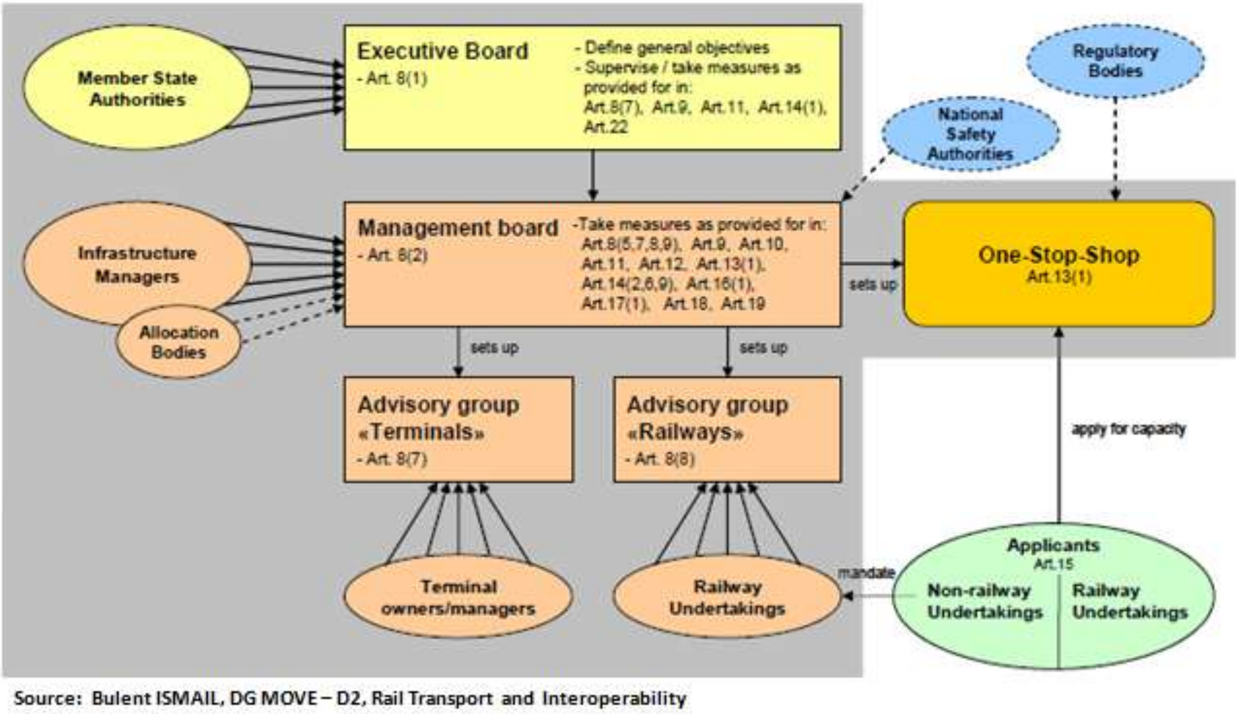

Figure 4. The governance structure of freight-oriented corridors

The implementation measures prescribed by the Regulation include: (a) a market study, (b) an implementation plan describing the characteristics of the freight corridor, including: bottlenecks, the programme of measures necessary for creating the freight corridor and the objectives for the freight corridor, in particular in terms of service quality and its capacity, (c) an investment plan including financial requirements and sources of finance, (d) a deployment plan relating to the interoperable systems along the freight corridor, (e) a performance monitoring mechanism and, (f) a user satisfaction survey; all updated periodically.

Another point of interest to SuperGreen is the definition of a freight-oriented corridor provided by the Regulation: a corridor crossing the territory of at least three Member States or of two Member States if the distance between the terminals served by the freight corridor is greater than 500 km.

The scheme:

- is compatible with the revitalisation of rail transport strategy,
- is compatible with the sustainable mobility strategy,
- minimises the need for major investments associated with a dedicated rail freight network,
- addresses the fragmented nature of European rail operations through enhanced international cooperation,
- is consistent with TEN-T,
- is consistent with ERTMS, and
- is consistent with the corridor approach.

The effects of the freight-oriented corridors on cargoes already transported by rail are very significant improvements in terms of bottlenecks, transport time and reliability. Improvements are also expected in term of safety and security (through better coordination) and costs, while ICT applications will have a significant role. If the scheme succeeds to attract road cargoes, significant gains will also materialise in congestion, emissions, accidents and noise.

5.12 Develop green corridors

The concept was introduced by the Freight Transport Logistics Action Plan [EC (2007b)] as “freight transport corridors between major hubs and by relatively long distances, along which the industry will be encouraged to rely on co-modality and on advanced technology in order to accommodate rising traffic volumes while promoting environmental sustainability and energy efficiency.”

The present project aims to provide a more detailed definition of green corridors, which could also be used to experiment with environmentally-friendly, innovative transport units, and with advanced ITS applications.

The selected KPIs, used in assessing the effects of changes throughout this report, and which will be closely monitored during the implementation phase of green corridors, signify the areas of potential improvements. Significant gains are expected in relation to emissions, noise, congestion, bottlenecks, reliability, use of ICT applications and accidents. Moderate improvements are expected in costs and cargo safety and security through better integration of modes, more effective transport chains and better utilisation of the vehicles/ vessels. Although monitored, the expected improvements in terms of transport time and service frequency are negligible.

5.13 Employ a spectrum of instruments to fund infrastructure and other actions

The transition towards a low carbon economy will impose a substantial overhaul of the transport system. This will require considerable funding, but as described in Section 7.9, the necessary resources will be difficult to find [EC (2009a)].

Presently, infrastructure projects are financed mostly by the Member States with support from EU instruments like the TEN-T Programme, the European Regional Development Fund, the Cohesion Fund, and the European Investment Bank. A small but increasing contribution comes from Private Public Partnership schemes.

In its proposal for a “Europe 2020” strategy, the Commission announced that it will work “to mobilise EU financial instruments (e.g. rural development, structural funds, R&D framework programme, TENs, EIB) as part of a consistent funding strategy that pulls together EU and national public and private funding.” EC (2010) builds on this idea, proposing setting up an integrated European funding framework, which “should not necessarily be restricted to supporting infrastructure investments only, but could also contribute to integrating other transport policy-related components (Marco Polo, SESAR, technological deployment, Green Corridors, links to the neighbourhood countries, research and development in transport) to promote the emergence of integrated transport systems.” This view is reaffirmed by the new White Paper [EC (2011)].

Internalisation charges to complement revenues from energy taxation are likely to be necessary in any event, while it is also predictable that the transport sector has to become increasingly self-financing in relation to infrastructure through congestion charges [EC (2009a), EC (2011)].

A taxation and state aid framework allowing positive measures to support greener transport [EC (2009b)], increased transparency in port charges [EC (2007d), EC (2011)], and the potential of the Inland Waterway Reserve Fund as an additional source of financing for inland navigation [EC (2006b)] constitute other dimensions of the funding problem.

The financing of infrastructure projects is associated with significant improvements in relation to cost, transport time, reliability, congestion, bottlenecks, emissions, noise and accidents in the short run. In the long run, however, the effects on these indicators can be mitigated due to the induced demand generated by the new/upgraded infrastructure. Additional demands on land use will be exerted in the case of new infrastructure.

The financing of greening transport and co-modality initiatives (green corridors, Marco Polo, etc.) will lead to significant improvements in terms of emissions, noise and accidents.

Before closing the section, it would be useful to make reference to the **“Motorways of the Sea”** (MoS), a concept that comprises a special infrastructure funding scheme. The concept builds on EU’s goal of transforming shipping into a genuine alternative to overcrowded land transport, and aims at introducing new intermodal maritime-based logistics chains in Europe [EC (2001)].

As of April 2004, TEN-T funding is the main source of investment. TEN-T has a dedicated budget of approximately €300 million to MoS for the programming period 2007- 2013 [Luis Valente de Oliveira (2009)]. The TEN-T guidelines specify three main objectives for MoS projects:
(1) freight flow concentration on sea-based logistical routes;
(2) increasing cohesion;
(3) reducing road congestion through modal shift.

Through Priority Project 21 of the TEN-T, the following four corridors have been designated for the setting up projects of European interest:
- Motorway of the Baltic Sea;
- Motorway of the Sea of western Europe;
- Motorway of the Sea of south-east Europe;
- Motorway of the Sea of south-west Europe.

In addition to TEN-T, funds can support MoS projects through:
- the Marco Polo II program,
- the structural and cohesion funds,
- the European Investment Bank and,
- state aid programmes in some regions.

The availability of all these instruments in combination with private sector funding presents opportunities but also major challenges in terms of financial engineering and synergies between the various instruments [EC (2007e)]. MoS may smartly take advantage of the array of financial schemes and funding tools available, each one of them specialising in a specific field of activity. In general, Marco Polo finances services whilst TEN-T focuses on integrated infrastructure development (both physical and information systems) for ports and their hinterland connections (e.g. logistic centres) [Luis Valente de Oliveira (2009)].

Unfortunately, so far, not very many actions have been developed with the label of MoS, a fact that apparently reflects a lack of interest from the sector. As reasons, InnoSuTra (2010) reports stakeholder arguments in need for better definitions of MoS and SSS, while Luis Valente de Oliveira (2009), the appointed European Coordinator, reports complaints of lack of directness and precision on the goals to be achieved and on the complexity of the application rules of the existing support frameworks. Nevertheless, the dozens of individual actions that have been launched and supported by the scheme make the Coordinator confident that with a better focus, the existing framework can be instrumental to the deployment of the Motorways of the Sea.

The MoS concept is highly relevant to green corridor development, as two of the four already operating links financed by the scheme, as reported in EC (2010b), form segments of the SuperGreen corridors. They concern the upgrading of the existing rail ferry link between Trelleborg and Sassnitz, which is part of the Brenner corridor, and the maritime link between Klaipeda and Karlshamn, which belongs to the Nureyev corridor.

5.14 Bring ICT applications to market (ITS, ERTMS, RIS, e-maritime, e-freight, e-customs)

Advanced information and communication technologies (ICT) can greatly contribute towards co-modality by improving infrastructure, traffic and fleet management, facilitating a better tracking and tracing of goods across the transport networks and better connecting businesses and administrations [EC (2007b), EC (2011)].

ITS for road transport, ERTMS for rail, RIS for inland navigation and e-maritime for marine transport all aim to achieve these objectives. Furthermore, the concept of e-Freight links all the above modal systems and aims at a paper-free, electronic flow of information associating the physical flow of goods with a paperless trail built by ICT. It includes the ability to track and trace freight along its journey across transport modes and to automate the exchange of content-related data for regulatory or commercial purposes.

Related to e-Freight is the e-customs Decision [(EP&C (2008a)] which, in the framework of the pan-European e-Government action, lays the ground for setting up secure, integrated, interoperable and accessible electronic customs systems for the exchange of data contained in customs declarations and other related documents.

Allowing a better utilisation of infrastructure and vehicles/vessels, ICT applications constitute a cost-effective way to achieve the sustainable mobility strategy objectives in the short run. Their multi-faceted function can be illustrated by the so-called RIS Directive [(EP&C (2005)]. Directive 2005/44/EC applies to all waterways of class IV or higher across the EU and aims at a Europe-wide framework for the implementation of River Information Services (RIS) ensuring compatibility and interoperability between current and new systems. The basic services foreseen and their end results are listed below:

- **Fairway information:** Optimise voyage planning, leading to shorter transport times and less emissions
- **Exchange of transport information:** Assists integrating inland navigation in the transport chains and tackles administrative bottlenecks
- **Traffic management services:** Optimise use of infrastructure and lead to more efficient and safer services
- **Calamity abatement services:** Safer services and mitigation of adverse effects on environment in case of an accident
- **Statistics and customs services:** Enhance performance monitoring and lead to more effective decision making by businesses and authorities.

ICT applications in the logistics chains and green corridors are the subject of WP4 of the SuperGreen project and there is no need for further analysis here. Their expected effects are significant improvements in cost, time and reliability, congestion, emissions and accidents. Moderate improvements are also expected in terms of bottlenecks and cargo safety.

5.15 Enhance education and training

The need for enhanced training in the transport sector has been expressed in numerous documents throughout the period examined (2001- today). The White Paper [EC (2001)] suggested the promotion of the necessary skills of professional drivers and the development of the profession of freight integrators. The Mid-term review [EC (2006a)] identified shortages of qualified personnel in the road, rail and maritime sectors and suggested "…further efforts to improve training and to motivate young people to take up transport professions in their own and in other Member States." The Freight Transport Logistics Action Plan [EC (2007b)] added the requirement for enhanced qualifications of logistics personnel and for mutually recognition of certificates in freight transport logistics and related areas (e.g. warehousing). More recently, the new White Paper reaffirmed the need to update seafarers training and address quality of work in all transport modes with respect to training, certification, working conditions and career development [EC (2011)].

Actions in this area are expected to bring improvements in transport costs, time, reliability, ICT applications, cargo safety, emissions, bottlenecks and accidents.

5.16 Ensure satisfactory working conditions

The social dimension of transport policy was addressed in both the 2001 White Paper [EC (2001)] and its Mid-term review [EC (2006a)]. Ensuring satisfactory working conditions not only enhances the attractiveness of the transport profession, needed to alleviate the increasing shortages in qualified personnel in all transport modes, but also creates a level playing field, strengthening fair competition.

More recently, the Commission's communication on a sustainable future for transport [EC (2009a)] and the new White Paper [EC (2011)] reaffirms the position that working conditions should be maintained or improved and suggests addressing the existing differences in rights and social conditions between Member States so that they become a factor of competitiveness with the increasing cross-border mobility of transport workers rather than resulting in a race to the bottom.

The improvement of working conditions is expected to lead to safer (for both humans and cargo), more reliable, more environmentally-friendly, and thus, less costly transport.

5.17 Support research & development

Technological innovation constitutes probably the most important contributor to achieving the objectives of the sustainable mobility strategy. In the long run, new technologies in renewable fuels and green propulsion [EC (2006a), EC (2011)], improved aerodynamics [Stelmaszczyk P. (2011), EC (2011)] and light weight materials [Vanelslander T. et al (2011), EC (2011)] can have very significant effects on lowering emissions and reducing oil dependency. The merits of "soft infrastructures" like the development of ICT applications have been already presented in Section 6.14 above.

Another dimension of research and technological development stems from the fact that Europe is a world leader in many fields of transport including infrastructure, manufacturing of transport equipment, transport services and logistics. In view of the expected increase in global competition, keeping and enhancing this leadership is a key factor in preserving the overall competitiveness of the EU economy, and will also provide an opportunity for the EU transport industry to serve new and expanding markets [EC (2009a), EC (2011)].

Furthermore, ERTRAC (2010) suggests the introduction of effective private-public partnership from research and innovation to development and commercial deployment, while Intelligent Energy Europe (2007) emphasizes on the role of demonstration projects on use of alternative fuels and mobility management at local level.

Very significant improvements in ICT applications, emissions, accidents and noise are expected to result from technological innovations. Improvements are also foreseen in relation to congestion, bottlenecks, transport time and reliability, leading to significant efficiency gains.

5.18 Educate, inform and involve the greater public in transport policies

The objective of educating, informing and involving the public in transport policies appears in many documents of the last decade. It seems, however, that it is gaining importance lately, as it has been recognised that a precondition for public acceptance of the proposed solutions is better understanding of the challenges that transport policy faces [EC (2009a)].

The Impact Assessment (IA) requirement in EU policy-making has institutionalised the greater public's involvement. Following the White Paper on European Governance[6] and the Better Regulation Action Plan[7], which envisaged an integrated approach to IA and a minimum duration of six weeks for consultations with the stakeholders, the Communication on Impact Assessment[8] of June 2002 formally introduced an integrated and balanced IA to replace previous sectoral approaches and separate assessment exercises. The latest guidelines define IA as "a key tool to ensure that Commission initiatives and EU legislation are prepared on the basis of transparent, comprehensive and balanced evidence" [EC (2009e)]. The same document renders the consultation of interested parties an obligation for every IA and sets minimum standards for:

- planning consultations early;
- ensuring engagement of all affected stakeholders, using the most appropriate timing, format and tools to reach them;
- ensuring that stakeholders can comment on a clear problem definition, subsidiarity analysis, description of the possible options and their impacts;
- maintaining contact with stakeholders throughout the process and providing feedback; and
- analysing stakeholders' contributions for the decision-making process and reporting fully in the IA report on how this input was used.

IA, then, becomes a valuable aid to political decision-making and a useful tool in avoiding over-regulating, which can be a problem as presented in Section 9.

In addition, the emerging "environmental consciousness" culture (refer to Section 3.8) can greatly assist in meeting the sustainable mobility objectives, especially in the difficult area of urban transport through traffic avoidance [Stelmaszczyk P. (2011)]. Of relevance is also the suggestion of Petersen M.S. et al. (2009a) that transport policy-making should put more

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[6] European Commission (2001). *EUROPEAN GOVERNANCE. A White Paper* COM(2001) 428, Brussels, 25.7.2001.

[7] European Commission (2002). *Action Plan "Simplifying and improving the regulatory environment".* Communication from the Commission COM(2002) 278, Brussels, 5.6.2002.

[8] European Commission (2002). *Impact Assessment.* Communication from the Commission COM(2002) 276, Brussels, 5.6.2002.

emphasis upon social sustainability concepts (social capital, social cohesiveness and political capital) in order to provide a more nuanced understanding of the "restriction on freedom" criticism levelled at attempts to manage demand.

Furthermore, public involvement is a key success factor for actions like recruitment campaigns [EC (2006b), EC (2007b), Pålsson C. et al (2008)], road safety awareness campaigns [EC (2006a)], exchange of experiences and dissemination of best practices in logistics [EC (2007b), EC (2011)], promotion of eco-driving [Kahn Ribeiro et al (2007), EC (2011)], promotion of night freight deliveries [Allen J. et al (2007) and STRATEC S.A. et al (2005)], and introduction of an annual intermodal award on a European level [ZLU et al (2003)].

It follows that public involvement has positive effects on all KPIs. Among them, significant gains are expected in terms of accidents and ICT applications.

5.19 Monitor and publish service quality indicators

The role of performance indicators as instruments for encouraging service quality and measuring environmental and social impacts has been recognised in a number of late transport policy documents. The Freight Transport Logistics Action Plan [EC (2007b)] alone includes five actions in this area concerning: (a) the performance of freight transport logistics chains, (b) the performance of intermodal terminals, (c) the performance of urban transport logistics, (d) the systematic reporting of operational, infrastructure-related and administrative bottlenecks and proposed solutions, and (e) the collection of statistical information.

Similarly, the NAIADES Action Programme for Inland Waterway Transport [EC (2006b)] calls for: (a) screening for barriers in existing and new European and national legislation, (b) drawing up an updated EU regulation on statistics of goods transport by inland waterways, and (c) establishing a European market observation system. Along the same line, Regulation (EU) No 913/2010 imposes a performance monitoring mechanism for the freight-oriented corridors.

Benchmarking is expected to lead to improvements in all monitored indicators due to increased awareness of the parties involved and the greater public. More profound effects are seen in relation to accidents, transport time and reliability, and the use of ICT applications.

5.20 Promote international cooperation with EU neighbouring countries

Although temporarily halted by economic crises and geopolitical instability, integration of the EU with neighbouring regions (Eastern Europe, North Africa) is likely to continue. The Commission’s communication on a sustainable future for transport [EC (2009a)] suggests further promotion of international transport cooperation aiming at establishing the necessary interconnection of the major transport axes of these regions and assisting them in ensuring sustainable development. The European Neighbourhood Policy (ENP) Action Plans, as well as bilateral partnership and cooperation agreements, include substantial sections on transport policy cooperation, including to varying degrees the adoption by ENP countries of EU transport legislation. The new White Paper places emphasis on the objective of extending our transport and infrastructure policy to our immediate neighbours, including in the preparation of mobility continuity plans, to deliver closer market integration [EC (2011)].

Potential gains stemming from these actions concern reductions in bottlenecks, transport time and cost, and improvements in reliability.

5.21 Green public procurement

Public authorities can make an important contribution to the achievement of the Europe 2020 strategic goals, by using their purchasing power to procure goods and services with higher "societal" value. A range of policy specific initiatives have been launched in the recent years to encourage the use of public procurement in support of these policy objectives [EC (2011)].

In particular, Green Public Procurement (GPP) is defined in EC (2008e) as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" and has been practiced in Member States for more than a decade. The EU has developed GPP criteria for 18 product and service groups.

The GPP criteria of relevance to freight transport operations concern waste collection trucks and services. The engines of these vehicles must be certified as meeting the EURO V standard for emissions, while additional points in contract awarding will be given for: (a) Euro VI emission standard, (b) capability to use renewable energy (biofuels, renewable electricity or hydrogen from renewable energy sources), (c) noise emissions below 102dB (A), (d) tyre pressure monitoring systems, and (e) pollutant emissions below certain limits for the engines of auxiliary units.

Although such schemes seem irrelevant to green corridors, which are international in nature, GPP has another function concerning market influence. Significant demand from public authorities for "greener", more innovative and socially responsible goods and services can also shape production and consumption trends for the years to come by providing the right incentives to the industry. Through this mechanism, GPP is expected to lead to reduced emissions and noise.

6 Operations

The section deals with changes in operations. A total of 14 changes in this theme have been identified through the document fiches. Their screening and processing has resulted in the 7 definite changes of Table 5 below. The role of enhanced training on environmental transport has covered in Section 5.15 and will not be repeated here.

6.1 Optimise fleet and terminal operations

The optimisation of transport operations includes:

- Vehicle/vessel capacity optimisation (maximisation of the load factor)
- Fleet optimisation (minimisation of the number of vehicles required for a given transport work)
- Voyage optimisation/weather routing (minimisation of time required to sail a given leg taking into consideration weather forecasts).

Measures like these use advanced ICT applications and lead to significant reduction of costs, congestion, emissions, noise and accidents. Moderate improvements in terms of time, reliability, frequency of service and bottlenecks are also expected. Using the so called “abatement curves”, Madsen et al (2009) conclude that operators have an incentive to take such measures on their own and no intervention is necessary.

Terminal operations optimisation, however, is a more complex issue due to the crucial role the intermodal and transhipment platforms play as nodes of a transport chain. The supply chain integration trend, described in Section 4.2, demonstrates a shift from competition among individual enterprises to competition among supply chains. In optimising their operations, terminal owners/managers need to take into consideration the performance of the transport chains they serve in their entirety. This might have repercussions to the opening hours of the terminal and the priority policies in serving the different terminal users/modes [Visser J.A. (2008)]. Special care should be given to this issue in the framework of green corridors.

6.2 Slow steaming and eco-driving

Containerisation has increased the importance of ship speed. Over the past two decades, container ships were built to go faster than bulk ships and since container ships were steadily gaining share, the world’s fleet speed picked up. But greater speed requires greater energy, as it does in all other modes of transport [Petersen M.S. et al (2009a)].

Slow steaming has been for years a usual practice of ship operators during periods of low freight rates and high fuel prices. A year ago, Elisabeth Rosenthal reported that with fuel prices and international awareness of GHG emissions soaring, over 220 shipping companies have decided to slow their vessels down from 24-25 knots (full throttle) to 20 knots (slow steaming). Industry giant, Maersk has taken the strategy to another level by mandating its ships sail at 12 knots (super-slow steaming). Since cutting its cruising speed in half, three years ago, Maersk has reduced its fuel consumption and GHG emissions by 30%. As a result, costs have been greatly reduced, even after accounting for the increased number of ships required for maintaining scheduled deliveries, and the increased labour costs due to having crews at sea for longer periods.

Soren Stig Nielsen, Maersk’s director of environmental sustainability, said that this is not a temporary trend. In the past customers demanded “fast and cheap” transportation. But now,

Table 5. Effects of changes in operations

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Optimise fleet and terminal operations	--	-	+	+	++			--	--	--	--	--	-		--	--	39/10, 43/9, 43/10, 43/11, 50/17, 57/10
2	Slow steaming	--	++		--				--	--	--	--						50/18
3	Eco driving	-	+						-	-	-	-				-	-	4/1
4	Introduce a container pool system	-				++			-	-	-	-		-				59/10
5	Introduce combined transport solutions	-	-	+					-	-	-	-	-	--		-	-	42/6
6	Introduce the Life Cycle Cost (LCC) methodology in decision-making	-				+			-	-	-	-					-	28a/8, 28a/9
7	Enhanced training on environmental transport	-	-	+		+	-		-	-	-	-		-		-		37/1, 40/8
Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)																		

a third dimension has been added: the CO_2 footprint. He added that Maersk is working with customers in the hopes of slowing more ships and contemplating charging customers variable rates, depending on speed [Rosenthal E. (2010)].

Slow steaming, thus, results in significant reductions of costs and emissions, at the expense of significantly increased transport time and reduced frequency of service. If the effects on frequency need to be reversed, more ships are required mitigating the gains of slow steaming.

Eco-driving is for road what slow steaming is for shipping. It is a driving behaviour suited to modern engine technology (smart, smooth and safe driving techniques) and applies to drivers of all types of vehicles, from minicars to heavy-duty trucks. Eco-driving training can be attained with formal training programmes or on-board technology aids. The major challenge is how to motivate drivers to participate in the training programmes, and how to make drivers maintain an efficient driving style long after participating. In the Netherlands, eco-driving training is provided as part of driving school curricula [Kahn Ribeiro et al (2007)].

The expected effects of eco-driving on costs, transport time and emissions are of the same direction with those of slow steaming, but the level of significance is lower due to the speed limits that already apply to trucks. For the same reason the expected effects on frequency are negligible. It has been estimated that eco-driving can lead to an average fuel savings of 5-10%. In addition, CIECA (2007) concludes that eco-driving reduces noise and accident risks.

6.3 Introduce a container pool system

The availability of containers is in many cases a problem. Today the ISO-containers are mainly owned by the big ocean shipping lines, making it harder to actually get those containers in areas being located further away from the harbours and possibly also for transport not involving overseas carriers.

ZLU et al (2003) proposed the initiation of a container pool, comparable to the Euro-palette pool existing today, as a potential solution to this problem. With container pools in the vicinity of the main industrial centres of Europe, the cost-intensive relocation of containers could be limited to a more bearable amount. Seen in conjunction with establishing intermodal loading units, the proposed container pool system could contribute to achieving the co-modality objectives of the Commission.

The expected effects of a potential container pool system would be reduced costs, emissions and bottlenecks in ports. Special ICT applications would be needed for managing the pool.

6.4 Introduce combined transport solutions

Combined Transport (CT) solutions constitute a good example of co-modality at work, and are usually applied to connect modal networks fragmented by major geographical barriers. The Ro-Ro ferries transporting trucks or semitrailers is the most common arrangement. The trucks-on-train services, sometimes also called piggyback or motorail services, are another type involving carrying the complete truck or semitrailer by train. The driver during the journey stays in a separate passenger cart. The piggyback services through Switzerland and Austria offer to road hauliers the advantage of being exempt from such restrictions as the ban on night-time and Sunday travel and the limitation on gross vehicle weight. The MODALOHR system applied on the connections between Aiton (St Jean-de-

Maurienne) and Orbassano (Turino), and between Le Boulou (Perpignan) and Bettembourg (Luxembourg) is another variation of piggyback services [Lloyd Michael (2010)]. Yet another type of combined transport arrangement is the train ferries operating in the Baltic Sea.

Kessel+Partner et al (2004) analysed 18 trans-European corridors and concluded that international CT will increase from 54.5 mill tones in 2002 by +113 % to 116.0 mill tonnes in 2015. Most of this increase will come from the unaccompanied CT, and more specifically from the "mature" CT markets in Western Europe owing to the existent market penetration and the robustness of services against economic weakening.

Combined transport offers significant solutions to geographical bottlenecks. To the extent that they shift cargoes from road to other more environmentally-friendly modes, they also produce gains in terms of costs, time, congestion, emissions, noise, accidents and reliability. The environmental benefits are mitigated by the need to carry the truck's own weight as cargo.

6.5 Introduce the Life Cycle Cost (LCC) methodology in decision making

A key challenge in greening transport services stems from the fact that green products/services are perceived to cost more. This perception results from the higher investment or initial purchasing price sometimes associated to green products/services when compared to their non-green equivalent. The LCC analysis is a method for calculating the total cost of a system or a product over its total lifespan. A very central target is the systematic process for evaluating and quantifying cost impacts [Ripke Burchard et al (2006)]. It is very probable, that despite their higher initial costs, the total present costs of environmentally-friendly products are actually decreased as their higher purchasing prices are compensated for by lower operating, maintenance and disposal costs.

PwC et al (2009) revealed that in general, Green Public Procurement (GPP) does not increase costs but can actually help the purchasing organisation to cut costs. Using a Life-Cycle Costing (LCC) approach to calculate the financial impact of GPP, the average financial impact of GPP within the seven best performing Member States was -1% (on average for 10 priority products groups/services) in 2006/2007. The same study concluded that the two main product groups leading to cost reductions through GPP were construction and transport.

The expected effect of introducing LCC methodology in decision making is moderate gains in environmental performance and costs through the procurement of greener products and services. ICT applications in implementing the LCC methodology might be needed.

7 Infrastructure development

The section deals with changes in infrastructure development. A total of 43 changes in this theme have been identified through the document fiches. Their screening and processing has resulted in the 11 definite changes of Table 6 below. The one concerning ensuring adequate public and private funds has been covered in Section 5.13 and will not be repeated here.

7.1 Increasing congestion

Europe began to suffer from congestion during the 1990s. As early as in 1993, the White Paper on Growth, Competitiveness and Employment warned: "Traffic jams are not only exasperating; they also cost Europe dear in terms of productivity" [EC (2001)]. Although congestion is prevalent in agglomerations and in their access routes, it also affects inter-urban freight transport as most trips start or end in urban areas.

It is noted that the term ‘congestion’ refers to road transport. Scheduled modes of transport like rail do not experience the same kind of congestion, as access to the infrastructure is controlled. The term ‘scarcity’ is used for rail transport to denote the inability to allocate more paths due to capacity limitations. For the purposes of this report, the term congestion is meant to include scarcity.

Tackling congestion was one of the main objectives of the 2001 White Paper, and the issue appears in almost every single policy document since then, including the 2011 White Paper. The trend of increasing congestion, coupled with its widely acknowledged negative repercussions for the environment, is expected to exert more pressure towards its containment. The policies employed to this end have been: the upgrading of existing infrastructure, the construction of new infrastructure, the internalisation of congestion costs, and shifting cargoes from road to modes with more available capacities.

Despite these efforts, congestion is not expected to be contained in the foreseeable future. Its direct effects are increased emissions, noise, transport time and costs, and reduced reliability.

7.2 Upgrade existing infrastructure

Making the optimal use of existing facilities is the most cost-effective way to increase the capacity of transport networks. This applies to all modes. Relevant measures identified in the reviewed documents include:

- Harden highway structures with fibre-reinforced concretes [EC (2006c)],
- Strengthen bridges by means of bonded reinforcements [EC (2006c)],
- Improve ancillary rail services like terminals and marshalling yards [EC (2007c)],
- Avoid dismantling currently underemployed overtaking rail tracks or flyovers [Kessel+Partner et al (2004)],
- Enlarge the loading gauge on a few main rail routes [Kessel+Partner et al (2004)],
- Improve existing port facilities [EC (2007d), EC (2009c)],
- Improve and maintain inland waterway infrastructures and transhipment facilities [EC (2006b), Planco Consulting GmbH et al (2007), Lloyd Michael (2010)].

Two more points need to be made in relation to this topic: The first one concerns the important role of ICT applications in enhancing the capacity of existing infrastructure with minimal investment requirements [EC (2011), EC (2009a), Kessel+Partner et al (2004)].

Table 6. Effects of changes in infrastructure development

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Increasing congestion	+	+	-					+	+	+	+	+				+	48/13
2	Upgrade existing infrastructure	-- (-)	-- (-)	++ (+)					-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)		-- (-)	-- (-)	10/3, 11/13, 12/7, 13/10, 22/2, 27/13, 28a/1, 28a/3, 28a/4, 28a/6, 40/5, 40/6, 42/12, 50/1
3	Expand infrastructure	-- (-)	-- (-)	++ (+)	+				-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)	11/10, 21/3, 22/2, 27/14, 40/1, 40/2, 48/12, 57/11
4	Create a core network of high EU added value	-- (-)	-- (-)	++ (+)	+				-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)	10/1
5	Promote intermodal freight villages (including urban distribution centres)	--	--	++	+	+++	(+)	--	--	--	--	--	--	---	++	--	--	1/6, 11/9, 21/6, 40/1, 42/11, 53/1, 59/7
6	Construct dedicated freight rail lines	- (+)	---	+++	+++	++			--	--	--	--	--	---	++	--	--	29/7, 40/3
7	Create dedicated parking areas for trucks with appropriate security levels							--										56/1
8	Designate unloading places for delivery vehicles in dense urban areas	-	-						-	-	-	-	-				-	1/1, 53/6
9	Reduced public expenditures on transport infrastructure	+	+	-					+	+	+	+	+	+		+	+	2/27
10	Ensure adequate public and private funds	-- (-)	-- (-)	++ (+)					-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)	10/4, 26/18, 29/18, 29/19, 29/20, 29/28, 47/3
11	Adopt common methodologies in project appraisal	-	-	+					-	-	-	-	-	-		-	-	11/12

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

The second one concerns the need for existing networks to accommodate new generations of vehicles using alternative fuels [EC (2010)]. For the road sector, this includes supply points initially for biofuels and, later, for other forms of green propulsion [EC (2007b)]. LNG installations [Pålsson C. et al (2008)] and the use of shore-side electricity [EC (2009b)] are presently the most prominent ones for ports.

The upgrading of existing infrastructure is associated with significant improvements in relation to cost, transport time, reliability, congestion, bottlenecks, emissions, noise and accidents in the short run. In the long run, however, the effects on these indicators can be mitigated due to the induced demand generated by the upgraded infrastructure.

7.3 Expand infrastructure

The expansion of existing networks through new infrastructure is another topic appearing very often in policy documents. The actions suggested are either horizontal covering all modes under the theme ‘improved accessibility’ [EC (2009a), Petersen M.S. et al. (2009a), EC (2011)], or refer to specific modes: rail [Kessel+Partner et al (2004), EC (2007c)]; ports [EC (2007d), EC (2011)]; and inland navigation [EC (2006b), Visser J.A. (2008)].

It is worth mentioning here the results of the recent TRANSvisions study [Petersen M.S. et al (2009a)] regarding the effectiveness of new infrastructure in reducing CO_2 emissions. Two types of analyses were carried out for this study. The first one used the TRANS-TOOLS model to assess the results of two policy measures: (i) pricing of passenger cars on interurban roads, and (ii) development of infrastructure networks (interurban road and rail). For the 2030 time horizon, the pricing measure led to a predicted reduction in CO_2 emissions, whilst the infrastructure measure led to a predicted increase of CO_2 emissions.

The second analysis used the purposely developed Meta-Models to test the following policy packages:

- Technology: Vehicle technologies, reducing CO_2 emission limits for new vehicles and the introduction of non-fossil fuelled vehicles
- Regulatory: A reduction of vehicle speeds in roads and motorways and increase in rail urban transport
- Economic: Use of pricing mechanisms to increase occupancy rates and load factors
- Infrastructure: Selective road investments in congested road links.

According to the analysis the most effective measures concern vehicle technologies and pricing to increase occupancy rates. The measure concerning reduction in vehicle speeds and improvement of public transport is moderately effective. The construction of new roads is the least effective, but still it may bring CO_2 reductions due to the reduction in congestion.

As with upgrading existing infrastructure, new infrastructure projects will bring in the short run significant improvements in relation to cost, transport time, reliability, congestion, bottlenecks, emissions, noise and accidents, but in the long run these gains will be mitigated (if not reversed) due to the induced demand generated by the new facilities. New developments will strengthen the strain on land use and can have a positive effect on frequency of service.

7.4 Create a core network of high EU added value

With its Green Paper on the future development of the TEN-T, published in February 2009, the Commission launched a review of the TEN-T policy. The main innovation proposed was the concept of a dual layer planning approach, which would be characterised as follows: While maintaining the fairly dense rail, road, inland waterways, ports and airports networks, which constitute the "comprehensive network" as the basic layer of the TEN-T and are, in large part, derived from the corresponding national networks, the "core network" would overlay the "comprehensive" network and give expression to a genuine European planning perspective focused on bringing about a systemic improvement in the transport system's resource efficiency and a significant overall reduction of GHG emissions from transport. The core network concept is a central feature of the vision for the future European transport system, as expressed by the new White Paper [EC (2011)].

The general principles for designing the TEN-T at all strategic levels, comprise: multimodality, interconnectivity and network optimisation, interoperability and improved efficiency of all modes of transport, sustainability, attention to biodiversity proofing, a focus on quality of service for both freight users and passengers, safety and security of transport infrastructure, application of advanced technologies and ITS, and minimisation of investment, maintenance and operational costs [EC (2010)].

The core network concept places emphasis on the European dimension of the transport networks and their integration, in a way that combines efficiency targets with the sustainable development goals of the EU. In this respect, the core network basically extends the green corridor concept across all Europe, making SuperGreen the laboratory of the new TEN-T policy.

The effects of the core network planning approach are identical to those of expanding infrastructure mentioned above.

7.5 Promote intermodal freight villages (including urban distribution centres)

EUROPLATFORMS, the European Association of Freight Villages, defines freight villages as "defined areas within which all activities relating to transport, logistics and the distribution of goods, both for national and international transit, are carried out by various operators. These operators can either be owners or tenants of buildings and facilities (warehouses, break-bulk centres, storage areas, offices, car parks, etc...) which have been built there[9]." It goes on by stating that a freight village must:

- preferably be served by a multiplicity of transport modes (road, rail, deep sea, inland waterway, air),
- allow access to all companies involved in the activities set out above,
- be equipped with all the public facilities to carry out the above mentioned operations,
- include public services for the staff and equipment of the users, and
- be run by a single body, either public or private.

Sogaris in Rungis, France was the first freight village in Europe. It begun as a truck terminal and its objective was to support business. Roissy-Sogaris is now 133-acre air freight Logistics Centre Freight Village (LCFV) with a truck-rail intermodal facility, and access to several nearby highways and the Orly Airport. The LCFV accommodates almost 100 transport-, warehousing-, and distribution-related companies, and a variety of worker support services.

Another successful example is Interporto Bologna S.p.A., which was established in 1971 to relieve the medieval city of Bologna of the heavy truck traffic and promote road-rail intermodality, economic development and environmental sustainability. It is managed by a

[9] http://www.freight-village.com/definition.php

public/private company, which is a common and efficient organisational structure for such activities [Lloyd Michael (2010)].

Similarly, Urban Distribution Centres (UDCs) offer freight transport companies the opportunity to deliver goods destined for urban area to a specialist centre for final delivery rather than having to make the delivery to the final customer in a busy part of the city. UDCs have the potential to improve delivery reliability and to improve the utilisation of goods vehicles. In addition, it is possible for a specialist fleet of environmentally-friendly goods vehicle to be used for the final delivery from the UDC to the customer. Given the environmental credentials of such vehicles in terms of pollutant emissions, noise and other factors, it can be possible to allow them to access and make deliveries in the urban area at times when delivery vehicles are usually prohibited, including during the night [Allen, J. et al (2007) and STRATEC S.A. et al (2005)].

The integration of transport modes offered by intermodal freight villages and transhipment platforms has been recognised by the Commission, which promotes their development [EC (2007c), EC (2009a)]. They are considered a crucial element of green corridor development.

The creation of intermodal freight villages, UDCs and other transhipment platforms result in improvements to all KPIs with the exception of land use, due to their extensive land requirements in the proximity of major urban areas, and cargo safety, due to increased damage risks inherent in every transhipment operation (if needed). Very significant reduction of bottlenecks is foreseen, while significant gains are expected in terms of congestion, emissions, noise, accidents, transport time and reliability, cargo security and costs. A wide variety of ICT applications will be necessary, and the frequency of connections to other intermodal terminals or ports/airports in the region will also be increased.

7.6 Construct dedicated freight rail lines

Up till now, rail infrastructure has been mainly designed for joint usage by passenger and freight trains, but the growth in traffic and the related congestion, especially in and around cities, has led to frictions between passenger and freight transport. The different profiles of these traffic segments in terms of speed, loads, etc. reduce the efficiency of using the rail network [EC (2009a)].

In recognition of this problem, the 2001 White Paper included an action on “supporting the creation of new infrastructure, and in particular rail freight freeways.” With the Mid-term review, the Commission softened this objective by suggesting “examining a possible programme to promote a rail freight oriented network within the broader context of a new freight transport logistics policy.” These two alternatives appear in numerous policy documents. Kessel+Partner et al (2004) and, more recently, EC (2009a) are two examples.

The Betuwe line (TEN-T Priority Project 5), inaugurated on 16 June 2007, is a 160 km long double track ERTMS equipped rail line dedicated to freight, which connects the Port of Rotterdam to the Dutch-German border at the level of Emmerich, Germany[10]. Despite its slow start, Betuwe line is expected to capture 60% of the freight traffic between NL and Germany, transferring significant volumes of cargo from road to rail. The cost of this project was €4.7 billion, twice the original budget of €2.3 billion and four times the initial €1.1 billion estimate of 1990 [Lloyd Michael (2010)].

[10] TEN-T Progress report 2010.

Given the high investment costs required by a dedicated freight rail network, the decision of the Commission to proceed with freight-oriented rail corridors instead (refer to Section 5.11) is no surprise.

The effects of dedicated freight rail lines are very significant improvements in terms of bottlenecks, transport time, reliability and frequency. Significant gains are also expected in terms of congestion, emissions, noise and accidents through modal shift from road to rail. Costs will be reduced due to increased efficiency, but can be increased if the high investment costs are reflected in user charges. ICT applications (ERTMS) will have to be employed, while the new infrastructure will strengthen the existing strains on land use.

7.7 Create dedicated parking areas for trucks with appropriate security levels

According to available European data on parking supply and transport demand models, a shortage of truck parking areas for long distance transport in the EU occurs currently in several EU Member States. Although most Member States include the provision of the number, size and location of truck parking areas in the infrastructure planning process, specific security concerns (e.g. with regard to the location-visibility of parking areas, need for fencing etc.) are mostly not included.

There seems to be a gap between the actual and perceived risks of the security at parking areas. A whole range of measures can be taken to improve the security level of truck parking areas. Measures can be aimed at physical properties of parking areas (e.g. fences), the organisation of security at parking areas (surveillance), as well as improving the communication on incidents (e.g. alarms) [Visser Hans et al (2007)].

A significant increase of cargo security in the road sector is the direct effect of this change.

7.8 Designate unloading places for delivery vehicles in dense urban areas

The system, known as “nearby delivery areas” (Espace de livraison de proximité – ELP) was established in 2003 in Bordeaux and since then has been applied in several other cases.

ELP is an area of street space that has been dedicated to goods vehicles for the loading and unloading of goods destined for the nearby shops.

This space is reserved and controlled by up to two members of staff who can also help goods vehicle drivers to deliver their goods to the shops using trolleys.

The space can accommodate 3 to 5 delivery vehicles at once (it is about 30 metres wide).

Figure 5. ELP in Bordeaux (Source: BESTUFS Good Practice Guide)

Such schemes reduce congestion, emissions, noise, transport time and the costs associated with deliveries in dense urban areas.

7.9 Reduced public expenditures on transport infrastructure

Already in 2006, the Mid-term review found that "the public financing capacities of the Member States remain constrained and the level of investment in transport infrastructure has fallen in all Member States and now amounts to less than 1 % of GDP." The situation became even more difficult due to the recent economic crisis, which after having put public finances under pressure has now resulted in a phase of budgetary consolidation.

In addition, a society with higher ratio of older people will need to devote more public resources to pension payments, health care and nursing. Through its effect on public finances, ageing will put a strain on the supply and maintenance of transport infrastructure and set a limit for funding available to public transport [EC (2009a)].

The effects of this development are expected to be increased congestion and bottlenecks, leading to increased transport time, emissions, noise, accidents and ultimately costs, as well as reduced reliability. The effects would have been more profound if other forms of financing (PPP, revenues from internalisation of external costs) were not available.

7.10 Adopt common methodologies in project appraisal

Given the scarcity of funds mentioned above, it is important to channel existing funds to those infrastructure projects exhibiting the best added value. Drawing from the experience provided by the application of the Environmental Impact Assessment and Strategic Environmental Assessment Directives, common methodologies and similar assumptions should be adopted in the appraisals of infrastructure projects across modes and, possibly, countries. Common data and indicators are needed, starting by those on traffic and congestion. This will help selecting projects on the basis of comparable cost-benefit ratios and taking all relevant elements into account: socio-economic impacts, contribution to cohesion and effects on the overall transport network. [EC (2009a)].

The new White Paper introduces ex-ante project evaluation criteria ensuring that infrastructure projects duly demonstrate the EU added value or are based on 'services rendered' and generate sufficient revenue. It also foresees a PPP-screening to the ex-ante evaluation process to ensure that the option of PPP has been carefully analysed before a request for EU funding is being asked [EC (2011)].

De Ceuster Griet et al (2010) have recently defined a methodological approach for planning the TEN-T network, in particular the core network.

Maximising the impact and leverage effect of infrastructure funding following a thorough environmental assessment is expected to lead to reduced congestion and bottlenecks, reduced emissions, noise and accidents, reduced transport time and costs, and increased reliability.

8 Technology development

The purpose of this section is to present the technology related changes that have emerged from the policy, basically, documents reviewed under Task 2.3, and assess their effects on green corridors. It follows that the coverage of technologies, either available or under development, is rather superficial and circumstantial, while only broad directions can be indicated in terms of their expected effects.

This should not be viewed as indicative of a peripheral role of technological developments in meeting the serious environmental challenges transport faces today. It is quite the contrary. The "Mitigation of Climate Change" part of the IPCC's Nobel Prize winning report on climate change [Kahn Ribeiro et al (2007)] concludes that "*since currently available mitigation options will probably not be enough to prevent growth in transport's emissions, technology research and development is essential in order to create the potential for future significant reductions in transport GHG emissions*." Similarly, the results of the TRANSvisions model runs [Petersen M.S. et al (2009a)] show that "*it is likely that an important contribution to the reduction of CO_2 emissions will come from 'emerging technology' instruments.*"

Thus, technological developments offer probably the most effective solution to the complexities of the sustainable mobility objective, defined in the Sustainable Development Strategy (SDS) as "*ensuring that our transport systems meet society's economic, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment*." Minimising the undesirable impacts on the environment, whilst meeting the society's economic and social needs, requires a structural change in the transport systems as we know them today. The two most important drivers for such change are technology and consuming behaviour. Given that today's consuming habits have been developed since WWII, their drastic change cannot be expected within a generation. This leaves technology, in particular commercially viable alternative fuels, as the only major alternative. But even this is a long term solution. For the immediate future, ICT applications, among others, offer the potential for significant gains in terms of capacity and efficiency of transport networks without requiring major investments. This view is basically shared by the new White Paper that considers technology related issues as two of the three strands that future development must rely on, the third one being the optimisation of multimodal logistic chains performance [EC (2011)].

It is for these reasons that green technologies/innovations and ICT applications are being examined in detail in two separate ongoing work packages of this project.

A total of 77 changes in this theme have been identified through the document fiches. Their screening and processing has resulted in the 11 definite changes of Table 7 below. Two of them, namely the development of ICT solutions and enhanced training on environmental transport have been covered in Sections 5.14 and 5.15 respectively and will not be repeated here.

8.1 Reduce forces on vehicles/vessels

The identified technologies in this category include:

- Reduced aerodynamic resistance [Kahn Ribeiro et al (2007), Stelmaszczyk Pawel (2011), EC (2011)]
- Reduced weight (through improved design and new materials) [Kahn Ribeiro et al (2007), Vanelslander Thierry et al (2011), EC (2011)]

Table 7. Effects of changes in technology development

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Develop ICT solutions for vehicles/vessels and infrastructure	--	--	++		+++	-		--	--	--	--	--	-		--		1/4, 2/9, 3/1, 9/2, 10/2, 11/16, 11/18, 12/10, 13/4, 14/2, 20/1, 20/2, 20/3, 20/4, 20/5, 20/6, 20/7, 29/31, 34/1, 40/7, 42/3, 48/11, 52/1, 53/7
2	Reduce forces on vehicles/ vessels	--							--	--	--	--						39/1, 39/5, 39/6, 43/7, 50/14
3	Increase efficiency of propulsion systems	--							--	--	--	--						14/3, 28b/2, 39/2, 39/8, 43/2, 43/5, 43/6, 50/5, 50/6, 50/7, 50/14, 57/5
4	Use alternative fuels	+							---	---	---	---					--	9/1, 9/6, 10/3, 28b/1, 39/3, 39/11, 39/12, 43/8, 47/4, 50/4, 53/2
5	Improve after-treatment of exhaust gases of existing and new generation fuels	+							--	--	--	--						28b/3, 50/8, 50/9, 50/10, 50/11, 50/12, 50/13
6	Improve environmental performance of auxiliary systems	+							-	-	-	-						28b/4, 39/7, 43/1, 43/3
7	Vehicle/vessel capacity optimisation	--							--	--	--	--	--	-		--	--	43/4, , 50/15, 50/16
8	Develop more efficient cargo handling and transport technologies	--	--			++			--	--	--	--	--	--		--	--	2/8, 9/4
9	Optimise vehicle and infrastructure characteristics in relation to noise generation	+															--	18/3, 28a/7, 53/3
10	Develop new methods for structural assessment of existing infrastructure	-							-	-	-	-		-			-	28a/2, 28a/5, 28a/10, 28a/11
11	Enhance training on environmental transport	-	-	+		+	-		-	-	-	-		-		-		37/1

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

- Hull optimisation [Planco Consulting GmbH et al. (2007)]
- Hull condition [Madsen et al (2009)].

Significant reductions of emissions and costs, through reduced fuel consumption, are the expected effects.

8.2 Increase efficiency of propulsion systems

This category includes the following technologies:

- Improved fuel conversion efficiency of diesel- and Otto-cycle engines [EC (2006c)]
- Optimisation of combustion chamber and injection system [Planco Consulting GmbH et al. (2007)]
- Engine monitoring [Madsen et al (2009), Planco Consulting GmbH et al. (2007)]
- Propeller efficiency [Madsen et al (2009)]
- Propulsion efficiency devices [Madsen et al (2009)]
- Setting of broader (e.g. worldwide) standards for IWT-engine specifications [Visser J.A. (2008)].

The expected effects are significant gains in terms of emissions and costs due to reductions in fuel consumption.

8.3 Use alternative fuels

The identified technologies include:

- Advanced electric and ICE-propelled vehicles [ERTRAC (2010)]
- Improved batteries for electric and hybrid vehicles [Kahn Ribeiro et al (2007)]
- Minimisation of the use of, and recycling, precious materials used in electric vehicles and, potentially, replacing them with more abundant alternatives [ERTRAC (2010)]
- Advanced biofuel conversion [Kahn Ribeiro et al (2007)]
- Hydrogen fuel cells for trucks and ships [Kahn Ribeiro et al (2007)]
- LNG for ships [Kahn Ribeiro et al (2007), Pålsson C. et al (2008)]
- Solar technologies for ships [Kahn Ribeiro et al (2007)]
- Sail technologies for ships [Kahn Ribeiro et al (2007), Madsen et al (2009)]
- Infrastructure accommodating new generations of vehicles using alternative fuels [EC (2010)].

The use of alternative fuels leads to very significant reductions of emissions and significant reductions of noise. The effect on costs depends on the technology used, but in general an increase in costs is expected at least for the start up phase.

8.4 Improve after-treatment of exhaust gases of existing and new generation fuels

Planco Consulting GmbH et al. (2007) suggest the following technologies:

- Exhaust gas recirculation
- Humidification
- Selective non-catalytic reduction
- Selective catalytic reduction
- Diesel oxidation catalyst
- Particulate matter filters

The effects are significant reductions in emissions at the expense of increased costs due to the installation and maintenance cost of the necessary equipment and the slightly increased fuel consumption required by some of these systems.

8.5 Improve environmental performance of auxiliary systems

The identified technologies include:

- Mobile air conditioning systems with reduced impact on the environment [EC (2006c)]
- Regenerative braking in trains [Kahn Ribeiro et al (2007)]
- Reduction of boiler consumption for ships [Madsen et al (2009)].

Improved environmental performance at an increased cost is the effect of these systems.

8.6 Vehicle/vessel capacity optimisation

The vehicle/vessel capacity optimisation has been presented in Section 6.1 as part of optimising fleet and terminal operations. The operational objective there was the maximisation of the load factor of a given vehicle/vessel. In contrast, the objective here is to maximise the payload capacity of a vehicle/vessel subject to certain dimension/weight constraints. Examples of such designs are:

- the Y-shaped hull for IWT vessels [Lloyd Michael (2010)], and
- the enlargement of hull dimensions [Planco Consulting GmbH et al. (2007)].

Design optimisation leads to significant reduction of costs, congestion, emissions, noise and accidents, as more cargo can be carried with the same number of trips. Moderate improvements in terms of bottlenecks are also expected. It is noted that the enlargement of dimensions excludes the long & heavy trucks, which have been covered in Section 5.6.

8.7 Develop more efficient cargo handling and transport technologies

No specific technologies have been identified for this category other than the general statement of the title. Containerisation and combined transport solutions could serve as examples of such technologies; both have been discussed in previous sections of this report. In general, more efficient cargo handling and transport technologies are expected to result in significant improvements regarding cost, time, emissions, congestion, bottlenecks, noise and accidents, with the assistance of ICT applications.

8.8 Optimise vehicle and infrastructure characteristics in relation to noise generation

The identified technologies in this category include:

- Optimised road surfaces in relation to noise generation, rolling resistance and safety [EC (2006c)], and
- Composite brake blocks for trains with improved noise characteristics [EC (2008d)].

The expected effects are significant reductions in noise levels accompanied by moderate increases in cost.

8.9 Develop new methods for structural assessment of existing infrastructure

Examples of technologies in this field include:

- A ground-penetrating radar system for fast and efficient monitoring of rail track substructure conditions [EC (2006c)], and

- New methods for structural assessment of existing railway bridges [EC (2006c)].

Reductions in bottlenecks, emissions, noise and cost are expected from such technologies. The benefits can be more profound in the case the new assessment methods result in the possibility of upgrading infrastructure that otherwise would have been replaced.

9 International regulations

In contrast with the previous sections of this report, the present one deals with changes in the regulatory environment that exceeds the limits of the EU.

A total of 23 changes that concern international regulations have been identified through the document fiches. Their screening and processing has resulted in the 9 definite changes of Table 8 below. It is worth noticing that all these changes concern shipping (8 apply on marine shipping and 1 on inland navigation). This is not surprising given the international nature of merchant shipping, which makes the international legal context particularly important for this industry.

The International Maritime Organisation (IMO) is the principle regulatory body in the industry. Other institutions of relevance include:

- the United Nations (Convention on the Law of the Sea – UNCLOS),
- the International Labour Organisation (ILO), which with its 2006 Maritime Labour Convention aims to achieve decent working conditions for seafarers and secure fair competition for quality shipowners,
- groups of individual countries who establish Port State Controls through Memoranda of Understanding (MoU),
- the Central Commission for Navigation on the Rhine (CCNR), which sets rules governing Rhine navigation, and
- the Danube Commission, which is concerned with the maintenance and improvement of navigation conditions on the Danube River.

9.1 Support fair international trade

Intensified globalisation has put more stress on the delicate balance of the international framework governing the rights and responsibilities of nations as flag, port and coastal states [EC (2009a)]. Liberalisation of trade in maritime services is an on-going process through dialogue both at the World Trade Organisation (WTO) and bilaterally with key trade and shipping EU partners. Supporting fair international maritime trade has been suggested in a number of the reviewed documents, the new White Paper [EC (2011)] being the most recent one. It basically concerns observing internationally agreed rules at global level, and more specifically the STCW Convention of IMO and the 2006 Maritime Labour Convention of ILO.

Competition with Member States' ports by ports in third countries is another concern. This is especially the case of some EU ports close to non-EU ones, as well as in relation to hubs. Lower levels of environmental constraints and social rules, fiscal dumping, public financing for hinterland connections, discriminatory charging practices for the use of hinterland connections, can distort fair competition and put the continuity of deep-sea activities at risk in different parts of the EU [EC (2007d)].

Bilateral agreements on maritime trade as they have been concluded with China or others are an example on how these matters can be actively dealt with. The permanent transport dialogue between the EU and Russia is another example of a forum that allows addressing such issues.

Table 8. Effects of changes in international regulations

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues			
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise	Fiche and measure number
1	Support fair international trade	-		+			--		-	-	-	-				--		12/1, 12/3, 12/4, 22/6, 47/1
2	Adopt EEDI	+	+		-				- (+)	- (+)	- (+)	- (+)						8/1, 8/2, 12/5, 39/9, 58/1
3	Internalise the external costs of GHG emissions from ships	+							-	-	-	-						8/1, 8/2, 12/5, 39/9, 54/1
4	Strengthen restrictions on NOx and SOx	++							(+)	- (+)	- (+)	(+)	(+)			(+)	(+)	12/6, 41/1, 50/2
5	Establish a mandatory Polar Code	--	--	+	++	++	--		--	--	--	--				---		7/1
6	Enhance international security	+ / - (++)	+ (++)	+		+		--						(+)				48/17, 51/1
7	Establish global standards for ICT applications in shipping	--	--	++		+++	-		--	--	--	--	--	-		--		47/9
8	Establish global standards for IWT-engines	-							-	-	-	-						57/5
9	Upgrade EU status in IMO	(+)					(-)	(-)	(-)	(-)	(-)	(-)				(-)		11/26, 26/23, 29/30, 47/6
Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)																		

Securing a level playing field in international maritime transport is expected to have significant impact on the safety of shipping operations (both in relation to crew and cargo) through better trained seafarers working under improved conditions. The removal of trade barriers should result in efficiency gains due to enhanced demand and better utilisation of the vessels. For the same reasons, improvements are expected on the environmental performance and the reliability of the services.

9.2 Adopt EEDI

The IMO's activities to combat GHG emissions from ships are very extensive. Its objective is to finalise soon a mandatory Energy Efficiency Design Index (EEDI) covering the environmental performance of new ships above 400 GRT[11]. In the absence of sufficient progress in the framework of IMO by the end of 2011, the European Commission will propose measures tackling GHG emissions from ships at EU level.

Without going into technical details, the EEDI value is calculated by a formula, the numerator of which is a function of all power generated by the ship (main engine and auxiliaries), and the denominator is a product of the ship's deadweight (or payload) and the ship's 'reference speed', appropriately defined as the speed corresponding to 75% of MCR, the Maximum Continuous Rating of the ship's main engine. The units of EEDI are grams of CO_2 per tonne mile. The way this index will work is as follows: The EEDI of a new ship is to be compared with the so-called "EEDI (baseline)," which is a function of the ship's deadweight. If a ship's EEDI is above the equivalent baseline, the ship would not be allowed to operate until and unless measures to fix the problem are taken [Working Group on Energy Efficiency Measures for Ships (2010)].

As the impending finalisation of the EEDI index will be a major milestone by the IMO on GHGs, it is still unclear how well this index will work in practice, and as a matter of fact there have been numerous concerns on its future use. For instance, an important caveat concerns the accuracy of the speed data that have been used in calculating the EEDI (baseline). Another concern is that the combination of formulae for EEDI and EEDI (baseline) essentially imposes a speed limit, and, in turn, an upper bound on the ship's MCR, shifting the focus from developing the most efficient hull forms, engines or propellers to reduce CO_2, to achieving the same objective just by reducing power and service speed. Some circles believe that the adoption of EEDI would favour the construction of underpowered ships, which, in their attempt to go faster or just maintain speed in bad weather, might emit disproportionately more CO_2. Smaller engines going at a higher percentage of MCR might emit more CO_2 than those produced by larger engines going at a lower percentage, even though the EEDI might be lower. Other possible side-effects of reduced speeds include (a) adding more ships to match demand throughput, (b) increasing cargo inventory costs due to delayed delivery, (c) increasing freight rates due to a reduction in ton-mile capacity, (d) reduced manoeuvrability and navigational safety, and (e) inducing reverse modal shifts to land-based modes (mainly road), something that would increase overall GHG emissions.

The adoption of EEDI, therefore, is expected to reduce GHG emissions (CO2-eq) directly, and air pollutant emissions (SOx, NOx, PM) indirectly through reduced consumption of fuel oil. On the other hand, the reduced speed implied by the EEDI formula will negatively affect transport time and frequency of service. Transport costs will go up in periods of high

[11] A similar index (EEOI - Energy Efficiency Operational Indicator), concerning the operation of all ships, new and existing, is also being developed but it will applied on a voluntary basis.

freight rates, when speed is an important factor, but will remain unaffected in low rate periods, when slow steaming is a usual practice. In the event the measure induces a back-shift from sea to road, the gains in environmental performance will be reversed.

9.3 Internalise the external costs of GHG emissions by ships

In addition to EEDI, the IMO is considering the adoption of a market-based measure (MBM), as a means to internalise the external costs of GHG emissions from ships. Such a measure would provide economic incentives to ship owners to build ships that are more energy efficient and/or adopt operational measures (for instance, slow steaming, or other) that would reduce GHG emissions. However, utmost care should be exercised on the choice of the instrument and on its implementation scheme, so as to avoid carbon leakage, evasion/fraud and cargo shifts to land-based modes that could produce more GHGs. Another effect of an MBM system is to raise money to purchase offsets for other sectors, i.e. invest in wind farms, photovoltaic parks, or other technologies that would reduce GHG emissions elsewhere. The document MBM Expert Group (2010) presents the submitted MBM proposals and their evaluation.

The effect of a possible market-based measure would be reduced emissions of GHGs (directly) and the other air pollutants monitored by SuperGreen KPIs (indirectly through lower fuel consumption) at the expense of a moderate increase in transport costs.

9.4 Strengthen restrictions on NOx and SOx

International rules (MARPOL, Annex VI) limit the NOx emissions from new diesel engines over a certain size constructed since 1 January 2000. The Commission has committed itself to considering a proposal to tighten these requirements in line with the proposed Tier 2 standards put forward by the United States Environment Protection Agency if there is no IMO proposal. Discussions in the IMO's working group on air pollution are ongoing [EC (2008a)].

As for SOx, MARPOL establishes a maximum worldwide level of sulphur in fuel of 4.5% for heavy fuel oil burned by ships. It also sets up SOx Emission Control Areas (SECAs) where more stringent specifications for fuel burned by ships apply. The Baltic and North Seas (including the English Channel) are currently designated as SECAs. In April 2008 the IMO’s MEPC 57 agreed in principle to further reduce the sulphur content of fuel used both within SECAs and worldwide. In SECAs, maximum sulphur levels have been reduced to 1% from 1 January 2010 and would be further reduced to 0.1% from 1 January 2015. The global limits would be reduced to 3.5% from 1 January 2012, with a further reduction to 0.5% from 1 January 2020 or 2025 if sufficient fuel is not available [EC (2008a)].

However, the suggested reduction of maximum sulphur content of fuel oil to 0.1% as from 1 January 2015 in SECAs receives a lot of criticism lately. A recent study commissioned by the Union of German shipowners and the Union of German Ports [Lemper et al (2010)] concludes that such a reduction can only be achieved by using diesel oil in place of heavy fuel oil. This, in turn:

- will increase the operational cost of shipping within SECAs in relation to shipping outside SECAs,
- will increase the operational cost of shipping within SECAs in relation to trucks and trains,
- will result in a shift from sea to land-based modes with adverse effects on GHG emissions, and
- will force some shipping lines and ports to exit the market.

Alternative measures suggested include:
- the use of secondary emissions reduction methods (scrubbers),
- measures reducing fuel consumption, and
- the use of alternative clean fuels (e.g. LNG, which is feasible only for new buildings).

However, the most important and viable suggestion is to increase the upper limit on sulphur content of the fuel for ships sailing in SECAs from 0.1% to 0.5% as from 2015. This measure will have insignificant environmental effects, while minimising the additional cost for marine fuel.

Another measure suggested at the Antwerp workshop was to extend the effective date of the regulation by 5 years allowing the industry to meet the sulphur content requirements in more cost effective ways.

The danger of over-regulation has been acknowledged by the European Commission, which in the 'Strategic goals and recommendations for the EU's maritime transport policy until 2018' Communication [EC (2009a)] states the action as:

> "Oversee the implementation of the amendments to MARPOL Annex VI to reduce sulphur oxides and nitrogen oxides emissions from ships, ensuring that 'back-shift' from SSS to road is avoided"

The implementation of the said amendments to MARPOL Annex VI concerning NOx and SOx emissions from ships is expected to result in improvements in the relevant KPIs, albeit at a significant cost increase (especially for reducing the sulphur content of marine fuel). In the event that the 'back-shift' from sea to road is not avoided, all environmental sustainability indicators will see a deterioration, which will be extended to congestion, accidents and noise.

Another suggestion resulting from the workshop was for the European Commission to take policy action towards provision of financial instruments aimed at avoidance of 'back-shift' from SSS to road. The possibility of amending the new Marco Polo programme to include such schemes is an option that could be assessed.

9.5 Establish a mandatory Polar Code

IMO has been developing requirements, guidelines and recommendations regarding navigation in polar ice-covered waters (Arctic, Antarctic areas) for over 20 years.

By nature, the polar environment imposes hard constraints and demands on ship systems, i.e. navigation, communication, life-saving appliances, machinery, protection and damage control. In that sense, the guidelines for ships operating in polar waters were adopted to mitigate the risk due to the harsh environmental and climatic conditions in polar waters. The guidelines were first issued in 2002, but came out to be finalised for both the Arctic and the Antarctic areas at 2009, and were approved by MSC[12] 86 and MEPC[13] 59.

Given the increasing interest of sailing in the polar waters and the importance of safely and clearly dealing with the unique natural difficulties, the aforementioned guidelines are used as a basis for new work towards the establishment of a mandatory code for ships operating in polar waters, the Polar Code, which is expected to be finished until 2012. The Code will cover ship design, construction, equipment, operational, training, search and rescue

[12] The IMO's Maritime Safety Committee (MSC)

[13] The IMO's Marine Environment Protection Committee (MEPC)

facilities and environmental protection issues relevant to ships operating in polar waters. This movement reflects the need of an international regulatory framework for traffic in polar areas.

In addition, Regulation 31 of the Safety of Life at Sea (SOLAS) Convention includes requirements on the communication of messages towards dangerous phenomena. As an example, the master of every ship which meets dangerous phenomena is obliged to communicate the information to ships in the vicinity and the authorities. The existence of such requirements reveals the need of capable ICT applications and relevant technologies to preserve an effective communication network at dangerous waters [Deggim (2009)].

A mandatory Polar Code would result in significant improvements in the safety of navigation in polar waters and enhance the reliability of the relevant services. It would further contribute to selecting the east- and west-bound arctic routes more often, a fact that could lead to substantial improvements in environmental performance, duration, and frequency of service due to significant shortening of travelled distances in relation to the traditional routes taken. Significant efficiency gains are also expected by such routing, while the role of ICT applications is expected to be important as already mentioned.

9.6 Enhance international security

Security has become a high profile policy issue since 2001. Transport is both a target and an instrument of terrorism, a fact that creates obvious overlaps between transport policy and security policy. This connection is further explained by the nature of operational measures enhancing security, which are likely to put barriers in the way of mobility, either by actually stopping certain flows of people or goods, or at least by adding time to journeys (as can be currently seen with the extra time need for air travel due to airport security measures) [Petersen et al. (2009a)].

In the Mid-Term Review the European Commission expressed its intention to extend the security rules already taken in aviation and maritime transport to land transport, including urban transport and train stations and the intermodal logistics chains. It recognizes, however, that in improving worldwide security standards, there is a need to avoid unnecessary and costly duplication of controls and to stimulate a level playing field where the cost of security measures is likely to distort competition.

The new White Paper keeps transport security high on the EU's agenda and further proposes a risk based approach to the security of cargo originating outside the EU [EC (2011)].

A very good example of the danger of over-regulating is the U.S. suggested requirement for 100% scanning of U.S.-bound containers. An impact assessment study [Policy Research Corporation (2009)] concluded that such a measure:

- will require additional movements to transfer containers to and from scanning site (if scanning takes place outside the terminal),
- will take up valuable terminal area (if scanning takes place at the terminal gate or on the terminal),
- will intensify the inherent congestion problem of several European ports,
- will raise direct costs for all containers due to reduced throughput capacity,
- will increase the turnaround time of feeder vessels and other vehicles delivering containers to the terminal,
- will increase external costs due to a shift from rail and barge to truck, and
- will increase cargo inventory costs due to extended times of goods destined for the U.S.,

while the security gains are questionable.

Enhancing international security will reduce significantly the relevant risks and improve reliability and ICT applications, at the expense of transport time and cost (although it is possible to have lower insurance premiums). However, due care needs to be given to avoid over-regulation, which can create bottlenecks and have significant adverse effects on transport time and cost.

9.7 Establish global standards for ICT applications in shipping

The merits for establishing standards for ICT applications in shipping are no different than in other applications, and will not be repeated. The only difference here is the global scope of the change, which is tuned to the international nature of merchant shipping. However, given the difficulties that ICT standardisation faces at European level, the measure looks overwhelmingly optimistic.

9.8 Establish global standards for IWT-engines

The rules on emission norms of engines are based on CCNR rules and also Directives by the European Commission. The EC legislative file of Non-Road Mobile Machinery (NRMM) contains today 4 directives: the "mother" Directive 97/68/EC, the amendments Directive 2002/88/EC and Directive 2004/26/EC, and the last amendment Directive 2006/105/EC. It turns out that engine industry is not very keen on building specific engines for inland waterway transport in Europe. The IWT market for this type of engine is simply too small for the manufacturers to invest heavily in the development of new types of engines. As a consequence, if there are specific regulations for engines in the IWT sector, the engines either will not be available in time and/or will be very expensive.

The proposed solution is to look at the possibility to agree upon broader based, e.g. worldwide, standards. The IWT standard, then, will preferably become part of a bigger standard for different engine applications and also geographic markets. A big scale of production of engines with the same specification will make it certainly more cost-efficient for engine manufacturers to develop cleaner engines. Also the price of the engine will then be lower. Already the European Commission is following this approach. There is co-operation with the USA, IMO, CCNR and Intermot for different engine applications (diesel locomotives, industrial engines, recreational crafts, etc.) [Visser J.A. (2008)].

Establishing global standards for IWT-engines can bring improvements in the environmental performance of inland navigation vessels faster in the market and at a lower cost.

9.9 Upgrade EU status in IMO

The European Commission has long expressed its wish to upgrade its present observer status in IMO and become a full member of this organisation. The intention is to increase EU’s ability to assert itself in the international arena and speak with a single voice in defence of its social, industrial and environmental interests. This wish was recently confirmed with the new White Paper [EC (2011)]. However, the fact is that the Member States do not always adopt a consistent position within IMO due to conflicting interests [EC (2001)].

A possible upgraded EU status in IMO could result in improvements in the environmental performance, safety and security of shipping operations probably at the expense of increased transport costs, provided that EU will succeed pursuing its policy objectives within this organisation.

10 Conclusions

The task identified 77 changes that might promote or hinder the implementation of the green corridor concept. They are presented by theme in Tables 2-8 of the preceding sections. To enhance legibility, the identified changes and their effects on SuperGreen KPIs are summarised in Table 9[14] below. Their effectiveness on reducing CO_2-eq (in descending order) was selected as the primary criterion for sorting the aggregated changes. As secondary one, their effect on reducing costs was used, while their combined impact on all other KPIs (at equal relative weights) was the tertiary criterion.

Supporting R&D appears at the top of the list as enabling very significant reductions of GHGs in the future. Its positive effects on most other KPIs should not be overlooked, either. Also related to R&D is the second most effective change in terms of environmental performance; the use of alternative fuels which, however, is expected to come at a higher price. These two changes are followed by 17 other ones that exhibit significant improvements in terms of CO_2 emissions. The most prominent among them are the promotion of intermodal freight villages (including UDCs) and the development of smart ICT applications for both vehicles/vessels and infrastructure.

An interesting observation regarding Table 9 relates to its bottom layer. The least favourable change in terms of environmental performance is increasing economic activity which in addition, will lead to significant increases in costs, congestion and other bottlenecks, noise and accidents, while significant pressures will also be exerted to land use because of it. The trouble lies to the fact that economic prosperity is one of the four key objectives of the EU Sustainable Development Strategy; the other three being: environmental protection, social equity and cohesion, and meeting EU's international responsibilities. The resulting challenge of 'sustainable mobility' can only be addressed if in the future transport develops along a path different than its past one. The employment of packages of complementary measures becomes necessary. Similar complexities are created by the adverse effects of EU enlargement and EU integration, both of which comprise well established European objectives, too.

The 77 identified changes can be sorted on the basis of different set of criteria. In order to avoid lengthy tables, Table 10 summarises the 4 most effective measures that result when the primary criterion has been changed to one of the following: (i) reducing cost, (ii) reducing time, (iii) increasing reliability, or (iv) increasing frequency. Containerisation enjoys a prominent position in all these new lists. The construction of dedicated freight rail lines and the creation of freight-oriented corridors are very important when transport time and reliability are concerned. In terms of frequency of service, the newcomers are the liberalisation of transport operations and the establishment of a mandatory polar code.

[14] This table was produced for the latest version of this report in response to the constructive comments of the Project Officer, Ms. Fleur Breuillin of DG MOVE.

Table 9. Summarised effects of all changes, sorted on the basis of CO_2 reduction

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues		
No.	**Change**	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise
1	Support R&D	--	-	+		+++			---	---	---	---	-	-		---	---
2	Use alternative fuels	+							---	---	---	---					--
3	Promote intermodal freight villages (including UDCs)	--	--	++	+	+++	(+)	--	--	--	--	--	--	---	++	--	--
4	Develop ICT solutions for vehicles & infrastructure	--	--	++		+++	-		--	--	--	--	--	-		--	
5	Develop more efficient cargo handling and transport technologies	--	--			++			--	--	--	--	--	--		--	--
6	Optimise fleet and terminal operations	--	-	+	+	++			--	--	--	--	--	-		--	--
7	Establish a mandatory Polar Code	--	--	+	++	++	--		--	--	--	--				---	
8	Vehicle/vessel capacity optimisation (technical)	--							--	--	--	--	--	-		--	--
9	Reduce forces on vehicles/ vessels	--							--	--	--	--					
10	Increase efficiency of propulsion systems	--							--	--	--	--					
11	Slow steaming	--	++		--				--	--	--	--					
12	Increasing social & env. consciousness								--	--	--	--	--	-		--	--
13	Supply chain integration	+ / --	--	++		+++	--		--	--	--	--	--				--
14	Harmonise infrastructure (interoperability)	+ / --	--	++		++			--	--	--	--		---			
15	Develop green corridors	-		++		++	-	-	--	--	--	--	--	--		--	--
16	Construct dedicated freight rail lines	- (+)	---	+++	+++	++			--	--	--	--	--	---	++	--	--

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 9. Summarised effects of all changes, sorted on the basis of CO_2 reduction (cont'd)

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues		
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise
17	Set energy/emission/noise standards & other regul.	+							--	--	--	--					--
18	Improve after-treatment of exhaust gases	+							--	--	--	--					
19	Internalise external costs	++				++			--	--	--	--	--	-			--
20	Liberalise transport operations	-- (-)	-- (-)	++ (+)	++	++			-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-		-- (-)	-- (-)
21	Upgrade existing infrastructure	-- (-)	-- (-)	++ (+)					-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)		-- (-)	-- (-)
22	Expand infrastructure	-- (-)	-- (-)	++ (+)	+				-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)
23	Create a core network of high EU added value	-- (-)	-- (-)	++ (+)	+				-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)
24	Ensure adequate public and private funds	-- (-)	-- (-)	++ (+)					-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	++	-- (-)	-- (-)
25	Create freight-oriented corridors	-	---	+++		++	-	-	(--)	(--)	(--)	(--)	(--)	---		(--)	(--)
26	Monitor and publish service quality indicators	-	--	++		++	-		-	-	-	-	-	-		--	-
27	Educate, inform and involve the greater public in transport policies (incl. labelling)	-	-	+		++	-	-	-	-	-	-	-	-		--	-
28	Introduce combined transport solutions	-	-	+					-	-	-	-	-	--		-	-
29	Enhance training on environmental transport	-	-	+		+	-		-	-	-	-		-		-	
30	Adopt common methodologies in project appraisal	-	-	+					-	-	-	-	-	-		-	-

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 9. Summarised effects of all changes, sorted on the basis of CO_2 reduction (cont'd)

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues		
No.	**Change**	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise
31	Harmonise rules and enforcement	-		+			-		-	-	-	-		-		-	-
32	Support fair international trade	-		+			--		-	-	-	-				--	
33	Designate unloading places for delivery vehicles in dense urban areas	-	-						-	-	-	-	-				-
34	Introduce a container pool system	-				++			-	-	-	-		-			
35	Ensure satisfactory working conditions	-		+			-		-	-	-	-				-	
36	Develop new methods for structural assessment of existing infrastructure	-							-	-	-	-		-			-
37	Introduce the Life Cycle Cost (LCC) methodology	-				+			-	-	-	-					-
38	Eco driving	-	+						-	-	-	-				-	-
39	Establish global standards for IWT-engines	-							-	-	-	-					
40	Green public procurement								-	-	-	-					-
41	Population size	+ / -	-	+					-	-	-	-	-	-		-	-
42	Improve env. performance of auxiliary systems	+							-	-	-	-					
43	Increasing scarcity of fossil fuels	+++	-		-				-	-	-	-	-	-		-	-
44	Hub & spoke system	--	++		+	++			+ / --	+ / --	+ / --	+ / --		+			+
45	Standardise transport units and vehicles	+ / --	--	++			-		- (+)		- (+)	- (+)	(+)	-		- (+)	(+)
46	Adopt EEDI	+	+		-				- (+)	- (+)	- (+)	- (+)					

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 9. Summarised effects of all changes, sorted on the basis of CO_2 reduction (cont'd)

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues		
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise
47	Standardise liability and documentation for multi-modal transport	-							(-)	(-)	(-)	(-)	(-)			(-)	(-)
48	Upgrade EU status in IMO	(+)					(-)	(-)	(-)	(-)	(-)	(-)				(-)	
49	Simplify administration	--	--			+++								---			
50	Net migration to the EU	-															
51	Increasing mobility of workers	-															
52	Promote international cooperation with EU neighbouring countries	(-)	(-)	(+)										(-)			
53	Information sharing	+ / -	-	++		+++	--							--			
54	Tighten up security standards	+ / -	+	+		+		--						(+)			
55	Ageing population	+ / -														-	
56	Create dedicated parking areas for trucks with appropriate security levels							--									
57	Enhance international security	+ / - (++)	+ (++)	+		+		--						(+)			
58	Tighten up and harmonise safety standards	+		+			-									---	
59	Optimise vehicle and infrastructure in relation to noise generation	+															--
60	Proliferation of electronic business	+ / -	-	+	+	+			+ / -	+ / -	+ / -	+ / -	+ / -			+ / -	+ / -

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 9. Summarised effects of all changes, sorted on the basis of CO_2 reduction (cont'd)

		Efficiency	Service quality						Environmental sustainability				Infr. Suff.		Social issues		
No.	Change	Transport cost	Transport Time	Reliability	Frequency	ICT applications	Cargo damages	Cargo theft etc.	CO2-eq.	SOx	NOx	PM	Congestion	Bottlenecks	Land use	Accidents	Noise
61	Urbanisation and city sprawl	++ / --	++ / --		++				++ / --	++ / --	++ /--	++ /--	+++	+	+++	+++	+++
62	Strengthen restrictions on NOx and SOx	++							(+)	- (+)	- (+)	(+)	(+)			(+)	(+)
63	Containerisation	---	---	++	++	+++	---	---	+	+	+	+		---		-	
64	Reverse logistics	+ / -	+			+			+	+	+	+	+			+	+
65	Improving responsiveness to customer requirements (agility/adaptability)	+	-	++	++	++	-		+	+	+	+	+			+	+
66	Increasing direct deliveries	+	-	+	+	+			+	+	+	+	+			+	+
67	Increasing individualisation	+	-	+	+	+			+	+	+	+	+			+	+
68	Globalisation	+						+	+	+	+	+	+	+			
69	Technological convergence (productivity)	+						+	+	+	+	+	+	+			
70	Increasing congestion	+	+	-					+	+	+	+	+				+
71	Reduced public expenditures on transport	+	+	-					+	+	+	+	+	+		+	+
72	Increasing transport emissions								++	++	++	++					
73	EU enlargement	++ / --	+	-					++	++	++	++	++	++		++	++
74	Spatial concentration of production and inventory	++	+		++	+			++	++	++	++	++	++		+	+
75	Wider sourcing of supplies and wider distribution of goods	++	+		++	+			++	++	++	++	++	++		+	+
76	EU integration	++	+	-	+				++	++	++	++	++	++		++	++
77	Increasing economic activity	++	+		+				++	++	++	++	++	++	++	++	++

Legend: +/- = moderate increase/decrease; ++/-- = significant increase/decrease; +++/--- = very significant increase/decrease (and combinations thereof)

Table 10. Most effective changes for other criteria

Primary criterion	Four most effective changes in descending order
CO_2-eq	Support R&D
	Use alternative fuels
	Promote intermodal freight villages
	Develop ICT applications
Transport cost	Containerisation
	Support R&D
	Promote intermodal freight villages
	Develop ICT applications
Transport time	Containerisation
	Construct dedicated freight rail lines
	Create freight-oriented corridors
	Promote intermodal freight villages
Reliability	Construct dedicated freight rail lines
	Create freight-oriented corridors
	Containerisation
	Promote intermodal freight villages
Frequency	Construct dedicated freight rail lines
	Containerisation
	Liberilise transport operations
	Establish a polar code

The main conclusions reached have been grouped below in those referring to the EU transport policy in general, and the more specific ones concerning the green corridors.

10.1 EU transport policy

Four points need to be made in relation to the general EU transport policy:

Firstly, all identified barriers to green corridor development have been adequately addressed by the various policy documents reviewed. Of particular importance are the administrative barriers addressed by the Freight Transport Logistics Action Plan. Given the European realities, the progress made by the European Commission during the last decade in creating a legal framework conducive to the needs of a modern European transport system is impressive. The effort needs to be continued to meet today's social and environmental challenges in the framework of increasingly scarce monetary and non-monetary resources. Special attention should be given to the enforcement of existing legislation.

Secondly, the corridor approach, as it has been emerged during the last decade, is an effective way to address the fragmented nature of European transport networks, especially in the rail sector. The necessary international cooperation among the Commission, the Member States, regional and local authorities, infrastructure owners and managers, transport operators, terminal owners/managers, and financiers can more effectively been achieved if focused on a corridor level. The same applies in relation to wider transport policy objectives like modal integration and internalisation of external costs. Furthermore, the corridor structure allows the voluntary involvement of shippers and transport operators to committing themselves to reducing their carbon footprint, especially if accompanied with a "green" labeling system.

Thirdly, the sustainable mobility objective of the EU policy is a complex matter; its complexity stemming from the requirement to minimise the undesirable impacts on the environment, whilst meeting the society's economic and social needs. Such an objective requires a structural change in the transport systems as we know them today. Technology, in particular commercially viable alternative fuels, appeals as the most effective driver for such change in the medium to long run. For the immediate future, ICT applications offer the potential for significant gains in terms of capacity and efficiency of transport networks without requiring major investments. Both these measures require sufficient support to the relevant R&D efforts. Furthermore, the potential contribution of other measures should not be overlooked. The significance of educating, informing and involving the greater public in transport policies has been acknowledged as a precondition for their effectiveness. In general, effectiveness is enhanced by employing packages of complementary instruments.

Fourthly, all points made above are adequately addressed by the new White Paper, which:

- includes most of the initiatives of the Freight Transport Logistics Action Plan that have not been completed yet (e.g. e-Freight, ITS, single transport document, standard liability clause, 'end-to-end' security, new legislation on weight and dimension, best practice guidelines for urban freight flows, etc.);
- foresees a vigilant enforcement of the competition rules across all transport modes;
- exploits the advantages of the corridor approach through the introduction of the core network concept; and
- recognises the need for new transport patterns, in fact naming the use of alternative fuels and advanced ICT applications as prominent features of two of the three strands that future development must rely on; the third one concerns the performance of multimodal logistic chains, which is the main objective of green corridors by definition.

Finally, over-regulating is an issue that needs not to be overlooked, since improvements in one aspect might create problems in another. Three such cases were identified in the literature survey performed under Task 2.3, all concerning maritime transport and non-EU institutions. The first one is the IMO's EEDI formula, which if adopted, might lead to the construction of underpowered ships which, in their attempt to go faster or just maintain speed in bad weather, might emit disproportionately more CO_2. The second one concerns the U.S. suggested requirement for 100% scanning of U.S.-bound containers, which can create bottlenecks and have significant adverse effects on transport time and costs through reduced port throughput capacity. The third one is the IMO's suggestion to reduce the maximum sulphur content of fuel oil burnt by ships from 1% to 0.1% as from 1 January 2015 in SECAs which, if applied, could lead to a 'back-shift' from short sea shipping to road transport with effects opposite to those intended.

Given the fact that the European Commission has acknowledged this last danger of over-regulation, policy action towards provision of financial instruments aimed at avoiding such 'back-shift' was proposed during the Antwerp workshop. A possibility worth assessing is the amendment of the new Marco Polo programme to include such schemes.

10.2 Green corridors

Green corridors concern the movement of international freight over long distances by all surface modes of transport, used alone or in combination. They further employ advanced ICT applications and innovative transport technologies in order to accommodate rising traffic volumes while promoting energy efficiency and environmental sustainability.

The concept, consistent with the corridor approach mentioned above, is by far more complicated than the recently introduced freight-oriented corridors. Nevertheless, four valuable lessons can be drawn from Regulation No 913/2010, which introduced the freight-oriented corridors.

Firstly, the Regulation separates the criteria for establishing a freight-oriented corridor from the indicators monitored after its establishment. In fact, while the establishment criteria are defined by the Regulation, the indicators to be monitored are left for the corridor's management to decide with only broad directions given. This is a logic that can be followed for the green corridors, too.

Secondly, one of the establishment criteria is the definition of a freight-oriented corridor: *a corridor crossing the territory of at least three Member States or of two Member States if the distance between the terminals served by the freight corridor is greater than 500 km.* Although there is no need to expand this definition to the green corridors, it certainly provides a guideline to this end.

Thirdly, in recognition of the multiplicity of entities involved, the Regulation sets up a detailed governance structure, including representatives of the Member State authorities, Infrastructure Managers, Railway Undertakings and terminal owners/managers. To simplify communication with applicants and other interested parties, the establishment of a one-stop-shop is foreseen. Both the international governance structure and the one-stop-shop provided for by the Regulation can be features for the green corridor governance, with minor adjustments where needed.

Fourthly, the Regulation prescribes a number of implementation measures including:

a) a market study,
b) an implementation plan describing the characteristics of the freight corridor, including:
   - bottlenecks,
   - the programme of measures necessary for creating the freight corridor, and
   - the objectives for the freight corridor, in particular in terms of service quality and its capacity,
c) an investment plan including financial requirements and sources of finance,
d) a deployment plan relating to the interoperable systems along the freight corridor,
e) a performance monitoring mechanism,
f) a user satisfaction survey, and
g) the requirement to update all the above periodically.

All these requirements tie very well with the green corridor concept and should be retained.

It follows that there is a need for drafting a blueprint handbook on governance, operations and monitoring of green corridors.

In relation to the criteria for labelling a particular corridor as "green", it is suggested that the Commission assesses the possibility of including as prerequisites:

- the fair and non-discriminatory access requirement of the Freight Transport Logistics Action Plan, and

- the internalisation of external costs, which for the time being remains voluntary.

In this way, green corridors in addition to being a field for experimenting with innovative transport technologies and advanced ICT applications, can become a field for experimenting with EU transport policies, too. It is important to note that, according to the new White Paper, both these issues comprise central targets of the European transport policy. Furthermore, the above suggestion is in line with the core network concept proposed for the new TEN-T guidelines, which by placing emphasis on the European added value of the transport networks and their integration, in a way that combines efficiency targets with the sustainable development goals of the EU, basically extends the green corridor concept across all Europe.

Another conclusion reinforced by Tables 9 and 10 above, concerns the role of intermodal terminals and freight villages in the development of green corridors. The demonstrated shift of competition from among individual enterprises to among supply chains necessitates optimising performance at the chain level and this is impossible without nodes permitting the effective and efficient modal interconnection.

A final conclusion concerns the SuperGreen KPIs. In accessing the effects of the various regulatory and operational changes on green corridor development through the use of KPIs, it became evident that the relative form of the KPIs on emissions, congestion and accidents, expressed respectively in mass per ton-km, average delay over total transport time, and fatalities & serious injuries per ton-km units, is not sufficient. The absolute figures (mass, average delay, and fatalities & serious injuries) are also necessary to complete the picture. It is, therefore, suggested to add these variations in the KPI structure. This does not lead to additional effort, as the absolute figures enter the calculation of their relative variations and, thus, should be available.

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SUPERGREEN Document Fiche		**Number :**	**29**	**Partner :**	**NTUA**
Document identity		Field[1] :	STR	Doc.date :	12.9.2001
Doc. number :	COM(2001) 370	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**WHITE PAPER. European transport policy for 2010: Time to decide**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf				

Objective(s)

The White Paper proposes some 60 specific measures to be taken at Community level under the transport policy. It includes an action programme extending until 2010, with milestones along the way, notably the monitoring exercises and the mid-term review in 2005 to check whether the precise targets are being attained or whether adjustments need making.

Main findings / results achieved / summary of measures

The document is structured in four parts, each one containing a number of guidelines. A set of measures are proposed under each guideline. As the most relevant measures are listed in the last section of this fiche, only the guidelines are presented here.

Part One: Shifting the balance between modes of transport
Two priority objectives need to be attained by 2010:
- regulated competition between modes;
- a link-up of modes for successful intermodality.

The guidelines that form the basis for Community action are:
- Improving quality in the road sector
- Revitalising the railways
- Controlling the growth in air transport
- Adapting the maritime and inland waterway transport system
- Linking up the modes of transport

Part Two: Eliminating bottlenecks
The guidelines that form the basis for Community action are:
- Towards multimodal corridors giving priority to freight
- Towards a high-speed passenger network
- Improving traffic conditions through traffic management plans
- Major infrastructure projects eliminating bottlenecks
- Innovative approaches in project finance

Part Three: Placing users at the heart of transport policy

The guidelines that form the basis for Community action are:

- Reducing the number of deaths on the road by half
- Towards gradual charging for the use of infrastructure
- The need to harmonise fuel taxes
- Intermodality for people
- Rights and obligations of users
- Diversified energy for public transport
- Promoting good practice in urban transport

Part Four: Managing the globalization of transport

The guidelines that form the basis for Community action are:

- The infrastructure challenge generated by EU enlargement
- The opportunity generated by EU enlargement for a well developed rail network
- The new dimension for shipping safety offered by EU enlargement
- A single voice for the European Union in international bodies
- The urgent need for an external dimension to air transport
- Galileo: the key need for a global programme.

Relevance to green corridor development

The document formulated the Common Transport Policy for the period 2001 – 2010. Although no specific reference is made to green corridors, the main objectives of adjusting the balance between the modes, of eliminating bottlenecks in the trans-European networks (TEN), and of reducing the number of road accidents are central for the concept of green corridors.

Measures/changes suggested or introduced

The document suggests some 60 measures. The most important among them concerning freight transport by surface modes are listed below.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Harmonise inspections and penalties for the road sector	PP	Improvements in efficiency through fair competition between road haulage companies and between modes.
2	Promote the necessary skills and ensure satisfactory working conditions for professional drivers	PP	As above
3	Harmonise the minimum clauses in contracts governing road transport activity in order to allow tariffs to reflect sudden cost increases	PP	Protect carriers from consignors‘ pressures and avoid unjustifiably low tariffs for road transport vis-a-vis other modes. Improvements in efficiency through fair competition.
4	Open up the national rail freight markets to cabotage	PP	Improvements in efficiency through better utilisation of resources
5	Update the railroad interoperability directives	PP	Improvements in efficiency and service quality
6	Set up a Community structure for railway interoperability and safety	PP	Improvements in efficiency, service quality and social issues (safety)
7	Support the creation of new infrastructure, and in particular rail	ID	Direct improvements in infrastructural sufficiency, indirect ones in all other KPI

	freight freeways		areas
8	Include "Motorways of the Sea" in the TEN-T	PP	Improvements in infrastructural sufficiency concerning ports and their connections to land-based transport networks
9	Create one-stop offices for administrative and customs formalities in relation to maritime and inland waterway transport	PP	Improvements in efficiency and service quality of maritime and inland waterway transport
10	Tighten up maritime safety rules	PP	Improvements in safety and efficiency through fair competition between EU and non-EU flagged ships
11	Propose measures on tonnage-based taxation of sea-going ships	PP	Improvements in service quality through ship reflagging to Community registers
12	Standardise technical requirements for the entire waterway network	PP	Improvements in efficiency, service quality and social issues (safety)
13	Harmonise boatmasters' certificates throughout the Community's inland waterway network	PP	As above
14	Harmonise crew composition, working conditions and navigation time of inland waterway vessels	PP	As above
15	Introduce a new "Marco Polo" programme to support intermodality	PP	Improvements in environmental sustainability and service quality (reduced congestion) through modal shift from to road to the other modes
16	Develop the profession of freight integrator	PP	Potential improvements in efficiency and service quality
17	Standardise transport units and freight loading techniques	PP	Improvements primarily in efficiency and service quality
18	Revise the TEN-T guidelines to encourage corridors with priority for freight, traffic management plans for major roads, and to add a number of priority projects	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
19	Increase to 20% the maximum funding under TEN-T budget for the main bottlenecks	ID	As above
20	Revise the TEN-T guidelines to integrate the networks of the accession candidate countries and improve territorial cohesion	ID	As above
21	Establish a Community framework for allocating revenue from charges on competing routes to the construction of new infrastructure, especially rail	PP	As above

	infrastructure		
22	Harmonise minimum safety standards for road and rail tunnels	PP	Improvements in safety. Care should be taken to minimise negative effects on other KPI areas like efficiency and service quality.
23	Guarantee interoperability of toll systems on the trans-European road network	PP	Improvements in efficiency and service quality
24	Draw up a list of "black spots" on trans-European routes where there are particularly significant hazards and harmonise their sign-posting	PP	Improvements in social issues (safety)
25	Develop a methodology at European level to encourage independent technical investigations of accidents	PP	As above
26	Set out the principles and structure of an infrastructure-charging system and a common methodology for setting charging levels	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users.
27	Propose uniform taxation for commercial road transport fuel	PP	As above
28	Make provision in the Community's future financial perspective for adequate public funding of infrastructure in the new member countries	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
29	Develop the administrative capacities of the candidate countries, notably by training inspectors and administrative staff responsible for enforcing transport legislation	PP	Create level playing field for competition within and between transport modes.
30	Full membership for the European Community in the main international organisations, in particular the International Civil Aviation Organisation, the International Maritime Organisation, the Rhine Navigation Commission, the Danube Commission and Eurocontrol	IR	It would enhance the chances of getting necessary and/or preferred decisions ratified in these organizations on safety, security and environmental impact
31	Develop a satellite navigation system with global cover, which will meet the EU's accuracy, reliability and security requirements (Galileo)	TD	Direct improvements in ICT applications in the transport sector; indirect ones on all other KPI areas

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 26		Partner : NTUA	
Document identity		Field[1] : STR		Doc.date : 22.6.2006	
Doc. number :	COM(2006) 314	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Keep Europe moving – Sustainable mobility for our continent: Mid-term review of the European Commission's 2001 Transport White Paper**				
Related doc's :	Impact assessment of the Communication "Keep Europe moving" {SEC (2006) 768}				
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0314:FIN:EN:PDF				

Objective(s)

The document is the mid-term review of the European Commission's 2001 Transport White Paper, which is presented in the previous fiche. The areas where the White Paper measures have proved insufficient are identified, and further measures are suggested.

Main findings / results achieved / summary of measures

The White Paper proposed policies to adjust the balance between the modes, stressed the need to do away with bottlenecks in the trans-European networks (TEN) and to reduce the number of road accidents, it called for an effective policy on infrastructure charging and it argued that the Community should strengthen its position in international organizations.

The experience since 2001 as well as further studies and projections suggest that the measures envisaged by the Commission in 2001 will not be sufficient on their own to continue achieving the fundamental objectives of EU policy, in particular to contain the negative environmental and other effects of transport growth whilst facilitating mobility as the quintessential purpose of transport policy. In the enlarged EU, situated in a globalised, rapidly changing world, a **broader, more flexible, transport policy toolbox** is needed. Solutions may range from European regulations and their uniform application, economic instruments, soft instruments, and technological integration to a geographically differentiated approach, using methods of tailor-made legislation or enhanced cooperation.

The document presents the prevailing situation in all transport sectors and covers the following horizontal themes: employment and working conditions; passenger rights; safety; security; energy related issues; congestion and accessibility; sources of financing; smart charging schemes; transport logistics; intelligent transport systems; and the global dimension of transport.

The measures suggested by the document are presented in the relevant section of the fiche and are not repeated here.

Relevance to green corridor development

All topics covered by the document affect the development of green corridors. Of particular interest is the reference to transport logistics as a means of using existing infrastructure and vehicles more efficiently.

Measures/changes suggested or introduced

The measures suggested by the document, excluding those referring to aviation or passenger transport and those involving soft instruments like consultations with stakeholders, are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Remove technical barriers to interoperability and mutual recognition of equipment in the rail sector	PP	Improvements in the efficiency and service quality of freight rail transport
2	Promote rail freight corridors within transport logistics	PP	As above
3	Monitor rail market opening through a scoreboard	PP	As above
4	Develop a comprehensive strategy for a "common European maritime space"	PP	Improvements in the efficiency and service quality of maritime transport
5	Develop a comprehensive European ports policy	PP	As above
6	Take action to reduce pollutant emissions from waterborne transport	PP	Improvements in environmental sustainability provided that the potential 'back-shift' from SSS to road transport is avoided
7	Promote SSS and motorways of the sea, with particular emphasis on landward connections	PP	Improvements in the efficiency and service quality of maritime transport through better integration of SSS in intermodal logistics chains. Potential cargo shift from road to SSS.
8	Implement the NAIADES action plan for river transport	PP	Improvements in the efficiency and service quality of IWT. Potential cargo shift from road to IWT.
9	Review legislation on working conditions in road haulage	PP	Create level playing field for competition between road hauliers and between modes
10	Promote transport professions and training	PP	Potential improvements in all KPI areas excluding infrastructural sufficiency
11	Bring ITS applications to market and prepare infrastructure for co-operative (vehicle-to-vehicle and vehicle-to-infrastructure) systems	PP	Allow improved real-time management of traffic movements and capacity use, as well as the tracing and tracking of flows for environmental and security purposes
12	Organise road safety awareness campaigns (annual road safety day)	PP	Improvements in social issues (safety) in relation to road transport
13	Strengthen the functioning of the	PP	Potential improvements in social issues

	European safety agencies		(safety)
14	Review security rules in land, urban and maritime transport	PP	Potential improvements in service quality (security). Care should be taken to minimise negative effects on efficiency and transport time.
15	Draw up a strategy for critical infrastructure protection in the framework of EPCIP	PP	As above
16	Develop an action plan for energy efficiency and a road map for renewable fuels in transport	PP	Improvements in efficiency and environmental sustainability. Increased cost of infrastructure in the case of renewable fuels.
17	Launch of a major programme for green propulsion	PP	As above
18	Develop the TEN-T multiannual investment programme up to 2013	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
19	Propose an EU methodology for smart infrastructure charging	PP	It ensures fair and non-discriminatory prices for users, revenue for future infrastructure investment, ways to fight congestion, and discounts to reward environmentally more efficient vehicles
20	Develop a freight transport logistics action plan	PP	Improvements in all KPI areas through better use of existing infrastructure
21	Deploy e-maritime systems	PP	Allow improved real-time management of traffic movements and capacity use, as well as the tracing and tracking of flows for environmental and security purposes
22	Implement ERTMS on certain corridors	PP	As above
23	Achieve membership in international organizations like IMO and ICAO	IR	It would enhance the chances of getting necessary and/or preferred decisions ratified in these organizations on safety, security and environmental impact

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :** 19		**Partner :** **NTUA**	
Document identity		Field[1] : STR		Doc.date : 18.10.2007	
Doc. number :	COM(2007) 606	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**The EU's freight transport agenda: Boosting the efficiency, integration and sustainability of freight transport in Europe**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0606:FIN:EN:PDF				

Objective(s)

In line with the mid-term review of the 2001 transport White Paper, presented in the previous fiche, the document introduces a set of new principles guiding freight transport policy formulation and presents a number of policy initiatives that are launched simultaneously.

Main findings / results achieved / summary of measures

The mid-term review of the White Paper takes note of the change of context since 2001 characterised by the acceleration of the globalisation of production, insecurity of energy supplies, the increase in global warming and the continental dimension of the EU after enlargement to Central and Eastern Europe. In view of these changes, it suggests broadening the focus and the instruments of transport policy to meet the new challenges. To contribute to this objective, the 2007 Freight Transport Agenda is launched by the present document, consisting of the following set of policy initiatives:

- The *Freight Logistics Action Plan*, suggesting a series of actions to promote freight and traffic management, sustainable quality and efficiency, simplification of administrative processes, to review loading standards and examine, with a view to possibly reviewing, Directive 96/53/EC on vehicle dimensions and weights (while bearing in mind the consequences on the other transport modes).
- The *Communication on a freight-oriented rail network*, making rail freight more competitive, in particular by ensuring lower transit times and increasing rail's reliability and responsiveness to customer requirements.
- The *Communication on a European Ports Policy*, providing a vision and a toolbox for enhancing the

performance of ports as essential hubs in Europe's transport system, helping them attracting new investment, creating a stable dialogue between all stakeholders and improving their image.

- The *Commission staff working paper "Towards a European maritime transport space without barriers"*, starting a consultation process on allowing short sea shipping to fully benefit from the Internal Market through facilitation and simplification of administrative and documentary procedures, putting maritime freight transport on an equal footing with other transport modes.
- The *staff working paper on Motorways of the Sea*, describing progress made in developing Motorways of the Sea and suggesting further quality elements.

These policy initiatives adopt a common approach, which is characterized by:

- a focus on corridors, also connecting the transport chains to and from the neighbouring countries and overseas,
- the promotion of innovative technologies and practices in infrastructure, means of transport (such as vehicles, wagons and vessels) and freight management,
- the simplification and facilitation of freight transport chains and related administrative procedures, and
- the reinforcement of quality.

Relevance to green corridor development

The principles guiding the implementation of the actions and initiatives proposed are:

- co-modality requires improving the efficiency, interoperability and interconnectivity of rail, maritime, inland waterway transport, air, road transport and related hubs to achieve their full integration in a seamless door-to-door service;
- Intelligent Transport Systems offer a way to improving transport and cargo management, and increasing the utilisation of available infrastructure;
- the concept of green corridors gives further substance to the objective to integrate environmental, as well as safety and security concerns in the design and operation of infrastructure on the trans-European transport network;
- finally, user requirements need to become the focus of the future.

Green corridor development is the concept that incorporates all these principles.

Measures/changes suggested or introduced

No measures are suggested directly by this document. The measures introduced by the policy initiatives presented by the document are mentioned in the fiches concerning these initiatives.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
			.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 11		Partner : NTUA	
Document identity		Field[1] : STR		Doc.date : 17.6.2009	
Doc. number :	COM(2009) 279	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**A sustainable future for transport: Towards an integrated, technology-led and user friendly system**				
Related doc's :					
Web address :	http://www.eu-oplysningen.dk/upload/application/pdf/e752d81a/20090279.pdf				

Objective(s)

Approaching the end of the ten-year period covered by the 2001 White Paper (covered by a previous fiche), the present document looks further ahead and prepares the ground for later policy developments. It summarises the results of a wide reflection launched, comprising an evaluation study on the European Transport Policy (ETP); a debate within three ‘Focus Groups’; a study – ‘Transvisions’ – identifying possible low-carbon scenarios for transport; and a consultation of stakeholders.

The study refers to recent developments of the European Transport Policy, identifies trends in transport drivers and the likely challenges they could pose to society, proposes some intermediate policy objectives and, describes some available instruments and possible lines of intervention for achieving the stated objectives.

Main findings / results achieved / summary of measures

Recent developments

The ETP has largely achieved the objectives set out in the past decade by substantially contributing to the development of the European economy and its competitiveness, by facilitating market opening and integration, by establishing high quality standards for safety, security and passenger rights and by improving working conditions. However, the environment remains the main policy area where further improvements are necessary.

GHG emissions can be seen as the product of three components: the amount of the activity that generates the emissions; the energy intensity of that activity; and the GHG intensity of the energy that is being used. Applying this analysis to past developments in transport, it can be seen that the sector has greatly increased its activity while making insufficient progress in reducing its energy and GHG intensity.

The strong increase in global trade and the deepening integration of the enlarged EU prevented the decoupling of freight transport from GDP in the last decade. The growth of freight transport is also linked to economic practices – concentration of production in fewer sites to reap economies of scale, de-localisation, just-in-time deliveries, wide-spread recycling of glass, paper, metals – that allowed reduction of costs and, possibly, of emissions in other sectors at the expense of higher emissions from transport.

The energy efficiency of transport is increasing, but the gains in efficiency have not been entirely devoted to reducing overall fuel consumption and have not been enough to outweigh the larger transport volumes. There has also been limited progress in shifting transport to more efficient modes, including through the development of short sea shipping, although a certain rebalancing has taken place and the relative decline of rail transport appears to have stopped.

Transport did not reduce significantly its GHG intensity by switching to cleaner energy sources and still depends to 97% on fossil fuels, which has negative implications also for the security of energy supply.

Trends and challenges

The European population is ageing fast. Through its effect on public finances (more public resources devoted to pension payments, health care and nursing), ageing will put a strain on the supply and maintenance of transport infrastructure and set a limit for funding available to public transport. A scarcity of labour and skills may arise, further aggravating the shortage of skilled labour already experienced in some segments of the transport sector. Overall, this may result in higher transport costs for society.

The expected significant net migration to the EU could play an important role in mitigating the effect of ageing on the labour market. Migrants, generally young and mainly living in urban areas, will further intensify Europe's ties with neighbouring regions, entailing more movement of people and goods.

Mobility of workers within the Union is also expected to increase with the gradual removal of administrative and legal barriers and further deepening of the internal market.

There is growing urgency for the transport sector to mitigate its negative impact on the environment. Many Europeans still remain exposed to dangerously high levels of air and noise pollution. Also pollution from shipping emissions of NOx and SOx needs to be addressed.

Transport itself will suffer from the effects of climate change. Global warming resulting in a rising sea level will amplify the vulnerability of coastal infrastructures, including ports. Extreme weather events, would affect the safety of all modes. Droughts and floods will pose problems for inland waterways.

Oil and other fossil fuels are expected to become more expensive as demand increases and low-cost sources dry up. At the same time, the need to move to a low-carbon economy and the growing concerns about energy security will bring about a greater supply of renewable energy, made much cheaper by technological progress and mass production. Investments in alternative energy sources will become more attractive. The need to establish supporting infrastructures and the long life span of vehicles will delay the transition process. The immediate consequence of such transformation will be the reduction in the need to transport fossil fuels, which currently represent around half of the volume of international shipping.

Urbanisation has been a clear trend in the past decades and is expected to continue. The city sprawl is the main challenge for urban transport, as it brings about greater need for individual transport modes, thereby generating congestion and environmental problems. On the other hand, the availability of land and public acceptability to construct new infrastructures for public or alternative means of transport will remain a great challenge.

Globalisation has been a powerful trend of the past decades, enabled by trade liberalisation agreements and by revolutionary developments in transport and communication technologies (from containers to satellite radio-navigation) that have reduced distance and time barriers. Although it may be temporarily halted by economic crises and geopolitical instability, the strong economic growth of many developing countries implies further globalisation, albeit at a slower pace.

Together with further deepening of the Single Market, integration of the EU with neighbouring regions

(Eastern Europe, North Africa) is likely to continue.

The fast increase of the world population will have a tremendous impact on global resources, making the goal of setting up a more sustainable transport system – one which uses fewer resources – all the more important.

Policy objectives for sustainable transport

The ongoing trends and future challenges highlighted above, point to the need for satisfying a rising demand for 'accessibility' in a context of growing sustainability concerns. The most immediate priorities appear to be the better integration of the different modes of transport as a way to improve the overall efficiency of the system and the acceleration of the development and deployment of innovative technologies. The following seven broad policy objectives are proposed:

- *Quality transport that is safe and secure:* An improvement of the overall quality of transport, including personal security, the reduction of accidents and of health hazards, the protection of passengers' rights and the accessibility of remote regions, must remain a high priority of transport policy.
- *A well maintained and fully integrated network:* A better exploitation of the network's capacity and of the relative strengths of each mode could contribute significantly to reducing congestion, emissions, pollution and accidents. This however requires the optimisation and operation of the network as a single entity, whereas currently modal networks are largely separated and even within modes there is a lack of integration between countries.
- *More environmentally sustainable transport:* In devising the future of the transport system, all elements of sustainability should be taken into account. This concerns the operation of transport means (emissions, noise) as well as the provision of infrastructure (land occupancy, bio-diversity).
- *Keeping the EU at the forefront of transport services and technologies:* ICT applications can optimise the use of the network and improve quality; innovative vehicle technology can lower emissions and reduce oil dependency, while keeping and enhancing the EU leadership in many fields of transport activity is a key factor in preserving the overall competitiveness of the EU economy.
- *Protecting and developing the human capital:* Any restructuring resulting from adapting to innovation and new market needs should be carried out in a socially responsible way entailing information and consultation of workers, social dialogue, early identification of skills shortages and training, while working conditions are maintained or improved.
- *Smart prices as traffic signals:* With correct pricing of externalities for all modes and means of transport, the EU transport operators and citizens would make the right choice just by opting for the cheaper solution.
- *Land-use planning with an eye to transport:* When taking land-use planning or location decisions, public authorities and companies should take into account the consequences of their choices in terms of travel needs of clients and employees in addition to the transport of goods.

Policies for sustainable transport

The suggested policies are organised in the following seven themes:

1. *Infrastructure: maintenance, development and integration of modal networks*
    - Promotion and development of intermodal and transhipment terminals
    - Well focused infrastructure expansion to remove bottlenecks
    - Identification of green corridors
    - Adoption of common methodologies and similar assumptions in the appraisals of infrastructure projects across modes and, possibly, countries
    - Upgrading the existing infrastructure, also through intelligent transport systems
    - Considering dedicated infrastructures for passenger and freight, either in the form of dedicated freight corridors or by setting 'smart' priority rules

- Making the 'motorways of the sea' a reality
- Developing ICT solutions as a support for better management and integration of transport flows.

2. *Funding: finding the resources for sustainable transport*
   - Implementation of the strategy for internalisation of external costs in all transport modes.
3. *Technology: accelerating the transition to a low-carbon society and leading global innovation*
   - Introduction of open standards and norms for new infrastructure and vehicles and other necessary devices and equipment
   - fostering R&D expenditures towards sustainable mobility.
4. *The legislative framework: further promoting market opening and fostering competition*
   - completion of the internal market with a strong enforcement of competition rules
   - administrative simplification aiming at reducing unnecessary burdens on transport companies
   - harmonised environmental obligations, effective supervision, uniform protection of workers conditions and users' rights
   - creation of transnational infrastructure managers.
5. *Behaviour: educate, inform and involve*
   - Influencing future consumer behaviour through education, information and awareness raising campaigns
   - Involvement of the greater public in transport planning through open consultations, surveys and stakeholders' representation in decision processes
   - Consultation of transport workers and the sectoral social partners on the development, application and monitoring of transport policy.
6. *Governance: effective and coordinated action*
   - Effective coordination in relation to equipment standards and interoperability
   - Provide a framework supporting local authorities to take measures.
7. *The external dimension: the need for Europe to speak with one voice*
   - Promote international cooperation aiming at establishing the necessary interconnection of the major transport axes of EU neighbouring countries
   - Upgrade EU status in international organizations.

Relevance to green corridor development

The document sets the ground for the European Transport Policy of the next decade; as such it is highly relevant to green corridor development, which happens to be one of the proposed policy measures.

Measures/changes suggested or introduced

The most important trends and policy measures identified by the project are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Ageing population	BE	Increased transport costs through reduced public funding available for transport, and further aggravation of skilled labour shortage
2	Net migration to the EU	BE	Mitigation of the effect of ageing population on the labour market. Increased demand for transport services particularly with EU neighbouring regions.
3	Increased mobility of workers	BE	Improvements in efficiency

	within the EU		
4	Increased environmental consciousness	BE	Stronger pressure to decrease emissions and use more environment-friendly transport modes, which in turn may modify modal split in favour of environment-friendly modes where possible
5	Increasing scarcity of fossil fuels	BE	Increased transport costs and modestly reduced demand for transport services in the short run due to increased fuel prices. Substantial improvements in environmental sustainability in the long run when alternative fuels would have entered the market, combined with reduced demand for the shipping industry.
6	Urbanisation and city sprawl	BE	Increased congestion and environmental problems mainly in urban areas, but also adversely affecting the inter-urban transport
7	Globalisation	BE	Increased demand for transport services basically through longer distances, although globalisation appears to level off.
8	EU integration	BE	Positive effect on consumption and freight transport demand
9	Promote intermodal and transhipment terminals	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
10	Expand infrastructure	ID	As above
11	Identify green corridors	PP	Direct improvements in all KPI areas
12	Adopt common methodologies in appraisals of infrastructure projects	ID	Improve effectiveness of investments in infrastructure
13	Upgrade existing infrastructure, also through intelligent transport systems	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
14	Promote dedicated freight corridors or set ‘smart’ priority rules	PP	Enhanced utilisation of the transport networks through improvement of capacity, transit time and reliability
15	Implement ‘motorways of the sea’	PP	It is an efficient way to improve traffic safety and reduce energy consumption and emissions of greenhouse gases per tonne-kilometre for cargoes shifted from land to sea
16	Develop ICT solutions	TD	Allow improved real-time management of traffic movements and capacity use, as well as the tracing and tracking of flows for environmental and security purposes
17	Internalise external costs in all transport modes	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and

			enhancement of fairness between transport users
18	Introduce open standards for new infrastructure, vehicles and other equipment	TD	Improvements in all KPI areas through enhanced interoperability within and between modes. Fostering European standards on an international scale would further enhance competitiveness and performance of European transport related industries.
19	Foster R&D expenditures towards sustainable mobility	PP	Potential improvements in all KPI areas
20	Complete the internal market with a strong enforcement of competition rules	PP	Improvements in efficiency through the creation of a level playing field for all transport operators
21	Simplify administration	PP	Significant improvements in efficiency and service quality
22	Harmonise environmental obligations and working conditions	PP	Improvements in efficiency through the creation of a level playing field for all transport operators
23	Promote transnational infrastructure managers	PP	Enhanced utilisation of transnational networks through improvement of capacity, transit time and reliability
24	Educate, inform and involve the greater public in transport planning	PP	A better understanding of the challenges ahead is a precondition for public acceptance of the solutions, which in turn leads to enhanced effectiveness of policy making
25	Promote international cooperation with EU neighbouring countries	PP	Improvements in the efficiency of international trade and the competitiveness of European industries
26	Upgrade EU status in international organizations	IR	It would enhance the chances of getting necessary and/or preferred decisions ratified in these organizations on safety, security and environmental impact

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number : 60**		**Partner : NTUA**	
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Doc. number :	COM (2011) 144	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**WHITE PAPER: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF				

Objective(s)

Building on the lessons learnt, this document takes a global look at developments in the transport sector, at its future challenges and at the policy initiatives that need to be considered in the coming decade. It contains the Commission's vision of future transport and the corresponding strategy. The latter is transformed into a long list of actions to be taken at Community level. A set of 10 benchmarks is also specified for achieving the ambitious target of reducing by year 2050 greenhouse gas emissions by at least 60% with respect to 1990.

Main findings / results achieved / summary of measures

The document is structured in the three parts that are briefly presented below:

1. Preparing the European transport area for the future

Serving as an introduction, this part refers to the challenges that transport faces despite the progress made during the last decade. Since the 2001 White Paper on Transport:

- further market opening has taken place in aviation, road and partly in rail transport;
- the Single European Sky has been successfully launched;
- the safety and security of transport across all modes has increased;
- new rules on working conditions and on passenger rights have been adopted;
- trans-European transport networks have contributed to territorial cohesion;
- international ties and cooperation have been strengthened; and
- a lot has been done to enhance transport's environmental performance.

However, the transport system remains unsustainable and new challenges have been added to the old ones. Reference is made to:

- the ability to provide unconstrained mobility while anticipating resource and environmental
- considerations;
- the remaining bottlenecks and other barriers in relation to the internal transport market;
- the need to unite the transport systems of the eastern and western parts of Europe;
- the need to reduce Europe's oil dependence;

- the need to drastically reduce world greenhouse gas emissions in line with Europe's international commitments;
- the need to develop and deploy new technologies for vehicles and traffic management as a means to fundamentally change the transport system;
- the need of the European transport industry to develop and invest in order to maintain its competitive position;
- the need to address congestion, particularly on the roads and in the sky;
- the need to provide adequate and intelligent infrastructure; and
- the increased pressure on public resources for infrastructure funding.

2. A vision for a competitive and sustainable transport system

The paramount goal of European transport policy is to help establish a system that underpins European economic progress, enhances competitiveness and offers high quality mobility services while using resources more efficiently. Curbing mobility is not an option. New transport patterns must emerge, according to which larger volumes of freight are carried jointly to their destination by the most efficient (combination of) modes. Individual transport is preferably used for the final miles of the journey and performed with clean vehicles. Information technology provides for simpler and more reliable transfers. Transport users pay for the full costs of transport in exchange for less congestion, more information, better service and more safety.

Future development must rely on three strands. These, together with the related benchmarks for achieving the GHG emissions reduction target (by at least 60% of 1990 GHGs by 2050) are listed below:

- Improving the energy efficiency performance of vehicles across all modes. Developing and deploying sustainable fuels and propulsion systems;
  (1) Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO2-free city logistics in major urban centres by 2030.

  (2) Low-carbon sustainable fuels in aviation to reach 40% by 2050; also by 2050 reduce EU CO2 emissions from maritime bunker fuels by 40% (if feasible 50%).

- Optimising the performance of multimodal logistic chains, including by making greater use of inherently more resource-efficient modes, where other technological innovations may be insufficient (e.g. long distance freight);
  (3) 30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors. To meet this goal will also require appropriate infrastructure to be developed.

  (4) By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.

  (5) A fully functional and EU-wide multimodal TEN-T 'core network' by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.

  (6) By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.

- Using transport and infrastructure more efficiently through use of improved traffic management and information systems (e.g. ITS, SESAR, ERTMS, SafeSeaNet, RIS), advanced logistic and market measures such as full development of an integrated European railway market, removal of restrictions on cabotage, abolition of barriers to short sea shipping, undistorted pricing etc.

(7) Deployment of the modernised air traffic management infrastructure (SESAR) in Europe by 2020 and completion of the European Common Aviation Area. Deployment of equivalent land and waterborne transport management systems (ERTMS, ITS, SSN and LRIT, RIS). Deployment of the European Global Navigation Satellite System (Galileo).

(8) By 2020, establish the framework for a European multimodal transport information, management and payment system.

(9) By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport.

(10) Move towards full application of “user pays” and “polluter pays” principles and private sector engagement to eliminate distortions, including harmful subsidies, generate revenues and ensure financing for future transport investments.

3. The strategy – What needs to be done

This section of the document transforms the vision described above in a 4-tier strategy:

- **A Single European Transport Area**
  Obstacles to a smooth functioning of and effective competition in the internal market persist. The objective for the next decade is to create a genuine Single European Transport Area by eliminating all residual barriers between modes and national systems, easing the process of integration and facilitating the emergence of multinational and multimodal operators. A vigilant enforcement of the competition rules across all transport modes will complement the Commission’s actions in this area. A higher degree of convergence and enforcement of social, safety, security and environmental rules, minimum service standards and users’ rights must be an integral part of this strategy, in order to avoid tensions and distortions.

- **Innovating for the future – technology and behavior**
  Innovation is essential for this strategy. EU research needs to address the full cycle of research, innovation and deployment in an integrated way through focusing on the most promising technologies and bringing together all actors involved. Innovation can also play a role in promoting more sustainable behaviour.

- **Modern infrastructure, smart pricing and funding**
  The efforts towards a more competitive and sustainable transport system need to include a reflection on the required characteristics of the network and must foresee adequate investments: EU transport infrastructure policy needs a common vision and sufficient resources. The costs of transport should be reflected in its price in an undistorted way.

- **The external dimension**
  Transport is fundamentally international. Because of this, many actions in this document are linked to challenges related to the development of transport beyond the EU borders. Opening up third country markets in transport services, products and investments continues to have high priority. Transport is therefore included in all our trade negotiations (WTO, regional and bilateral). Flexible strategies will be adopted to ensure the EU’s role as a standard setter in the transport field.

A total of 131 initiatives are proposed by the document for the materialization of this strategy. As most of these initiatives are listed in the last section of this fiche, they are not repeated here.

Relevance to green corridor development

The document formulates the Common Transport Policy for the period 2011 – 2020. Although the term “green corridor” appears only once in it, the commonalities in the underlying philosophies of the

White Paper and the green corridor concept are surprising. The five pillars of green corridors, as they have been expressed in the selected KPIs (efficiency, service quality, environmental sustainability, infrastructural sufficiency and social issues), have all a central role to play in the new policy. In a sense, the platform for innovations that characterises green corridors is expanded to include the entire Europe with emphasis on the new core network.			
Measures/changes suggested or introduced The document suggests 131 measures in total. The most important among them concerning freight transport by surface modes are listed below.			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Develop an integrated approach to freight rail corridor management	PP	Enhance the share of railways in freight transport through improvement of transit time, reliability and capacity use along specific rail corridors
2	Ensure effective and non-discriminatory access to rail infrastructure	PP	Improvements in efficiency through better utilisation of resources
3	Reinforce the role of the European Railway Agency	PP	Potential improvements in social issues (safety)
4	Ensure full interoperability between ICT systems in the waterborne sectors	TD	Improvements in efficiency and service quality of maritime and inland waterway transport
5	Set up appropriate port facilities ("Blue Lanes")	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
6	Review restrictions on provision for port services	PP	Improvements in efficiency and service quality
7	Enhance the transparency on ports' financing	PP	Potential improvements in infrastructural sufficiency through attraction of investments
8	Eliminate remaining restrictions on road freight cabotage	PP	Improvements in efficiency and environmental sustainability through avoidance of empty runs
9	Harmonise sanctions for infringement to EU rules on professional road transport	PP	Improvements in efficiency through fair competition between road haulage companies
10	Adapt legislation on truck weight and dimension to new circumstances	PP	Improvements in efficiency and environmental sustainability; potential adverse effects on infrastructure costs and traffic safety
11	Create and deploy a single transport document in electronic form (e-Freight)	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental

			sustainability and social issues areas
12	Deploy tracking and tracing technologies (e.g. RFID)	TD	Improvements in efficiency and service quality
13	Ensure that liability regimes promote rail, waterborne and intermodal transport	PP	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas
14	Encourage dialogue between social partners on a social code for road transport workers	PP	Improvements in efficiency through fair competition between road haulage companies
15	Enforce ILO and IMO conventions	IR	Improvements in efficiency, service quality and social issues
16	Establish a mutually recognisable framework on the training of port workers	PP	As above
17	Pursue Joint Security Assessment covering all modes of transport	pp	Improvements in security
18	Harmonise and deploy road safety technology	PP, TD	Improvements in safety
19	Develop common definitions and standard classifications of injuries and fatalities	PP	Potential improvements in safety
20	Enhance training and education of all road users	PP	Improvements in all KPI areas
21	Develop SafeSeaNet into the core system for all relevant maritime information tools	TD	As above
22	Streamline rules for intermodal transport of dangerous goods to ensure interoperability between the different modes	PP	Improvements in efficiency and service quality. As secondary effects, improvements in all other KPI areas are expected if modal shift from road to rail and waterborne transport takes place.
23	Develop mobility plans ensuring service continuity in case of disruptive events	PP	Direct improvements in service quality. Indirect improvements in all other KPI areas
24	Support joint R&D efforts in clean, safe and silent vehicles for all modes, sustainable alternative fuels, integrated transport management and information systems, and sustainable urban mobility	PP	Potential improvements in all KPI areas
25	Ensure rapid deployment of smart mobility systems (ERTMS, SafeSeaNet,	TD	Direct improvements in the efficiency, service quality and infrastructural

	RIS, ITS and the next generation of multimodal ICT systems)		sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas
26	Define and deploy an open standard electronic platform for vehicle on board units	TD	As above
27	Develop an investment plan in new navigation, traffic monitoring and communication services based on a European Integrated Multimodal Information and management Plan	PP	As above
28	Deploy smart mobility partnerships and demonstration projects for sustainable urban transport solutions (including road pricing schemes etc)	PP	Improvements in all KPI areas
29	Promote increased replacement rate of inefficient and polluting vehicles	PP	Improvements in efficiency and environmental sustainability
30	Set appropriate standards for CO_2 emissions of vehicles in all modes	PP	As above
31	Propose a revised test cycle to measure vehicle emissions	PP	As above
32	Set vehicle standards for noise emission levels	PP	Reduction of noise pollution but care should be taken to avoid bias against certain transport modes (e.g. rail)
33	Develop interface standards for infrastructure-to-infrastructure, vehicle-to-infrastructure, and vehicle-to-vehicle communications	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas
34	Develop specifications and conditions for transport related smart charging and payment systems	TD	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users
35	Ensure better implementation of existing rules and standards	PP	Improvements in all KPI areas
36	Review the labelling Directive for CO_2 emissions and fuel efficiency	PP	Improvements in efficiency and environmental sustainability
37	Encourage business-based GHG certification schemes and develop common EU carbon footprint calculators	PP, TD	Improvements in environmental sustainability
38	Accelerate the deployment of ITS	TD	Improvements in efficiency, environmental

	applications in support of eco-driving		sustainability and social issues
39	Limit the maximum speed of light commercial road vehicles	PP	Improvements in efficiency, environmental sustainability and social issues
40	Produce best practice guidelines to better monitor and manage urban freight flows	PP	Direct improvements in all KPI areas
41	Promote joint public procurement for low emission vehicles in commercial fleets	PP	Improvements in efficiency
42	Define a core network of strategic European infrastructure	ID	Improvements in all KPI areas through addressing major bottlenecks. New infrastructure projects will strain land-use.
43	Ensure that EU-funded transport infrastructure takes into account energy efficiency needs and climate change challenges	ID	Improvements in efficiency and environmental sustainability
44	Create multimodal freight corridor structures in the context of the 'core network'	PP	Direct improvements in all KPI areas
45	Introduce ex-ante evaluation for transport infrastructure projects	ID	Improved effectiveness of investments in infrastructure, leading to direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
46	Develop an integrated infrastructure funding framework	ID	Improvements in all KPI areas through addressing major bottlenecks. New infrastructure projects will strain land-use.
47	Establish an enabling framework for enhanced private sector engagement	ID	As above
48	Revise motor fuel taxation with clear identification of the energy and CO_2 component	PP	Improvements in efficiency and environmental sustainability
49	Proceed with the internalisation of external costs for all modes of transport	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users
50	Earmark revenues from transport for the development of an integrated and efficient transport system	PP	Improvements in all KPI areas through addressing major bottlenecks. New infrastructure projects will strain land-use.
51	Extend internal market rules through work in international organisations	IR	Improvements in the efficiency of international trade and the competitiveness of European industries
52	Attain full EU membership in international organisations	IR	It would enhance the chances of getting necessary and/or preferred decisions ratified in these organizations on safety,

			security and environmental impact

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

Appendix II. Policy issues

Kahn Ribeiro et al (2007). *Transport and its infrastructure. In Climate Change 2007: Mitigation.* Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Metz et al (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

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Maibach et al (2008). *Handbook on estimation of external costs in the transport sector.* IMPACT study. Delft, CE, 2008.

European Parliament & Council (2008a). *Decision No 70/2008/EC of the European Parliament and of the Council of 15 January 2008 on a paperless environment for customs and trade.* Strasbourg, 15.1.2008.

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Document identity		Field[1] : POL		Doc.date : 2007	
Doc. number :		Study :	X	Regulatory act :	
Author :	Kahn Ribeiro et al	Research proj.:		- Suggestion :	
On behalf of :	IPCC	Other doc.:		- In force :	
Title :	**Transport and its infrastructure. In Climate Change 2007: Mitigation**				
Related doc's :					
Web address :	http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter5.pdf				

Objective(s)

This is Chapter 5 of the "Mitigation of Climate Change" part (Working Group III) of the "Fourth Assessment Report: Climate Change 2007" of the Intergovernmental Panel on Climate Change, which has been honoured with the 2007 Nobel Peace Prize.

After examining the current status and future trends of transportation, the document presents existing and future mitigation technologies and strategies per mode, their mitigation potential, as well as the related policies and measures.

The document covers predominantly road transport and light-duty vehicles. Rail transport is mentioned as one of the most energy efficient modes nowadays, however with substantial opportunities for improvements. Shipping is referred to as one of the least energy intensive modes, also exhibiting potential for increased energy efficiency.

Main findings / results achieved / summary of measures

The document refers to two widely cited projections of world transport energy use, those of the U.S. Energy Information Administration (EIA, 2005) and the International Energy Agency (IEA, 2004). The results of the second report are very similar to those of the World Business Council on Sustainable Development study, 'Mobility 2030' (presented in another fiche), which are shown in the following figure.

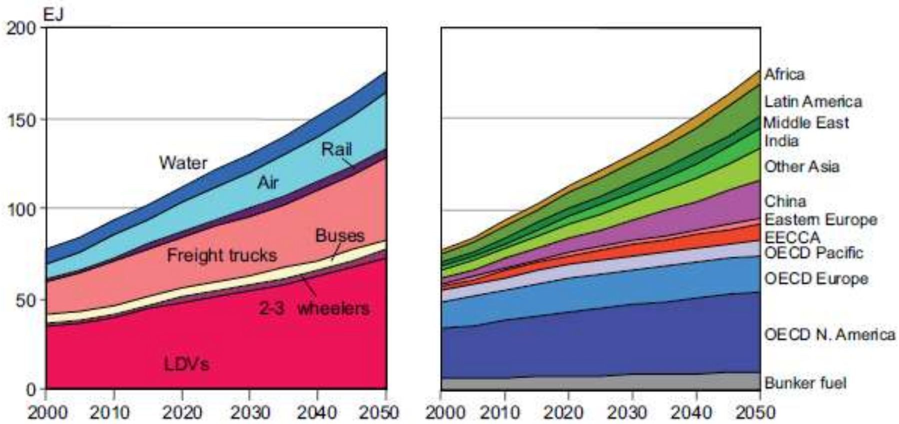

Figure 5.3: *Projection of transport energy consumption by region and mode*
Source: WBCSD, 2004a.

All forecasts assume that world oil supplies will be sufficient to accommodate the large projected increases in oil demand, and that world economies continue to grow without significant disruptions. With this caveat, all forecast robust growth in world transport energy use over the next few decades, at a rate of around 2% per year. This means that transport energy use in 2030 will be about 80% higher than in 2002. Almost all of this new consumption is expected to be in petroleum fuels, which the forecasts project will remain between 93% and slightly over 95% of transport fuel use over the period. As a result, CO_2 emissions will essentially grow in lockstep with energy consumption.

The sectors propelling worldwide transport energy growth are primarily light-duty vehicles, freight trucks and air travel. The Mobility 2030 study projects that these three sectors will be responsible for 38, 27 and 23%, respectively, of the total 100 EJ growth in transport energy that it foresees in the 2000–2050 period.

Mitigation technologies and strategies

Many technologies and strategies are at hand to reduce the growth or even, eventually, reverse transport GHG emissions. The most promising strategy for the near term is incremental improvements in current vehicle technologies. Advanced technologies that provide great promise include greater use of electric-drive technologies, including hybrid-electric power trains, fuel cells and battery electric vehicles. The use of alternative fuels such as natural gas, biofuels, electricity and hydrogen, in combination with improved conventional and advanced technologies, provide the potential for even larger reductions.

GHG emissions associated with road transport vehicles can be reduced by four types of measures:
1. Reducing the loads (weight, rolling and air resistance and accessory loads) on the vehicle, thus reducing the work needed to operate it: use of lightweight materials, improvements in aerodynamic performance, and improvements in the Mobile Air Conditioning (MAC) systems.
2. Increasing the efficiency of converting the fuel energy to work, by improving drive train efficiency and recapturing energy losses: use of advanced direct injection gasoline / diesel engines, improvements in transmissions, use of hybrid drive trains.
3. Changing to a less carbon-intensive fuel: biofuels, natural gas (CNG/LNG/GTL), hydrogen / fuel cells, electric vehicles.
4. Reducing emissions of non-CO_2 GHGs from vehicle exhaust and climate controls.

The GHG emission mitigation strategies in relation to road transport concern basically modal shifts in passenger traffic and are omitted here. A strategy concerning heavy-duty trucks, too, is improving driving practices (eco-driving), which can lead to a possible improvement of 5-20% in fuel economy.

Major R&D goals for railway transport are higher speeds, improved comfort, cost reductions, better safety and better punctuality. R&D programmes aimed at CO_2 reduction include:

1. Reducing aerodynamic resistance
2. Reducing train weight (aluminum car bodies, lightweight bogies, lighter propulsion equipment)
3. Regenerative braking
4. Higher efficiency propulsion system.

As for shipping, in the past few years, IMO has started research and discussions on the mitigation of GHG emissions by the shipping industry. The potential of technical measures to reduce CO_2 emissions was estimated at 5–30% in new ships and 4–20% in old ships. These reductions could be achieved by applying current energy-saving technologies vis-à-vis hydrodynamics (hull and propeller) and machinery on new and existing ships.

For existing ships, if policy is to be effective before 2020, only operational emission abatement measures, such as speed reduction, load optimization, maintenance, fleet planning, etc., should be considered due to the long service life of a marine diesel engine (30 years or more).

A significant shift from a primarily diesel-only fleet to a fleet that uses alternative fuels and energy sources cannot be expected until 2020, as most of the promising alternative techniques are not yet tested to an extent that they can compete with diesel engines. A significant potential (~20%) exists only for segments where a switch from diesel to natural gas is possible (this approach is being pursued as a measure in Norway for inland ferries and offshore supply vessels operating on the Norwegian Continental Shelf). A co-benefit of a switch from diesel to natural gas is that it also reduces emissions of SOx and NOx that contribute to local air pollution in the vicinity of ports.

One potential option for the long-term (2050) is a combination of solar panels and sails. The use of large sails for super tankers is currently being tested in Germany and looks promising and may even be a cost-effective measure in the short term in case oil prices continue to soar. The use of large sails does not require fleet turnover but can be added to existing vessels (retrofit). The introduction of hydrogen-propelled ships and the use of fuel cell power at least for the auxiliary engines seem to be a possibility as well.

Policies and measures

The commonly applied and potentially effective policies and measures considered in this document for the road and rail sectors are:

- Land use and transport planning;
- Taxation and pricing;
- Regulatory and operational instruments (e.g., traffic management, control and information);
- Fuel economy standards – road transport;
- Transport demand management;
- Non-climate policies influencing GHG emissions;
- Co-benefits and ancillary benefits.

Climate policies related to GHG from international shipping are discussed separately, reflecting the international coordination that is required for effective reduction strategies in this sector. The same applies to aviation, which is omitted from this fiche as irrelevant to SuperGreen.

Land use and transport planning
The recent history almost everywhere in the world has been increasing travel, bigger vehicles, decreasing land-use densities and sprawling cities. But some cities are far less dependent on motor vehicles and far denser than others, even at the same incomes. The potential exists to greatly reduce transport energy use and GHG emissions by shaping the design of cities, restraining motorization and altering the attributes of vehicles and fuels. Indeed, slowing the growth in vehicle use through land-

use planning and through policies that restrain increases in vehicle use would be an important accomplishment. Planning and policy to restrain vehicles and densify land use not only lead to reduced GHG emissions, but also reduced pollution, traffic congestion, oil use, and infrastructure expenditures and are generally consistent with social equity goals as well.

In general, single policies or initiatives tend to have a rather modest effect on the motorization process. The key to restraining motorization is to cluster a number of initiatives and policies, including improved transit service, improved facilities for NMT (Non-motorized transport) and market and regulatory instruments to restrain car ownership and use.

Taxation and pricing
Transport pricing refers to the collection of measures used to alter market prices by influencing the purchase or use of a vehicle. Typically measures applied to road transport are fuel pricing and taxation, vehicle license/registration fees, annual circulation taxes, tolls and road charges, and parking charges. Pricing, taxes and charges, apart from raising revenue for governments, are expected to influence travel demand and hence fuel demand and it is on this basis that GHG reduction can be realized.

Empirically, throughout the last 30 years, regions with relatively low fuel prices have low fuel economy (USA, Canada, Australia) and regions where relatively high fuel prices apply (due to fuel taxes) have better car fuel economy (Japan and European countries). As an alternative to fuel taxes, registration and circulation taxes can be used to incentivise the purchase (directly) and manufacturing (indirectly) of fuel-efficient cars. This could be done through a revenue neutral fee system, where fuel-efficient cars receive a rebate and guzzler cars are faced with an extra fee. There is evidence that incentives given through registration taxes are more effective than incentives given through annual circulation taxes.

The most renowned area licensing and parking charges scheme has been applied in Singapore with effective reduction in total vehicular traffic and hence energy (petroleum) demand. The area licensing scheme in Singapore resulted in 1.043 GJ per day energy savings with private vehicular traffic reducing by 75%. General estimates of reduction in use of private vehicle operators resulting from fuel pricing and taxing are 15–20%.

In general, while transport demand responds to market trends, the demand for transportation means, fueling and travelling is inelastic in terms of pricing, which shows that to make changes in GHG emissions, large increases in prices or taxes are required.

Regulatory and operational instruments
Potential effective (and cost-effective) non-fiscal measures are regulatory measures such as:

- Lower speed limits on motorways;
- High occupancy vehicle requirements for certain roads and networks;
- Vehicle maintenance requirements;
- Odd/even number plate and other driving restrictions;
- Providing information on CO_2 emission performances of vehicles (labelling);
- Establishing carbon standards for fuels;
- Direct traffic restrictions (e.g., no entry into business district);
- Free/expanded urban public transport;
- Encouraging alternatives to travel (e.g., greater telecommuting);
- Emergency switching from road to rail freight;
- Reducing congestion through removal of night-time/weekend driving bans for freight.

In OECD countries vehicles consume 10–20% more fuel per km than indicated by their rated efficiency. It is estimated that 5–10% reduction in fuel consumption can be achieved by stronger inspection and vehicle maintenance programmes, adoption of on board technologies, more widespread driver training and better enforcement and control of vehicle speeds. Vehicle travel demand can be reduced by 10–15% by aggressively combining infrastructure improvements, intelligent transport technologies and systems (e.g., better routing systems and congestion reduction), information systems and better transit systems in addition to road pricing. In general, fuel related regulations have been effective, but their impact was overwhelmed by the transport market raise.

Fuel economy standards – road transport
Most industrialized nations (U.S., E.U., Japan, Australia, Canada, and China) now impose fuel economy requirements (or their equivalent in CO_2 emissions requirements) on new light-duty vehicles. Recent studies of the costs and fuel savings potential of technology improvements indicate considerable opportunity to achieve further fleet fuel economy gains from more stringent standards. For example, the US National Research Council estimates that US light-duty vehicle fuel economy can be increased by 25–33% within 15 years with existing technologies that cost less than the value of fuel saved. The document annotates that the standards' effectiveness can be increased if they are combined with fiscal incentives and consumer information.

Transport demand management
Transport Demand Management (TDM) is a formal designation for programmes in many countries that improve performance of roads by reducing traffic volumes. There are many potential TDM strategies in these programmes with a variety of impacts. Some improve transport diversity (the travel options available to users). Others provide incentives for users to reduce driving, changing the frequency, mode, destination, route or timing of their travel. Some reduce the need for physical travel through mobility substitutes or more efficient land use. Some involve policy reforms to correct current distortions in transport planning practices. In practice, TDM strategies are mostly focused on managing congestion and pollution and they need more support in becoming more effective.

Non-climate policies
Globally, transport subsidies are significant in economic terms. It has been estimated that transport subsidies affect over 40% of world trade. In a competitive environment (not necessarily under full competition), subsidies decrease the price of transport. This results in the use of transport above its equilibrium value and most of the time also results in higher emissions, although this depends on the type of subsidy. Secondly, they decrease the incentive to economise on fuel, either by driving efficiently or by buying a fuel-efficient vehicle. Not all transport subsidies result in higher emissions of GHGs. Some subsidies stimulate the use of climate-friendly fuels. In many countries, excise duty exemptions on compressed natural or petroleum gas and on biofuels exist.

Co-benefits and ancillary benefits
In the field of transport, local air pollutants and GHGs have a common source in motorized traffic, which may also induce congestion, noise and accidents. Addressing these problems simultaneously, if possible, offers the potential of large cost reductions, as well as reductions of health and ecosystems risks. Tackling these problems would also contribute to more effective planning of transport, land use and environmental policy. Model studies indicate a potential saving of up to 40% of European air pollution control costs if the changes in the energy systems that are necessary for compliance with the Kyoto protocol were simultaneously implemented.

A simulation of freight traffic over the Belgian network indicated that a policy of internalizing the marginal social costs caused by freight transport types would induce a change in the modal shares of trucking, rail and inland waterways transport. Trucking would decrease by 26% and the congestion cost it created by 44%. It was estimated that the total cost of pollution and GHG emissions (together) would decrease by 15.4%, the losses from accidents diminish by 24%, the cost of noise by 20% and wear and tear by 27%. At the same time, the total energy consumption by the three modes would decrease by 21%.

The policy of increasing trucks' weight and best practices awareness in Sweden, UK and the

Netherlands lead to a consolidation of loads that resulted in economic benefits as well as environmental benefits, including a decrease in CO_2 emissions. Likewise, the Swiss heavy vehicle fee policy also leads to better loaded vehicles and a decrease of 7% in CO_2 emissions.

Shipping

IMO has adopted a strategy with regard to policies and measures, focusing mainly on further development of a CO_2 emission indexing scheme for ships and further evaluation of technical, operational and market-based solutions. The basic idea behind a CO_2 emission index is that it describes the CO_2 efficiency (i.e., the fuel efficiency) of a ship, i.e., the CO_2 emission per tonne cargo per nautical mile. This index could, in the future, assess both the technical features (e.g., hull design) and operational features of the ship (e.g., speed).

Other than this, there are currently only a few cases of countries or ports introducing economic instruments to create incentives to reduce shipping emissions. Examples include environmentally differentiated fairway dues in Sweden, the Green Award scheme covering 35 ports around the world, the Green Shipping bonus in Hamburg and environmental differentiation of tonnage tax in Norway. None of these incentives are based on GHG emissions, but generally relate to fuel sulphur content, engine emissions (mainly NOx), ship safety features and management quality.

Other policies to limit shipping emissions would be the inclusion of international shipping in international emissions-trading schemes, fuel taxes and regulatory instruments. New policy frameworks need to be developed for the maritime sector.

Relevance to green corridor development

The document presents a wide range of available tools assisting policy makers in mitigating GHG emissions, which is one of the targets of green corridors. Despite the fact that most of them concern light-duty vehicles, which lie outside the scope of SuperGreen, the material includes valuable examples of successful applications around the world that could be of use in developing green corridors. The simultaneous positive effects of GHG emission mitigation policies on other aspects of green corridors (transport cost, congestion, noise, accidents) comprise another useful view.

Measures/changes suggested or introduced

The document does not introduce a specific measure or change. It refers, however, to a number of potential measures and policies that could lead to emission mitigation in a variety of environments. The most important among them are listed below.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Reduce forces on road vehicles	TD	Improvements in efficiency and environmental sustainability
2	Increase the efficiency of converting the fuel energy to work	TD	As above
3	Use less carbon-intensive fuels	TD	Improvements in environmental sustainability. Effects on efficiency depend on costs of new fuels.
4	Promote eco-driving	PP	Improvements in efficiency, environmental sustainability and social issues
5	Reduce aerodynamic resistance	TD	Improvements in efficiency and

	of trains		environmental sustainability
6	Reduce train weight	TD	As above
7	Use regenerative braking in trains	TD	As above
8	Enhance efficiency of train propulsion system	TD	As above
9	Develop a new policy framework for international shipping	IR	Improvements in environmental sustainability. Care should be taken to avoid side effects.
10	Take operational measures for existing ships	OP	Improvements in environmental sustainability. Effects on efficiency depend on nature of measures.
11	Switch from diesel to natural gas propelled ships where possible	TD	Improvements in environmental sustainability.
12	Develop the hydrogen fuel cell, solar and sail technologies for ships	TD	Improvements in environmental sustainability. Effects on efficiency depend on costs of new technologies.
13	Slow growth in vehicle use through land-use planning	PP	Improvements in all KPI areas.
14	Introduce more stringent fuel economy standards for road vehicles	PP	Improvements in efficiency and environmental sustainability.
15	Increase trucks' weight in order to achieve better load factors	PP	Improvements in efficiency and environmental sustainability. Potential adverse effects on infrastructure costs and traffic safety.
16	Internalize marginal social costs caused by freight transport	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 48		Partner: NTUA	
Document identity		Field[1]: POL		Doc. date: March 2009	
Doc. number:	TRvCR503_001	Study:	X	Regulatory act:	
Author:	Petersen M.S. et al.	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Report on Transport Scenarios with a 20 and 40 year Horizon, Final report**				
Related doc's:					
Web address:	http://ec.europa.eu/transport/strategies/studies/doc/future_of_transport/2009_02_transvisions_report.pdf				

Objective(s)

This report presents the final results of the TRANSvisions study. The purpose of this study was to provide technical support to a debate on transport scenarios with a 20- and 40- year horizon, inter alia, by collecting and analysing information on transport long-term scenario forecasting, by developing long-term transport scenarios including modelling work and case studies, and by suggesting long-term objectives for the European transport policies.

Main findings / results achieved / summary of measures

Transport drivers

A comprehensive discussion of the drivers related to transport was carried out in the study, resulting in a subdivision of the drivers in question into: external drivers, that is drivers external to the transport sector, where five main categories of drivers were identified (population, economic development, energy, technology development and social change); internal drivers, that is drivers internal to the transport sector e.g. infrastructure, vehicles and fuel development and transport impact on environment and society; and finally policy drivers, that is broad policy responses which affect the evolution of the transport system, and in particular the governance of the transport sector.

Drivers found to have an impact on freight transport, and their sub-drivers are listed below:

Type of driver	Driver	Sub-driver
External drivers	Population	Population size
		Age structure
	Economy	GDP development
		Globalisation
		Relocation of production processes (logistics)
		Technological convergence (productivity)
	Social change	Sustainable consumption
	Energy	Energy price
		Availability of fuel
	Technology	New and improved transport modes
		ICT applications
Internal drivers	Infrastructure	Improved accessibility
		Congestion
		Interoperability
	Environment	Internalisation of external costs
Policy drivers	Enlargement	
	Security	

Definition of scenarios

A number of different exploratory scenarios for 2050 were formulated based on identified drivers. The scenarios are formulated as different paths towards a post carbon society. These scenarios were named:

1. "Move Alone" (Individualistic transport, technology, supply management and market spontaneous self-organisation);
2. "Move Together" (pricing and modal shift, land planning, emphasis on cohesion);
3. "Move Less" (behavioural policies and regulation, lifestyle changes, priority to local production);
4. "Stop Moving" (society initially puts a strong emphasis upon technology, but when breakthroughs do not take place it falls back on regulation and banning activities).

An important aspect of the study was to analyse different transport policy options to obtain reductions of the transport sector's CO_2 emissions by arbitrarily set targets of 10 % in 2020 and 50 % in 2050, compared to 2005. The main tool to accomplish this analysis was the use of "Meta-Models", developed by the project for this particular purpose. Meta-Models comprise sets of interdependencies between exogenous input and resulting output, mainly in the form of elasticities between two or more variables. It is emphasized that while TRANS-TOOLS is a forecast model based on a detailed description of the present (2005) situation, the Meta-Models are less accurate and their main application is in foresight studies e.g. providing transport indicators for the exploratory scenarios mentioned above.

Scenarios for 2030 were also developed. These are fitted to the use of EC's transport model TRANS-TOOLS in the sense that the scenarios are established based on the main inputs for the TRANS-TOOLS model. These scenarios are:

5. "Baseline",
6. "High Growth" and
7. "Low Growth".

Different policy options were analysed with the TRANS-TOOLS model for 2030 and with the Meta-Models in 2020, 2030 and 2050.

Transport structure and trends

A detailed analysis of the development of the structure of transport in the EU was carried out based on statistics and TRANS-TOOLS results. The following overall conclusions can be drawn for freight transport:

- Total freight motorised transport with origin and/or with destination in EU27 (measured in tonnes-km) will keep growing following previous patterns, following the overall growth of the economy for all scenarios, but the elasticity to GDP growth will depend on the scenarios.
- The freight transport elasticity towards GDP depends very much on the types of movement considered.
  - ✓ National transport has a low elasticity, while export and import in tonnes- km inside EU show growth rates more in line with GDP growth.
  - ✓ The development of freight transport is even faster if neighbouring countries are included, in particular because the import of crude oil and oil derivates from Norway and Russia are linked to economic development.
  - ✓ When overseas trade is included, the growth rates of tonnes-km are increasing considerably more than the EU GDP.
- Road transport may be losing shares, but just marginally.
- It is expected that Short Sea Shipping will continue to grow in Europe in line with overseas traffic. Therefore transhipments hubs and secondary ports in Europe may become more important in their regional hinterlands.
- The footprint of Europe in the rest of the world measured in terms of CO_2 direct emissions due to freight and passenger transport activities is already high, just a bit smaller than emissions generated inside the EU. Therefore, it is absolutely necessary to think more of European transport as an activity that European citizens and companies do at world level, and not only within Europe.

Policy packages

The study identified five different groups of policy instruments which could be implemented solely or in combinations in the future. These instruments are presented in the following table.

Instrument group	Examples of instruments
Infrastructure	• The TENS and intermodal platforms • Separated infrastructure networks for passenger and freight traffic
Technology	• Intelligent Transport Systems (ITS) • SESAR (Single European Sky) • ERTMS (European Rail Traffic Management System) • Galileo • Vehicle technology
Economic	• Pricing for infrastructure use • Fuel taxes • Vehicle taxes
Regulatory	• Access to infrastructure by third parties • Interoperability standards • Land-use planning • Speed control • Instruments to protect the rights of passengers • Standards of employment for transport workers
Participatory	• Instruments heightening public participation in transport planning (for example Commission Green papers and local participation events). To be described below in Section 8.2

Analyses were carried out, using the TRANS-TOOLS model, of two policy measures: Pricing of passenger cars on interurban roads and development of infrastructure networks. For the 2030 time horizon, the pricing measure led to a predicted reduction in CO_2 emissions, whilst the infrastructure measure led to a predicted increase of CO_2 emissions. In general though, the impacts of these policy measures (for 2030) on transport levels and CO_2 emissions was very limited in comparison to the impacts resulting from socio-economic changes, such as population development and economic development.

Analyses were also carried out with the Meta-Models testing four policy packages involving combinations of instruments from each of the first four of the policy instrument groups in the table. The analysis shows that by combining different policies it is possible to meet the CO_2 emission reduction targets mentioned above.

Most measures contained in the table were tested against a baseline that includes measures already «in the pipeline" such as: ETS for aviation; CO_2 emission limits for cars; and the internalisation of external costs for lorries. According to the analysis the most effective measures concern vehicle technologies and pricing to increase occupancy rates. The measure concerning reduction in vehicle speeds and improvement of public transport is moderately effective. The construction of new roads is the least effective, but still it may bring CO_2 reductions due to the reduction in congestion. The analysis shows that, in the long term, technology and/or changed behaviour will have an important effect on reducing CO_2 emissions, whereas more traditional transport policy measures are necessary in order to fulfill the 2020 target.

Conclusions: Policy aims and objectives

Various EU policy documents were examined by the TRANSvisions study with respect to their stated aims and objectives. As a result of this review, the following policy aims were suggested for the transport sector in Europe:

(1) To ensure that EU transport systems meet society's economic, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment.
(2) To ensure that EU transport systems are sufficiently resilient to be able to meet the future challenges presented by an uncertain world.

Furthermore, the following objectives were suggested, corresponding to the three axes of sustainable development (economic, environmental and social):

<u>Economic sustainability</u>

- Two objectives concerning the ability of the transport system to:
  - ✓ Contribute to economic growth;
  - ✓ Contribute to generation of employment
- A further objective concerned with reduction and avoidance of congestion.

<u>Environmental sustainability</u>

- Three objectives concerned with the reduction and avoidance of
  - ✓ climate change effects by reducing greenhouse gases;
  - ✓ harmful local pollutants;
  - ✓ noise nuisance from transport
- Protection of environmentally-sensitive areas from transport encroachment.

<u>Social sustainability</u>

- Reduction and avoidance of fatal and serious accidents;
- Provision of accessibility to opportunities/services;
- Enhancement of social cohesion, including the reduction of social and territorial exclusion;
- Enhancement of political capital through the encouragement of a participatory approach to

transport planning;
- Enhancing the rights of travelers to good quality transport provision; and
- Attaining and maintaining high quality standards of employment within the transport sector.

Conclusions: Policy synthesis

The most important conclusions from the synthesis of both modelling and non-modelling activities of the study are:

- When formulating policy instruments for meeting specific aims, it is useful to think in terms of the creation of policy packages, where such a package is a combination of a number of instruments that are synergetic, or at least complementary, in their overall impact.
- With respect to the reduction of CO_2 emissions, large reductions need to involve instruments that can be implemented at a variety of levels of governance, including urban. In the specific context of European Transport Policy, this result has important consequences for subsidiarity issues.
- It is likely that an important contribution to the reduction of CO_2 emissions will come from "emerging technology" instruments. Two actions can be taken by the EU in this direction. Firstly the EU can provide financial support to help research and development of new technology. Secondly, once such technology is available, the EU can help its introduction through a variety of regulatory instruments and demonstration actions.
- It is suggested that transport policy-making puts more emphasis upon social sustainability, particularly concerning the "external social impacts" of transport policy (as opposed to "internal impacts" concerned with passenger rights and the working conditions of transport employees, which are well covered in terms of current EU policy-making). One immediate use of social sustainability concepts (social capital, social cohesiveness and political capital) is to provide a more nuanced understanding of the "restriction on freedom" criticism levelled at attempts to manage demand.
- With respect to policy instrument formulation, packages of policy instruments need to be devised to meet objectives associated with the three dimensions of sustainability. Traditional transport policy instruments have generally not been devised with the purpose of meeting social sustainability aims and future instrument packages need to rectify this omission.

Relevance to green corridor development

The document contributes to the formulation of the Common Transport Policy for the next decade and, in this respect, it is only indirectly relevant to green corridor development. However, the focal point of the study is policies reducing CO_2 emissions and this lies at the core of the green corridor concept.

Measures/changes suggested or introduced

A selection of the changes identified or suggested by the study appears below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Population size	BE	Reduced freight transport demand after 2020, when EU population is expected to decline
2	Age structure of population	BE	Increased transport costs through reduced public funding available for transport, and further aggravation of skilled labour shortage
3	GDP growth	BE	Positive effect on consumption and freight transport demand
4	Globalisation	BE	Increased demand for transport services basically

			through longer distances, although globalisation appears to level off
5	Relocation of production processes	TL	Increased freight transport demand due to increased lengths of haul and quantities, which in turn might induce larger vehicle sizes and higher load factors to achieve economies of scale. The increased traffic will concentrate along certain transport corridors, and increased investments might be required to mitigate the resulting congestion.
6	Technological convergence (productivity)	BE	Increased demand for transport services basically through longer distances.
7	Sustainable consumption	BE	Stronger pressure to decrease emissions and use more environment-friendly transport modes, which in turn may modify modal split in favour of environment-friendly modes where possible
8	Energy price	BE	Increased transport costs and modestly reduced demand for transport services in the short run due to increased fuel prices. Substantial improvements in environmental sustainability in the long run when alternative fuels would have entered the market, combined with reduced demand for the shipping industry.
9	Availability of fuel	BE	Reduction of freight transport demand due to higher fossil fuel prices, until alternative fuels become commercially viable
10	New technologies	TD	Improvements in all KPI areas depending on the nature of the new technology
11	ICT applications	TD	Direct improvements in the efficiency, service quality, social issues (traffic safety) and infrastructural sufficiency (in relation to capacity utilisation and administrative bottlenecks) KPI areas. Indirect improvements in environmental sustainability.
12	Improved accessibility	ID	Improvements in all KPI areas at the expense of land-use
13	Congestion	ID	Increased transport costs, longer transport times, diminished reliability and worsening of environmental performance
14	Interoperability	PP	Improvements in all KPI areas through better integration of transport modes and operations
15	Internalisation of external costs	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and enhancement of fairness between transport users
16	EU enlargement	BE	Positive effect on freight transport demand

17	Security issues	IR	Negative effects on transport costs and service quality through adoption of security enhancement measures

[1] *Field*				[2] *Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

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<tr><td colspan="2">SUPERGREEN Document Fiche</td><td colspan="2">Number : 15</td><td colspan="2">Partner : NTUA</td></tr>
<tr><td colspan="2">Document identity</td><td colspan="2">Field[1] : POL</td><td colspan="2">Doc.date : 8.7.2008</td></tr>
<tr><td>Doc. number :</td><td>COM(2008) 433</td><td>Study :</td><td></td><td>Regulatory act :</td><td></td></tr>
<tr><td>Author :</td><td>European Commission</td><td>Research proj.:</td><td></td><td>- Suggestion :</td><td></td></tr>
<tr><td>On behalf of :</td><td>European Commission</td><td>Other doc.:</td><td>X</td><td>- In force :</td><td></td></tr>
<tr><td>Title :</td><td colspan="5">Greening Transport</td></tr>
<tr><td>Related doc's :</td><td colspan="5">Greening Transport Inventory{SEC(2008) 2206}</td></tr>
<tr><td>Web address :</td><td colspan="5">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0433:FIN:EN:PDF</td></tr>
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Objective(s)

The document presents three policy initiatives aiming at making transport greener, i.e. disconnecting mobility from its harmful effects. The first is a strategy for the internalisation of external costs in all transport modes. The second is a proposal for the revision of the heavy goods vehicles charging directive encouraging Member States to implement differentiated charging systems. The third is a set of rail noise abatement measures addressing the existing fleet.

Main findings / results achieved / summary of measures

After summarising the existing EU legal framework in the field of sustainable transport, as this is described in detail in the supporting document ‘Greening Transport Inventory’, the document presents the three policy initiatives mentioned above.

As all these initiatives are presented in separate fiches below, there is no need to repeat here their content and the rationale for their adoption.

Relevance to green corridor development

“Getting the prices right” through differentiated charging systems addressing transport related external costs is a course of action supporting the development of green corridors to the extent that affects the behaviour of transport users towards more efficient use of infrastructure and reduction of the negative externalities associated with transport activities.

Measures/changes suggested or introduced

No measures are suggested directly by this document. The measures introduced by the policy initiatives presented by the document are mentioned in the fiches concerning these initiatives.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]

SUPERGREEN Document Fiche		Number : 16		Partner : NTUA	
Document identity		Field[1] : POL		Doc.date : 8.7.2008	
Doc. number :	COM(2008) 435	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Strategy for the internalisation of external costs**				
Related doc's :	Impact assessment on the internalisation of external costs {SEC(2008) 2208}				
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0435:FIN:EN:PDF				

Objective(s)

The document proposes a common methodology for the internalization of transport related external costs. It is based on common principles that prevent any discrimination and ensure market transparency. The methodology ensures that charges are not disproportionate to the existing external costs in order to avoid hampering freedom of movement. It also proposes setting up a monitoring system that will make the process clear and effective for all concerned.

Main findings / results achieved / summary of measures

Transport generates negative externalities that involve a cost to society and the economy. By internalising these external costs, the intention is to give the right price signal, so that users will bear the costs they create and will thus have an incentive to change their behaviour in order to reduce those costs. The need for a transport pricing system that is more efficient and more accurately reflects the true costs involved, is an issue pursued by the European Commission for a number of years.

According to economics literature, **“social marginal cost charging”** is the appropriate price setting mechanism that does not lead to overexploitation of resources, and at the same time does not damage the transport sector, or ultimately the economy. According to this approach, transport prices should correspond to the additional short-term cost created by one extra person using the infrastructure.

Nevertheless, marginal costs vary according to time and place and, in practice, it is difficult to judge their exact level. A certain degree of simplification is therefore inevitable. In some cases, the marginal cost approach may have certain limitations. It does not necessarily make it possible to include infrastructure costs, as is the case where fixed costs are high or traffic density is low. In such cases, it may be combined with other approaches to make sure that infrastructure is funded according to the “user pays” principle and external costs are internalised according to the “polluter pays” principle. Furthermore, for some costs, such as those relating to noise, the method for estimating the marginal costs is very complex, and a pragmatic approach based on the average cost may be more feasible.

After setting the principles, the document proposes a methodology adapting the overall strategy of external cost internalization to the characteristics of each mode of transport.

For the road sector, Directive 1999/62/EC on the charging of heavy goods vehicles precludes incorporating any of the external costs when calculating tolls. It was amended in 2006 to allow different tariffs to be applied depending on vehicles’ environmental characteristics. However, with the exception of mountainous regions, and then only in certain circumstances, toll revenues may not exceed infrastructure costs. This is the case even in more congested regions or regions with higher levels of pollution.

The Commission therefore proposes to revise Directive 1999/62/EC in order to allow charges to include external costs. The revision process will focus primarily on the following areas: (1) taking account of the external costs of air pollution, noise pollution and congestion, (2) setting up Community coordination mechanisms with a common methodology and ceilings for the calculation of charges and (3) allocating revenue to the transport sector. To be effective, tolls should vary depending on the vehicle concerned, the type of route and the time. Furthermore, payments should be made via electronic toll systems in order to prevent tailbacks at the toll booths.

These charging principles could also be extended to private cars. For reasons of subsidiarity, Member States retain the freedom to choose whether to do so or not.

For the rail sector, Directive 2001/14/EC allows internalisation of external costs. However, in order to avoid the measure leading to a mere increase in the revenue accruing to the infrastructure manager, the Directive allows internalisation only if there is an equivalent increase for competing modes of transport, which would be made possible after revising Directive 2001/14/EC for the road sector as mentioned above. In addition, the Commission intends to tackle noise pollution, which remains a major challenge for rail transport.

As for the maritime transport, the Commission wishes to include it in the post-2012 agreement on preventing climate change. If IMO does not make sufficient progress, the Commission will suggest taking action at European level, with one of the possible options being to include the maritime sector in the EU Emissions Trading System.

The revenue generated by internalization should also be earmarked for the transport sector and the reduction of external costs, always on the basis of cost-benefit studies or similar analyses which guarantee that the chosen uses maximise the net benefits to society.

However, for internalization to be effective, the transport user must be price sensitive. Sometimes this is not possible for specific reasons, such as the lack of credible alternatives, insufficient competition with regard to a particular mode of transport, insufficient incentive to innovate and switch to clean vehicles, etc. Internalisation is a necessary step in itself, but it must be accompanied by other measures intended to create greater elasticity of demand, i.e. greater sensitivity to price variations, to make the supply of certain services more attractive or to speed up technological innovation. In order to reduce the external costs, we therefore need a strategy that includes various other elements in addition to internalisation, elements such as providing infrastructure, encouraging technological innovation, competition policy, legislation and setting standards.

Relevance to green corridor development

Internalisation of external costs is a measure supporting the development of green corridors to the extent that affects the behaviour of transport users towards more efficient use of infrastructure and reduction of the negative externalities associated with transport activities. Care should be taken to avoid overcharging. Significant additional benefits can be achieved by earmarking the revenues generated by internalisation for environmentally friendly transport infrastructure and elimination of existing bottlenecks, leading to improvements in all SuperGreen KPI areas.

Measures/changes suggested or introduced

The proposed measures concerning surface transport include:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Revise Directive 1999/62/EC	PP	More efficient use of infrastructure, reduction

			of the negative side effects of transport activity and improvement of fairness between transport users.
2	Provide incentives for reducing noise levels in rail transport	PP	As above
3	Include maritime sector in the post-2012 agreement on preventing climate change	PP	As above
4	Use revenue generated by internalization to enhance transport sustainability	PP	As above

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number : 17**		**Partner : NTUA**	
Document identity		Field[1] : POL		Doc.date : 8.7.2008	
Doc. number :	COM(2008) 436	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Proposal for a Directive of the European Parliament and of the Council amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0436:FIN:EN:PDF				

Objective(s)

The document contributes to the broader strategy of internalization of external costs (presented in the previous fiche), aiming at setting transport prices correctly so that they better reflect the costs of the actual use of vehicles, trains, planes or ships in terms of pollution, congestion and climate change. In the road sector, this implies greater recourse to tolls which vary according to the distance travelled, the location and the time of use in proportion of the external costs caused by vehicles.

The objective is to amend Directive 1999/62/EC in order to establish a framework which enables Member States to calculate and vary tolls on the basis of the costs of traffic based pollution and of congestion in a way compatible with the internal market.

Main findings / results achieved / summary of measures

Currently the external costs of road freight transport related to air and noise pollution, congestion, climate change and accidents are borne by the society either through general taxation or through the impact on people's health and quality of life. In most cases, current levies by Member States, in the form of fuel and vehicle taxes, time-based user charges (Eurovignette) or distance-based charges (tolls), fail to send the right price signals.

With the exception of climate change, most of the external costs are borne by the population and the local or national governments of the territory where transport takes place and not where the vehicle is registered, nor where the vehicle is refuelled. The best pricing instrument for assigning air pollution, noise and congestion costs to users in a fair and efficient way is tolls. Unlike fuel taxes, they can vary according to the emission standards of vehicles; contrary to vehicle taxes or time-based user charges (vignettes), they can vary according to the intensity, location and time of use.

As to climate change, the impact of motor vehicles is global. Hence, fuel taxes are usually considered a simple and efficient way of internalising this cost. On this issue, the Commission has already proposed improving coordination of taxes on motor fuels, partly by raising the minimum Community rate for commercial diesel fuel [COM(2007) 52]. A further revision of the general energy taxation Directive is due by the end of 2013.

The most effective instrument to internalize road accident costs is through insurance rates, as these risks are related more to complex behavioral factors (such as speeding, driving under the influence of alcohol or failure to use seat belts) than to the distance travelled. As such, these costs are not covered by the proposed document.

The Directive in force (Directive 1999/62/EC) limits revenues from tolls to what is strictly necessary to recover infrastructure costs, even in areas exposed to traffic-based pollution and congestion costs above the recoverable construction costs. The Directive provides an option for toll rates varying according to vehicle emission standards or congestion levels, but under a condition of revenue neutrality on a biennial basis which, due to high administrative burdens, has limited the exercise of this option only to Germany and the Czech Republic. In 2006, the Directive was amended by Directive 2006/38/EC to allow tolls in mountainous areas to be marked-up by up to 25% to co-finance alternative infrastructure labelled as TEN-T priority projects (this mark-up is currently applied on the Brenner motorway in Austria to co-finance the Brenner rail base tunnel). But in general, it fails to provide effective incentives to differentiate charges according to time periods, the place and the types of vehicles. Moreover, it covers only the use of the TEN-T network, which may lead to inconsistent pricing structures between the main corridors and other inter-urban roads used by international transport.

The proposed Directive enables Member States to integrate in tolls levied on heavy goods vehicles an amount which reflects the cost of air pollution and noise pollution caused by traffic. During peak periods, it also allows tolls to be calculated on the basis of the cost of congestion imposed upon other vehicles. The amounts will vary with the travelled distance, location and time of use of roads to better reflect these external costs. The proceeds will have to be used by Member States for making transport more sustainable through projects such as research and development on cleaner and more energy efficient vehicles, mitigating the effect of road transport pollution or providing alternative infrastructure capacity for users.

Member States which opt for it must respect common charging principles together with mechanisms for notifying and reporting tolling schemes to the Commission. Member States must designate independent authorities to set the chargeable costs by using a common method which can be easily monitored and adapted to scientific progress. This will ensure that charging schemes are transparent, proportional to the objective pursued and do not discriminate against the nationality of hauliers.

The charge must be collected through electronic systems which does not create hindrance to the free flow of traffic and local nuisance at tollbooths, and which can be extended to other part of the network at a later stage without significant additional investments. A transition period for the current systems with barriers is planned. To avoid undue charging of users, other conditions must be met when a charge based on the costs of congestion and pollution is combined with a charge to recover the cost of infrastructure.

The proposal extends the scope of the current Directive beyond the TEN-T network to avoid inconsistent pricing schemes between major corridors and other interurban roads. It makes more practicable the provisions in the current Directive on the mark-up levied in mountainous areas to co-finance EU labelled priority projects.

It does not prevent Member States from applying on urban roads regulatory charges specifically designed to reduce traffic congestion or combat environmental impacts in built up areas.

Relevance to green corridor development

Internalisation of external costs is a measure supporting the development of green corridors to the extent that affects the behaviour of transport users towards more efficient use of infrastructure and reduction of the negative externalities associated with transport activities. Significant additional benefits can be achieved by earmarking the revenues generated by internalisation for environmentally friendly transport infrastructure and elimination of existing bottlenecks, leading to improvements in all SuperGreen KPI areas.

Measures/changes suggested or introduced The proposed measures are:			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Revise Directive 1999/62/EC to allow differentiated charging on heavy goods vehicles taking into consideration pollution and congestion related external costs	PP	Implementation would encourage transport operators to use cleaner vehicles, to choose less congested routes, to optimise the loading of their vehicles, and ultimately to make more efficient use of infrastructure
2	Use revenue generated by internalization to enhance transport sustainability	PP	Increased funds for facilitating efficient pricing, reducing road transport pollution at source, mitigating its effects, improving CO_2 and energy performance of vehicles, and developing alternative infrastructure for transport users. All these activities lead to direct improvements of environmental sustainability and indirect ones to all other KPI areas.

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number : 44**		**Partner : NTUA**	
Document identity		Field[1] : POL		Doc.date : Feb. 2008	
Doc. number :	07.4288.52	Study :	X	Regulatory act :	
Author :	Maibach et al (CE Delft)	Research proj.:		- Suggestion :	
On behalf of :	European Commission DG TRE	Other doc.:		- In force :	
Title :	**Handbook on estimation of external costs in the transport sector (IMPACT study)**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/sustainable/doc/2008_costs_handbook.pdf				

Objective(s)

The central aim of the study is to provide a comprehensive overview of approaches for estimation and internalisation of external costs in the transport sector and to recommend a set of methods and default values for estimating these costs when conceiving and implementing transport pricing policy and schemes.

Main findings / results achieved / summary of measures

The study covers all environmental, accident and congestion costs and considers all transport modes. The focus is on the marginal social cost pricing concept of welfare economics. The analysis does not cover existing taxes and charges or infrastructure (fixed and variable) costs. The information is provided at three levels: (a) methodological level (methods used to produce external cost figures), (b) input values (values needed for the estimation), and (c) output values (external cost estimates). The following external costs are covered by the study:

1. Congestion and scarcity costs: The costs experienced by all other infrastructure users due to the entrance of an additional operator into the system. They include primarily travel time increases and additional fuel costs, while secondary effects are additional vehicle provision and operating costs and higher valuation of delay times compared to standard in vehicle time due to the unreliability of travel time (particularly important for freight transport).

Estimation is based on the difference between average and marginal costs at optimal traffic levels through the formula:

*External congestion costs = Increased journey time * Value of time * Traffic volume*

Important input values are speed-flow relations and the value of time. Willingness to Pay (WTP) is the best practice approach for the estimation of the value of time (based on stated preference approaches). Furthermore, as levying the external costs to transport users will affect the level of demand and thus the level of congestion itself, price-relevant marginal social congestion costs need to be computed for the equilibrium of demand and supply. Demand elasticity figures are then also needed as input values.

Output unit values for road transport depend on location (urban, interurban) and time of the day (peak, off-peak). For rail transport, external costs of this category include opportunity costs (slot allocation) and delay costs (operative deficits). A figure of 0.20 €/train-km in morning peak is suggested based on UK and Swiss evidence. No costs of this type are suggested for waterborne transport, provided that there is no slot allocation in ports/channels (congestion is considered individual).

2. Accident costs: Those social costs of traffic accidents, which are not covered by risk oriented insurance premiums. They can be estimated by the formula:

*External accident costs = Traffic volume * Risk elasticity * Unit cost per accident * External part,*

where risk elasticity is the risk of an additional accident at the actual level of traffic volume. In calculating the unit cost per accident, the Value of Statistical Life (VSL) is needed. VSL is taken at an average value of € 1.5 million per fatality. Values for severe injuries are derived as 13% of VSL, and for slight injuries as 1% of VSL. In addition to the risk values, further direct and indirect economic costs (medical cost, net production losses, administrative costs, etc.) are considered. The percentage of the resulting accident costs internalised depends on the national insurance system. Case studies have shown that the internal part varies between 59 and 76% for road transport.

Output marginal accident costs are derived for passenger cars, motor cycles and heavy goods vehicles (HGV) for different countries differentiated by network type (urban roads, motorways, other roads).The insurance systems for individual (road) transport differ from insurance systems for other modes, generally resulting in a lower external part of accident costs for the non-road modes. There are no studies available concerning risk elasticities for rail transport. It follows that the existing results represent average rather than marginal costs. European average external accident costs for rail transport amount to € 0.08 - € 0.30/train-km.

3. Air pollution costs: They are caused by the emission of air pollutants such as particulate matter (PM), NOx, SO_2, O_3 and VOC and consist of health costs, building/material damages, crop losses and costs of further damages to the ecosystem (biosphere, soil, water). Most important are the costs for $PM_{2.5}$ and NOx. They are calculated by the formula:

*External air pollution costs = Specific emission * Cost factor per pollutant*

The cost factor is estimated by differentiated damage cost curves based on the impact pathway approach (established within the ExternE project), which is broadly acknowledged as the preferred approach for estimating air pollution costs. Important input value is the VSL (based on WTP). It is noted that VSL related to air pollution is estimated at ca. € 1 million, lower than the one related to accidents. The main reasons for the differences of VSL in health and accident cost estimation are different WTP research designs and the fact that accident risk perception (sudden fatalities) is different to air pollution related long-term mortality risks (loss of life years). Other input values include population densities, country-specific meteorological conditions and traffic patterns (distribution of exhaust emissions).

Air pollution costs, expressed in €/tonne of each pollutant, are recommended for road, rail, air and inland waterway transport (per country) and separately for maritime transport (per sea region). These figures can be transformed into unit cost rates per vehicle-km through the use of models taking into account the different modes and vehicle categories engaged in transport services in each country. As an example, emission costs are presented for Germany based on TREMOVE model outputs. For road transport, costs for passenger cars and trucks are presented, differentiated by vehicle-size, emission category (EURO-norm) and network type (metropolitan, urban, interurban and motorway). It is noted that emissions of air pollutants vary considerably depending on average speed (figures are based on certain assumptions regarding speed for each vehicle size and type of network). Rail transport related unit costs are differentiated by passenger and freight transport, traction type and type of network. For inland waterway transport, unit values for an average ship are presented.

4. Noise costs: They consist of costs for annoyance and health. The annoyance costs are usually economically based on preferences of individuals (by stated or revealed preference methods), whereas health costs (especially due to increased risk of heart attacks) are based on dose response figures. Due to the logarithmic nature of the relationship between noise and traffic volume, marginal noise cost is a decreasing cost function, leading to marginal costs below average costs for medium to high traffic volumes. In addition to existing noise levels, other cost drivers include the time of the day (noise disturbances at night will lead to higher marginal costs than at other times of the day), the receptor density close to the emission source (indication of the population exposed to noise) and a number of technical characteristics of the infrastructure and vehicles used, including the presence of noise walls. The formula used for estimating external noise costs is:

*External noise costs = Specific noise emission * number of people affected * damage per dB(A)*

The thresholds above which noise is considered a nuisance are somewhat arbitrary. Usually 50 dB(A) is adopted to define a reasonable level of noise. Furthermore, empirical evidence has shown that for a given decibel output, noise nuisance due to rail transport is experienced as less of a nuisance than road traffic noise. To correct for this effect, rail transport is often given a 5 dB 'discount' (rail bonus).

The study recommends unit values for marginal noise costs for road and rail transport. These are differentiated by type of vehicle (car, motor cycle, bus, LGV, HGV, passenger train, freight train), network type (urban, suburban, rural) and by time of day (day, night). Marginal noise costs due to maritime and inland waterway transport are assumed to be negligible, because emission factors are comparably low and most of the activities occur outside densely populated areas.

5. Climate change costs: Climate change or global warming impacts of surface transport are mainly caused by emissions of the greenhouse gases (GHG) CO_2, N_2O and CH_4. To a smaller extent emission of refrigerants (hydrofluorocarbons) from mobile air conditioners also contribute to global warming. The related social costs should reflect impacts due to sea level rise, energy use impacts, agricultural impacts, water supply impacts, health impacts, ecosystems and biodiversity impacts, impacts due to extreme weather events, and impacts due to major - potentially catastrophic - events.

The general approach for quantifying total external climate change costs for the transport sector is to: (i) assess total vehicle kilometres by type of vehicles of different categories for the area of interest, (ii) multiply vehicle kilometres by emission factors (in g/km) for the various GHGs, (iii) add various GHG emissions to a total CO_2 equivalent GHG emission using Global Warming Potentials, and (iv) multiply total tonnes of CO_2 equivalent emission by an external cost factor expressed in €/tonne. Given long-term reduction targets for CO_2 emissions, the avoidance cost approach is the best practice for estimating the external cost factor. The formula expressing this approach is:

*External climate change costs = Specific GHG emissions * External cost factor of CO_2 equivalent*

The most critical parameter in quantifying external climate change costs is the external cost factor of CO_2 equivalent. After recognising that "…the choice of specific values for the valuation of external costs associated with climate change is highly political and cannot be made on scientific grounds alone", the study recommends a bandwidth and a central value for each year of application from 2010 to 2050. The central value steadily increases from 25 €/tonne in 2010 to 85 €/tonne in 2050. By multiplying these values with the well-to-wheel CO_2 emissions per unit of fuel, these external costs are expressed in terms of cost per amount of fuel. The latter costs are further transformed into unit costs per vkm based on examples for different types and sizes of vehicles. For road transport, external climate change costs are provided differentiated by vehicle category (passenger car petrol, passenger car diesel, truck), vehicle size (<1.4L, 1.4-2L and >2L for passenger cars and <7.5t, 7.5-16t, 16-32t and >32t for trucks), EURO standards and type of network (metropolitan, urban, interurban and motorways). These figures are based on TREMOVE model outputs and represent fleet average 2005 emission values for

Germany for different vehicle categories. The corresponding rail transport figures differentiate among passenger and freight trains, type of traction (electric, diesel) and type of network (metropolitan, other urban, non-urban). Unit costs are also provided for a number of representative ships (dry cargo, tankers and push barges) employed on inland waterways.

6. Other external costs: Consist of the following 6 categories:

6.1 Costs for nature and landscape: They refer to costs related to habitat loss, habitat fragmentation and habitat quality loss. The repair cost approach is proposed. Average cost figures (in €/km/year) are provided for Switzerland. However, these costs are basically related to the construction of infrastructure and not its use. The marginal costs are therefore negligible.

6.2 Costs for soil and water pollution: The most important negative effects of traffic on soil come from the emission of heavy metals and polycyclic aromatic hydrocarbons (PAH) by different transport modes. These pollutants can lead to plant damage and decreased soil fertility along the transport infrastructure and sometimes even pose a threat to animals or human beings. The repair cost approach (for disposal and replacement of the polluted soil) is also proposed here as an estimation procedure. Unit costs are estimated for road and rail transport in Switzerland for year 2004 (1.05 €ct/vkm for HGV and 1.02 €ct/train-km for freight trains).

6.3 External cost in sensitive areas: Sensitive areas are defined as areas where damages are higher (because of higher environmental pressures and/or because of more damaging effects of the same pressure level) and possibly where unique natural resources or cultural heritages are in danger. Reference is made to a GRACE case study focussing on cost differentials between an Alpine area and a flat, 'insensitive' area for road and rail transport, based on the impact pathway approach. The case study suggests an overall multiplying factor of around 2.3 for external costs of HGV and 2.8 for freight rail transport. However these results only refer to increased costs in alpine areas and cannot be transferred to other transport sensitive areas.

6.4 Costs of up- and downstream processes: They are additional external costs caused by the production of energy, vehicles and transport infrastructure. It is important to note that these costs occur in other than the transport market, and the level of internalisation within these markets need to be considered. Costs of up- and downstream processes are calculated the same way as the direct external cost categories of transport operating, mainly based on additional air pollution and climate change costs. Pre-combustion costs for road, rail and inland waterways are proposed in the format used for the presentation of climate change costs. Costs for infrastructure and vehicle production/ maintenance/ disposal for each mode of transport are suggested only as a percentage of total external costs of up- and downstream processes (the share for road transport is between 30-40%, for rail transport the share is highly dependent of the electricity generation mix, and for inland waterways this share is between 20-30%).

6.5 Additional costs in urban areas: They refer to effects that motorised traffic in urban areas have on non-motorised participants (time losses for pedestrians due to separation effects of road infrastructure and loss of space availability for bicycles). The proposed additional unit costs in urban areas are 0.77 €ct/vkm for HGV and 17.93 €ct/train-km for freight trains.

6.6 Costs of energy dependency: The two major costs of this category mentioned in the literature are economic losses as a result of oil prices above a competitive market level (due to market power of the oil suppliers) and costs of oil supply disruptions. Most of the studies on these costs are U.S. studies on the costs of U.S. oil imports and can thus be used only as indicative values for European countries. Energy dependency costs range from 3.6 to 13.6 USD per barrel.

It is concluded that external costs of transport activities depend strongly on parameters like location (urban, interurban), time of the day (peak, off-peak, night), as well as on vehicle characteristics (EURO standards). The total external costs of a EURO-3 HGV in Germany range from 19.4 €ct/vkm (interurban, day, off-peak) to 109.8 €ct/vkm (urban, day, peak) in 2000 € prices. Similarly, the total unit costs of a freight train range from 95 €ct/train-km (urban, day, electric, off-peak) to 611 €ct/train-km (urban, night, diesel, off-peak). Total external costs for inland waterways range from 105 to 1,482 €ct/ship-km.

In general, the figures presented in the study are representative for average Western European countries and for a common base year (2000). However, the value transfer approach described in the study provides the necessary information for transferring these figures to other countries and specific traffic situations. These values will have lower accuracy, but still provide bandwidths and could be used for policy purposes.

A detailed assessment of the major studies and research projects reviewed by the study team is provided in the Annexes. The study itself has been reviewed by a panel of more than thirty experts, including experts who were designated by Member States.

Relevance to green corridor development

The study provides valuable insights for three of the five aspects of a transport corridor that concern SuperGreen, namely environment, infrastructure and social issues. The value of the study results is enhanced by the fact that they incorporate the findings of numerous earlier studies and research projects. The study is instrumental not only for understanding the nature of the externalities involved in a transport operation, but more importantly for the definition and estimation of relevant KPIs.

Measures/changes suggested or introduced

The study as such does not propose or introduce a specific change. It is a useful tool, however, in developing policies aiming at internalisation of external costs.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Internalisation of external costs	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number:**	**31**	**Partner:**	**NTUA**
Document identity		Field[1]:	POL	Doc. date:	15.1.2008
Doc. number:	OJ L 23, 26.1.2008	Study:		Regulatory act:	X
Author:	European Parliament & Council	Research project:		Suggestion:	
On behalf of:	European Parliament & Council	Other doc.:		In force:	X
Title:	**Decision No 70/2008/EC of the European Parliament and of the Council of 15 January 2008 on a paperless environment for customs and trade**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:023:0021:0026:en:PDF				

Objective(s)

The document concerns the decision to set up secure, integrated, interoperable and accessible electronic customs systems for the exchange of data contained in customs declarations, documents accompanying customs declarations and certificates and the exchange of other relevant information. It is related to the pan-European e-Government action, requiring measures to increase the efficiency of the organisation of customs controls and ensure the seamless flow of data in order to make customs clearance more efficient, reduce administrative burdens, help to combat fraud, organised crime and terrorism, serve fiscal interests, protect intellectual property and cultural heritage, increase the safety of goods and the security of international trade and enhance health and environmental protection.

Main findings / results achieved / summary of measures

The electronic customs systems shall be designed to meet the following objectives:

- to facilitate import and export procedures;
- to reduce compliance and administrative costs and to improve clearance times;
- to coordinate a common approach to the control of goods;
- to help ensure the proper collection of all customs duties and other charges;
- to ensure the rapid provision and receipt of relevant information with regard to the international supply chain;
- to enable the seamless flow of data between the administrations of exporting and importing countries, as well as between customs authorities and economic operators, allowing data entered in the system to be re-used.

The decision describes in detail the systems to be implemented and the relevant timetable. The target is to establish and make operational within six years "...single window services providing for the seamless flow of data between economic operators and customs authorities, between customs authorities and the Commission, and between customs authorities and other administrations or agencies, and enabling economic operators to submit all information required for import or export clearance to customs, including information required by non customs-related legislation."

Relevance to green corridor development

The Commission intends through this decision to create a paperless environment for customs and

trade in the EU. Customs clearance has been identified as a serious bottleneck in international freight transport. The development of single access points and the necessary electronic interfaces enabling economic operators to conduct all customs-related business electronically (e-customs) addresses this problem and contributes to corridor greening through improvements in efficiency and service quality.
Measures/changes suggested or introduced The decision aims at the following measures:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Harmonise exchange of customs related information	PP	Improvements in efficiency and service quality through eliminating a major administrative bottleneck
2	Re-engineer customs and related processes with a view to their simplification and to reducing the costs of customs compliance	PP	As above
3	Offer to economic operators a wide range of electronic customs services	PP	As above

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

Appendix III. Infrastructure

European Commission (2010). *Consultation on the future trans-European transport network policy.* Commission working document, COM(2010) 212, Brussels, 4.5.2010.

De Ceuster Griet et al. (2010). *Trans-European transport network planning methodology.* Final report, Leuven, Belgium, 18.10.2010.

Petersen M.S. et al. (2009b). *Report on Scenario, Traffic Forecast and Analysis of Traffic on the TEN-T, taking into Consideration the External Dimension of the Union.* TENCONNECT Final Report, Copenhagen, Denmark, 14.12.2009.

NEA et al. (2004). *Traffic, bottlenecks and environmental analysis on 25 corridors.* Deliverable D6 of the TEN-STAC (Scenarios, Traffic Forecasts and Analysis of Corridors on the Trans-European Network) project, September 2004.

European Commission (2006c). *Sustainable Surface Transport Research Technological Development and Integration: 2002-2006 Projects Synopses.* ISBN 92-79-04584-9, Brussels, 2006.

SUPERGREEN Document Fiche		Number: 10		Partner: NTUA	
Document identity		Field[1]: INFR		Doc. date: 4.5.2010	
Doc. number:	COM(2010) 212	Study:		Regulatory act:	
Author:	European Commission	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:	X	In force:	
Title:	**Consultation on the future trans-European transport network policy**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0212:FIN:EN:PDF				

Objective(s)

The document launches a public consultation aimed at refining the available policy options that have emerged from previous contributions made in 2009 by EU institutions and a wide range of stakeholders towards a revised Trans-European Transport Network (TEN-T) policy, which is also linked to the preparation of the White Paper for the future Common Transport Policy (CTP).

Main findings / results achieved / summary of measures

With its Green Paper on the future development of the TEN-T, published in February 2009, the Commission launched a review of the TEN-T policy. The main innovation proposed was the concept of a dual layer planning approach with a "core network" as the top layer. The vast majority of stakeholders, as well as the EU institutions and consultative bodies, preferred this approach over the other two planning options put forward by the Commission.

The "core network" would include axes and nodes of vital importance for transport flows within the internal market and between the EU, its neighbours and other parts of the world. It would also support the economic, social, and territorial cohesion of the European Union. It would provide, for all transport modes and across the modes, the necessary infrastructure basis for the achievement of common transport policy objectives required to match the "Europe 2020" strategy and the decarbonisation agendas.

The TEN-T dual layer planning approach would be characterised as follows: While maintaining the fairly dense rail, road, inland waterways, ports and airports networks, which constitute the "comprehensive network" as the basic layer of the TEN-T and are, in large part, derived from the corresponding national networks, the "core network" would overlay the "comprehensive" network and give expression to a genuine European planning perspective focused on bringing about a systemic improvement in the transport system's resource efficiency and a significant overall reduction of greenhouse gas (GHG) emissions from transport.

The general principles for designing the TEN-T at all strategic levels, comprise:
- Multimodality, including intermodal links and facilities for co-modal and/or combined transport,
- Interconnectivity and network optimisation,
- Interoperability and improved efficiency of all modes of transport,
- Sustainability, by reducing greenhouse gas emissions ("de-carbonisation") to minimize climate change impacts and pollution as well as by respecting relevant EU environmental legislation, including the Espoo Convention and in particular the following Directives: SEA, EIA, Habitats and Birds, Water Framework Directive, Floods Directive,
- Attention to biodiversity proofing, in particular Natura 2000 network when it comes to transport infrastructure,
- A focus on quality of service for both freight users and passengers,
- Safety and security of transport infrastructure,
- Application of advanced technologies and ITS, and
- Minimisation of investment, maintenance and operational costs, while nevertheless meeting the relevant policy objectives and the criteria below in a balanced way.

Planning the core network

Planning a core network is not meant to initiate a new infrastructure programme of immense scope: ensuring continuity for ongoing projects, giving due attention to the removal of key bottlenecks and building largely on existing infrastructure, it aims at becoming the basis for an efficient, less carbon intensive, safe and secure transport system.

In shaping the network configuration, based on a geographical approach, a number of criteria will need to be taken into account, such as spatial integration and cohesion effects, internal market needs, external and global trade flows, passenger and freight traffic and customers' needs, inter-connectivity and multimodality of the network, environmental and climate change issues.

Planning the core network involves four successive major steps:
1) Identifying the main nodes, which configure the overall layout of the network.
2) Linking the main nodes and selecting intermediate nodes for inclusion into the network.
3) Determining the relevant technical parameters to be applied, according to functional and capacity needs.
4) Including relevant complementary or auxiliary hard or soft infrastructure, so as to meet the requirements of operators and users, in line with specific policy objectives, and to enhance efficiency and sustainability.

The main nodes determining the basic structure of the network configuration will be:
- The biggest or most important nodes, such as Member State capitals, other cities or agglomerations of supra-regional importance in administration, economy, social and cultural life and transport;
- Gateway ports, intercontinental hub ports and airports, connecting the EU with the outside world, and the most important inland ports and freight terminals.

Planning the comprehensive network

As in the past, the future Comprehensive Network should ensure accessibility of and access to the core network, and contribute to the internal cohesion of the Union and the effective implementation of the internal market. It should address a series of different needs:
- a reference for land use planning;
- a geographic reference for other policies;
- a reference on the requirements of the relevant EU environmental legislation and policies, in particular on the protection of biodiversity;
- a target for technical and legal requirements on interoperability and safety;
- the accommodation of technical standards to enable effective modal integration with the aim of door to door co-modality.

The future comprehensive network, would take the current comprehensive network as a starting point and:

- Update the current comprehensive network to reflect progress in its implementation and adjust it where necessary to changes in national planning;
- Add selected and well-defined missing links and nodes, especially in Member States which have acceded the EU since 2004, where necessary to ensure homogeneous network planning and the interconnection of national networks, and to contribute significantly to the TEN-T objectives;
- Eliminate dead ends and isolated links in the current comprehensive network if not justified with geographical particularities.

Innovative infrastructure measures

The core network should give priority to transport infrastructure-related measures that stem from EU policy goals.

Intelligent Transport Systems, innovation and new technologies represent an important part of the Core Network. ITS should enhance the efficient use of infrastructure and is the key to genuine network integration. They can also contribute to environmental performance, (energy) efficiency, safety and security as well as passenger and freight mobility, and can help to connect TEN-T corridors and urban transport networks.

The TEN-T should, in line with the 2020 goals, address technological innovation and knowledge, so as to be able to accommodate new generations of vehicle and boost infrastructure advances, in particular with respect to energy provision for transport. The use of clean, alternative fuels should be promoted as an integral part of future TEN-T development.

TEN-T implementation

Following the definition of the TEN-T as the result of the planning process, the assessment and prioritisation of infrastructure projects is necessary in order to ensure a greater impact and leverage effect of the TEN-T funding. In order to allow implementing the projects with the highest European added value, it is of great importance to define the way those projects are identified and to implement them in a coordinated way.

In order to meet the funding challenge, consideration should be given to setting up an integrated European funding framework to coordinate EU instruments for transport, such as the TEN-T programme and the TEN-T related contributions of the Cohesion and Structural Funds. The funding framework should not necessarily be restricted to supporting infrastructure investments only, but could also contribute to integrating other transport policy-related components (Marco Polo, SESAR, technological deployment, Green Corridors, links to the neighbourhood countries, research and development in transport) to promote the emergence of integrated transport systems.

Relevance to green corridor development

The core network concept places emphasis on the European dimension of the transport networks and their integration, in a way that combines efficiency targets with the sustainable development goals of the EU. In this respect, the core network basically extends the green corridor concept across all Europe, making SuperGreen the laboratory of the new TEN-T policy.

Measures/changes suggested or introduced

The main policy directions suggested by the document are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Create a core network of high European added value	ID	Improvements in all KPI areas through addressing major bottlenecks. New

			infrastructure projects will strain land-use.
2	Deploy ITS applications	TD	Improvements in all KPI areas through more efficient use of infrastructure, integration of transport modes and better connection of TEN-T corridors with urban transport networks
3	Accommodate new generations of vehicles using alternative fuels	TD, ID	Improvements in environmental sustainability
4	Set up an integrated European funding framework	ID	Improvements in all KPI areas through addressing major bottlenecks. New infrastructure projects will strain land-use.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 5		Partner: NTUA	
Document identity		Field[1]: INFR		Doc. date: 18.10.2010	
Doc. number:		Study:	X	Regulatory act:	
Author:	De Ceuster Griet et al.	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Trans-European transport network planning methodology**				
Related doc's:					
Web address:	http://ec.europa.eu/transport/infrastructure/studies/doc/2010_10_ten-t_planning_methodology.pdf				

Objective(s)

The document aims at defining a methodological approach of the TEN-T planning network, in particular the "core network", as defined in the European Commission's Green Paper on the TEN-T policy review. TEN-T policy is part of the central planning guideline of European transport planning and aims to achieve a multimodal and interoperable network with European added value. The study provides analyses of transport development options which lead to solutions and recommendations, anchored in policies and institutions.

Main findings / results achieved / summary of measures

The proposed method consists of:

1) Selection and functional classification of nodes and defining a core network on the connection level

This entails a vision of the overall structure of the network, including, for example, the settlements that need to be connected, the various scale levels required, etc. Current practice often employs a bottleneck approach: problems are solved at the element level. This leads to an approach that follows demand, offering little scope for a well-structured spatial policy. The design must be one of the 'perfect, most desired structure', free from the existing one. The ideal structure functions as a long-term focus.

2) Quality criteria for the connections (links) in the core network and assessment of missing links

In order to realise a particular accessibility the function and the desired quality of the connections need to be clearly defined. Quality implies aspects such as speed, reliability and comfort, but also the pricing concepts that need to be applied. In a second phase, the existing network is assessed according to the quality standards. This will lead to a list of underachieving, or even missing links.

3) Network assessment strategy: ranking (MCA) and evaluating (CBA) projects

A cost-benefit analysis is the most appropriate tool for the appraisal of network connections. However, on the strategic level, a multi-criteria analysis could be more adequate to quickly scan the possible effects on sustainability.

The design proceeds mainly in top-down fashion, using feedback from a bottom up approach. Firstly an ideal network is defined, a network that is neither influenced by the applicable modes of transport nor 'obscured' by existing rail or road infrastructure. This is done to obtain a better picture of the function of the infrastructure to be designed. Of course this ideal network may deviate from the existing transport network.

Because the primary function of a network is to offer transport connections between various access points (or nodes), the selection of access points precedes the inclusion of the network links.

A hierarchy in the access points is established (e.g. based on number of inhabitants) and used as a selection criterion. The size of the flows between the various access points can be used to check the selection. The spatial orientation of the various access points is also an important factor influencing the network structure.

The part of the report that is most relevant to SuperGreen is the section dealing with quality criteria. It is noted that these criteria have been selected for network design and not for the performance of a physical network.

The study first identifies the following seven objectives pursued by TEN-T policy:
- Internal market, social and economic cohesion
- Territorial cohesion
- Sustainable development
- Specific objectives aiming to achieve a multimodal and interoperable network
- Climate change
- Globalisation and international dimension
- Transport policy development

It then translates these objectives into quality criteria for the network connections. "Quality" is defined in a broad way, and can be translated into three views:
- The view of the society: This boils down to the overall sustainability goals, in their 3 dimensions: economy, environment and social quality.
- The view of the users: They want a fast, cheap and comfortable connection.
- The view of the network owner as the service provider: They want an easy and cheap exploitation, and a large flexibility and interoperability.

The study concludes with the following performance criteria:
- **Mean speed:** It includes average congestion, access time and delays, cross-border delays, service frequency (in case of public transport, air transport), and geographical detours.
- **Reliability:** It describes the ability of the transport network to cope with transport demand peaks and includes congestion on the road network and punctuality in rail and air connections.
- **Environmental hindrance (air quality, noise):** Emissions include CO, NOx, PM, SOx and VOC, and their calculation is based on the kilometres covered per road type. Quantification of noise nuisance is based on load per stretch of road, composition of the traffic, speed of the traffic, distance of road axis from building facades, and building density (number of premises/residents along the side of the road).
- **Climate change:** Impacts can be measured by transport emissions of greenhouse gases by mode and by type of gas, expressed in CO_2 equivalent.
- **Landscape:** This effect is difficult to quantify generically; each case will largely have to be examined on its own merits. One way of calculating the effect is to determine which remediation measures (investments) are desirable to retain the original situation.
- **Safety:** The kilometres on the network are multiplied by risk factors that indicate the possibility of an accident with (fatal) injury as a function of the distance covered.
- **Security:** It is hard to measure security by indicators. Some existing indicators are the number of vehicle thefts and other vehicle related crimes per inhabitant, and the number of security incidents on public transport per year per inhabitant. The relevance for TEN network design is however

small.

- **Interoperability and harmonisation:** It can include technical aspects as curve radii, gradient, cross-section (number of lanes or tracks), legal regulations (e.g. speed limits), traffic control harmonisation (all modes), harmonisation of operational procedures and practices, rolling stock standards, rail electrification and track widths.
- **Operational costs:** They include cost of traffic management, maintenance costs, safety costs etc.
- **Costs to the user:** They include the costs of vehicle acquisition, operational costs (fuel cost, parking, …).

Relevance to green corridor development

The methodology for designing the "core network", which is the objective of this study, is rather peripheral to green corridor development. What is of value, though, is the performance criteria that have been proposed for selecting the "core network" connections.

Measures/changes suggested or introduced

The document does not propose any measures.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1			

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

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<tr><td>On behalf of:</td><td>European Commission</td><td>Other doc.:</td><td></td><td>In force:</td><td></td></tr>
<tr><td>Title:</td><td colspan="5">Report on Scenario, Traffic Forecast and Analysis of Traffic on the TEN-T, taking into Consideration the External Dimension of the Union</td></tr>
<tr><td>Related doc's:</td><td colspan="5"></td></tr>
<tr><td>Web address:</td><td colspan="5">http://ec.europa.eu/transport/wcm/infrastructure/studies/2009_12_ten_connect_final_report.pdf</td></tr>
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Objective(s)

This report is the final report of the TENconnect project. The project analysed the existing Trans European Network for Transport (TEN-T) as part of the process of developing the forthcoming EU transport policy from 2010 and onwards.

The TENconnect project dealt with many aspects of the TEN-T, from analysis of the existing traffic flows, forecasts of traffic flows until 2020 and 2030 and identification of major axes taking into account a number of aspects like cohesion, internal market and access to neighbouring countries. Based on the findings, the project proposed an outline of a TEN-T core network. Analysis was carried out as to identification of bottlenecks and missing links on the main European transport networks, and this resulted in the definition of a number of improvement projects of European interest. The project also identified the parts of the priority projects not yet implemented, and thus eligible for a screening and evaluation.

Main findings / results achieved / summary of measures

1. Forecasts

Two scenarios were established for 2030, a Baseline scenario prolonging existing trends and a Sustainable Economic Development (SED) scenario anticipating a higher level of economic development and integration in EU. Also a Baseline 2020 scenario was defined. The TRANS-TOOLS model was used to identify the future traffic levels in these scenarios.

The Baseline scenario for 2030 indicates an increase in the number of passenger trips in Europe (the complete coverage area of the TRANS-TOOLS model) of about 29% and in lifted tonnes of about 24%. Both passenger km and tonne km increase faster than trips and lifted tonnes indicating that transport distances are expected to increase in the future. The results are summarized in the table below.

	Mode	Model 2005	Model 2030 Baseline	Diff. 2030/2005 (%)	Model 2030 SED	Diff. SED/Base-line (%)
Passenger	Passenger car, 1000 m. pkm	4507	6076	35%	6763	11%
	Railway, 1000 m. pkm (excl. Tram and Metro)	375	659	76%	787	19%
Freight	Truck, 1000 m. tonne km	1712	2442	43%	2596	6%
	Railway, 1000 m. tonne km	447	797	78%	894	12%
	IWW, 1000 m. tonne km	130	181	39%	207	15%

Tonne km in inland freight in EU increases with 49 %, the highest growth being envisaged for rail transport with 78 %. This would mean that rail freight transport would account for 33 % of all inland freight in EU in 2030 compared to only 26 % in 2005. The major rail freight flows in 2030 are linked to the development in Russia and the outlet to the Baltic countries and via Poland to Germany. It is bulk commodity groups which are developing fast in this relation.

In the SED scenario passenger and tonne kilometres are increasing over the level of the Baseline scenario. This is expected because the economic growth is higher in this scenario.

2. Trans European core networks

The study proposed a formalised methodology for identifying networks of European interest where a number of key indicators were assessed in order to provide a comprehensive picture of the road and rail infrastructure networks taking into account single market issues, cohesion and trade with neighbouring countries.

The methodology includes assessing assignment results by link for international and long-distance national traffic, identifying links between each Metropolitan European Growth Area (MEGA) and the nearest three other MEGAs, identifying links between MEGAs and major European airports and ports and ensuring that the density of networks in terms of km per inhabitant or km per international traveller is comparable for the European countries. The final step analyses the infrastructure networks in relation to land-use impacts. Using this methodology combining results from the TRANS-TOOLS model with more general GIS methodologies provided two different sets of exemplified core networks for road, passenger rail and freight rail in Europe, the difference being the length of the networks and thus the potential investment demand. The networks incorporate the EU27, Switzerland, Norway and the west Balkan countries.

Having identified the exemplified core networks for road and rail the study identified shortcomings in the networks and established packages of projects which could be prioritized.

3. Analysis of bottlenecks

Different types of bottleneck were analysed, like congested links in the road and rail networks, links with poor condition, links and nodes with particular problems including border crossings, airports and ports and social and environmental bottlenecks.

For road, bottlenecks can be identified as links where traffic exceeds available capacity. In principle the analysis should be carried out by Time of Day period. However, the identified bottlenecks are characterised by having congestion in most hours of the day. Particularly the southern part of UK has a high level of congested road links.

Bottlenecks in the rail network were identified based on general assessments of number of trains which can possibly be served on the different links compared to predicted flows of passenger and freight trains. The results indicate that the rail networks in Germany and UK will be congested, and also that specific routes like Paris – Marseille and Verona – Innsbruck will be congested unless improvements are carried out. Particularly in peripheral areas a number of single track links are expected to develop into bottlenecks in 2030.

The bottleneck analysis also included sea ports and particular bottlenecks in the maritime systems mainly related to specific routes where limitations in draught and ship passages exist, e.g. Bosporus and the Kiel Canal. In general the port capacity in terms of sea/land interface is expected to develop parallel with demand, although constrains are expected to develop particularly in the Russian Baltic ports. An increasing challenge is maintaining a smooth interface between the port and its hinterland, and social bottlenecks related to location of ports in dense urban areas were also identified as a challenge primarily in Genoa, Piraeus and south UK. In the inland waterway system (IWW) bottlenecks were identified on the Danube and the link between Danube and the Rhein.

The administrative bottlenecks are extremely visible at the borders between EU and the neighbouring countries, where administrative procedures may take many hours or even days, far outweighing the time gains obtained by infrastructure improvement. In addition, different weight and dimension regulations for road haulage within EU and national railway regulations on driver's education, inspection of wagons etc create also waiting times and administrative bottlenecks inside EU which need to be tackled.

Environmental bottlenecks comprise partly traffic related nuisance inflicted to the population living near the infrastructure under consideration and partly conflicts between new infrastructure development and environmental preservation areas of European interest. The inflicted nuisance comprises noise, emissions and fatalities, and based on the TRANS-TOOLS results the environmental bottlenecks occur mainly in the major urban areas in Europe.

4. Evaluation of projects

The next stage was matching bottlenecks and missing links with the exemplified core networks, thus identifying the most important problems from a European perspective. Solutions to these problems consist of infrastructure improvements of bottlenecks and missing links. The cost of improvement projects was assessed making intensive use of available cost estimates and engineering experience. Cost Benefit Analyses (CBA) in line with the HEATCO recommendations were carried out for a number of sample projects. Although the methodology is able to provide results for the international traffic it should be recognised that a large amount of the benefit attributable to the projects stems from local benefits, which in many cases are not described.

5. Other tasks

TENconnect included two separate tasks not related to the main project of identifying and assessing projects in the exemplified core networks. One of these tasks encompassed an analysis of freight flows between Europe and Asia with particular relevance for overland transport, and also an analysis of cost and time for overland transports between Europe and Asia compared to the overwhelmingly used maritime transport. The findings indicated that there is a potential for overland transport particularly from West China and Iran to Europe. But there are still a number of obstacles which should be removed, ranging from poor infrastructure to diverse administrative regulations in the different countries. The other separate task was a GIS mapping ensuring that TRANS-TOOLS results can be displayed on the EC GIS. In addition, the project provided a new and improved version of the TRANS-TOOLS model.

Relevance to green corridor development

The parts of the study most relevant to green corridors are:

a) The methodology developed for identifying the core network, which concentrates on international and long-distance national traffic between each Metropolitan European Growth Area (MEGA) and the nearest three other MEGAs. Green corridors by definition connect major hubs.

b) The analysis of bottlenecks, which are also monitored as a KPI of the infrastructural sufficiency group.

c) The analysis of freight flows between Europe and Asia with particular relevance for overland transport, which happens to be one of the 9 corridors studied under the SuperGreen project.

Measures/changes suggested or introduced

No measures are suggested by the study.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 46		Partner: NTUA	
Document identity		Field[1]: INFR		Doc. date: Sept 2004	
Doc. number:		Study:	X	Regulatory act:	
Author:	NEA et al.	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Traffic, bottlenecks and environmental analysis on 25 corridors**				
Related doc's:					
Web address:	http://ec.europa.eu/ten/transport/documentation/index_en.htm				

Objective(s)

In the TEN-STAC project, a uniform framework has been developed to compare and assess the expected future impacts (until the year 2020) of various proposed transport infrastructure projects in Europe. The infrastructure projects considered for examination include the list of priority projects of TEN-T.

Main findings / results achieved / summary of measures

The methodology adopted by the project answers the following questions:

- What will be the changes in the size, composition, modal split and spatial distribution (routing) of future transport flows as a consequence of the realisation of the infrastructure project(s)?
- What are the changes in the use of transport infrastructure networks as a consequence of the realisation of the infrastructure project(s)?
- What are the benefits for the economy and society of the changes in transport flows and network use of the realisation of the infrastructure project(s)?
- What is the dimension of these benefits for the society compared to the costs for the realisation of these projects?

Part of the work in the TEN-STAC project consists in working out the aforementioned questions in more detail and proposing an indicator set that is capable of answering such questions. These indicators have been applied to all of the projects assessed, in a way that the measurements of indicators are comparable across projects.

The 32 selected indicators are presented in the table below:

Objective	Indicator	Ind.#	Unit of measure
ECONOMIC IMPACTS IN THE TRANSPORT SECTOR			
IMPROVEMENT OF ROAD LEVEL SERVICE	Changes in time costs caused by road congestion	1	Mln. € / year
REDUCTION OF TRAVEL TIME	Changes in monetary value of the reduction of passenger travel time	2a	Mln. € / year
		2b	passenger * hour / year
	Changes in monetary value of the reduction of freight travel time	3	Mln. € / year

ENVIRONMENTAL SUSTAINABILITY			
GLOBAL WARMING	Change (in monetary value) of the transport contribution to global warming	4a	1000 € / year
		4b	Mln. kg CO2 / year
ATMOSPHERIC POLLUTION	Change (in monetary value) of the NOX transport emission	5a	1000 € / year
		5b	Mln. kg NOx / year
	Change (in monetary value) of particulates' emissions of transport	6a	1000 € / year
		6b	Mln. kg particulates / year
TRANSPORT SAFETY	Variation on monetary value of accidents	7	Mln. € / year
INVESTEMENT COST			
INVESTMENT COST	Total project costs	8	Mln. €

Objective	Indicator	Ind.#	Unit of measure
GENERAL TRANSPORT RELEVANCE			
TOTAL TRAFFIC VOLUME ON THE PROJECT	Total passenger traffic on the project section	10	Mln. passengers / year
	Total freight traffic on the project section	11a	Mln. tons / year
		11b	Mln. tons / year
		11c	Bln. ton km /year
INTERMODALITY	Quantitative appraisal of the project's contribution for an intermodal transport system	12	Mln. tons
CREATION OF EUROPEAN VALUE ADDED			
DEVELOPMENT OF INTERNATIONAL PASSENGER TRAFFIC	Share of international passenger traffic on total traffic on the project	13	%
	Volume of international passenger traffic on the project	14	Mln. passengers / year
DEVELOPMENT OF INTERNATIONAL FREIGHT TRAFFIC	Share of international freight traffic on total traffic on the project	15	%
	Volume of international freight traffic on the project	16	Mln. tons / year
INTEROPERABILITY	Reduction of passengers waiting time at borders for international traffic	17	-
	Reduction of freight waiting time at borders for international traffic	18	-
	Length of networks becoming interoperable because of the project	19	-
IMPROVEMENT OF ACCESSIBILITY			
PASSENGER ACCESSIBILITY	Variation of the STAC centrality index for passenger transport	20	%
FREIGHT ACCESSIBILITY	Variation of the STAC centrality index for freight transport	21	%
PERIPHERAL ACCESSIBILITY	Variation of the STAC centrality index for passenger transport in regions identified as peripheral	22	%
	Variation of the STAC centrality index for freight transport in regions identified as peripheral	23	%
ENVIRONMENTAL SUSTAINABILITY			
MODAL REBALANCING	Volume of road freight traffic shifted to rail, IWW or sea transport	24	Mln. t·km / year
	Volume of road and air passenger traffic shifted to rail	25	Mln. passenger·km / year
LEVEL OF CONCERN: TRAFFIC TRANSFER	Transfer of traffic from infrastructure lying in sensitive zones to the projected infrastructure	26	% of road traffic transferred from sensitive areas
LEVEL OF CONCERN: DISTANCE	Percentage of the length of the project lying in a sensitive area	27	% length
LEVEL OF CONCERN: EMISSIONS	Changes of inhabitants' level of concern caused by emissions of NOx and particulates	28a	% NOx
		28b	% Particulates
LEVEL OF CONCERN: PROXIMITY	Synthetic appreciation of the proximity of the project from specially protected areas (SPAs) or densely populated areas	29a	Proximity of the project from SPA (km)
		29b	Number of inhabitants living in the zone traversed by the project
MATURITY AND COHERENCE OF THE PROJECT			
DEVELOPMENT OF THE PROJECT	Appraisal of the project planning status	30	-
INSTITUTIONAL SOUNDNESS	Qualitative appraisal of the project's compliance with national plans	31	-
COHERENCE OF THE PROJECT	Qualitative appraisal of the project's coherence with main international traffic corridors	32	-

One of the main findings of the project consists of the modal shift from road to alternative modes of transport. The project concluded that when all priority projects of the list were to be realised, approximately 107 mln tones additional freight volumes would be shifted from road freight transport to other modes of transport. The size of the shift potentials is very modest compared to the forecasted size of total road freight transport volumes in Europe in 2020 (this is expected to amount to approx. 6,200 mln tonnes). This figure however is much more impressive when compared to the forecasts of the volume of international road freight transport in 2020 (which is approx. 1,200 mln tonnes). So, the TEN-STAC study confirms that infrastructure is important and very relevant for modal choice.

When comparing the shift potential forecasts in TEN-STAC with the shift potentials as reported in individual country cost-benefit assessments, it is generally found that the individual country estimates are much higher than the forecasts in TEN-STAC. Differences vary per project but on average the size of TEN-STAC estimates is approximately 30- 50% of the reported national figures. This large gap between forecasts can be explained by the factors like overlap between projects, the filtering out of impacts of other policies like e.g. infrastructure pricing policies in TEN-STAC, differences in the assumptions on which the forecasts are based.

Comparing the sum of all individual priority projects outcomes with the scenario involving all priority projects being implemented simultaneously indicates that generally priority projects more tend to complement each other than that there is rivalry between them. Although there certainly are examples of rival priority projects, most of the priority projects increase the size of the modal shift in the "all projects" scenario. The total additional boost of implementing all priority projects is approx. 20 mln tonnes. So it appears that there is an increasing return to scale.

As may be expected just looking at modal shift opportunities, projects in the geographic and economic centres of the Europe score highest. Priority projects in peripheral regions generally appear to have a limited modal shift potential. The majority of the priority projects are rail transport related but also the two water related corridors show sizeable modal shift potentials.

Relevance to green corridor development

The study shows the importance of the TEN-T priority projects in the functioning of the European transport networks. Parameters of importance to SuperGreen like CO_2, NOx and PM emissions, congestion and accidents are not only taken into consideration but are evaluated in money terms.

Measures/changes suggested or introduced

No measures are suggested by the study.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
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All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 28a		Partner : SITO	
Document identity		Field[1] : INFR		Doc.date : 2006	
Doc. number :	ISBN 92-79-04584-9	Study :		Regulatory act :	
Author :	European Commission	Research proj.:	X	- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Sustainable Surface Transport Research Technological Development and Integration: 2002-2006 Projects Synopses**				
Related doc's :	ARCHES, ECOLANES, HP FUTURE-BRIDGE, INNOTRACK, ITARI, SAFE-RAIL, SUSTAINABLE BRIDGES				
Web address :	http://www.gppq.mctes.pt/brochuras/online/SST%20FP6.pdf				

Objective(s)

This is a reference book containing the synopses of surface transport research projects co-financed under the 6th FP of the European Commission. The seven projects cited below concern the design and manufacture of new construction concepts for road, rail and inter-modal infrastructures.

Main findings / results achieved / summary of measures

The overall goal of ARCHES is to reduce the gap in the standard of highway infrastructure between Central and Eastern European Countries (CEEC) – particularly new Member States – and the rest of the EU. This key problem will be addressed by a combined approach including:

- developing more appropriate tools and procedures to avoid unnecessary interventions (repairs / replacements) in structures and prevent the development of corrosion by simpler and less expensive techniques
- implementing faster, more cost-effective and longer lasting repair or strengthening techniques of sub-standard and unsafe bridges
- aggressive dissemination of results and general best practice to the key stakeholders.

Another important objective of this project is to help society and politicians to understand the need for sustainable maintenance of their road networks, together with their engineering infrastructure, and to help managers of infrastructure to spend their resources in a more optimal way.

ECOLANES' main objective is to develop, test and validate steel fibre reinforced concrete (SFRC) pavements. It aims to reduce construction costs in the range of 10-20%, reduce construction time by 15% and energy consumption by up to 40%. Three key research areas will be addressed:

- Tyre recycling: Techniques and equipment will be developed for post-processing steel fibres extracted from tyres, to arrive at fibres suitable for incorporation in concrete.
- Concrete engineering: Development of steel fibre reinforced concrete (SFRC) mixes suitable for slip forming and roller compaction, which have reduced energy requirements and use recycled materials. Both industrial fibre reinforcement and fibres from recycled tyres will be used, as well as low energy cements, pulverised-fly-ash and recycled aggregates.

- Transport engineering: The concept of the long lasting, rigid road pavement (LLRRP), made of low energy concrete reinforced with steel fibres, will be developed and technically validated on a circular accelerated testing facility. Numerical analyses and parametric studies will be carried out to develop design models for LLRRPs.

The overall objective of the HP FUTURE-BRIDGE project is the development of a new high-performance and cost-effective construction concept for bridges based on the application of fibre-reinforced polymers (FRP) for rapid renewal, providing a longer lasting repair for these infrastructures in the new Member States.

A major parameter determining the environmental friendliness of road transport is the road texture influencing noise generation, rolling resistance and safety. ITARI aims to find optimal tyre/road combinations that minimise total energy loss due to rolling resistance and lead to a reduction of fuel consumption and hence emission of greenhouse gases. Improved safety can also be achieved through highly sophisticated road surfaces designed to provide optimum grip. Furthermore, the combination of low-noise road textures with sound absorbing and/or flexible constructions could give a reduction of about 10 dB in road traffic noise independently from tyres and speed.

ITARI will develop:

- a tool for designing low noise surfaces based on a hybrid simulation model for tyre/road noise
- a prediction tool for rolling resistance as a function of surface properties
- a prediction tool for wet grip
- a measurement tool concerning:
  - absorption characteristics of road surfaces
  - flow resistance of surfaces
  - mechanical impedance of road surfaces.

The project will also:

- suggest optimised innovative road surfaces with an improved overall performance
- build such virtually designed surfaces by applying new and innovative road surface technology
- validate the results by measurements.

INNOTRACK will perform research on four key topics: track support structure, switches and crossings, rails, and logistics for track maintenance and renewal. It will also provide an innovative methodology for Life Cycle Cost (LCC) calculation and Reliability Availability Maintainability Safety (RAMS) assessment to be used by all infrastructure managers across Europe.

INNOTRACK will provide railway infrastructure managers with crucial information, innovative solutions and technologies to facilitate the understanding and implementation of leading-edge track system technologies, which can effectively contribute to LCC reduction. Manufacturing industry will also benefit through the implementation of appropriate changes to specifications and standards to reduce production costs and time to market, and improve profitability.

After drawing together a common European specification regarding RAMS and LCCs, INNOTRACK will ensure that the project results from the separate areas are integrated into an overall, coherent package of measures that will achieve the targeted reduction in LCCs.

The INNOTRACK project will also provide the following, which are all internationally accepted:

- LCC methodology (fundamental for an economic assessment of technical solutions for European problems)
- RAMS technology (a recognized management and engineering discipline to guarantee the specified functionality of a product over its complete lifecycle)
- A European cost matrix including national costs due to national standards – relevant for

international comparisons of LCCs and for an economic assessment of technical innovation
- LCC models for track components with different levels of detail – relevant for LCC analysis and economic optimization.

The SAFE-RAIL aims at developing an innovative radar for fast and accurate monitoring of rail track substructure conditions. The SAFE-RAIL system is based on a completely new concept of rail-track substructure monitoring radar and on innovative data interpretation and analysis tools, based on expert systems and neural networks providing field information in a user-friendly way. This will allow full integration of the SAFERAIL subsurface monitoring system on high-speed diagnostic trains for :
- real-time subsurface assessment and delivery of 'diagnostic' information to the onboard operator, and
- storage of the collected information for long-term multi-temporal analyses.

The objectives of the SUSTAINABLE BRIDGES project are:
- to increase the transport capacity of existing railway bridges by allowing axle loads of up to 33 tons for freight traffic with moderate speeds or for speeds of up to 350 km/hour for passenger traffic with low axle loads
- to increase the residual service lives of existing bridges by up to 25%, and
- to enhance management, strengthening and repair systems.

To achieve these objectives, the project will develop:
- new methods for structural assessment of existing bridges
- a scanning application and a combination of echo methods for condition assessment
- monitoring systems based on optical fibres, micro-electromechanical-systems (MEMS), a local area communication infrastructure and smart data processing tools
- easy-to-handle systems and a guideline for quality assurance of repair and strengthening.

Relevance to green corridor development

All projects cited above aim at improvements in existing infrastructure or the design and manufacture of new construction concepts for road and rail. Their direct impact will be enhanced infrastructural sufficiency, which in turn will have positive effects on all other KPI areas, thus contributing to green corridor development.

Measures/changes suggested or introduced

The major development directions of these projects are:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Optimise use of existing infrastructure through better safety and monitoring procedures	ID	Direct improvements in infrastructural sufficiency. Indirect improvements in all other KPI areas.
2	Develop innovative reinforcement materials highly resistant to corrosion	TD	As above
3	Strengthen bridges by means of bonded reinforcements	ID	As above
4	Harden highway structures with fibre-reinforced concretes	ID	As above
5	Use of steel cord extracted from waste tyres to arrive at fibres suitable for	TD	As above

	concrete reinforcement		
6	Use of fibre-reinforced polymers for rapid renewal of bridges	ID	As above
7	Optimise road surfaces in relation to noise generation, rolling resistance and safety	TD	As above
8	Introduction of the Life Cycle Cost (LCC) methodology for rail infrastructure	OP	As above
9	Introduction of the Reliability Availability Maintainability Safety (RAMS) assessment discipline for rail infrastructure	OP	As above
10	Develop a ground-penetrating radar system for fast and efficient monitoring of rail track substructure conditions	TD	As above
11	Develop new methods for structural assessment of existing railway bridges	TD	As above

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

Appendix IV. Logistics and business environment

European Commission (2007b). *Freight Transport Logistics Action Plan*. Communication from the Commission COM(2007) 607, Brussels, 18.10.2007.

BE LOGIC (2009). *Analysis of the impact of the external environment, supply chain and freight transport trends on the performance of the freight transport system.* Deliverable 3.1 of the BE Logic project, 25.9.2009.

ISL (2006). *Comparative benchmarking of performance for freight transport across the modes from the perspective of transport users: Short sea shipping vis-à-vis rail, road and inland waterways***.** Maritime Transport Coordination Platform (MTCP), January 2006.

The World Bank (2010). *The 2010 Logistics Performance Index*. [WWW] <URL: http://info.worldbank.org/etools/tradesurvey/mode1b.asp > [Accessed 5 January 2011].

Hollweg et al (2009). *Measuring Regulatory Restrictions in Logistics Services.* ERIA Discussion Paper Series**,** 2009.

Sjögren Jerker (2010). *e-Freight: One of the key facilitators for green corridors*. Presentation at the First SuperGreen Workshop, Helsinki, Finland, 28.6.2010.

Lloyd Michael (2010). *InnoSuTra: Preliminary Innovation Report.* Deliverable D 2.1 of the InnoSuTra project, 5.5.2010.

ZLU et al (2003). *Study on Freight Integrators.* Berlin, 16.9.2003.

SUPERGREEN Document Fiche		Number : 20		Partner : NTUA	
Document identity		Field[1] : ALL		Doc.date : 18.10.2007	
Doc. number :	COM(2007) 607	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Freight Transport Logistics Action Plan**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/logistics/freight_logistics_action_plan/doc/action_plan/2007_com_logistics_action_plan_en.pdf				

Objective(s)

The document is one of a series of policy initiatives jointly launched by the European Commission to improve the efficiency and sustainability of freight transport in Europe. It presents a number of short- to medium-term actions that will help Europe address its current and future challenges and ensure a competitive and sustainable freight transport system in Europe.

Main findings / results achieved / summary of measures

The proposed actions are organized in the following themes:

1. E-Freight and Intelligent Transport Systems (ITS)

The concept of e-Freight denotes the vision of a paper-free, electronic flow of information associating the physical flow of goods with a paperless trail built by ICT. This will be made more practical and affordable by emerging technologies such as radio frequency identification (RFID) and the use of the Galileo satellite positioning system. The deployment of Intelligent Transport Systems (ITS) in road transport is slow. A cohesive deployment strategy for ITS, incorporating the specific requirements of road haulage, such as for navigation systems, digital tachographs and tolling systems, could contribute significantly to material change in the logistics chain.

2. Sustainable quality and efficiency

The theme contains actions concerning the identification of operational, infrastructural and administrative bottlenecks; improvements in training and supply of skilled personnel in freight transport logistics; improvements in the performance of transport chains through the establishment of a set of common generic indicators across modes; the benchmarking of intermodal terminals; the promotion of best practice in multimodal freight transport; and improvements in availability of statistical data.

3. Simplification of transport chains

The theme contains actions concerning the simplification of administrative procedures in all modes; the possible establishment of a single transport document for all carriage of goods irrespective of mode; the possibility of establishing a uniform cross-modal liability regime; and improvements in security procedures with minimum effects on trade flows.

4. Vehicle dimensions and loading standards

Technological developments, changed transport requirements, and the need to increase the competitiveness of intermodal freight transport call for a review of the current standards concerning vehicle weights and dimensions, and standardization of an optimal European Intermodal Loading Unit.

5. "Green" transport corridors for freight

The concept of "green" transport corridors is introduced, along which the industry will be encouraged to rely on co-modality and on advanced technology in order to accommodate rising traffic volumes while promoting environmental sustainability and energy efficiency.

6. Urban freight transport logistics

The theme covers the urban dimensions of freight transport logistics and introduces a holistic vision paying attention to aspects of land use planning, environmental considerations and traffic management.

Relevance to green corridor development

The document is probably the most relevant one to the SuperGreen project. In addition to introducing the concept of green transport corridors for freight, which is the subject of SuperGreen, all actions mentioned in the document contribute towards developing integrated, efficient and environmentally friendly freight transport logistics chains.

Measures/changes suggested or introduced

The document introduces the following actions:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Develop a roadmap for the implementation of e-freight	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas.
2	Standardisation of information flows ensuring integration and interoperability of modes	TD	As above
3	Develop a standard data set to describe freight taking into consideration regulatory requirements	TD	As above
4	Make a proposal on e-maritime, improving maritime transport's integration with other transport modes	TD	As above
5	Develop ITS applications including monitoring of dangerous goods and live animals, tracking & tracing, and digital maps	TD	As above
6	Standardisation of functional specifications for a single interface (on-board unit) for the exchange of business-	TD	As above

	to-admin. and business-to-business information		
7	Accelerate work towards interoperability in Electronic Fee Collection	TD	As above
8	Continue the exercise of identifying freight transport logistics bottlenecks and related solutions	PP	Direct improvements in infrastructural sufficiency and indirect to all other KPI areas.
9	Work towards mutual recognition of training certification for freight transport logistics	PP	Improvement potential in all KPI areas
10	Improve attractiveness of transport logistics professions	PP	As above
11	Establish a core set of common indicators monitoring performance of transport chains across modes	PP	As above
12	Elaborate a set of generic (dynamic and static) benchmarking indicators for intermodal terminals	PP	As above
13	Extend the role of the Shortsea Promotion Centres and their European network to inland transport logistics	PP	As above
14	Establish a network between logistics institutes and promote industry initiatives to exchange experience and disseminate best practice	PP	As above
15	Determine data requirements on freight transport logistics across modes	PP	As above
16	Establish a single window (single access point) and one-stop- administrative-shopping for administrative procedures in all modes	PP	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas.
17	Simplify and facilitate short sea shipping towards a maritime transport space without barriers	PP	As above
18	Examine the possibility of establishing a single transport document for all carriage of goods, irrespective of mode	PP	As above
19	Assess the need for introduction within the EU of a standard (fall-back) liability clause	PP	As above
20	Assess the need for a legal instrument to allow full coverage of the existing	PP	As above

	international, mode-based liability regimes over the entire multimodal logistics chain		
21	Develop European standards facilitating the secure integration of transport modes in the logistic chain	PP	Direct improvements in terms of security. Potential problems in other features of service quality (time, reliability, frequency), efficiency and infrastructural sufficiency.
22	Simplify port access requirements	PP	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas
23	Study the options for a modification of the standards for vehicle weights and dimensions	PP	Direct improvements in terms of efficiency
24	Update the 2003 proposal on Intermodal Loading Units to technical progress	PP	Direct improvements in terms of efficiency
25	Establish a mandate for standardising an optimal European Intermodal Loading Unit that can be used in all surface modes	PP	Direct improvements in terms of efficiency
26	Define green transport corridors and identify improvements ensuring adequate infrastructure for sustainable transport	PP	Direct improvements in all KPI areas
27	Reinforce green corridors in the TEN-T and in the Marco Polo priorities	PP	As above
28	Develop a freight-oriented rail network	PP	Direct improvements in all KPI areas. Potential problems in passenger rail traffic.
29	Promote the establishment and recognition of Motorways of the Sea through a better coordination of different funding sources	PP	Direct improvements in all KPI areas
30	Implement the NAIADES programme for inland waterway transport	PP	As above
31	Encourage the exchange of experiences in order to establish a set of recommendations, best practice, indicators or standards for urban transport logistics	PP	As above
32	Make recommendations of commonly agreed performance indicators to measure efficiency and sustainability in urban transport logistics and planning	PP	As above
33	Reinforce the freight part of CIVITAS	PP	As above

SUPERGREEN Document Fiche		Number : 2		Partner : NTUA	
Document identity		Field[1] : ALL		Doc.date : 25.9.2009	
Doc. number :		Study :		Regulatory act :	
Author :	BE LOGIC	Research proj.:	X	- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Analysis of the impact of the external environment, supply chain and freight transport trends on the performance of the freight transport system**				
Related doc's :					
Web address :	http://www.be-logic.info/files/BE-LOGIC_D3_1_Final.pdf				

Objective(s)

BE Logic is an ongoing collaborative research project funded under FP7. The project aims at improving efficiency within and across different modes of transport and supporting the development of a quality logistics system. This is done through the benchmarking of: (a) transport policy, (b) transport chains and (c) inland and sea terminals. The project will also develop and implement an e-benchmarking self-assessment tool, incorporating the benchmarking methodologies and the related KPIs.

The aim of the project deliverable analysed here is to assess, for year 2020, the evolution of the Socio-cultural, Technological, Economic, Ecological, and Political (STEEP) environment, the supply chain management trends, and the freight transportation system characteristics and performance through a set of aggregate indicators.

Main findings / results achieved / summary of measures

First, the major drivers of the external environment believed to have an impact on the development of trends and the performance of the freight transport system are identified. They are presented in Table 1, together with the projected change, in terms of direction and intensity, for year 2020. It should be mentioned that all projections of this section are basically qualitative, supported by quantitative results where available.

The next step involves the identification of major supply chain trends. Their evolution, as affected by the external drivers is examined, and the resulting projections are shown in Table 2.

Similarly, the major freight transport trends are identified. Their evolution is examined in relation to the external drivers and the supply chain trends as presented in the previous tables (Table 3). Freight transport trends are analysed modal wise.

At this point, the Aggregate Performance Indicators (APIs), reflecting the performance of the freight transport system at a strategic level, are entered in the analysis. APIs are higher-level characteristics than the KPIs developed in other tasks of the BE Logic project. The APIs (refer to Table 4) are expressed at a modal level, as opposed to KPIs, which are expressed at company/terminal/transport chain level.

Table 1. Major drivers affecting the freight transport system

Category	Driver	Direction / intensity of change for 2020
Socio-cultural	EU population projections	+
	Working population	-
	Concentration of population in financially dominant regions	++
	Increase in individualisation	++
	Proliferation of electronic business	+++
	Increase of social and environmental consciousness	+++
Technological	Road vehicle engines with stricter environmental standards	++
	Development of more efficient cargo handling and transport technologies	++
	Proliferation of ICT technologies for vehicle/cargo management	+++
	Advancements in intelligent transportation systems and technologies	+++
	Advancements in ICT for supply chain security	+++
Economic	Long-term projected increase in EU economic activity	0 / +
	Increase of EU trade integration with international partners	++
	Globalisation of industry and services	0
	Market enlargement	++
Ecological	Reduction in oil reserves	++
	Increase in total emissions produced by transportation	++
Political	Deregulation of transport activity	+
	Harmonisation of transport infrastructure	++
	Connection of European transport policy with energy and environmental policy	++
	Internalisation of external costs	++
Legend: + / -: moderate increase / decrease, ++ / --: significant increase / decrease, +++ / ---: very significant increase / decrease (and combinations thereof)		

Table 2. Supply chain trends

Category	Trend	Direction / intensity of change for 2020
Spatial structure	Spatial concentration of production	+++
	Spatial concentration of inventory	+++
	Wider sourcing of supplies and wider distribution of goods	+++
Organisation & management	Supply chain integration	+++
	Agility / adaptability	+++
Supply chain flows	Reverse logistics	+++
	Information sharing	+++
	Increase in direct deliveries	+++
Legend: + / -: moderate increase / decrease, ++ / --: significant increase / decrease, +++ / ---: very significant increase / decrease (and combinations thereof)		

Table 3. Freight transport trends

Category	Trend	Direction / intensity of change for 2020
Freight transport demand	Quantities of freight transported in tonnes	++ (for road, rail, SSS) +/++ (for IWT)
	Distances travelled in km	+++ (for road) ++/+++ (for rail) + (for IWT, SSS)
	Freight transport activity in tkm	+++ (for road, rail) +/++ (for IWT) ++ (for SSS) In terms of modal split: road share will be slightly reduced rail share will be reduced but at slower rate SSS share will increase IWT share will remain unchanged
Freight transport supply	Fleet size	0/+ (for road) -/-- (for rail, IWT) N/A (for SSS)
	Fleet composition (in terms of clean technologies)	++/+++ (for road) +/++ (for rail, IWT) ++ (for SSS)
	Vehicle size	+/++ (for road, rail, IWT) N/A (for SSS)
	Transportation infrastructure capacity	+/++ (for road) ++ (for rail) + (for IWT, SSS)
	Terminal infrastructure capacity	Same as above
Demand-supply interaction	Vehicle capacity utilisation (load factor)	+++ (for road) +/++ (for other modes)
	En-route congestion	+ (for road, rail) 0/+ (for IWT, SSS)
Legend: + / -: moderate increase / decrease, ++ / --: significant increase / decrease, +++ / ---: very significant increase / decrease (and combinations thereof)		

Table 4. Aggregate Performance Indicators

Benchmarking area	APIs	Definition	Direction / intensity of change for 2020
Transport chain	Frequency of service	Ability of mode to offer frequent services that are in line with the respective demand	++ (for road) + (for rail, IWT, SSS)
	Flexibility of service	Ability of mode to adjust the provision of its services in order to meet changes (sudden or anticipated) in demand	++ (for road) + (for rail, IWT, SSS)
	Reliability of service	Ability of mode to offer services that are punctual and according to the published schedule or promised delivery date and time	+/++ (for road) + (for rail, IWT, SSS)
	Environmental intensity	Emissions produced per unit of transport activity (e.g. kg of CO2/tkm)	-/-- (for road) - (for rail, IWT, SSS)
	Energy intensity	Energy consumed per unit of transport activity (e.g. toe/tkm)	-/-- (for road) - (for rail, IWT, SSS)
	Operating cost	Operating cost per unit of transport activity (e.g. €/tkm)	0 (for all modes)
Terminal	Terminal utilization and congestion	The level of use of the available terminal capacity	++/+++ (for road/rail terminals) ++ (for sea ports) 0 (for inland waterway term.)
	Environmental pollution	Emissions produced per unit of cargo handled	-- (for all terminals)
	Energy use	Energy consumed per unit of cargo handled	- (for all terminals)
Policy	Infrastructure charges	Level of charges for infrastructure use	++
	Taxation levels	Level of taxes levied on transport system users	+ (for old technology vehicles and fossil fuels) - (for clean technology vehicles and alternative fuels)
	Transport funding	Nature and level of funding for the development of transport infrastructure	+ (for private funds) - (for state funding)
Legend: + / -: moderate increase / decrease, ++ / --: significant increase / decrease, +++ / ---: very significant increase / decrease (and combinations thereof)			

Relevance to green corridor development

The document is particularly relevant to Task 2.3 of the SuperGreen project, as it identifies a number of changes in the business and regulatory environment, and tries to assess their effects on transport chains, and hence, the development of green corridors.

Measures/changes suggested or introduced

The most important among the changes identified by the document are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Slow increase of EU27 population until 2020 and decline as of 2025	BE	Increased freight transport demand until 2020.
2	Significant increase in the average age of the population and decrease of the active workforce of EU27	BE	Negative effect on the freight transport demand and on the size of the labour force for the freight transport industry
3	Concentration of population in financially dominant regions	BE	Concentration of consumption
4	Increase in individualisation	BE	Increase in direct deliveries, increase of demand intensity in terms of frequency, decrease of consignment size, increased demand for flexible and agile transport services
5	Proliferation of electronic business	BE	As above. Plus geographically wider distribution of goods and decrease of quantities transported due to dematerialization of certain goods (e.g., software, music, books)
6	Increase of social and environmental consciousness	BE	It may generate pressures to companies to decrease their emissions footprints and use more environment-friendly transport modes, which in turn may modify modal split in favour of environment-friendly modes where possible
7	Stricter environmental standards for road vehicle engines	PP	Improvements in efficiency and environmental sustainability
8	Development of more efficient cargo handling and transport technologies	TD	As above
9	Proliferation of ICT technologies for vehicle/cargo management	TD	Provides significant opportunities for increasing the capacity and performance of the freight transport system through improved management, control and use of resources and allows for the efficient flow of information along the transport chain, thus increasing the efficiency of freight transport en-route and facilitating transfers across modes
10	Long-term projected increase in EU economic activity	BE	Small positive effect on consumption and freight transport demand
11	Increase of EU trade integration with international partners	BE	Positive effect on freight transport demand, especially for deep sea shipping
12	Globalisation of industry and services	BE	No effects on freight transport demand are expected, as globalisation appears to level off, especially after the recent economic crisis
13	EU market enlargement	BE	Positive effect on consumption and freight transport demand

14	Reduction in oil reserves	BE	Possible reduction of freight transport demand due to higher fossil fuel prices, until alternative fuels become commercially viable
15	Increase in total emissions produced by transportation	TL	The expected increase in transport related emissions will lead to international or regional regulatory measures
16	Deregulation of transport activity	PP	Increased competition both within and among transport modes will lead to higher levels of efficiency, service quality and environmental sustainability
17	Harmonisation of transport infrastructure	PP	Improved infrastructural sufficiency through capacity increases. Enhanced demand and supply of freight transport services.
18	Connection of European transport policy with energy and environmental policy	PP	Improved environmental sustainability basically through initiatives gradually replacing oil by other fuels
19	Internalisation of external costs	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users
20	Spatial concentration of production and inventory	TL	Increased freight transport demand due to increased lengths of haul and quantities, which in turn might induce larger vehicle sizes and higher load factors to achieve economies of scale. The increased traffic will concentrate along certain transport corridors, and increased investments might be required to mitigate the resulting congestion.
21	Wider sourcing of supplies and wider distribution of goods	TL	As above
22	Supply chain integration	TL	It results in higher performance of the supply chain, which in turn leads to lower lead times and higher quality of transport services (in terms of punctuality, cargo safety etc.)
23	Improved responsiveness to customer requirements (agility/adaptability)	TL	Improved service quality with possible negative effect on efficiency through reduced load factors due to smaller size consignments
24	Reverse logistics	TL	Increased freight transport demand due to increased quantities. Potential improvements in efficiency through increased vehicle utilisation and reduced number of empty runs.
25	Information sharing	TL	Direct improvements in service quality through enhanced supply chain integration. Indirect improvements in all KPI areas.
26	Increased direct deliveries	TL	It leads to more and smaller vehicles in order to provide more flexible and customised freight

			transport services (only applicable to road freight transport). A negative impact on load factor (and hence efficiency) of trucks is expected, since it becomes more difficult to combine smaller size shipments with geographically dispersed destinations.
27	Reduced public expenditures on transport infrastructure	ID	Worsening of bottlenecks and congestion with adverse effects on environmental performance, efficiency, transport time and reliability

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 38		Partner : HSSA	
Document identity		Field[1] : ALL		Doc.date : Jan 2006	
Doc. number :	M21.00.19.052.001	Study :		Regulatory act :	
Author :	ISL	Research proj.:	X	- Suggestion :	
On behalf of :		Other doc.:		- In force :	
Title :	**Comparative benchmarking of performance for freight transport across the modes from the perspective of transport users: Short sea shipping vis-à-vis rail, road and inland waterways (MTCP report)**				
Related doc's :					
Web address :	http://www.props-sss.eu/propsknowledge/Info.aspx?docID=124				

Objective(s)

This report deals with benchmarking service performance in the area of freight transport across modes from the perspective of transport users. Based on desk research on existing literature, studies and projects, the report makes an inventory of existing tools for the benchmarking of different modes, i.e. short sea shipping, rail and inland waterways from a multimodal door-to-door perspective, and road from a unimodal perspective.

Main findings / results achieved / summary of measures

I. Introduction

The aim is to answer three questions:

1. Is it feasible to benchmark transport performance across modes?
2. What could be the tools or performance indicators that would allow such a comparison?
3. Are these tools available and are they practicable?

While these questions are answered it is also created a set of indicators for being applied on selected transport routes.

II. Inventory of tools

An inventory of existing approaches and tools for benchmarking different modes from a multimodal and unimodal perspective is performed. This is mainly done by desk research on existing literature, studies and projects, and by contacting persons and organizations involved in similar exercises. Special emphasis is laid on the recommended work done by the European Shippers' Council and the UK Freight Trade Association. Modes included are:

- short sea shipping (SSS) including pre-haulage and delivery with subdivision
    - roro transport

  - container transport
- inland water transport (IWT)
- rail transport
- road transport
- combined transport with subdivision
  - road/rail
  - road/IWT
  - SSS/rail

The projects and studies that were considered are: ADVANCES, INTERMODA, IQ-Intermodal Quality, REALISE, RECORDIT and TRILOG projects. Among them, the projects INTERMODA, IQ and TRILOG are dealing with indicators along the supply chains in intermodal transports.

III. Extraction of KPIs

The section presents the KPIs extracted from the following five studies:

FTA Study "Service Performance Indicators for Short Sea Shipping (2001)

Eight service performance indicators (SPIs) for SSS were chosen in this study:

- The booking
- Pick-up shipment
- Deliver shipment to terminal
- Terminal handling and the voyage I
- Terminal handling and the voyage II
- Collect shipment from terminal and deliver to consignee I
- Collect shipment from terminal and deliver to consignee II
- Collect shipment from terminal and deliver to consignee III

However, they are considered insufficient because important aspects like costs, external costs or safety are not regarded.

Performance Indicators in the Netherlands

The following lists show indicators which are proposed in the Netherlands by various target groups:

Policy makers:

Aggregate performance indicators	Journey time index Average cost index Reliability index
Environmental performance of different modes / modal combinations	Emissions (NOx, CO_2) Fuel consumption
Efficiency and use of infrastructure	Average use of road, IWT and rail network Length of road, IWT and rail network Average travel speed on road, IWT and rail network Growth and growth potential of road, IWT and rail network Congestion/risk Costs of maintenance and repair of the road, IWT and rail network

Safety per mode	Number of deaths/accidents
External costs (per mode)	Infrastructure costs; safety; noise; emissions

Shippers:

Relative performance of the intermodal chain	Total logistic costs (production, sales, collection, storage, transport) Transit time from true origin to final destination Reliability; flexibility; risk of damage

Semi-public organizations:

Terminal efficiency	Handling time per container Number of container cranes TEU per container crane Movements per hour Crane-intensity Movements per crane-hour Net crane-productivity
Use of space	Stackable height Deposit area Total container area in hectares
Handling cost and revenue	Cost per container per handling Cost per container for stacking Cost for renting the container Revenue per container
Service level	Reliability Facilities (Quayage, maximum draught, deposit area, container-cranes) Average waiting time Level of technology / EDI Number and frequency of connections (to other terminals)

Transport industry and logistic service providers:

Transport company performance	Return on assets Return on equity Trading margin etc.

Degree of utilization of vehicle	In volume: measured by payload of weight, pallet numbers and average pallet height In distance/empty running: measured as the number of miles the vehicle travelled empty and the number of miles the vehicle travelled with only returnable items In time: measured on hourly basis as one of seven activities (running on the road, rest period, loading or unloading, preloaded and awaiting departure, delayed or otherwise inactive, maintenance and repair, and empty stationary) over a 48-hour period
Schedule adherence and deviations from schedule	Problem at collection point and/or delivery point Own company actions Traffic congestion on major corridors and at border crossings Equipment breakdown Lack of personnel Availability of required infrastructure (terminals, access roads, right-of-way, highways, short-line rail services) Availability of appropriate equipment at terminals Operating procedures at ports and terminals
Fuel efficiency	Measured as km per litre Measured as ml. fuel needed to move one standard industry pallet 1 km
Relative performance of the intermodal chain	Timing: transit time, frequency of service and on time reliability The total logistics costs and service in relation to the level and quality of logistics services Efficient, seamless transfers between modes Use of integrated enterprise systems Compatibility of technology in different global regions Use of ITS to speed transport, improve connectivity, reduce congestion High asset utilisation, leading to lower cost of operation, leading to lower freight rates
Harmonisation/regulation	Harmonised vehicle weights and dimensions Harmonised safety regulations Harmonised labour regulations

	Immigration policies (leading to such issues as trucking companies not able to hire drivers from other countries during periods of driver shortage) Conflicting policies between government departments leading to tensions in transportation system

INTERMODA - Integrated Solutions for Intermodal Transport between the EU and the CEEC

In the first step of this project a set of ideal performance indicators was developed, from which a selection was made for reasons of practical feasibility.

The ideal performance indicators were:

- time (e.g. the total length of time between when the load unit is ready for transport and when it is delivered);
- reliability (the absence of unforeseen lowering of performance);
- flexibility (the ease with which the system adjusts to an unexpected change in logistic requirements);
- qualification (the capability of personnel to cope with complex logistic requirements);
- accessibility (the ease with which the intermodal transport system can be used);
- monitoring (how well the status of the loading units can be tracked);
- safety and security (the risk of losing equipment and goods).

In a second step the project uses the following categories for the classification of the final selection of performance indicators:

- time
- reliability
- flexibility
- safety
- capacity
- tariff
- accessibility
- utilisation
- monitoring

IQ – Intermodal Quality

The project proposed performance indicators for terminals and investigated the main technological developments (hardware, software) in order to measure their impact.

The performance indicators refer to:

- load unit moves per hour
- dwell time of load unit or vehicle
- reliability, maintainability, availability
- flexibility and automation
- safety and security.

TRILOG – Europe

Commonly used indicators measuring the performance of the core logistics function can be classified as follows:

	External performance indicators	**Internal performance indicators**
Business perspective	Delivery time Sales Price Customer satisfaction	Result vs. budget Inventory value Customer service
Engineering perspective	Sustainability Availability Reliability Quality	Cycle time Turnover rate Productivity Asset utilization

General indexes have been developed in order to compare different logistics items in various countries and in several industries. The TRILOG consortium uses the taxonomy proposed by Andersson et al. They define the external performance according to the following indicators:

- availability
- reliability
- quality
- lead time
- customer service
- price

IV. Comparison between modes

The finally selected KPIs for benchmarking across transport modes are:

KPI	Definition	Unit
Transport costs	Total freight cost to the customer	€ per load un t
External costs	Costs to the public because of emissions of (CO2, NOx, SO2) and noise	€ per ton-km
Time	Average total time of regular service including transport, handling and waiting	Hours
Delay	Average time resulting from delays including congestion and equipment breakdown (additional to total transit time)	Hours
Availability	Minimum time required between booking and start of transport	Hours
Flexibility	Reaction to special requests of customers and reaction to hold-up of transport	Ranking
Safety	The risk of financial damage expressed by insurance premiums and security fees	€ per load unit

Regulations	Framework conditions	n.a.

V. Small-scale demonstration

A small-scale demonstration comparing the modal performance of door-to-door SSS with rail, road and IWT was done in order to validate the suitability of the selected KPIs for benchmarking various modes on the same route, i.e. between the same origin and destination. Three different routes were defined according to:

- mode-specific characteristics (as mentioned before)
- regional characteristics
  - Baltic Sea/Eastern Europe
  - North Sea/River Rhine
  - South Europe/Mediterranean
- good-specific characteristics
  - high value general cargo
  - dry bulk
  - liquids and dangerous cargo

VI. Conclusions

The main conclusion of the study is that the application of these KPIs is possible. They work in any region and for any mode. The careful application should show detailed results that can assist to specify and mitigate the disadvantages of SSS. As for the SSS performance, it is concluded that:

Transport cost:

SSS has the lowest costs where the route is long enough and if containers are used.

Time:

Conventional ships and container ships need always much more time than road transport because of longer terminal times and lower frequency of ship departures.

Punctuality:

Punctuality of ships is not the problem.

Availability:

Booking and supply of a truck is faster than the preparation of the complete chain in combined transport.

Flexibility:

Reaction to special requests of customers and a reaction to hold-up of transport are always easier for a truck driver.

Safety:

A disadvantage of sea transport is the lower liability limit.

Regulation:

There will always be more technical standards and regulations to obey in any form of combined transport compared to the exclusive use of trucks.

Relevance to green corridor development

The study is very relevant to SuperGreen objectives, as it develops a set of KPIs for benchmarking the performance of all surface modes of transport along routes. In addition, it provides a good coverage of

previous works related to benchmarking transport operations.
Measures/changes suggested or introduced No specific measures are suggested or introduced by the study.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :**	**55**	**Partner :**	**NTUA**
Document identity		Field[1] :	ALL	Doc.date :	2010
Doc. number :		Study :	X	Regulatory act :	
Author :	The World Bank	Research proj.:		- Suggestion :	
On behalf of :	The World Bank	Other doc.:		- In force :	
Title :	**The 2010 Logistics Performance Index**				
Related doc's :					

Web address :	http://info.worldbank.org/etools/tradesurvey/mode1b.asp

Objective(s)

The 2010 LPI is a web-based interactive benchmarking tool created by the World Bank to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The 2010 LPI allows comparisons across 155 countries.

Main findings / results achieved / summary of measures

The Logistics Performance Index (LPI) is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries with which they trade, and experience of global logistics environment.

Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work. Data have been collected for nearly 130 countries.

The LPI consists therefore of both qualitative and quantitative measures and helps build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a country and offers two different perspectives: International and Domestic.

The **International LPI** is a single index with a numerical value equal to the mean value of the following 6 qualitative indicators (their values ranging from 1 to 5), as they have been evaluated by a country's trading partners (logistics professionals working outside the country):

- *Customs* [efficiency of the clearance process (i.e. speed, simplicity and predictability of formalities) by border control agencies, including customs]
- *Infrastructure* [quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology)]
- *International shipments* [ease of arranging competitively priced shipments]
- *Logistics competence* [competence and quality of logistics services (e.g. transport operators, customs brokers)]
- *Tracking and tracing* [ability to track and trace consignments]
- *Timeliness* [how often do shipments reach the consignee within the scheduled or expected delivery time].

There is a seventh indicator in the international group, named 'Comparison to year 2005', which evaluates answers to the question 'Is it easier or more complicated to comply with the cargo security requirements (i.e. screening, advance information) when arranging shipments?' The value of this indicator is not included in the LPI calculation.

The LPI 2010 index is available for 155 countries.

Domestic logistics are not described by a composite indicator like LPI. The relevant indicators provide both qualitative and quantitative assessments of a country by logistics professionals working inside it. They include detailed information on the logistics environment, core logistics processes, institutions, and performance time and cost data, organized in two themes:

The first one, named 'Environment & Institutions', provides qualitative indicators on the following:

- Level of fees and charges
- Quality of infrastructure
- Competence and quality of services

- Efficiency of processes
- Sources of major delays
- Changes in the logistics environment since 2005.

The second one, named ‘Performance’, provides quantitative estimates on the following:

- Clearance time
- % of cargo physically inspected (single and multiple inspections)
- Number of agencies involved
- Lead time (median case) for a typical shipment for which only distance is reported
- Typical charge for a 40” container or a semi-trailer (for the typical shipment).

Information on domestic logistics is available for nearly 130 countries.

The LPI survey, used for the collection of the necessary information, is designed and implemented by the World Bank International Trade and Transport Departments, with Finland's Turku School of Economics (TSE). It is endorsed and promoted by the Global Facilitation Partnership for Transportation and Trade (GFP) and has been actively supported by the International Federation of Freight Forwarders Associations (FIATA) and the Global Express Association (GEA).

World Bank conducts the LPI Survey every two years to improve the reliability of the indicators and to build a dataset comparable across countries and over time.

Relevance to green corridor development

The logistics performance is highly related to the greening of a corridor, in the notion that a green corridor should reflect a healthy logistics and trading system.

As for the indicators themselves, those entering the International LPI are all covered by KPIs proposed by SuperGreen, with the exception of ‘Logistics competence’, an aspect that we should probably consider including during the upcoming KPI revision session.

It is noted that the emphasis placed on efficiency of customs is due to the nature of the World Bank institution. This is not the case with SuperGreen, dealing basically with EU member states.

Measures/changes suggested or introduced

There are no measures suggested.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
			.

SUPERGREEN Document Fiche		**Number :**	**36**	**Partner :**	**DNV**
Document identity		Field[1] :	ALL	Doc.date :	2009
Doc. number :		Study :	X	Regulatory act :	
Author :	Hollweg et al	Research proj.:		- Suggestion :	
On behalf of :	ERIA	Other doc.:		- In force :	
Title :	**Measuring Regulatory Restrictions in Logistics Services**				
Related doc's :					
Web address :	http://www.eria.org/pdf/ERIA-DP-2009-14.pdf				

Objective(s)

The scope of this document is to investigate the government-imposed restrictions to the Logistics Service Providers (LSP) of the ASEAN+6 (Australia, Brunei Darussalam, Cambodia, China, India, Indonesia, Japan, Republic of Korea, Lao PDR, Malaysia, Myanmar, New Zealand, Philippines, Singapore, Thailand, and Vietnam) economies and illustrate that large differences in the relevant regulatory environments exist, i.e. many of these economies are open to trade in logistics services, while others are relatively restrictive.

Main findings / results achieved / summary of measures

To analyse this issue, the study adopts the notion of the restrictiveness index and focuses on what relationships may exist between regulatory restrictions and logistics sector performance, with the latter being measured by the World Bank's survey-based Logistics Performance Index (LPI).

The study claims that a competitive and efficient logistics sector is the one that has the ability to move goods expeditiously, reliably and at low cost. Interesting results towards several policies and their impact on the logistics performance can be retrieved.

Since, in the logistics industry, time is of high importance and the costs of delays are passed to the consumers, any regulatory restrictions that cause delays on logistics services providers (LSPs) can increase the price, reliability and quality of these services. In this notion, these regulations are considered as restrictions to trade.

Some common policies that can impose restrictions on the supply of logistics services are presented in Table 1.

Table 1. Examples of Restrictions on (and Definitions of) Logistics Services

Restriction	Description of restriction
Customs documentation	Submit import/export documentation at the customs border of the respective economy.
Customs broker	Limitations on a person or firm, licensed by the treasury department of their country when required, to engaged in entering and clearing goods through Customs for a client (importer).
Electronic Data Interface (EDI)	Generic term for transmission of transaction data between computer systems. EDI is typically via a batched transmission, usually conforming to consistent standards.
Harmonized System (HS) Codes	An international goods classification system for describing cargo in international trade under a single commodity-coding scheme.
DeMinimis level	The threshold value for waiver of duty on imported goods below which the tax will not be collected.
Local employment requirements	Regulations that require firms to hire local labor for their operations.
Cabotage	Restrictions that restrict the domestic movement of cargo or persons by a foreign service supplier, and applies to maritime, aviation and road transport services.
Fifth freedom rights	Commercial aviation rights granting a country's airlines the privilege to enter and land in another country's airspace.
Cargo reservation laws	Policies that constrain the type of cargoes that may be carriers by the carriers.
Freight forwarder	A person whose business is to act as an agent on behalf of the shipper. A freight forwarder frequently makes the booking reservation.
Cargo-handling	Policies that restrict the loading and discharging of cargo off and on a ship, plane or truck.
Hours of operation	Restrictions that prohibit operation on certain days of a week or hours of the day.
Restrictions on foreign direct investment	Government regulation that impedes foreign firms from investing locally. This regulation prohibits any foreign direct investment or limits foreign direct investment to a maximum proportion.

Source: de Souza *et al.* (2007).

The logistics services providers considered are in accordance with Tier 1 and Tier 2 logistics services, as defined by the US International Trade Commission (2005). Tier 1 includes transport management and supply chain consulting services (network design, development of distribution strategies, storage, warehousing, cargo handling, transport agency, services and customs brokerage), while Tier 2 comprises of related freight logistics services (sub-sectors of maritime, inland waterways, air, rail and road transport services).

The methodology is as follows: First, the different types of restrictions faced by LSPs are defined. Then, a set of existing policies of each restriction category in each economy is compiled. Using that set, a logistics sector restrictiveness index is constructed, calculated and used to assess the restrictiveness between different economies and tackle the relation between logistics regulation and logistics sector performance. The logistics sector restrictiveness quantifies the overall extent of restrictions on trade and investment in logistics services, including domestic and foreign providers.

Among the regulations, light is shed to the regulatory customs procedures, which inherently increase time consumption (documentation, customs inspections). In addition, licensing requirements for the transportation services and cross-sectoral investment regulations are significant trading barriers. Also, the impacts of law that prohibit hiring of foreign labour are tackled.

Focusing on transport-specific regulatory barriers, which directly concern the potential greening of a corridor, barriers on maritime, aviation or road transport have significant impacts on the operational efficiency of logistic services.

The restrictions are grouped into six categories according to the sector where they occur: customs, investment, movement of people, and sector-specific restrictions for maritime, aviation, and road transport. For each restriction category a score of restrictiveness (0 for least restrictive to 1 for most restrictive) is assigned and then weighted to reflect its restrictiveness related to other categories. The weight reflects how restrictive a regulation can be compared to the others. As an example, a statutory government-owned monopoly limits other domestic and foreign firms from entering the market, controls highly the logistics services and thus receives a high restrictive score. In the case of bilateral treaties or, in general, most-favoured-nation (MFN) exemptions the scoring is partially restrictive but still recognizes that such economies have lower restrictions than others without such arrangements. To account for these issues, relevant categories are considered: foreign equity participation, licensing requirements on management, movement of people – permanent or temporary-, maritime cabotage, maritime cargo reservation, maritime storage and warehousing, and road equipment usage. Utilizing the results of the analysis, the study focuses on separate economies and discusses their restrictiveness and the main regulatory reasons that result in it.

As a general conclusion, the document states that Malaysia, China, Indonesia, Lao PDR, the Philippines and Vietnam are the most restricted economies in this region for logistics services, for domestic and foreign trades, whereas Singapore, Australia, Japan and New Zealand are the most open ones.

Given the calculation of restrictiveness indexes for different regulatory categories, the document extends the analysis on a preliminary investigation of how that restrictiveness is related to the logistics sector performance. The restrictiveness index is plotted against the World Bank's Logistics Performance Index (LPI). The same comparison is held for the customs regulations index and the customs component of the LPI, since customs regulations are considered to impose one of the greatest barriers in logistics services.

The results of the study show that there's a clear relationship between the logistics performance and national/international regulation, with a negative correlation between the logistics restrictiveness index and the overall LPI, as well as components of the LPI, i.e. international shipments, logistics competence, tracking and tracing, and timelines. In the same context, a customs restrictiveness index is used (based on customs regulations) and found to be negatively correlated with the customs component of the LPI. As a conclusion, a less restricted trade environment results in better logistics performance.

As stated by the authors, the results of this paper could help future research towards the highly linked improvement of the logistics sector and trade performance, meaning that future work could extend to a survey on the impacts of regulations on LSPs on a wider economy level.

Relevance to green corridor development

The logistics performance is highly related to the greening of a corridor, in the notion that a green corridor should reflect a healthy logistics and trading system.

As stated in the study, there's a negative correlation between the logistics regulatory restrictiveness and the overall logistic performance, considering components such as international shipments, logistics competence, tracking and tracing, and timeliness. As a conclusion, a less restricted trade environment results in better logistics performance.

Measures/changes suggested or introduced			
There are no suggested measures. The reviewed document presents an approach to compare the logistics performance to the regulatory restrictiveness and investigate their relation.			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
			.

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 52		Partner: NTUA	
Document identity		Field[1]: ALL		Doc. date: 28.6.2010	
Doc. number:		Study:		Regulatory act:	
Author:	Sjögren Jerker	Research project:	X	Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**e-Freight: One of the key facilitators for green corridors**				
Related doc's:					
Web address:	http://www.supergreenproject.eu/docs/public/helsinki2010/eFreight-%20one%20of%20the%20key%20facilitators%20for%20green%20corridors.pdf http://www.efreightproject.eu/default.aspx				

Objective(s)

The e-Freight Integrated Project, co-funded by FP7, started on 1.1.2010 bringing together 30 partners from 14 Member States and Norway, for a program addressing the development, validation and demonstration of innovative e-Freight capabilities.

The fiche is based on a presentation on the e-Freight project made by Sjögren Jerker at the First SuperGreen Workshop, held in Helsinki, Finland on 28.6.2010.

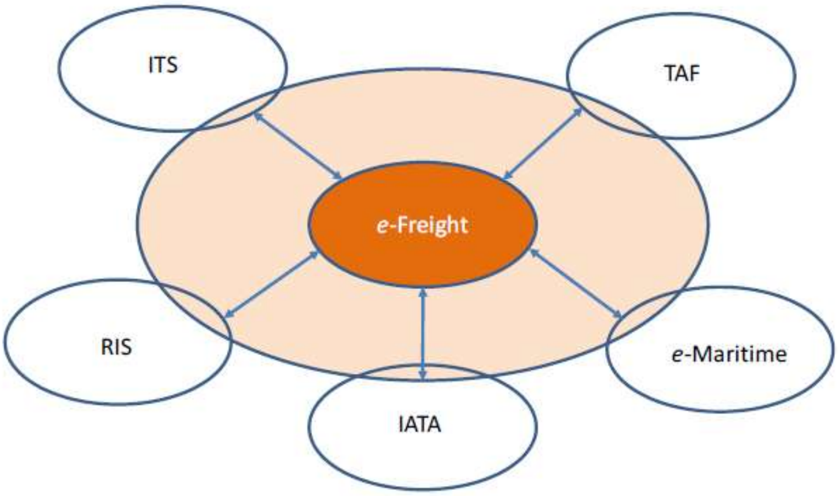
Main findings / results achieved / summary of measures

The project's vision is to produce a zero paper document needed for planning, executing and completing any transport operation within EU, independent of:
- the parties involved;
- cargo type;
- transport mode or combination of modes;
- authorities involved;
- type of service demanded; and
- transport corridor.

In addition, there shall be zero waiting time related to administrative procedures at all border crossings within EU or from countries outside EU, with which secure trade lanes have been established.

The e-Freight goals are:
- a standard freight information framework;
- a single European transport document;
- a single window and one stop shop for administrative procedures;
- simple, harmonised border crossings procedures; and
- secure and efficient transport corridors between Europe, USA, and Asia.

In line with the requirement for "seamless flow of goods regardless of transport mode", communicated by the European Commission in the 'Freight Transport Logistics Action Plan' (Oct. 2007) and the 'ITS Action Plan' (Oct. 2008), e-Freight links all modes and facilitates logistics.



The e-Freight capabilities will support directly, from a transport perspective, the three pillars of European policy namely:

- Strengthening of the internal market and competitiveness;
- Improving regulation to create a more dynamic business environment;
- Promoting sustainable development.

Another dimension of e-Freight is contributing to the development of a European-wide surveillance system for cargo movements needed for the implementation of the various EU security and environmental related policies and directives, and evolving international regulations.

Relevance to green corridor development

Green corridors aiming at the provision of efficient and environmentally-friendly co-modality operations, need effective solutions to all kinds of bottlenecks, including administrative ones, and require efficient co-operation between several actors. The goals of e-Freight are very supportive in this respect.

Measures/changes suggested or introduced

The project is expected to:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Create a a standard freight information framework	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in all KPI areas through better integration of transport modes.
2	Introduce a single European transport document	PP	As above
3	Create a single window and one stop shop for administrative procedures	PP	As above

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<tr><td colspan="2">SUPERGREEN Document Fiche</td><td colspan="2">Number : 42</td><td colspan="2">Partner : NTUA</td></tr>
<tr><td colspan="2">Document identity</td><td colspan="2">Field[1] : ALL</td><td colspan="2">Doc.date : 2010</td></tr>
<tr><td>Doc. number :</td><td></td><td>Study :</td><td></td><td>Regulatory act :</td><td></td></tr>
<tr><td>Author :</td><td>Lloyd Michael</td><td>Research proj.:</td><td>X</td><td>- Suggestion :</td><td></td></tr>
<tr><td>On behalf of :</td><td>European Commission</td><td>Other doc.:</td><td></td><td>- In force :</td><td></td></tr>
<tr><td>Title :</td><td colspan="5">InnoSuTra: Preliminary Innovation Report</td></tr>
<tr><td>Related doc's :</td><td colspan="5">InnoSuTra: First Consultation Wrap-up Report</td></tr>
<tr><td>Web address :</td><td colspan="5">http://www.innosutra.eu/docs/Innosutra_D2_1_PIR_Final.pdf</td></tr>
</table>

Objective(s)

The main objective of the EU-funded INNOSUTRA project is to advance innovation integration in transport and logistics chains by focusing on improved market understanding, knowledge management and network organisation.

The objective of the project report reviewed is to develop a framework for analysis of transport related innovations and assess a number of selected cases. The related document presents the conclusions of an expert consultation workshop, which has been organised with the aim of selecting a number of 'success' and 'failure' cases for further analysis in subsequent phases of the project.

Main findings / results achieved / summary of measures

What is of interest in relation to Task 2.3 is the innovations selected by the project as worth studying. The initial assessment covered the following 60 cases (in fact in covered 59; one more was added later, while four of them was somewhat modified):

ROAD TRANSPORT			
Case 1.	Trucks-on-Train	Case 7.	ECMT Multilateral Road Transport Permit System
Case 2.	Road Pricing	Case 8.	Off-Peak Deliveries
Case 3.	Electronic Toll Collection	Case 9.	European Vehicle Emission Standards
Case 4.	Eurovignette Directive	Case 10.	Environmental Zones
Case 5.	EU International Road Transport Market Liberalization: Cabotage	Case 11.	ITS: Intelligent Truck Parking
Case 6.	Long & Heavy Vehicles (LHVs)	Case 12.	ITS: Variable Speed Limits
MARITIME TRANSPORT			
Case 1.	Reefer Containerisation	Case 7.	Lash Carrier
Case 2.	Mega Containerships	Case 8.	Cold Ironing
Case 3.	Strategic Alliances	Case 9.	Green Ports
Case 4.	Hub & Spoke	Case 10.	Indented Berth
Case 5.	Port State Control	Case 11.	Double Hulled Tankers
Case 6.	Italian International Ship Register	Case 12.	European Register of Shipping (EUROS)

RAIL TRANSPORT

Case 1. Modalohr
Case 2. Commutor
Case 3. European Rail Traffic Management
Case 4. Plan of revitalization of the European rail freight
Case 5. Trans-Siberian railway freight
Case 6. Froidcombi
Case 7. Betuwe Line
Case 8. Tri-Modal Platform
Case 9. Proximity of Freight Train Operator: TPCF
Case 10. Eurotunnel Shuttle
Case 11. Rigid Freight Train
Case 12. Direct rail freight line between France and Russia (GEFCO)

INLAND WATERWAYS TRANSPORT

Case 1. Whale Tail Propulsion
Case 2. Air Lubrication of Ships
Case 3. Distrishipping
Case 4. Proportional Freight Partitioning
Case 5. Ro-Ro Shipping
Case 6. River Information Services
Case 7. Container-transport in Inland Shipping
Case 8. European regulations to sanitize the inland shipping industry
Case 9. Shore Power
Case 10. Advising Tempomaat
Case 11. Project Waterslag
Case 12. Y-shaped hull, Scheldehuid

INTERMODAL TRANSPORT

Case 1. Bi-polar Short Sea Shipping
Case 2. Collaborative Distribution Centers
Case 3. PPP Schemes for Intermodal Freight Villages
Case 4. Image of Short Sea Shipping
Case 5. Marco Polo programs
Case 6. Integrated ICT for Intermodal Freight Transport
Case 7. Internalisation of External Costs
Case 8. Integrated Management of Port Operations
Case 9. ISO Standard Container
Case 10. Motorways of the Sea
Case 11. European Intermodal Loading Unit (EILU)
Case 12. Intergraded Intermodal Companies

Among them, the following 27 innovations were selected by the experts for further consideration:

	Road	Maritime	Rail	IWW	Intermodal
Success	Case 5: EU International road transport market liberalization: Cabotage	Case 1: Reefer containerization	Case 3: ERTMS	**New Case:** Information Technology in the inland navigation industry	**New Case:** Freight Villages
	Case 12: ITS: Variable speed limits in Sweden	Case 5: Port state control	Case 5: Trans-Siberian railway freight	**New Case:** Container transport in the inland navigation industry	Case 6: Integrated ICT
Not-Yet-Successful or Failure Cases	Case 4: Eurovignette Directive	Case 9: Green ports (focused on cold ironing)	Case 1: The MODALOHR	Case 2: Air lubrication of ships in the inland navigation industry	Case 7: Internalization of external costs
	Case 7: Three loaded trips limit in ECMT multilateral road transport permit system	Case 10: Indented berth	Case 7: Betuwe Line	**New Case:** Utilization of the available capacity on small inland waterways	Case 11: EILU - European Intermodal Loading Unit
Intermediate Case	Case 6: Introduction of LHVs (Long and Heavy Vehicles)	Case 2: Mega containerships	Case 10: Eurotunnel Shuttle	Case12: Y-shaped hull, Scheldehuid	**New Case:** Short Sea Shipping
	Case 11: ITS: Intelligent Truck Parking		Case 4: European freight revitalization plan		

Relevance to green corridor development

By definition green corridors comprise a testing field for innovations in the freight transport sector; hence the relevance of the document is self evident.

Measures/changes suggested or introduced

The innovations suggested can be summarised in the following 14 changes of broader nature:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Liberalise road and rail transport	PP	Improvements in efficiency and environmental sustainability (through avoidance of empty runs), and in service quality (through increased level of competition)
2	Internalise external costs of transport	PP	More efficient use of infrastructure, reduction of the negative side effects of transport activity and improvement of fairness between transport users
3	Introduce ICT applications on all modes	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to capacity utilisation and administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas.
4	Set European vehicle emission standards	PP	Improvements in efficiency and environmental sustainability
5	Introduce Environmental Zones	PP	Improvements in environmental sustainability if combined with rigid enforcement
6	Introduce trucks-on-train schemes	OP	Improvements in environmental sustainability provided that traffic is not diverted to alternative longer routes
7	Introduce long & heavy vehicles (LHVs)	PP	Improvements in efficiency and environmental sustainability. Adverse effects on rail and inland waterway transport. Increased costs of infrastructure.
8	Hub & spoke system	TL	Improvements in efficiency and environmental sustainability through better load factors and larger (cleaner) vehicles. Adverse effects include increased transit time and environmental problems at hubs (pollution, congestion, noise).
9	Containerisation	TL	Significant direct improvements in efficiency and service quality. Indirect improvements in all other KPI areas.
10	Freight-oriented railway corridors	PP	Enhanced share of railways in freight transport through improvement of transit time, reliability and capacity along specific rail corridors. Large investments needed.

11	Promote intermodal freight villages	ID	Improvements in all KPI areas
12	Enhance capacity utilisation in small inland waterways	TD	Improvements in efficiency (through better use of resources) and in environmental sustainability (through modal shift from road to IWT)
13	Standardise loading units	PP	Improvements primarily in efficiency and service quality
14	Marco Polo programmes	PP	Improvements in environmental sustainability and service quality (reduced congestion) through modal shift from road to the other modes

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
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Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 59		Partner: NTUA	
Document identity		Field[1]: ALL		Doc. date: 16.9.2003	
Doc. number:		Study:	X	Regulatory act:	
Author:	ZLU et al	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Study on Freight Integrators**				
Related doc's:					
Web address:	http://ec.europa.eu/transport/logistics/documentation/freight_integrators/doc/final_report_freight_integrators.pdf				

Objective(s)

The study aimed at researching comparable concepts and developing a definition for Freight Integrators as well as indicators for their identification. The situation of freight integrating companies as well as their major problems was identified, and recommendations were made for measures overcoming the main barriers to the emergence of Freight Integrators.

Main findings / results achieved / summary of measures

The basis of the study was a sample of 50 companies, the data on whom was collected both by questionnaire and by extensive interviews.

To describe Freight Integrators, the definition was elaborated as follows:

"Freight integrators are transport service providers who arrange full load, door-to-door transportation by selecting and combining without prejudice the most sustainable and efficient mode(s) of transportation."

The study has used the following 10 indicators for the identification of Freight Integrators:

1. Specialisation on full loads
2. Relevant market participation in the field of intermodal transports
3. Intermodal transports as a relevant business field within the company
4. Commitment to intermodality
5. Knowledge and experience
6. Supporting the idea of environmental sustainability
7. Economic substantiation of intermodality
8. Customer relationships
9. Co-operations and partners
10. Geographic spread as a EU-wide business

With these indicators, the development of companies to become Freight Integrators was evaluated. As a result, companies were classified in 4 categories: highly developed Freight Integrators, companies developed towards Freight Integrators, companies with little development towards Freight Integrators but with the first rudiments set, and companies not developed towards Freight Integrators.

The identified indicators were validated in the company sample, in which 6 highly developed Freight

Integrators were identified as well as 19 companies developed towards Freight Integrator. It was estimated that in Europe about 30 to 40 highly developed Freight Integrators exist today as well as about 150 companies developed towards Freight Integrator.

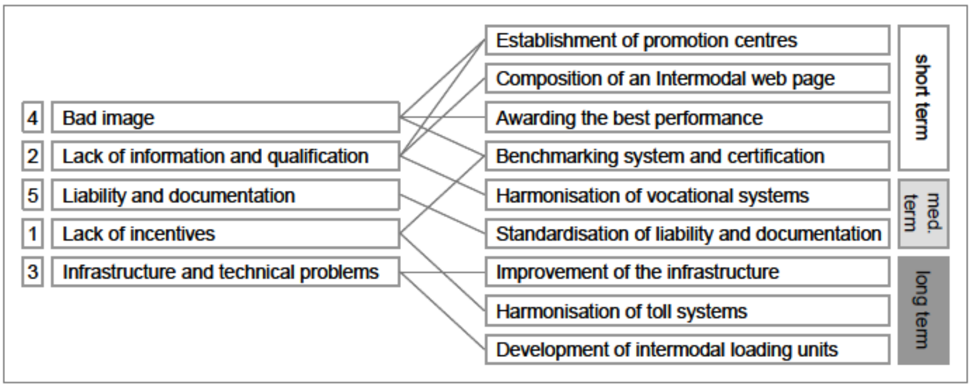
The change towards a greater use of freight integration comes from the worsening conditions on the roads and mainly from the fact that the distances that goods are being transported are rising, making intermodal transportation, which is seen as more competitive over the longer distance journeys, more interesting. In general shippers do not care how their goods are transported, however because of the current greater awareness of environmental issues, there is a potential for convincing them to favour intermodal transport.

The ongoing outsourcing by companies together with the increased use of strategic partnerships was the main trend influencing the emergence of Freight Integrators. These are the situations where transport service providers get a chance to turn to the use of intermodality. Globalisation and the restructuring of logistics systems involving concentration of production and inventory facilities lead to increases in the distances over which goods are transported, a fact which, in turn, favours the use of intermodal transport.

The following problem areas were identified on the basis of the interviews conducted:

- Transported goods: Examples of goods for which it is currently a problem to transport intermodally. A lack of return freight is a special problem arising in intermodal transport.
- Containers: The availability of containers (as the preferred unit for intermodal transportation). The standardisation and adaptation to intermodal transport's current needs.
- Infrastructure: Infrastructure problems were mentioned concerning harbours, trimodal terminals and rail tracks.
- Rail: Service quality problems (reliability and journey time) and a lack of co-operation complicate international transports. Monopolistic structures of national railways are seen as the reason for high prices and the lack of a competitive approach.
- Water transport: Though considered as developing positively, short sea as well as inland waterway shipping is not widely seen as a possible transport mode to use.
- Education/staff: There is a lack of a European-wide vocational training system, especially with regard to intermodal transport, which leads to knowledge often being focused on the road mode.
- Mentality/attitude: A lack of awareness of the possibilities of intermodal transport along with difficulties to get the necessary information makes it difficult to favour freight integration. In general, intermodal transport has a bad image, it is regarded as complicated and not the normal choice.
- Lack of incentives: Transport service providers do not see any reason why they should engage in intermodal transportation if they are not doing so at present. They are generally of the opinion that no profit can be earned in this field.

The recommendations shown in the figure below address these barriers.



The stated recommendations are divided into short, medium and long term approaches. They are considered as the main steps that would focus directly on the implementation of the Freight Integrator concept in Europe.

Relevance to green corridor development

The co-modality supported by the proposed measures is one of the key characteristics of green corridors.

Measures/changes suggested or introduced

The measures suggested by the study are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Establish a network of promotion centres	PP	Potential improvements in all KPI areas through enhanced integration of transport modes.
2	Create an intermodal transport Website providing detailed information on offered services	PP	As above
3	Introduce an annual intermodal award for Freight Integrators in a European level	PP	As above
4	Establish a new system of benchmarking the performance of Freight Integrators under the European Intermodal Association	PP	As above
5	Harmonise vocational systems	PP	As above
6	Standardise liability and documentation for multimodal transport.	PP	As above
7	Develop tri-modal terminals in the EU	ID	As above
8	Harmonise toll systems	PP	Improvements in efficiency
9	Standardise loading units so as to hold the common Euro-palettes	PP	As above
10	Introduce a container pool system comparable to the existing Euro-palette pool	OP	Improvements in all KPI areas through reduced need for relocation of empty boxes

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

Appendix V. Rail transport

European Commission (2007c). *Towards a Rail Network Giving Priority to Freight*. Communication from the Commission COM(2007) 608, Brussels, 18.10.2007.

European Parliament & Council (2010). *Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight.* Strasbourg, 22.9.2010.

European Commission (2008d). *Rail noise abatement measures addressing the existing fleet.* Communication from the Commission COM(2008) 432, Brussels, 8.7.2008.

Kessel+Partner et al (2004). *Study on Infrastructure capacity reserves for combined transport by 2015.* International Union of Railways, Combined Transport Group, May 2004.

SUPERGREEN Document Fiche		Number : 21		Partner : TCDD	
Document identity		Field[1] : RAIL		Doc.date : 18.10.2007	
Doc. number :	COM(2007) 608	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Towards a Rail Network Giving Priority to Freight**				
Related doc's :	Proposal for a Regulation of the European Parliament and of the Council concerning a European rail network for competitive freight				
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0608:FIN:EN:PDF				

Objective(s)

The aim of this communication is to promote the creation of a strong European rail network which will offer a better quality of service in freight transport than today in terms of journey times, reliability and capacity. Improving service throughout this network should have a positive impact on all segments of the freight market, including that of the single wagonload. This objective ties in with the Commission's initiatives to improve the quality of freight transport in Europe.

Main findings / results achieved / summary of measures

The EU has been developing policies since 1990 so as to revitalise the rail sector but they have not yet produced the intended results and the fragmentation of the European rail market still remains a significant problem that needs to be tackled with a great diligence. The European Commission (EC) considers the creation of a European freight-oriented rail network as a key factor in order to sustain a strategy of revitalisation of rail freight transport. Therefore, EC lists down several initiatives taken by the players in the rail sector towards developing international rail routes, to provide good conditions for the movement of freight or to develop coordination among infrastructure managers in investment planning or improving international freight traffic management. The Commission declares its intention to monitor these initiatives, to support and extent their use and to add new measures.

After studying several options, a specific programme that includes the following proposed actions has been launched by EC to create a European freight-oriented rail network:

1. Creation of a freight-oriented corridor

The Commission will propose a legal definition of a freight-oriented corridor structure, in particular setting down the main rules applying to this type of corridor. It will encourage Member States and infrastructure managers to create transnational freight-oriented corridors. Each Member State will have to be participating in at least one corridor structure by 2012. It will examine the possible sources of finance for corridor structure activities within existing programmes.

2. Measure on service quality along a corridor

The Commission will, after an impact assessment, propose a legislative measure on the publication of quality indicators. Generally, it will continue to promote all measures designed to improve the transparency of information on the quality of rail freight service. Before 2008 it will publish a report on steps taken by rail freight operators to improve their quality of service.

3. Increasing infrastructure capacity of a corridor
The Commission will ask the corridor structures to draw up a programme of investments aimed at eliminating bottlenecks and harmonising and improving infrastructure capacity especially in terms of train length and gauge. It will study the advisability of extending the Community legal framework to include the technical characteristics with which freight-oriented corridors will have to comply. It will examine the possible sources of finance for these investments within existing programmes.

4. Allocation of train paths: more coordination and more priority to international freight
The Commission will propose additional legislation on the international allocation of train paths and on the priority accorded to international freight. It will propose enabling authorised applicants to request train paths throughout the freight-oriented network. It will encourage infrastructure managers to offer additional efficient international train paths and to intensify the work already started in the framework of *RailNetEurope*. It will specify the powers of the regulatory authorities in regard to international traffic and encourage the development of cooperation between them.

5. Priority rules applying in the case of traffic disturbance
The Commission will propose tightening up the existing legislation relating to the priority of international freight in the event of disturbance of the network. It will ask the corridor structures and infrastructure managers concerned to harmonise the priority rules throughout the infrastructure under their charge.

6. Improving ancillary rail services (especially terminals and marshalling yards)
The Commission will encourage the corridor structures and infrastructure managers to set up, together with the players concerned, an efficient and appropriate network of terminals and marshalling yards. It will examine the possible sources of finance for the development of this type of infrastructure within existing programmes. It will look into the possibility of additions to the existing legislation to improve the transparency and ease of access to ancillary rail services.

7. Monitoring of the measures proposed
All of these measures will be examined in the framework of structured deliberations in the form of a strategic group. This group will have in its remit in particular to define and identify the characteristics of the corridors, to determine what legislative and operational measures are required and to fix the powers and responsibilities of the corridor structures.

Relevance to green corridor development

The document promotes the creation of freight oriented rail corridors, and as such is highly relevant to green corridor development. The specific objectives pursued concern the enhancement of service quality in freight transport in terms of journey times, reliability and capacity, all of which are covered by the KPIs proposed by SuperGreen. The requirement for monitoring a set of quality indicators related to both infrastructure and operations is also very much in line with the green corridor methodology.

Measures/changes suggested or introduced

The basic measures suggested by the document are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Define a freight-oriented corridor	PP	Enhance the share of railways in freight transport through improvement of transit time, reliability and capacity along specific rail corridors.

2	Monitor and publish service quality indicators	PP	As above
3	Increase infrastructure capacity	ID	As above
4	Give more priority to international freight when allocating train paths	PP	As above
5	Give more priority to international freight in the case of traffic disturbance	PP	As above
6	Improve ancillary rail services like terminals and marshalling yards	ID	As above

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number : 30**		**Partner : NTUA**	
Document identity		Field[1] : RAIL		Doc.date : 22.9.2010	
Doc. number :	Regulation (EU) No 913/2010	Study :		Regulatory act :	
Author :	European Parliament & Council	Research proj.:		- Suggestion :	
On behalf of :	European Parliament & Council	Other doc.:		- In force :	X
Title :	**A European rail network for competitive freight**				
Related doc's :	Towards a Rail Network Giving Priority to Freight, COM(2007) 608				
Web address :	http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!CELEXnumdoc&lg=EN&numdoc=32010R0913				

Objective(s)

This Regulation is the implementation of the measures suggested by the document of the previous fiche. It lays down rules for the establishment and organisation of international rail corridors for competitive rail freight with a view to the development of a European rail network for competitive freight. It sets out rules for the selection, organisation, management and the indicative investment planning of freight corridors.

Main findings / results achieved / summary of measures

As in many legal documents, the preamble contains a lot of substance. The following excerpts from this part of the document are the most interesting ones from the SuperGreen point of view:

“The creation of an internal rail market, in particular with regard to freight transport, is an essential factor in making progress towards sustainable mobility.”

“In order to be competitive with other modes of transport, international and national rail freight services, which have been opened up to competition since 1 January 2007, must be able to benefit from a good quality and sufficiently financed railway infrastructure, namely, one which allows freight transport services to be provided under good conditions in terms of commercial speed and journey times and to be reliable, namely, that the service it provides actually corresponds to the contractual agreements entered into with the railway undertakings.”

“Although the opening of the rail freight market has made it possible for new operators to enter the rail network, market mechanisms have not been and are not sufficient to organise, regulate and secure rail freight traffic. To optimise the use of the network and ensure its reliability it is useful to introduce additional procedures to strengthen cooperation on allocation of international train paths for freight trains between infrastructure managers.”

“The establishment of international rail corridors for a European rail network for competitive freight on which freight trains can run under good conditions and easily pass from one national network to another would allow for improvements in the conditions of use of the infrastructure.”

“In order to establish international rail corridors for a European rail network for competitive freight, the initiatives already taken in terms of railway infrastructure show that the establishment of international corridors, which meet specific needs in one or more clearly identified segments of the freight market, is the most appropriate method."

"The implementation of international rail freight corridors forming a European rail network for competitive freight should be conducted in a manner consistent with the trans-European Transport Network (TEN-T) and/or the European Railway Traffic Management System (ERTMS) corridors. To that end, the coordinated development of the networks is necessary, and in particular as regards the integration of the international corridors for rail freight into the existing TEN-T and the ERTMS corridors. Furthermore, harmonising rules relating to those freight corridors should be established at Union level. Projects aimed at reducing noise from freight trains should be encouraged. If necessary, the establishment of those corridors should be supported financially within the framework of the TEN-T, research and Marco Polo programmes, and other Union policies and funds, such as the European Regional Development Fund or the Cohesion Fund as well as the European Investment Bank."

"Within the framework of a freight corridor, good coordination between the Member States and the infrastructure managers concerned should be ensured, sufficient priority should be given to rail freight traffic, effective and adequate links to other modes of transport should be set up and conditions should be created which are favourable to the development of competition between rail freight service providers."

"The development of intermodal freight terminals should also be considered necessary to support the establishment of rail freight corridors in the Union."

"Freight trains running on the freight corridor should be able to enjoy, as far as possible, sufficient punctuality in the event of disturbance with regard to the needs of all types of transport."

"In order to evaluate objectively the benefits of the measures aimed at the establishment of the freight corridor, the performance of the rail freight services along the freight corridor should be monitored and quality reports should be published regularly. The evaluation of the performance should include the outcome of satisfaction surveys of the users of the freight corridor."

In its main text, the Regulation, among others:

- Defines a "rail freight corridor" as all designated railway lines, including railway ferry lines, on the territory of or between Member States, and, where appropriate, European third countries, linking two or more terminals, along a principal route and, where appropriate, diversionary routes and sections connecting them, including the railway infrastructure and its equipment and relevant rail services in accordance with Article 5 of Directive 2001/14/EC.
- Designates the following 9 corridors as initial freight corridors:
    1. Zeebrugge-Antwerp/Rotterdam-Duisburg-[Basel]-Milan-Genoa
    2. Rotterdam-Antwerp-Luxembourg-Metz-Dijon-Lyon/[Basel]
    3. Stockholm-Malmö-Copenhagen-Hamburg-Innsbruck-Verona-Palermo
    4. Sines-Lisbon/Leixões Madrid-Medina del Campo/Bilbao/San Sebastian-Irun-Bordeaux-Paris/Le Havre/MetzSines-Elvas/Algeciras
    5. Gdynia-Katowice-Ostrava/Žilina-Bratislava/Vienna/Klagenfurt-Udine-Venice/Trieste/ /Bologna/Ravenna/ Graz-Maribor-Ljubljana-Koper/Trieste
    6. Almería-Valencia/Madrid-Zaragoza/Barcelona-Marseille-Lyon-Turin-Milan-Verona-Padua/Venice-Trieste/Koper-Ljubljana-Budapest-Zahony (Hungarian-Ukrainian border)
    7. Bucharest-ConstantaPrague-Vienna/Bratislava-Budapest Vidin-Sofia-Thessaloniki-Athens
    8. Bremerhaven/Rotterdam/Antwerp-Aachen/Berlin-Warsaw-Terespol (Poland-Belarus border)/Kaunas
    9. Prague-Horní Lideč-Žilina-Košice-Čierna and Tisou (Slovak/Ukrainian border)

- Makes it mandatory for each Member State with a rail border with another Member State to participate in the establishment of at least one freight corridor, unless this obligation has already been met with the 9 initial corridors.
- Lists the following set of criteria that need to be accounted for in the selection of further freight corridors and their modification:
  a) the crossing by the freight corridor of the territory of at least three Member States, or of two Member States if the distance between the terminals served by the freight corridor is greater than 500 km;
  b) the consistency of the freight corridor with the TEN-T, the ERTMS corridors and/or the corridors defined by RNE (RailNetEurope);
  c) the integration of TEN-T priority projects into the freight corridor;
  d) the balance between the socio-economic costs and benefits stemming from the establishment of the freight corridor;
  e) the consistency of all of the freight corridors proposed by the Member States in order to set up a European rail network for competitive freight;
  f) the development of rail freight traffic and major trade flows and goods traffic along the freight corridor;
  g) if appropriate, better interconnections between Member States and European third countries;
  h) the interest of the applicants in the freight corridor;
  i) the existence of good interconnections with other modes of transport, in particular due to an adequate network of terminals, including maritime and inland ports.
- Sets up detailed rules for the governance of each freight corridor through:
  - an executive board composed of representatives of the authorities of the Member States concerned;
  - a management board composed of the infrastructure managers concerned and, where relevant, the allocation bodies as referred to in Article 14(2) of Directive 2001/14/EC;
  - an advisory group made up of managers and owners of the terminals of the freight corridor including, where necessary, sea and inland waterway ports; and
  - a further advisory group made up of railway undertakings interested in the use of the freight corridor.
- Defines measures for implementing the freight corridor, including:
  - carrying out and periodically updating a transport market study relating to the observed and expected changes in the traffic on the freight corridor;
  - drawing up an implementation plan describing the characteristics of the freight corridor, including bottlenecks, the programme of measures necessary for creating the freight corridor and the objectives for the freight corridor, in particular in terms of performance expressed as the quality of the service and the capacity of the freight corridor;
  - drawing up and periodically reviewing an investment plan providing details of indicative medium and long-term investment for infrastructure and its equipment along the freight corridor, the relevant financial requirements and sources of finance, a deployment plan relating to the interoperable systems along the freight corridor which satisfies the essential requirements and the technical specifications for interoperability which apply to the network as defined in Directive 2008/57/EC, and a plan for the management of the capacity of freight trains which may run on the freight corridor, which includes removing the identified bottlenecks;
  - setting up an one-stop shop for application for infrastructure capacity, which would also display infrastructure capacity available at the time of request and its characteristics in accordance with pre-defined parameters, such as speed, length, loading gauge or axle load authorised for trains running on the freight corridor;
  - monitoring the performance of rail freight services on the freight corridor and publishing the

results of this monitoring once a year; and
- organising a satisfaction survey of the users of the freight corridor and publishing the results of it once a year.

- Describes the process of capacity allocation to freight trains with a view to increasing freight transport through better coordination of priority rules relating to capacity allocation on the freight corridor, and prioritizing, among freight trains, those that cross at least one border.

Relevance to green corridor development

The document lies at the core of green corridor development, as it constitutes the first piece of legislation towards their creation. Of particular importance to SuperGreen is:

- the defining criterion (crossing by the freight corridor of the territory of at least three Member States, or of two Member States if the distance between the terminals served by the freight corridor is greater than 500 km);
- the capacity allocation procedure aiming at increased freight transport;
- the governance rules emphasising the necessary coordination of all parties involved;
- the requirement to meet technical specifications related to interoperability; and
- the performance monitoring provisions, with emphasis placed on journey time, reliability and user satisfaction.

Measures/changes suggested or introduced

The single measure introduced by the document is:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Create freight-oriented corridors	PP	Enhance the share of railways in freight transport through improvement of transit time, reliability and capacity along specific rail corridors.

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 18		Partner : TCDD	
Document identity		Field[1] : RAIL		Doc.date : 8.7.2008	
Doc. number :	COM(2008) 432	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Rail noise abatement measures addressing the existing fleet**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0432:FIN:EN:PDF				

Objective(s)

The aim of this document is to suggest Community action reducing the exposure of citizens to rail noise by promoting the establishment of rail noise abatement programmes to curb noise emissions of freight trains without jeopardizing the competitiveness of rail freight mainly by retrofitting freight wagons with low-noise brakes as the most cost-effective type of measure.

Main findings / results achieved / summary of measures

Rolling noise of freight wagons has been identified as the biggest source of rail noise. The braking technology currently used (cast-iron brake blocks braking on the wheels' surface) produces rough wheel surfaces and subsequently leads to a high level of vibration of rails and wheels. As freight trains often operate at night, their noise emission is even more critical.

Measures at source (vehicles and tracks) have been recommended as more cost-effective than other noise abatement programmes like noise barriers. If barriers are coupled with measures at source, the length and/or height of barriers can be reduced, leading to significant cost savings. In December 2005 the Commission adopted technical specifications for interoperability relating to rail noise (Noise TSI) introducing limits for rolling stock used in the European Union. These limits apply to new and renewed rolling stock including freight wagons, which have to be equipped with low-noise brake blocks reducing the noise emission by about 50%.

However, given the long lifetime of rolling stock, it will take several years before overall noise emissions from freight trains can be reduced significantly under existing legislation and if no additional measures addressing the existing fleet are introduced.

In the past 10 years, several types of composite brake blocks have been developed by the industry in order to replace the conventional cast-iron blocks as the main source of rail and wheel roughness. The so-called K-blocks are a proven technology used for new wagons but entail high costs for retrofitting. Other types, so-called LL-blocks, are thus being developed explicitly for retrofitting. In early 2008 one type of K-blocks received definitive UIC homologation, while three types of LL-blocks have provisional homologation.

Retrofitting should in principle include all European freight wagons with an annual mileage of more than 10,000 km and a remaining life expectancy of at least five years. Cost-benefit analysis has shown considerable net benefits of retrofitting in the range of 3 to 10 as compared to costs. The main obstacle to retrofitting freight wagons on a large scale is financial, as stakeholders do not have sufficient resources or incentives to do it.

To overcome the obstacles to retrofitting, the Commission analysed different measures and concluded that a combination of noise-differentiated track access charges, noise emission ceilings and voluntary commitments is the most appropriate solution.

Introduction of differentiated track access charges
At European level, Directive 2001/14/EC12 harmonises charging principles. One of these principles is that infrastructure charges may take account of the cost of the environmental impact of train operations, including noise. Any charge differentiation should in principle reflect the magnitude of the impact on the environment. Three basic models of differentiated track access charges could be used as an incentive:

- a cost-neutral bonus-malus system with reduced charges for silent wagons and higher charges for noisy ones;
- a bonus system consisting of charges which are reduced to enable the retrofitting of existing wagons with high degree of noise emissions; the infrastructure manager receives financial compensation from the Member State;
- a malus system consisting of increased charges for noisy wagons.

In the course of the recast of Directive 2001/14/EC, the Commission will propose legal requirements for the implementation of noise-differentiated track access charges. Infrastructure managers will be in charge of the installation of identification systems and necessary IT tools. The completion of the retrofitting programmes is expected by the end of 2015 considering a timeframe of three years for the replacement of brake blocks.

Introduction of noise emission ceilings
The noise emission ceiling limits the average emissions within a determined period at a certain location along the line. Such schemes leave it to the rail sector to find optimal solutions: the railway undertaking may use vehicles with lower emissions to increase the number and/or speed of trains without exceeding the noise limits. The noise emission ceiling therefore gives an incentive to use low-noise vehicles.

In order to maintain the noise reduction achieved by retrofitting, the European Commission recommends Member States to introduce noise emission ceilings for major rail freight lines as a second step after the initial retrofitting programmes have been completed.

Voluntary commitments by the rail sector
Accompanying voluntary commitments can guarantee the effectiveness of differentiated track access charges and help to speed up their implementation even before legal requirements enter into force. Voluntary commitments by railway undertakings on passing the noise bonuses received from infrastructure managers to the wagon owners (where they do not use own wagons) will support market mechanisms to ensure that the noise bonus can be used to finance the costs of retrofitting. Furthermore, voluntary commitments by the sector to set up and implement individual retrofitting programmes as soon as possible would lead to better coordination of individual activities and would increase the visibility of the action. The European Commission urges the rail sector to conclude such voluntary commitments without delay.

Reducing costs of retrofitting
Clearly, the technology available today cannot be regarded as sufficient for retrofitting on a European scale. The Commission therefore urges industry to further develop composite brake blocks in close cooperation with railway undertakings and wagon owners in order to reduce costs significantly. The Commission will continue to support appropriate research and demonstration projects within existing

programmes such as FP7 and LIFE+.

Relevance to green corridor development

Reduction of noise pollution generated by freight transport activities is an attribute of green corridors. Furthermore, if no remedial action is taken, public opposition to rail noise could lead to restrictions on rail traffic along the most important European rail corridors, in particular freight trains, and a possible modal shift from rail to road on these corridors would lead to increasing environmental impacts, in particular greenhouse gas emissions and increased bottlenecks.

Measures/changes suggested or introduced

The most important measures suggested by the document are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Introduction of market based measures (differentiated track access charges)	PP	Reduction of noise pollution generated by freight rail transport. Care should be taken to avoid harmful effects on competitiveness of rail vis-a-vis road transport.
2	Introduction of noise emission ceilings	PP	As above
3	Continue supporting research on further developing composite brake blocks	TD	Potential improvements through reduction of retrofitting costs.

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : **40**		Partner : **TCDD**	
Document identity		Field[1] : RAIL		Doc.date : May 2004	
Doc. number :		Study :	X	Regulatory act :	
Author :	Kessel+Partner et al.	Research proj.:		- Suggestion :	
On behalf of :	Combined Transport Group of the International Union of Railways (UIC)	Other doc.:		- In force :	
Title :	**Study on Infrastructure capacity reserves for combined transport by 2015**				
Related doc's :					
Web address :	www.uic.org/IMG/pdf/uic_finalreport.pdf				

Objective(s):

The aim of the study, commissioned by the Combined Transport Group (GTC) of the International Union of Railways (UIC) and supported by the International Union of Rail-Road Companies (UIRR), is to help identify the measures that should be taken by transport stakeholders (political decision-makers, railway undertakings, operators and infrastructure managers) to ensure the rail network and terminals can accommodate the increased demand for combined transport.

Main findings / results achieved / summary of measures

The study analysed the capacity of 18 trans-European freight corridors, which portray nearly the entire European cross-border combined transport (CT) volume, except of a few Intra-Scandinavian and Intra-Eastern European flows (refer to table below). More specifically, the following tasks were performed:

- Analysis of the volume and structure of existing international combined rail-road transport (base year: 2002).
- Prognosis of the volume and structure of international combined transport by 2015.
- Investigation into the enlargement investments scheduled or already in progress for the rail network and combined transport terminals by 2015.
- Evaluation whether the 2015 infrastructure capacity (rail network, intermodal terminals) will be sufficient to absorb an increased international combined transport.
- Recommendations on additional enlargement investments, which would be required if, in 2015, infrastructure capacities were insufficient.
- Recommendations on services and products, which should be implemented by intermodal actors to overcome infrastructure capacity limitations recognized.

Corridor		Via…
1	Benelux, Germany, Switzerland, Italy	
2	Benelux, France, Switzerland, Italy	Bettembourg/Athus, Metz, Basel
3	Benelux, France, Italy	Bettembourg/Athus, Metz, Modane
4	Benelux, France, Italy	Paris, Modane
5	Scandinavia, Germany, Austria Italy	
6	Germany, Poland	
7	Benelux, Germany, Czech Republic, Slovakian Republic	
8	Benelux, France, Spain	Paris, Bordeaux, Hendaye
9	Benelux, France, Spain	Paris, Dijon, Lyon, Cerbère
10	Germany, France, Spain, Portugal	Cerbère and Hendaye
11	France, Germany, Austria, Hungary	Le Havre/Forbach or Paris/ Basel
12	France, Hungary	Switzerland
13	United Kingdom, France, Spain	Cerbère or Hendaye
14	United Kingdom, France, Germany, Austria, Hungary	Calais, Metz or Forbach
15	United Kingdom, France, Italy	Paris or Metz or Modane
16	United Kingdom, France, Switzerland, Italy	Metz, Strasbourg or Basel
17	United Kingdom, France, Belgium, Germany, Switzerland, Italy	
18	Italy, France, Spain	Modane or Ventimiglia/ Cerbère or Hendaye

The 2002 volume totaled to 4,741,653 TEU or 54.5 million tones, of which 44.1 mill tonnes (81%) were carried on unaccompanied CT services and 10.4 mill tonnes on accompanied CT services. All 17 “rolling highway” services existing at that time were covered in the accompanied CT services. They conveyed 547,000 trucks, of which one third were using services on the Brenner corridor and some 20% on the Tauern axis. As for the unaccompanied CT in 2002, 60% of total European transport was generated by continental services and 40% by the hinterland transport of maritime containers.

The forecast for 2015 is summarized in the following table:

Market segment	TEU (mill)		Net tonnage (mill tonnes)		
	2002	2015	2002	2015	2015/2002
Unaccompanied	3.48	8.7	44.1	103.6	+ 135 %
Accompanied	1.26	1.5	10.4	12.4	+ 19 %
Total	**4.74**	**10.2**	**54.5**	**116.0**	**+ 113 %**

International CT on the 18 trans-European corridors will increase from 54.5 mill tonnes (2002) by +113 % to 116.0 mill tonnes in 2015. Most of this increase will come from the unaccompanied CT, and more specifically from the “mature” CT markets in Western Europe owing to the existent market penetration and the robustness of services against economic weakening.

The study clearly shows that, even if all planned infrastructure investments were realised until 2015, considerable bottlenecks in terms of a lack of capacity for operating daily trains would remain. This is even truer, if capacity-raising enhancements regarding train and line capacity parameters, which are considered ambitious, will not be achieved. In that case network bottlenecks would increase further. Major bottlenecks are expected on the following axes:

Country	Main axes with bottlenecks
Germany	Hamburg – Rhein/Main
	Köln – Rhein/Main
	Saarbrücken – Stuttgart
France	Metz – Dijon
	Lyon – Avignon
	Paris – Orléans – Tours
Belgium	Freight corridors from/to Anvers
Switzerland	Greater Basel area
Spain	Barcelona-Tarragona

These bottlenecks are located on the major European freight corridors and their elimination is of great strategic significance for European transport. Therefore, considerable efforts will be required until 2015 to cope with the expected increase in transport volumes.

Furthermore, the study analysed 34 transport areas on the 18 corridors, representative of the network of terminals for unaccompanied CT services. They include the 25 largest transport areas and 9 end-of-corridor areas, which are relevant for intermodal services beyond the limits of the 18 corridors examined. These areas cover 70 individual terminal sites representing some 85% of the total 2015 volume of international unaccompanied combined transport.

The total transhipment volumes in these 34 transport areas is forecast to increase by 80% from 6.3 mill intermodal load units (2002) to 11.4 million units (2015). Investigations into enlargement programmes proved that a large scope of investments is scheduled or already in progress, both extending existent and building new terminal sites. According to that, the nominal total transhipment capacity is due to rise from 9.6 million units (2002) by 39% to 13.3 mill load units. Despite these ambitious enlargement programmes, capacity gaps are likely to arise in 20 out of 34 transport areas by 2015.

As a consequence, on top of the investments scheduled another 13% of transhipment capacity enabling to handle 1.7 mill units p.a. is required to meet the increasing demand for unaccompanied CT services, and to maintain a high quality of service towards intermodal customers.

Relevance to green corridor development

Combined transport, which is the subject of this study, is a key aspect of green corridors. Furthermore, many of the corridors examined by the study are covered by SuperGreen in whole or in part. The study, despite its age, proves how crucial the timely implementation of planned infrastructure improvement investments is for the growth of CT and other rail freight transport. It further identifies capacity gaps in rail lines and intermodal terminals along the corridors examined.

Measures/changes suggested or introduced

The most important of the measures suggested are listed below:

No.	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Enhance capacity of rail network and intermodal terminals through implementation of planned projects	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
2	Schedule new capacity enlargement projects aiming at eliminating bottlenecks, crucial for the entire	ID	As above

	European CT network		
3	Construct dedicated freight lines	ID	Enhance the share of railways in freight transport through improvement of transit time, reliability and capacity along specific rail corridors. Large investments needed.
4	Construct priority networks for rail freight services	PP	Enhance the share of railways in freight transport through improvement of transit time, reliability and capacity along specific rail corridors.
5	Avoid dismantling currently underemployed overtaking tracks or flyovers	ID	Potential improvements in flexibility at the expense of land use
6	Enlarge the loading gauge on a few main routes	ID	Direct improvements in infrastructural sufficiency and indirect ones in all other KPI areas
7	Use specialized ICT applications increasing the capacity of existing infrastructure through better management	TD	As above
8	Improve qualifications of terminal management and staff	OP	Potential improvements in all KPI areas
9	Create open terminals permitting non-discriminatory access to any intermodal operator	PP	Direct improvements in efficiency and infrastructural sufficiency through higher capacity utilization.

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

Appendix VI. Road transport

De Ceuster et al (2008). *Effects of adapting the rules on weights and dimensions of heavy commercial vehicles as established within Directive 96/53/EC.* TML report, TREN/G3/ 318/2007, Leuven, 6.11.2008.

Visser Hans et al (2007). *Study on the feasibility of organising a network of secured parking areas for road transport operators on the Trans European Road Network.* NEA Transport research and training report, R20060265/30466000/jvi/cwi, Rijswijk, the Netherlands, January 2007.

European Commission (2007f). *Proposal for a Regulation on access to the market in the carriage of goods by road within the Community to or from the territory of a Member State or passing across the territory of one or more Member States.* COM(2007) 265, Brussels, 23.5.2007.

European Commission (2007g). *Proposal for a Regulation establishing common rules concerning the conditions to be complied with to pursue the occupation of road transport operator.* COM(2007) 263, Brussels, 23.5.2007.

Morcello et al (2009). *Alpine Traffic Observatory. Annual report covering year 2008.* 18.12.2009.

ERTRAC (2010). *ERTRAC Strategic Research Agenda 2010: Towards a 50% more efficient road transport system by 2030. Executive Summary.* October 2010.

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Carrota Alessandro (2009). *eSafety Recommendation Note (December 2008).* Deliverable D1.3 of the eSafety Support project, ERTICO-ITS EUROPE, Brussels, 11.2.2009.

SUPERGREEN Document Fiche		Number : 6		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : 6.11.2008	
Doc. number :	TREN/G3/318/2007	Study :	X	Regulatory act :	
Author :	De Ceuster et al	Research proj. :		- Suggestion :	
On behalf of :	European Commission	Other doc. :		- In force :	
Title :	**Effects of adapting the rules on weights and dimensions of heavy commercial vehicles as established within Directive 96/53/EC**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/strategies/studies/doc/2009_01_weights_and_dimensions_vehicles.pdf				

Objective(s) The aim of the project is to provide advice to the Commission on the optimal weights and dimensions of heavy vehicles. The advice focuses on the effects, both positive and negative, of the use of bigger and/or heavier vehicles, including the modular concept at various maximal dimensions and weight levels in and between adjacent and consenting Member States.
Main findings / results achieved / summary of measures In the study, four scenarios concerning LHV (Long and heavy vehicles) for 2020 are studied: *Scenario 1:* “Business as usual”. This first scenario assumes no changes to the road transport equipment constraints that were valid in 2000. The scenario takes into account projected economic developments and projected transport demand in Europe until 2020. All other scenarios take this one as the reference/ base case. *Scenario 2*: “LHV Full option”: Europe-wide permission of 25.25 m and 60 t trucks. These LHVs are allowed on all European motorways (i.e. backbone roads). The usage of LHVs on regional roads may be restricted. *Scenario 3*: “Corridor/Coalition”: LHVs of 25.25 m and 60 t are allowed in some countries, while Europe-wide only 18.75 m and 40 t trucks are allowed. This scenario is a mix of scenarios 1 and 2. There is a group of countries that permit LHVs on their motorways, possibly putting some restrictions for the usage of regional roads, while the rest stick to the current restrictions (40t 18.75m). The following 6 European countries are included into the coalition: Sweden, Finland, Denmark, Germany, The Netherlands and Belgium. *Scenario 4*: “Intermediate”: Europe-wide permission of up to 20.75 m 44 t trucks. This scenario represents a gradual increase in vehicle constraints, namely 10% of carrying capacity. The choice of dimensions and constraints is “realistic” and reflects wishes of car transporters and chemical industry.

All scenarios give an overall positive effect on society compared to the reference, with scenario 2 showing a greater benefit than scenarios 3 and 4. The main reason for this is that society has to spend less money for transporting the same (even slightly more) goods. LHVs seem to be more cost-effective than current HGVs (heavy goods vehicles). They produce more tonne-km [tkm] (+1 %) with less vehicle-km [vkm] (-12.9 %). Even without counting the projected transport work shifted from rail (-3.8 % tkm) and inland waterways (-2.9 % tkm) to road, the road transport sector will grow. Additionally, positive effects are predicted for safety and emissions, mainly due to a reduction in road vkm (-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).

Scenario 3's impact is very much the same as scenario 2's in the countries of the corridor. Outside it, results are mixed: while some countries will have more traffic as a result of cheaper transport in corridor countries, others, often transit countries "competing" with corridor countries for traffic, will see a decline in volumes.

Scenario 4 has a much lower positive impact than scenario 2, as the smaller variant is not so efficient for the transport sector. Also, this type of truck is less beneficial for safety, and even has a negative impact on emissions, while the investment costs for maintenance and infrastructure are about as high as for the full size LHV. Any of such intermediate scenarios would also require new equipment.

Transport demand and modal choice

In scenario 2, in which LHVs of 25.25 m and 60 t are allowed in the entire Europe, the total volume of road transport (in tkm) rises by 0.99 % in comparison to the benchmark scenario 1 (price elasticity is -0.416). On the other hand, it is concluded that the number of vkm done by HGVs (LHV is a sub-class of heavy goods vehicles) declines by 12.9 %. It should be noticed that the decrease of vkm happens in heavy cargo traffic. There is a large variation in change of vkm over the countries. The most affected countries are big and sparsely populated countries with clear aggregation of population and economical activity such as Spain, Finland and Greece.

The total aggregate effect of LHVs on the European rail and inland waterway transport is a 3.8 % reduction in rail tkm and a 2.9 % decrease in inland waterway tkm. This may be seen as an unwelcome effect.

Scenario 4 leads to an aggregate increase in road tkm by 0.42 % and decrease in the number of vkm by 3.4 %. There is an interesting comparison between scenarios 3 and 2. The countries that are not included into the coalition/corridor are not noticeably affected. The road volumes and cargo traffic in countries that are included into the coalition respond differently. For instance, for the Netherlands there is almost no difference between scenarios 2 and scenario 3, while Belgium and Germany would witness bigger differences.

Safety

The assessment of road safety aspects when adapting Directive 96/53/EC and permitting LHVs in road traffic does not reveal an inherent increase of safety risks in general. However, there may be a higher risk for some LHV combinations regarding handling characteristics. Vehicles which are not (only) longer but just heavier may induce more severe accidents and casualties. Generally, from the road safety assessment point of view it can be concluded that increasing the weight or increasing the dimensions would lead to only minor additional risks whereas an increase of both may increase the risks for road safety to a greater extent. This has to be balanced with the potential reduction of the number of lorries that LHVs may provide. As a reduction of the total number of heavy duty trucks is predicted, safety will increase. This increase will completely balance out the increased risk factor of the individual vehicle.

Infrastructure

The assessment of infrastructure concerns bridges and pavements. To assess the impact of an evolution of the traffic on a particular bridge several points must be considered:

1. Its ability to support the passage of maximum intensity traffic (extreme load).
2. Its ability to withstand the repeated passage of traffic (the phenomenon of fatigue).
3. The increase in the resulting costs of monitoring, maintenance and strengthening.

The impacts from the traffic of different combinations of vehicles, with different gross vehicle weight, driving on different kinds of pavements were assessed. It was shown that in some cases important consequences have to be expected and that the corresponding combinations should be avoided. Particularly noteworthy is 44 tonnes on 5 axles combination A44, 2 axle tractor and 3 axle tridem semi-trailer, which is already operational in a number of member states. If the Directive is revised and LHVs permitted, it is strongly suggested to avoid this combination A44.

Emissions and energy consumption

The energy consumption is predicted to go down when LHVs are introduced (scenario 2). The main reason for this is the fact that 60 t vehicles are up to 12.45 % more efficient in terms of fuel consumption per ton-km performed. This effect is bigger than the predicted increase in tkm by road. NOx transport emissions will decrease by 4.03 %. For PM, the effect is even greater, as a drop of 8.39 % can be expected, mainly due to less non-exhaust PM: fewer kilometres driven cause less dust re-suspension and mechanical wear. In the “corridor/coalition” scenario 3, the effect is smaller, as only 6 countries allow LHVs. In the “intermediate” scenario 4, there would be an increase of 0.61 % in emissions. This implies that the efficiency gain caused by the increase from 40t to 44t gross vehicle weight is insufficient to offset the extra emissions of the higher transport demand. Moreover, using a heavier vehicle (with one extra axle) removes even the smallest improvement in cost per tkm: it increases by 0.28 %. The extra load that can be carried does not offset the extra fuel consumption required to do so. The NOx emissions are up by 0.32 % compared to the “business as usual” scenario. PM emissions from transport are down however, by 1.85 %.

Stakeholder consultation

There is an enormous number of stakeholders involved. Consultation with them was a major part of the project. The results of the consultation were used in the calculation of the effects of introducing LHVs in Europe. In parallel to live interaction, an internet questionnaire was set up to allow the maximum number of stakeholder to contribute to the discussion.

A large group of supporters was found in shippers, hauliers and manufacturers: all potential beneficiaries of the expected decrease in transportation costs that increased weights and dimensions may entail. Authorities of the few countries where the modular concept has been used or successfully tested have also shown a positive attitude towards a change in the directive.

The opponents of such change are equally numerous. Governments of large countries such as France, Germany and UK, and of Alpine and Eastern European countries are reluctant to modify the current Directive, and above all to increase the weight and dimension limits. Operators or representative organizations of rail and inland waterways, which are at risk of losing volume as a result of a change, hold on firmly to prevent any disturbance in the current market situation. Environmental organisations, albeit with a different agenda, are generally opposed to a modification without compensation on other levels. A final group of opponents are authorities in charge of road infrastructure. The main arguments cited as favourable to an increase of dimensions include:

• Decrease of operational costs due to greater loads

• Decrease of emissions (CO2, NOx, PM)
• Positive impact on safety as less trucks are needed for the same amount of goods transported
• Driver shortage is alleviated.

General recommendations

The general recommendation is that introducing LHVs in Europe can be done without harming European society in general. However, some effects will need countermeasures:

1. Rail and inland waterway transport will grow somewhat less than expected, leading to a risk of local rail lines getting into difficulties.
2. The safety of the individual LHV is worse than that of a smaller truck.
3. Infrastructure investments need to be made.

From a purely economical point of view, harmonisation is not necessary. In a scenario where the EC sets minimum standards, and countries can choose themselves to allow LHVs (scenario 3), benefits are substantial. However, there is concern on timing. Introduction of a major change in weights and dimensions of heavy commercial vehicles needs to be announced well ahead. This accommodates the time needed to adapt infrastructures, and gives also the opportunity to monitor the effects on transport demand and modal choice, emissions and safety. Stepwise introduction is also an option, though the competitive position of smaller transporters could be at risk in this case.

Relevance to green corridor development

The result in the sense of greening is dependent on the development of load factor / load level when cargo is transported by bigger heavy vehicles. More effective and thus more environmental friendly transport could be enabled through new regulation.

Measures/changes suggested or introduced

Introducing LHVs in Europe can be done without harming European society in general.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Introducing LHVs	PP	Improvements in efficiency and environmental sustainability. Adverse effects on rail and inland waterway transport. Increased costs of infrastructure.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 56		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : January 2007	
Doc. number :	R20070008/30466000/jvi/cwi	Study :	X	Regulatory act :	
Author :	Visser Hans et al	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Study on the feasibility of organising a network of secured parking areas for road transport operators on the Trans European Road Network**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/road/studies/doc/2007_01_secured_parking_country_reports.pdf				

Objective(s)

The study investigates the extent of the security problems in and around parking areas, explores possible improvements/solutions of the problems and examines the regulatory and financial conditions for the provision of secure rest places.

Main findings / results achieved / summary of measures

Different types of demand

Policymakers should clearly distinguish between different types of demand for parking areas. Firstly, the demand for truck parking areas for short stays should be distinguished from the demand for long stays. Secondly, one should clearly distinguish different levels of security needs at parking areas. Moreover, these security needs are not fixed but dependent on situations. The demand for parking areas for long rests with a low/minimal security level is far higher than the demand for truck parking areas with a high security level and to a less extent than the demand for parking areas with a medium security level.

Shortage of parking areas

According to available European data on parking supply and transport demand models, a shortage of truck parking areas for long distance transport in the EU occurs currently in several EU Member States, while in others there is an overcapacity of parking slots. Shortages occur in specific regions. The shortage problem is more important for general parking than secure parking. “Hot-spot” areas should feature high on the priority list of policymakers. Existing hot-spots are frequently located in metropolitan areas.

Investments

Total new parking area investments in the EU needed to accommodate transport demand would be in the range of € 1.2-1.5 billion. Comparisons of the outcomes of cost models and the operators’ willingness to pay clearly indicate that parking tariffs of secured parking areas in particular in the case of Western European metropolitan areas (with high prices of land use) are very close to, and in some cases, even above the maximum boundary of the operator’s willingness to pay. In this instance a form of subsidization by local Member States may significantly help to increase the number of secured parking areas. Revenues from infrastructure may be allocated to improve the security of parking areas.

In countries where the motorway network is operated and developed through Public-Private Partnership (concessions), a number of initiatives to improve the security of truck parking areas already exist. One should be aware that Public-Private Partnership contracts may lead to a form of monopoly (truck parking area exploitation is in the hands of one company) when proper controls are inadequate, or to a reduction of competition between parking areas in the region of a single concessionaire (e.g. pressures to "harmonize" tariffs).

Infrastructure

Although most Member States include the provision of the number, size and location of truck parking areas in the infrastructure planning process, specific security concerns (e.g. with regard to the location-visibility of parking areas, need for fencing etc.) are mostly not included. It is recommended that such security related elements should already be considered/ incorporated in the planning process.

There is wide divergence with regard to the legislative framework conditions between Member States regarding building and exploitation of truck parking areas along the trans-European road network. A more systematic, harmonized inclusion of truck parking security requirements e.g. in the concession contracts is recommended.

Security

There seems to be a gap between the actual and perceived risks of the security at parking areas. A whole range of measures can be taken to improve the security level of truck parking areas. Measures can be aimed at physical properties of parking areas (e.g. fences), the organisation of security at parking areas (surveillance), as well as improving the communication on incidents (e.g. alarms).

Recommendations

Separated or dedicated truck parking is recommended. Surveillance cameras should cover parking areas but also cover / be able to make images of the entry/exit points of the parking area. The lighting of parking places should be sufficient. There should always be a security manager at the parking area. Distance reservation/checking of parking space capacity should be available. There should be regular police presence and direct communication lines to the police should be available. Changes in the security levels/measures implemented at a particular parking area should be communicated to the industry.

It is recommended to explore the possibilities of making use of spare capacity of depots of operators and/or shippers parking areas by (temporally) converting such spare capacity into public parking areas.

It is recommended to improve the registration of freight crimes at parking areas. The registration should be centralised per Member State. All drivers and parking operators report directly and immediately security sensitive incidents to a well identified authority. There will have to be a common form of registration of all criminal acts.

It is recommended to promote the set-up by the industry of a parking area security labelling system for EU parking areas with three distinguished levels of security. The criteria corresponding to these three different security levels will have to be verified through an external certification procedure. The periodic certification results could be made public in the form of a "blue flag" or labelling system.

It is not necessary to aim at the highest security level for all parking areas.

Relevance to green corridor development

The study is relevant to green corridor development to the extent that security of freight transported by trucks can be improved by the suggested measures. This development can also have positive effects

on cost of transport through lower insurance costs.
Measures/changes suggested or introduced The following measures are suggested by the study:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Create dedicated parking areas with appropriate security levels	ID	Direct improvements in security and efficiency through lower insurance costs
2	Put in place a centralised registration system per Member State	PP	As above
3	Put in place a labelling system	PP	As above

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 24		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : 23.5.2007	
Doc. number :	COM(2007) 265 final	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	X
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Proposal for a Regulation on access to the market in the carriage of goods by road within the Community to or from the territory of a Member State or passing across the territory of one or more Member States**				
Related doc's :	Study on road cabotage in the freight transport market				
Web address :	http://www.europeanlawmonitor.org/legislation/2007/COM2007265text.pdf				

Objective(s)

The objective of the proposal is the recasting of Regulation (EEC) N° 881/92, Regulation N° (EEC) 3118/93 and Directive 2006/94/EC to enhance the clarity, readability and enforceability of the current rules on access to the market in the carriage of goods by road within the Community to or from the territory of a Member State or passing across the territory of one or more Member States.

Main findings / results achieved / summary of measures

1. Consultation of the interested parties and Impact Analysis

A public consultation exercise was conducted before drafting the proposal in order to gather as many comments and suggestions as possible from individuals and the bodies concerned. The consultation was carried out through a questionnaire which was published on the internet. Synthesis of the received answers was made and the main results were as follows:

- Simplification and clarification of the current regulatory framework for the road transport market is needed. There is also a need to render the current rules, notably the ones on access to the market of road haulage, more easily and effectively enforceable.
- Goods transport and passenger transport by road should remain regulated in two separate sets of rules. These are two different types of transport and stakeholders feel that they do not have sufficient commonalities to treat them in one legal text.
- There is almost unanimity among them that a simple, clear and enforceable definition of cabotage needs to be found. As regards the actual solution, the replies are – not surprisingly – quite diverse. However, there seems to be large support for the approach to link cabotage to an international journey, hence to avoid empty runs.
- Many contributions pointed out the need for applying correctly the existing rules and have them enforced properly. A better cooperation between national enforcement authorities should take place, which would require the setting-up of an EU-wide register of licensed operators or database of Community licenses.

- There has also been a clear support to further standardize the models of Community license, certified copies and driver attestation.

In addition, an Impact Analysis was carried out with five policy options assessed.

2. Proposed measures

The proposal consolidates and merges the two regulations on access to the road transport market and the first Council directive exempting certain transport. It clarifies the existing legal provisions and supplements them on certain aspects to strengthen overall consistency and to guarantee effective application. It introduces the following substantial modifications:

- a simple, clear and enforceable definition of "cabotage" allowing for up to three transport operations consecutive to an international journey and within seven days and the obligation for the holder to keep in the vehicle documents like the consignment letters which show the date and place of arrivals and departure;
- a simplified and standardized format for the Community license, certified copies and the driver attestation in order to reduce the administrative burden and delays especially at road side checks;
- enhancing of the current legal provisions by obliging a Member State to act, when requested to do so by another Member State, when a haulier to whom it delivered a Community license commits an infringement in the Member State of establishment or in another Member State. Such action should take the form of at least a warning. Enhanced procedures of communication between Member States are put in place using the contact points established pursuant to the new Regulation on the admission to the occupation of road transport operator.

Relevance to green corridor development

The regulation would lead to empty run avoidance, fairer competition, improved compliance with the road transport rules and higher level of professional qualifications in the sector. All these effects are beneficial to green corridor development.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Link cabotage to an international journey	PP	Improvements in efficiency and environmental sustainability through avoidance of empty runs
2	Introduce a simplified and standardized Community license	PP	Improvements in service quality and social issues through better enforcement of regulations
3	Set-up an EU-wide register of licensed operators	PP	As above

SUPERGREEN Document Fiche		Number : 25		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : 23.5.2007	
Doc. number :	COM(2007) 263 final	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	X
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Proposal for a Regulation establishing common rules concerning the conditions to be complied with to pursue the occupation of road transport operator**				
Related doc's :	Study on admission to the occupation of road transport operator: Review of current arrangements in Member States and acceding countries				
Web address :	http://www.europeanlawmonitor.org/legislation/2007/COM2007263text.pdf				

Objective(s)

The proposal for a Regulation is intended to replace the Directive 96/26/EC on admission to the occupation of road transport operator and rectify the shortcomings related to it. It will also harmonize the national rules imposed on companies regarding admission to the occupation.

Main findings / results achieved / summary of measures

The proposal lays down the conditions with which all companies must comply to be authorised to pursue the occupation of road transport operator. It clarifies the existing legal provisions and supplements them so as to strengthen overall consistency and to guarantee effective and uniform application.

It introduces:

- the concept of the responsibility of the transport manager who lends his or her professional competence certificate to a company to enable it to obtain an authorisation, and stricter rules governing his or her links with the company;
- criteria to be met to ensure that a company is actually stably established in a Member State and that its conduct can be properly monitored by the national authority which authorised it to pursue the occupation;
- comparable financial indicators to measure a company's financial standing, compulsory minimum training of 140 hours prior to the examination to test professional competence which all applicants must sit, and the accreditation of training centres and examination centres;
- the obligation for authorities which discover that a transport operator no longer satisfies the good repute, financial standing or professional competence conditions to warn the operator and, if remedial action is not taken within a specified period, to impose administrative sanctions ranging from withdrawing its authorisation to disqualifying its transport manager;
- mutual recognition between Member States of infringements of EC road transport rules. This will result in the totaling-up of serious repeated infringements wherever they are committed which, above a certain threshold, are likely to tarnish a transport operator's good repute and lay it open to

the sanctions referred to above; • electronic registers interconnected between all Member States so as to reduce the administrative cost of monitoring companies and facilitate the exchange of information between Member States; • the gradual elimination of certain exceptions which, since they are left to the discretion of Member States, are not granted to companies in a uniform manner. These exceptions are no longer justified and distort competition to the detriment of the vast majority of companies which do not benefit from them.
Relevance to green corridor development Green corridors are international by nature. Harmonization of the national rules imposed on companies regarding admission to the occupation will improve the effectiveness of internal market and the desired features of green corridors.
Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Enhance the professional competence of road transport operators	PP	Direct improvements in service quality and social issues, indirect improvements in all other KPI areas
2	Ensure sufficient financial standing of road transport operators	PP	Improvements on service quality and social issues
3	Set-up electronic registers interconnected between all Member States	PP	As above
4	Mutual recognition between Member States of infringements of EC road transport rules	PP	As above
5	Gradual elimination of certain exceptions offered by the Member States	PP	Improvements in efficiency. Improvements in service quality and social issues in the affected sub-sectors.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

<table>
<tr><td colspan="2">SUPERGREEN Document Fiche</td><td colspan="2">Number : 45</td><td colspan="2">Partner : SITO</td></tr>
<tr><td colspan="2">Document identity</td><td colspan="2">Field[1] : ROAD</td><td colspan="2">Doc.date : 18.12.2009</td></tr>
<tr><td>Doc. number :</td><td></td><td>Study :</td><td></td><td>Regulatory act :</td><td></td></tr>
<tr><td>Author :</td><td>Morcello et al.</td><td>Research project :</td><td></td><td>- Suggestion :</td><td></td></tr>
<tr><td>On behalf of :</td><td>European Commission</td><td>Other doc.:</td><td>X</td><td>- In force :</td><td></td></tr>
<tr><td>Title :</td><td colspan="5">Alpine Traffic Observatory. Annual report covering year 2008</td></tr>
<tr><td>Related doc's :</td><td colspan="5"></td></tr>
<tr><td>Web address :</td><td colspan="5">http://ec.europa.eu/transport/road/non_eu-countries_en.htm</td></tr>
</table>

Objective(s)

This is the second annual report about traffic and transport monitoring by Alpifret (Ventimiglia on the French-Italian border to Wechsel in Austria), and concerns road and rail traffic in 2008. It aims at analysing the evolution of transalpine freight transport between 1999 and 2008, and presenting the short term (2007-2008) developments in more detail.

Main findings / results achieved / summary of measures

Examples of changing transport policies by measures promoting rail and significant reduction of HGV (heavy goods vehicles) traffic across the Alps in France, Switzerland and Austria

During the last three years, *France* has modified its transport policy to address sustainable development concerns. The long-term objective set is shift of long distance road transport to alternative modal solutions. The medium-term objectives set are: increase rail share by 25% by 2012 and reduce GHG emissions by 20% by 2020. Very few new projects and policies have been set up during 2008 but the process of formulating operational measures has been started.

In Switzerland, the parliament has passed a Federal law on road-rail transfer for freight across the Alps on 19 December 2008. This law confirms the willingness of the Swiss authorities to implement the shift of transalpine transport from road to rail. It also foresees the possibility to introduce an alpine crossing exchange in coordination with foreign countries. As a complement to this law, a Federal decree (third of December 2008) has allocated a budget envelop to promote rail transport development for freight across the Alps.

In Austria, on May 2, 2008, traffic bans have been set up at the Brenner corridor between Kufstein and Zierl for specific goods (garbage, stones, etc.). At the beginning of 2009, the bans will be extended to cover other goods. The immediate consequences of these bans are the increase of combined accompanied rail services at the Brenner corridor (more than 10 new services between Wörgl and Brenner were introduced).

In 2008, 206 million tons of goods were carried across the Alps, of which 67.1% by road. 10.5 million HGVs crossed the Alps in 2008. Brenner is the most important road corridor with 2.1 million HGVs (21% of the total traffic). Trade statistics of the period 1999 – 2008 exhibit a growth of trade across the Alps, mainly due to the economic growth and the accession of Eastern European countries to the E.U. The number of HGVs has grown by 16.1% during this period, whereas the volume of cargo (in tons) transported has increased by 31.8%. However, not all three countries have experienced the same growth rates. While cargo volumes through the Swiss and Austrian corridors have increased, those through France are basically stable (slightly decreasing in fact). Moreover, the share of rail has been significantly decreased in French, while the opposite development occurred in the other corridors.

The beginning of the economic crisis at the end of 2008 was an exogenous event that affected the transalpine traffic. The impact of the crisis became visible at the 4th quarter 2008, with a 9.6% drop in freight volume compared to the same quarter in 2007.

Alpifret monitors special indicators like congestion and environmental quality in addition to traffic evolution

Regarding congestion, it is difficult to highlight a significant trend. In France, congestion remained at a very low level at the Mont-Blanc and Fréjus tunnels. However, very high levels of congestion were noticed at Ventimiglia. In Switzerland, congestion remained stable between 2007 and 2008. However, congestion at the Gotthard South has been further increased, whereas it has been decreased at the Northern part of the corridor.

Relevance to green corridor development

Although the report does not introduce any measures or changes, it has been reviewed because of its relevance to SuperGreen and especially to the Brenner corridor. The surveillance of transport policies pursued by the Alpine States and the monitoring of their effects on traffic volumes, modal split, GHG emissions and congestion, are all activities that the institutions responsible for green corridor development will have to undertake.

Measures/changes suggested or introduced

No measures or changes are introduced by the report.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
			.

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

<table>
<tr><td colspan="2">SUPERGREEN Document Fiche</td><td colspan="2">Number : 9</td><td colspan="2">Partner : SITO</td></tr>
<tr><td colspan="2">Document identity</td><td colspan="2">Field[1] : ROAD</td><td colspan="2">Doc.date : October 2010</td></tr>
<tr><td>Doc. number :</td><td></td><td>Study :</td><td></td><td>Regulatory act :</td><td></td></tr>
<tr><td>Author :</td><td>ERTRAC (European Road Transport Research Advisory Council)</td><td>Research proj.:</td><td>X</td><td>- Suggestion :</td><td></td></tr>
<tr><td>On behalf of :</td><td>ERTRAC (European Road Transport Research Advisory Council)</td><td>Other doc.:</td><td></td><td>- In force :</td><td></td></tr>
<tr><td>Title :</td><td colspan="5">ERTRAC Strategic Research Agenda 2010: Towards a 50% more efficient road transport system by 2030. Executive Summary</td></tr>
<tr><td>Related doc's :</td><td colspan="5"></td></tr>
<tr><td>Web address :</td><td colspan="5">www.ertrac.org</td></tr>
</table>

Objective(s)

The European Road Transport Research Advisory Council was established to mobilise all stakeholders, develop a shared vision, and ensure timely, co-ordinated and efficient application of research resources to meet the continuing challenges of road transport and European competitiveness.

The aim of the Strategic Research Agenda 2010 (SRA 2010) is to provide private and public decision makers with a set of up-to-date recommendations for strategic research and innovation priorities that recognize Europe’s priorities for sustainable transport and environmental protection.

Main findings / results achieved / summary of measures

The guiding objective of the SRA is to deliver, by 2030, a road transport system that is 50% more efficient than today. This objective addresses the societal demand for decarbonisation, reliability and safety of the road transport system, as well as the growth, employment, skills and resource issues that are of critical importance for a globally competitive European road transport industry. Indeed, meeting the evolving demand for new sustainable and affordable mobility solutions will require a major transition towards a wide range of complementary, energy-efficient vehicle designs and powertrains. These new technologies will enable the introduction of a variety of (renewable) energy sources to the transport system and, through the use of information and communication technology (ICT), will become highly integrated with the next generation of road infrastructure and services.

For each of the societal needs of the road transport system from a user’s perspective, clear indicators have been selected, each with specific guiding objectives towards 2030 (see table below).

	Indicator	Guiding objective
Decarbonization	Energy efficiency: urban passenger transport	+80% (pkm/kWh) *
	Energy efficiency: long-distance freight transport	+40% (tkm/kWh) *
	Renewables in the energy pool	Biofuels: 25% Electricity: 5%
Reliability	Reliability of transport schedules	+50% *
	Urban accessibility	Preserve Improve where possible
Safety	Fatalities and severe injuries	-60% *
	Cargo lost to theft and damage	-70% *

* Versus 2010 baseline

In addition to the end-user's need for a more efficient road transport system, the SRA 2010 also recognizes the urgent need to ensure global competitiveness of the road transport-related industry in general, and the automotive industry in particular. Aside from its domestic importance to the European economy and society, the European automotive industry is one of the most 'globalized' production sectors, and faces significant competition on the global market.

Efforts to address the urgent need for global competitiveness of the automotive industry aim at producing vehicles that are affordable and which meet (domestic and global) consumer's demands, as well as producing them in a sustainable way. The indicators selected to measure the required changes in the production systems are: total cost of ownership (TCO); earnings before interest and taxes (EBIT); energy footprint of the supply chain; and the human development index (HDI).

ERTRAC's vision identifies four research and innovation domains: vehicles, infrastructure, logistical and mobility services, and energy and resources.

Vehicles
In the decades ahead, the challenge will be the need for a wide range of complementary propulsion systems and fuel/energy types to be developed simultaneously. Although the electrification of road transport will be a strong and inevitable trend, the fact is that, by 2030, the internal combustion engine (ICE) will remain the dominant propulsion technology.

Advances in vehicle technology will see a leap in intelligence through the progressive introduction of ICT. This will not only bring advances in vehicle performance and driver support systems, but will also enable the exchange of information with intelligent infrastructure and a variety of system services.

The cost-effective development of such a wide array of energy sources and associated propulsion technologies and vehicle concepts will depend on economies of scale. In this respect, the forthcoming decades will see a strong trend towards extended standardization in terms of weight, dimensions and modularization.

Infrastructure
The rate of expansion of the road transport infrastructure will not keep pace with the increase in demand for road transport services. The critical challenge will therefore be to make the best possible use of the available infrastructure in order to accommodate the growing transport demand (an estimated 50% increase over the coming two decades) through measures that increase its intrinsic capacity (e.g. the number of vehicles and travelers per area, and infrastructure uptime) as well as

through advanced demand management measures.

As in-vehicle ICT systems are introduced, together with ICT-based logistics and mobility services, ICT-driven intelligence will also be progressively introduced into the road infrastructure.

The use of 'multi-modal hubs' (i.e. transport interfaces) and dedicated road capacity will enable the optimal integration of transport modes and services to relieve bottlenecks in specific areas of high congestion.

Logistics and mobility services

Increasing levels of congestion will place mounting pressure on the mobility services, particularly in the larger urban areas. This will give rise to comprehensive, integrated service concepts and business models that complement existing modes, and for which the dominant factor will be extensive cooperation between the various actors in the chain. In turn, this will serve to optimize the movement of goods and people to better reflect the actual demand for mobility services (including public transport). Models and service solutions will be introduced to support innovative business practices, route planning regimes and efficient trans-shipment of goods (in particular, over the 'last mile') and people, between modes and networks. Again, ICT and a better knowledge of transport demand will play a major role in these developments, as will the trend towards extended standardization for freight carriers in terms of dimensions and modularization.

Energy and resources

Although the energy basis for road transport will diversify considerably over the coming decades, the expectation is that fossil-based fuels will still dominate the energy pool for road transport in 2030. However, the supply of crudes and distillates will not be able to keep pace with the increase in global demand, and hence, the future energy market will become volatile and competitive. Efforts will therefore aim at taking a 'greening' approach to diversifying the fuel pool through the development of new combustion-based propulsion technologies in order to achieve optimal performance on a well-to-wheels basis.

Additional decarbonisation will occur through the increased uptake of electrically-powered drivetrains, for which the electricity supplied by the power sector would need to be generated from renewable energy sources. However, the challenge will be how to store the electricity onboard the vehicle in such way that it can compete with hydrocarbon fuels in terms of the required energy density. In addition, the minerals used in the production of electric vehicles (e.g. neodynium, dysprosium and copper) are scarce and unevenly distributed throughout the world. Hence, to rely on such minerals would limit the security of supply and lead to fluctuations in pricing. There is, therefore, a strong drive towards minimizing the use of, and recycling, such precious materials and, potentially, replacing them with more abundant alternatives in order to achieve optimal performance in a life cycle analysis.

Achieving global competitiveness

During the next decades, the global market balance for the automotive industry will shift significantly in favour of the currently emerging markets in the BRIC nations (Brazil, Russia, India, China), as the rate of motorization in these countries begins to outpace that in Europe. The capacity for innovation in these countries will also grow as they benefit from their increasing share of the global mass markets, and this will place Europe in a critical position as it struggles to maintain its competitiveness.

The industry will face significant levels of competition in two important areas: the available levels of skill and funding required to support the development of future technologies, and the emerging technologies and products themselves. Success in these areas will have a fundamental impact on the industry's level of success in the marketplace. Key to success will be a good balance of investments in product, process and service innovations as well as in integrated production systems. This can only be justified if a sustainable return on investment from the entire production network can be ensured.

Relevance to green corridor development

The research and innovation proposed will enable improvements by addressing the broad range of challenges related to the road transport system, including: the supply of energy and resources; global climate change and the environment; health and safety; and increased global competitiveness of the road transport industry leading to economic growth and high quality employment in Europe. All KPI areas of green corridors will be positively affected by developments based on the research actions proposed by ERTRAC.

Measures/changes suggested or introduced

The most important of the measures suggested by the document are:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Research in most advanced electric and ICE-propelled vehicles	TD	Improvements in efficiency and environmental sustainability
2	Introduction of ICT applications involving vehicles, road infrastructure and logistics/mobility services	TD	Direct improvements in efficiency, service quality, infrastructure sufficiency and social issues. Indirect improvements in environmental sustainability.
3	Extended standardization in terms of weight, dimensions and modularization	PP	Improvements in efficiency
4	Improved transport interfaces leading to multimodal hubs	TD	As above
5	Extensive cooperation between various actors in the transport chain	TL	It results in higher performance of the supply chain, which in turn leads to lower lead times and higher quality of transport services (in terms of punctuality, cargo safety etc.)
6	Minimize the use of, and recycle, precious materials used in electric vehicles and, potentially, replace them with more abundant alternatives	TD	Improvements in efficiency and environmental sustainability
7	Secure a considerable level of public investment on road transport related research	PP	Potential improvements in all KPI areas
8	Introduce effective private-public partnership from research and innovation to development and commercial deployment	PP	As above
9	Enhanced education and training system	PP	Research activities will give valuable information which will help in greening the corridors.

SUPERGREEN Document Fiche		**Number :**	**4**	**Partner :**	**SITO**
Document identity		Field[1] :	ROAD	Doc.date :	5.11.2007
Doc. number :		Study :		Regulatory act :	
Author :	CIECA	Research proj.:	X	- Suggestion :	
On behalf of :	CIECA	Other doc.:		- In force :	
Title :	**ECODRIVEN: ‘Eco-driving’ in category B driver training & the driving test (2007)**				
Related doc's :					
Web address :	http://www.ecodrive.org/ http://www.ecodrive.org/fileadmin/dam/ecodrive/Downloads/CIECA_Eco-driving_project_final_report_EN.pdf				

Objective(s)

Campaign for improving driving behaviour, energy-efficiency and traffic safety among drivers of passenger cars, delivery vans, lorries and buses.

Main findings / results achieved / summary of measures

ECO-DRIVING is a way of driving that reduces fuel consumption, greenhouse gas emissions, accident rates and noise. It concerns drivers of cars, vans, lorries and buses.

ECO-DRIVING is about driving in a style suited to modern engine technology: smart, smooth and safe driving techniques that lead to average fuel savings of 5-10%. Several European countries have implemented successful ecodriving programmes.

The ECO-DRIVING campaign was organised and co-ordinated by a consortium of organisations, which were partners to the ECODRIVEN project. A total of 9 countries, all members of the European Union, took part in the campaign. During the campaigning period, end-users were regularly informed about ecodriving activities within their familiar social environment, which has stimulated them to reflect on and optimise their driving behaviour in a safe and energy-efficient manner.

In the context of the ECODRIVEN project, the golden rules of eco-driving are as follows:

1. Shift up as soon as possible
   Shift up between 2.000 and 2.500 revolutions.
2. Maintain a steady speed
   Use the highest gear possible and drive with low engine RPM
3. Anticipate traffic flow
   Look ahead as far as possible and anticipate surrounding traffic
4. Decelerate Smoothly
   When you have to slow down or stop, decelerate smoothly by releasing the accelerator in time, leaving the car in gear

5. Check the tyre pressure frequently
25% too low tyre pressure increases rolling resistance by 10% and your fuel consumption by 2%.

The TREATISE project (covered by a separate fiche) adds some more detailed tips to the above ones, such as:

- Driving uphill: The most efficient way to drive up a hill is to use the highest gear possible with a deep accelerator position.
- Negotiating Bends: Drive round bends in a high gear, when safe & practical.
- Fuel Saving In-car Devices: various in-car devices encourage eco-driving, such as the rev counter, cruise control, on-board computers and satellite navigation systems.
- Get your engine regularly tuned.

The core techniques of this new driving style boil down to:

1. Smooth, consistent driving, looking far ahead and avoiding unnecessary braking and stops.
2. Changing gears at relatively low rpms and driving in the highest gear possible.

…in a well-tuned vehicle with appropriate tyre pressure.

The overall campaign results were:

- At least 2,500,000 drivers of passenger cars, delivery vans, lorries and buses in 9 EU-countries have been stimulated to drive in a safer and more energy-efficient manner.
- Until 2010, 0.5 Mtons of CO_2 emissions have been avoided, as well as significant amounts of other emissions deriving from road transport (e.g. NOx and particulates).
- ECODRIVEN has led to the establishment of a European-wide network of local and regional collaborations between local actors, relevant local departments and outlets of national and international companies and organisations.

The main conclusions made on the basis of evaluation results in the context of the ECODRIVEN project are:

- There is sufficient information about the short-term effects (< 1 year) of training measures. Fuel consumption can be reduced on average between 15 and 25%.
- There are some studies which indicate a long-term effect (> 1 year) of training measures between 4.7% and 8% (in terms of reduced fuel consumption). The long-term effects are less than the short-term ones as the old driving habits of the experienced drivers tend to re-emerge.
- Eco-Driving also reduces accident risk. Maintenance costs and accident costs are reduced.
- The effect of combined measures is greater than the effect of single measures.
- Communication measures have proved their worth.

Relevance to green corridor development

ECO-DRIVING improves road safety as well as the quality of the local and global environment and saves fuel and costs. ECO-DRIVING reduces noise pollution as well as local air pollution.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Eco-driving	OP	Improvements in efficiency, environmental sustainability, traffic safety and noise

SUPERGREEN Document Fiche		Number : 37		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : November 2007	
Doc. number :		Study :		Regulatory act :	
Author :	Intelligent Energy Europe	Research proj.:	X	- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Training programme for local energy agencies & actors in transport & sustainable energy actions (TREATISE)**				
Related doc's :	TRAIN-ALL				
Web address :	http://ec.europa.eu/energy/intelligent/projects/doc/factsheets/treatise.pdf http://www.trainall-eu.org/				

Objective(s)

The objective of the project was to train local energy agencies and other stakeholders in environmental transport & help them to start their own environmental transport projects.

Main findings / results achieved / summary of measures

The EU-funded TREATISE project ran from January 2005 to June 2007 providing free training in environmental transport for energy, environmental and fleet professionals in Austria, Belgium, Finland, France, Greece, Netherlands, Spain and the UK. TREATISE also produced training manuals on Cleaner Fuels & Vehicles, Eco-driving, and Mobility Management, and created a pc-based eco-driving simulator, a green fleet management tool and a CO_2 calculator to encourage people to choose less carbon-intensive modes.

Results produced by the project include:

- 63 workshops across eight countries training a total of 1722 people.
- Three reference manuals, each in eight languages.
- Three electronic training tools.
- A website *(www.treatise.eu.com),* which received nearly 400,000 hits during the life of the project.
- 41 local projects under way or complete and a further 50 projects planned.
- Thorough evaluation of the project undertaken.
- Calculated CO_2 savings of 95kton; with a further 1,011kton CO_2 savings forecast.

The EU-funded TRAIN-ALL project has similar objectives. It aims to develop a computer-based training system for different land-based driver cohorts, that integrates multimedia software, driving simulator, virtual driving simulator and on-board vehicle sensors, into a single modular platform.

Relevance to green corridor development			
The combination of enhanced training on environmental transport and demonstration projects on the use of alternative fuels and mobility management at the local level can contribute to improvements in efficiency, environmental sustainability and other attributes of green corridors.			
Measures/changes suggested or introduced			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Enhanced training on environmental transport	TD, OP	Direct improvements in efficiency and environmental sustainability; indirect improvements in traffic safety and noise.
2	Demonstration projects on use of alternative fuels and mobility management at local level	PP	Potential improvements in efficiency and environmental sustainability.

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 28b		Partner : SITO	
Document identity		Field[1] : ROAD		Doc.date : 2006	
Doc. number :	ISBN 92-79-04584-9	Study :		Regulatory act :	
Author :	European Commission	Research proj.:	X	- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**Sustainable Surface Transport Research Technological Development and Integration: 2002-2006 Projects Synopses**				
Related doc's :	CLEANENGINE, ECO-ENGINES, IPSY, NICE, PAGODE, TOP EXPERT, TOPMACS, ULYSSES				
Web address :	http://www.gppq.mctes.pt/brochuras/online/SST%20FP6.pdf				

Objective(s)

This is a reference book containing the synopses of surface transport research projects co-financed under the 6th FP of the European Commission. The eight projects cited below concern basically road transport and their common theme is propulsion increasingly based on alternative and renewable fuels (thermal engines, auxiliary systems and components, hybrid technology).

Main findings / results achieved / summary of measures

CLEANENGINE is focused on developing modern clean internal combustion engines based on liquid biofuels coming from biomass (biodiesel and bioethanol) and environmentally friendly and ash-free lubes and/or lubrication concepts. The objective is to increase efficiency and minimise harmful emissions.

Diesel and gasoline engine configurations will be evaluated and compatible solutions in terms of materials (base materials and anti-corrosion, low-friction coatings), engine part geometry and after-treatment systems will be developed in order to:

- increase engine efficiency (by reducing internal friction and improving combustion)
- reduce CO_2 emissions at the source (taking into account the complete lifecycle of the biofuels)
- reduce NOx, CO and PM emissions when using mixtures of oxygenated biofuels as bioethanol
- improve the technological and industrial practice related to the use of alternative fuels in combination with environmentally friendly lubricants
- increase the utilisation share of biofuels.

ECO-ENGINES aims to set up a virtual research centre (VRC) on advanced engine combustion modes for road transport, giving special emphasis to the use of alternative and renewable fuels. Three research topics will be addressed by the VRC, covering all aspects of research on advanced engine combustion:

1. Experimental techniques, including research on optical diagnostics to explore flow and combustion inside the combustion chamber of engines, as well as research on experimental techniques for measuring ultra low pollutant emissions.
2. Combustion simulation, including research on 3D numerical simulation of fuel injection, flow and

combustion inside the combustion chamber of engines.
3. Fuel/engine emissions, including research on fuel test methods, procedures to evaluate the performance of fuel/engine couples in terms of CO_2 emissions/efficiency and pollutants, and methods to characterise fuels.

IPSY aims at improved filtration efficiency, even on ultra fine particulates above 95% with nearly constant fuel consumption at slightly increased back pressure, and advanced regeneration strategies in the range of 580°C. One of the main pillars of the project is to design, develop, construct and test an innovative multifunctional filter/reactor (MFR) for treating the particulate and gaseous pollutants from the exhaust streams of a diesel engine in the complete engine map. The other main pillar is the development of advanced regeneration strategies to minimise active regeneration cases.

The main objective of NICE is to develop a new integrated combustion system that, independent of the type of fuel (i.e. neutral fuel), is able to achieve today's highest fuel conversion efficiency of the DI diesel engine (43%), while complying with a zero-impact emission level. As a result of the gained knowledge and realised technologies of such an integrated combustion system, innovative diesel- and Otto-cycle engines will be developed. The fully flexible powertrain will be characterised by very high fuel conversion efficiency, mainly using newly designed bio and/or alternative fuels and gas, in the given emission constraints.

The aim of PAGODE is to provide a comprehensive, system-oriented view on potentially new after-treatment processes that will be required for the next HCCI (homogeneous charge compression ignition) combustion systems taking into account the next fuel generation.

The scientific objectives of this project are:
- to understand the complex kinetic mechanisms and chemical principles of CO/HC low temperature oxidation for the next generation diesel engines exhaust environment
- to develop robust, efficient, and accurate computational models to analyse, simulate and improve the performance of next generation catalytic converters: a transient one-dimensional model and a single spatial dimension will be developed as a first step, and then 2D and 3D calculations will be investigated and integrated.

The TOP EXPERT project is focused on the selection and assessment of an integrated active after-treatment system, compliant with Euro V regulations and beyond and capable of superior performances pursued through the generation of activated chemical agents via two alternative ways, a catalytic and an energy-based approach.

The goal of the TOPMACS project is to develop mobile air conditioning systems (MACS) with a reduced impact on the environment. The systems will be considered for two vehicle applications: passenger cars and trucks. The project aims at:
- eliminating the environmental impact from refrigerant leakages. The refrigerants used (water, ammonia or hydrogen) are in agreement with the new regulations (no refrigerants having a Global Warming Potential higher than 150 can be used on MACS as of 2011).
- reducing indirect emissions. The MAC system's impact on fuel consumption will be minimised since the primary energy source will be waste heat.
- decoupling the MAC systems from the engine. The availability of a low-consumption electrical powered cooling system could be the ideal solution for a vehicle with electrical traction architectures (stop&start vehicles, hybrid vehicles or fuel cells). These vehicle types risk serious commercial problems, and elimination of their environmental advantages, if a high efficiency solution for thermal comfort is not available.
- developing an auxiliary heating system. Since these systems are capable of a heat pumping operation, they can be a solution for the lack of waste heat of highly efficient diesel engines and also for vehicles not powered by an internal combustion engine.

- developing additional functions like pre-conditioning. The potential of these systems to provide energy storage or the presence of an APU, will allow pre-warming and pre-cooling, for which the car market demand is growing and it is considered all important in the truck.
- downsizing the system. To have pre-conditioning systems is also beneficial from an energy point of view, allowing a system design with lower peak power.

The aim of ULYSSES is to provide a platform for exchanging information and strategic planning of RTD projects on an internal combustion powertrain running on new fuels. This Concerted Action will identify links and favour integration by targeting pollutant/CO_2 reduction and energy supply security.

Relevance to green corridor development

All projects cited above aim at improved efficiency and environmental performance of road vehicles, and as such, can contribute in greening freight transport.

Measures/changes suggested or introduced

The major development directions of these projects are:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Use of alternative fuels	TD	Increased efficiency and lower emissions
2	Improve the fuel conversion efficiency of diesel- and Otto-cycle engines	TD	As above
3	Improve after-treatment of exhaust gases of existing and new generation fuels	TD	Improved environmental performance of internal combustion engines
4	Develop mobile air conditioning systems with a reduced impact on the environment	TD	Improved environmental performance of cars and trucks

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 3		Partner : NTUA	
Document identity		Field[1] : ROAD		Doc.date : 11.2.2009	
Doc. number :		Study :	X	Regulatory act :	
Author :	Carrota Alessandro, eSafety Support	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc. :		- In force :	
Title :	**eSafety Recommendation Note (December 2008)**				
Related doc's :	APSN				
Web address :	http://www.esafetysupport.org/en/esafety_activities/about_esafety_support/index.html http://www.esafetysupport.org/download/D1.3%20-%20eSafety%20Recommendation%20Note%20end08.pdf				

Objective(s)

*e*Safety is a joint industry-public sector initiative driven by the European Commission and co-chaired by ERTICO – ITS Europe and ACEA (Association of European Car Manufacturers), with the aim to promote the development, deployment, and use of Intelligent Integrated Road Safety Systems (IIRSS) to enhance road safety throughout Europe. *e*Safety Support stimulates and monitors the activities, progress and results generated by the *e*Safety initiative by offering support to the *e*Safety Forum and its Working Groups and disseminating results to all stakeholders.

In November 2002, the eSafety Working Group on Road Safety prepared a report that concluded with 28 Recommendations. The objective of the reviewed document is to report on the progress of the work performed to support these 28 Recommendations.

Main findings / results achieved / summary of measures

The following colour code is used to summarize the progress made on each Recommendation:

Green: The Recommendation has been fulfilled/nearly fulfilled and there are no deviations from the expected progress.
Yellow: The recommendation has not been fulfilled or some deviations from the expected progress are present, due to some bottlenecks. Further actions are needed to insure a smooth progress.
Red: The recommendation is far from being fulfilled or there are some important deviations that risk jeopardizing its fulfillment. Special attention should be given to undertake actions to bring the progress back on track.

The recommendations and their progress status are listed below:

1. Consolidate analyses from existing EU, Member State and industry road accident data [YELLOW]
2. Develop jointly a European Accident Causation Database covering all EU countries, and facilitate access to it [YELLOW]
3. Develop a methodology to assess the potential impact of intelligent integrated road safety technologies in Europe. Develop a validation methodology and procedures for vehicles equipped

with intelligent integrated road safety systems [GREEN]

4. Set up a coordinated validation framework for Field Operational Tests in the Member States [GREEN]
5. Assess the reports by the Member States on the Commission Recommendation regarding Human-Machine Interaction and decide on further actions. Urgent action is needed to assess the risk of portable (nomadic) devices [YELLOW]
6. Develop workload assessment, testing and certification methodology for complex in-vehicle working environments [YELLOW]
7. Develop Road Maps with technical steps and economic implications for the introduction of IIRSS in Europe. The public sector Road Maps should indicate the investments required for improvements in the road networks and information infrastructure [YELLOW]
8. Analyse existing accident causation data and possible countermeasures and determine clear goals and priorities for further RTD [GREEN]
9. Where necessary, develop specifications for interfaces and communications protocols for vehicle-to-vehicle and vehicle-to-infrastructure communications [YELLOW]
10. Pursue international cooperation [YELLOW]
11. Define requirements for a European digital road map database, with agreed road safety attributes. Create a public-private partnership to produce, maintain certify and distribute this database [YELLOW]
12. Adopt the Commission Recommendation on the introduction and implementation of E-112 in Europe [YELLOW]
13. Establish a European Emergency Communications Forum to continue the CGALIES work [YELLOW]
14. For in-vehicle emergency calls (e-Calls), finalize standardization efforts for MSD, operating requirements (CEN) and transport/communication protocols/data bearer (ETSI), high-level application-protocol and quality of service standards (CEN). Develop guidelines to establish national roll-out platforms and form working clusters to exchange best practices and speed up implementation of both infrastructure and in-vehicle e-Call systems. Agree on clear roll out timing [YELLOW]
15. Analyse the Member States’ responses to the Real-time Traffic and Traveller Information (RTTI) Recommendation and draw up further actions [YELLOW]
16. Create public-private partnerships to capture, process and provide real-time traffic, travel and road condition data including Floating Vehicle Data [YELLOW]
17. Support the wider use of the pan-European RDS/TMC network for safety related traffic information. Provide a report with required actions to the European Commission on the status of RDS/TMC implementation and the remaining bottlenecks [YELLOW]
18. Determine what actions may be required for bringing rapidly forward road safety improvements obtainable with IIRSS in vehicles [YELLOW]
19. Analyse specific needs and priorities of IIRSS for standardisation in ISO, CEN and ETSI. Promote accelerated standardization [YELLOW]
20. Develop a methodology for risk-benefit analysis, achieve a consensus on a European Code of Practice, and establish guidelines for facilitating market introduction of IIRSS [YELLOW]
21. Take the necessary actions for early review of regulatory conditions to the use of short-range radar (SRR) in Europe, taking into account the proposal for a frequency shift to a centre frequency around 26.5 GHz for UWB [RED]
22. Undertake the standardisation in ETSI for the 24.25-29 GHz UWB radar [RED]
23. Estimate the socio-economic benefits, which can be obtained through the reduction of fatalities, injuries and material damage [GREEN]
24. Stimulate and support road users and fleet owners to buy vehicles equipped with IIRSS [RED]
25. Identify best practices for positive business cases to promote the introduction of IIRSS [RED]
26. Support the e-Call business model by implementing the full service chain and ensuring

interoperability and compatibility with E-112 [RED] 27. Design and execute awareness campaigns that explain the benefits, functioning and use of the IIRSS to the consumers [YELLOW] ***28.*** Create an eSafety Forum with the objective to monitor and promote the implementation of these recommendations, and support the development, deployment and use of IIRSS [GREEN].			
Relevance to green corridor development The above recommendations concern the development, deployment, and use of Intelligent Integrated Road Safety Systems (IIRSS), aiming at enhancing road safety throughout Europe. The use of ICT applications and traffic safety are both features of green transport corridors.			
Measures/changes suggested or introduced			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Development, deployment and use of Intelligent Integrated Road Safety Systems (IIRSS)	TD,PP	Improvements in traffic safety through the use of ICT applications

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

Appendix VII. Maritime transport and ports

European Commission (2009b). *Strategic goals and recommendations for the EU's maritime transport policy until 2018.* Communication from the Commission COM(2009) 8, Brussels, 21.1.2009.

Pålsson C. and Bengtsson N. (2008). *Benchmarking strategic options for European shipping and for the European maritime transport system in the horizon 2008-2018***.** OPTIMAR.

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Deggim Heike (2009). *International requirements for ships operating in polar waters.* Paper submitted to IMO, Maritime Safety Division, Meeting of experts on the management of ship-borne tourism in the Antarctic Treaty Area, Wellington, New Zealand, 9-11 December, 2009.

SUPERGREEN Document Fiche		**Number : 12**		**Partner : HSSA**	
Document identity		Field[1] : MAR		Doc.date : 21.1.2009	
Doc. number :	COM(2009) 8	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Strategic goals and recommendations for the EU's maritime transport policy until 2018**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0008:FIN:EN:PDF				

Objective(s)

The purpose of this study is to present the main strategic goals for the European maritime transport system up to 2018 and to identify key areas, where action by the EU will strengthen the competitiveness of the sector while enhancing its environmental performance. The underlying economic context and the characteristics of shipping market cycles have been taken into account. It also aims at supporting other relevant policies, namely the EU's energy and environmental policy.

Main findings / results achieved / summary of measures

European Shipping in globalized markets

- It is of key interest for the EU to achieve and maintain stable and predictable global competitive conditions for shipping and other maritime industries.
- A clear and competitive EU framework for tonnage taxation, income taxation and state aid should be maintained and, where appropriate, improved, in the light of the experience gained under the State aid guidelines for maritime transport.
- Strong action in support of fair international maritime trade conditions and access to markets is vital.
- Commitment to quality shipping efforts, whereby, working together to achieve a level playing field for maritime transport by observing internationally agreed rules at global level, should be part of these efforts.
- The Commission will take the lead to promote alignment of the substantive competition rules globally.
- Intensified globalization has also put more stress on the delicate balance of the international framework governing the rights and responsibilities of nations as flag, port and coastal states.

Human resources, Seamanship and Maritime know-how

- Adopt positive measures facilitating lifelong career prospects in the maritime clusters.
- Enhance the image of shipping and careers at sea, improve awareness of job opportunities and facilitate labor mobility in the maritime industries throughout Europe.
- Support the work of the International Maritime Organization (IMO) and the International Labor Organization (ILO) on the fair treatment of seafarers.

- Follow up the Commission’s Communication on reassessing the regulatory social framework for more and better seafaring jobs in the EU.
- Promote better use of information and communication technologies (ICT) for improving quality of life at sea.
- Implement simplification measures to reduce the administrative burden on Masters and senior officers on board ships.

The maintenance of high training standards and the professional competence of crews create the need for measures aimed in particular at:
- ensuring thorough enforcement of international and Community requirements under the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) by all nations granting seafarers’ certificates of competence,
- making a substantial contribution to the revision of the STCW Convention,
- promoting cooperation between European maritime training institutions for upgrading seafarers’ competences and adapting requirements to the prerequisites of today’s shipping industry,
- working in partnership with training institutions and the industry towards establishing ‘maritime certificates of excellence’,
- introducing, for the education of officers, an ‘Erasmus’-type model for exchanges between the maritime training institutions of the Member States and,
- promoting in partnership with industry the provision of places, where necessary backed by incentives, for cadets to be taken on board during their studies in EU training institutes.

With regard to labor conditions, the first priority of the European Union is to ensure the implementation of the ILO 2006 Maritime Labor Convention. The action of the EU and its Member States should aim to:
- move towards rapid ratification of the 2006 MLC by Member States,
- ensure the effective enforcement of the new rules by means of adequate measures, including flag and port State control requirements,
- promote the development of a goal-based framework for the safe manning of ships,
- foster and support research addressing the human element factor and,
- consider measures to improve on board health care.

<u>Quality Shipping as a key competitive advantage</u>

Improving the environmental performance
- Ensure steady progress towards a coherent and comprehensive approach to reduce greenhouse gas emissions (GHG).
- Actively work in the IMO to pursue the limitation or reduction of emissions of greenhouse gases from ships.
- Ensure that Member States are able to achieve "good environmental status" in marine waters by 2020, as required by the new Marine Strategy Framework Directive.
- Strengthen EU legislation regarding port reception facilities for ship-generated waste and cargo residue.
- Follow up the proposals detailed in the Commission's Communication on an EU strategy for better ship dismantling.
- Oversee the smooth implementation of the amendments adopted by the IMO in October 2008 to MARPOL Annex VI to reduce sulphur oxides and nitrogen oxides emissions from ships. This includes assessing which European sea areas qualify as Emission Control Areas, the availability of the adequate fuels and the impacts on short-sea shipping. The Commission's proposals should ensure that modal ‘back-shift’ from short-sea shipping to road is avoided.
- Promote alternative fuel solutions in ports, such as the use of shore-side electricity.
- Re-launch the Commission’s ‘Quality Shipping Campaign’.
- Promote a European Environmental Management System for Maritime Transport (EMS-MT), targeting the continuous improvement of the environmental performance of shipping; consider

modulation of registration fees, port dues and other charges, with a view to rewarding efforts towards greener shipping.

Maritime transport safety

- Give priority to the enforcement of existing EU and international rules and the speedy implementation of measures introduced with the 3rd Maritime Safety Package.
- Revise the mandate and the functioning of the European Maritime Safety Agency.
- Increase the effectiveness of EU involvement in the IMO and reinforce international cooperation with EU trading and shipping partners.
- Devote special attention to the challenges posed by extreme navigation conditions, such as ice, as well as the constantly increasing size of vessels.
- Take care to ensure the systematic application of the IMO "Guidelines on the treatment of persons rescued at sea".
- Ensure that all European maritime administrations deploy the economic and human resources needed to ensure the fulfillment of their responsibilities as flag, port and coastal States.
- Act within the IMO with the aim of reaching, as soon as possible, an agreement on an efficient international framework regulating liability and compensation for damage in connection with the carriage of hazardous and noxious substances by sea.
- Ensure that, by 2012, all Member States are bound, in line with their commitment, by all relevant international conventions and that they fulfill the requirements of the Code for the Implementation of Mandatory IMO Instruments.

Maritime transport security

- In respect of terrorism threats, the Commission and Member States should continue to support the implementation of international security measures. Seafarers need to receive the appropriate basic and continuous training.
- The Commission and Member States should take full advantage of the framework offered by the security amendments to the Community Customs Code.
- As regards piracy and armed robbery, the Commission and Member States must adopt a firm response and contribute to safer shipping in the afflicted areas. Europe should play a role in the development and stabilisation of the countries from where such attacks come from.
- In that regard, the most urgent priority is to protect seafarers, fishermen and passengers on ships sailing off the coast of Somalia, in the Gulf of Aden or in any other region of the world that could become problematic in the future.
- The stability of the world seaborne transport system requires protecting international shipping lanes against any acts that might disrupt the flow of traffic through them.
- The Commission and the Member States should establish resilience plans, including early alert systems, joint monitoring of events and protection plans.
- The Commission and the Member States should work together to ensure adequate improvements to the International Ship and Port Facility Security Code (ISPS).

Maritime surveillance

Looking ahead to 2018, the capacities of the EU's maritime transport system should be strengthened by putting in place an integrated information management system to enable the identification, monitoring, tracking and reporting of all vessels at sea and on inland waterways to and from European ports and in transit through or in close proximity to EU waters.

Maritime transport as a key element of EU energy security

Maritime transport is key to Europe's energy security and therefore is an important instrument of the European energy policy. Seaborne transport is to be seen as part of the EU strategy of diversification of routes and of energy sources. More particularly, LNG facilities are essential for increasing flexibility in gas supplies in the internal energy market.

Working together on the international scene

- Concerted action at European level is crucial in several fora (UNCLOS, WTO, UNCITRAL, IMO, ILO, WCO).
- The Commission and the Member States should strive for and cooperate towards achieving all the objectives of the EU maritime safety and security policies by means of international instruments agreed through the IMO.
- Enhance the recognition and visibility of the EU within the IMO by formalising the EU coordination mechanism and granting formal observer status, if not full membership, to the EU within this organisation.
- The Commission and the Member States should work towards a better mechanism for rapid ratification of IMO conventions at world level.
- EU international cooperation efforts should lead to the establishment of a mechanism to ensure actual enforcement of internationally agreed rules by all flag and coastal states in the world.
- The Commission's recent Communication on the Arctic Region presents suggestions for protecting and preserving this maritime basin.

Exploiting the full potential of short-sea shipping and sea transport services for business and citizens in Europe

- Establish a true 'European maritime transport space without barriers' removing unnecessary administrative barriers.
- Implement the measures announced in the Communication on a European Ports Policy.
- Ensure the right conditions for attracting investment flows to the port sector.
- Regarding environmental assessments for port expansion, fast-track procedures that cut the overall lead time significantly should be generalized.
- Reinforce the EU strategy for ensuring the full deployment of Motorways of the Sea projects.
- EU funding programs such as the Trans-European Network Transport projects, Marco Polo or the Regional Policy instruments should assist in those developments and address modal shift factors.
- Promote measures to facilitate better connection of islands and long-distance intra-EU passenger transport through quality ferry and cruise services, and appropriate terminals.
- Examine economic instruments (such as taxes, charges or emission trading schemes) for "getting the prices right".
- Address the issue of passenger rights for users of ferry and cruise services in Europe.

Europe should be the world leader in maritime research and innovation

- A major challenge is how to come up with new ship designs and equipment to improve safety and environmental performance.
- Technological development and advanced logistics conceptions which maximize the efficiency of the overall transport chain are required for achieving sustainable mobility.
- Full use should be made of RTD platforms such as the "WATERBORNE" Technology Platform.
- The Commission's recent Communication on a European Marine and Maritime Research Strategy sets out a framework for Europe's maritime industries to address these technological challenges through a better integration with marine science and research.
- Adequate ICT inspection and monitoring tools, also related to surveillance, should be developed.

Relevance to green corridor development

The strategic options presented in this Communication for European shipping and for the European maritime transport system address all KPI areas defined by the SuperGreen project as important in developing green transport corridors for freight.

Measures/changes suggested or introduced

The most important of the strategic measures mentioned in the document are listed below.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	The EC should intensify the dialogue and bilateral agreements with key trade and shipping partners in support of fair international maritime trade	IR	Improvements in efficiency
2	The taxation and state aid framework should allow positive measures to support greener shipping efforts, technological innovation, as well as maritime careers and professional skills	PP	Improvements in efficiency, service quality, environmental sustainability and social issues
3	Ensure thorough enforcement of the STCW Convention by all nations granting seafarers' certificates of competence	IR	Improvements in efficiency, service quality and social issues
4	Ensure the implementation of the ILO 2006 Maritime Labor Convention	IR	Improvements in social issues
5	Actively work in the IMO to pursue the limitation or reduction of emissions of greenhouse gases from ships	IR	Improvements in the environmental record of maritime transport. Care should be taken to minimize potential adverse effects on other KPI areas depending on the specific measures approved
6	Oversee the implementation of the amendments to MARPOL Annex VI to reduce sulphur oxides and nitrogen oxides emissions from ships, ensuring that 'back-shift' from SSS to road is avoided	IR	Improvements in SOx and NOx emissions. Adverse effects on efficiency and GHG emissions if the 'back-shift' from SSS to road is not finally avoided
7	Promote alternative fuel solutions in ports, such as the use of shore-side electricity	ID	Improvements in environmental sustainability
8	Promote a European Environmental Management System for Maritime Transport rewarding efforts towards greener shipping	PP	Improvements in environmental sustainability (directly) and efficiency (indirectly)
9	The Commission and the Member States should work together to ensure adequate improvements to the International Ship and Port Facility Security Code (ISPS)	PP	Improvements in security
10	Put in place an integrated information management system	TD	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in

	(e-Maritime)		relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas.
11	Examine economic instruments (such as taxes, charges or emission trading schemes) for "getting the prices right"	PP	Improvements in efficiency

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 47		Partner : HSSA	
Document identity		Field[1] : MAR		Doc.date : Sept 2008	
Doc. number :		Study :	X	Regulatory act :	
Author :	C. Pålsson, N. Bengtsson (Lloyd's Register Fairplay)	Research proj.:		- Suggestion :	
On behalf of :		Other doc.:		- In force :	
Title :	**Benchmarking strategic options for European shipping and for the European maritime transport system in the horizon 2008-2018 (OPTIMAR)**				
Related doc's :	Strategic goals and recommendations for the EU's maritime transport policy until 2018 COM(2009) 8				
Web address :	http://ec.europa.eu/transport/maritime/studies/doc/2008_09_optimar.zip				

Objective(s)

The objective of this study is to identify trends and plausible shipping scenarios in the horizon 2008-2018 in view of formulating possible future EU policy options for maritime transport.

There are two major issues that are addressed in this report:

- By 2018, the shipping transport services available to the European industry should at minimum be just as efficient, reliable and sustainable as today. This includes that there should be sufficient transport capacity available and that the port and port hinterland capacities should be able to cope with the anticipated cargo volumes.
- By 2018, the shipping industry should at minimum be just as competitive and have an equally strong, or better, position on the global markets.

For the two major issues, factors are identified that could jeopardize or strengthen the efficiency, reliability and sustainability of the shipping services, the availability of tonnage supply and the adaptation of port & hinterland capacities.

Main findings / results achieved / summary of measures

The report is divided into four parts:

- Part A: Geographical distribution and evolving patterns of seaborne trade,
- Part B: Signals of future change in shipping,
- Part C: SWOT analysis,
- Part D: Shipping scenarios and strategic recommendations.

Global growth, trade and seaborne transport

Deep sea trades in 2007 amounted to about Bn6.9 tonnes, whereof Bn2.6 tonnes of liquid bulks, a little less major dry bulks and about Bn1.7 tonnes of general cargo. Trade grows steadily over time even in periods of business contraction, however at a slower pace. Over the last 20 years, containerized trade has grown at an average annual rate of 10%. Meanwhile, the general cargo category excluding containers has hardly grown at all and over the last three years it has decreased significantly.

The baseline growth forecast looks at an average growth rate of 2% per annum for the liquid bulk seaborne trade. Russia and North Sea remain the main source of oil supply to Europe up to 2018. The average annual oil price is parked at historically high levels. Inwards volumes will continue to dominate port handling in EU27.

Growth in the dry bulk market will slow to 3.1% in the next five years (2008-2012) before slowing to 2.3% per annum over the long-term forecast (2012-2018). Far East continues to be the main driver in this trade. Ores and coal are the largest bulk commodities. Americas are the largest sources for European imports. NW Europe is the largest import region.

Containerized cargo will grow at an annual average of 7% in tonnes and 8% in TEUs. Cargo handled in the roro system is forecasted to about 5% p.a. Other general cargo is forecasted to grow slowly. Far East continues to be the main source for containerized cargo. Roro is used mostly for intra-European volumes, vehicle trade being the exception.

European regions and their ports

In general there are vast differences between the European regions and the port volumes follow population density. Bulk ports are located nearby power plants and refineries. Rotterdam is by far the largest port in all types of trade, followed by Antwerp and Hamburg.

Major ship markets and the EU interest

In general the most shipping segments will have strong fleet growth until 2018. The EU operators' share of world fleet control has been unchanged over the last 30 years. Over the same period the EU flagged share of the fleet has decreased by a third.

The major conclusion is that the supply will be enough in general (even if it always can be short supply deficiencies in short periods) but maybe too large in some fleets, which itself can distort the markets.

Other European shipping actors

Europe's maritime sector is a world player. Shipping and logistics, shipbuilding, and related services and fields, ranging from cargo handling and coastal tourism to off-shore energy fields, fishing and aquaculture provide about 5 million jobs across Europe. Coastal tourism accounts for a fair share of these. Some 70% of shipping-related jobs are onshore – in shipbuilding, naval architecture, science, engineering, electronics, cargo handling and logistics. Commercial shipping and port operations account for a third of the economic value of the maritime cluster and are seen as important new growth areas for employment, notably in the field of logistics.

Signals of future change

To make SWOT analysis and scenarios for the EU27 shipping industry, 19 signals of future change were chosen. Some of the 19 drivers are more likely to happen simultaneously with other drivers, hence the clustering below:

Technology

ID 1: New materials
ID 2: New sustainable sources of energy
ID 3. ICT

Human resources

ID 4: Availability and quality of crew

Globalization

ID 5: Trade barriers
ID 6: The role of multinationals, location of economic activity

Trust and security

ID 7: Terrorism
ID 8: Regional conflicts

Environment

ID 9: Global warming
ID 10: Consumers' perceptions of sustainability

Regulations

ID 11: Greenhouse gas emissions
ID 12: Pollution, emissions
ID 13: Transport mode taxation
ID 14: Container shipping conferences

Safety

ID 15: Safety

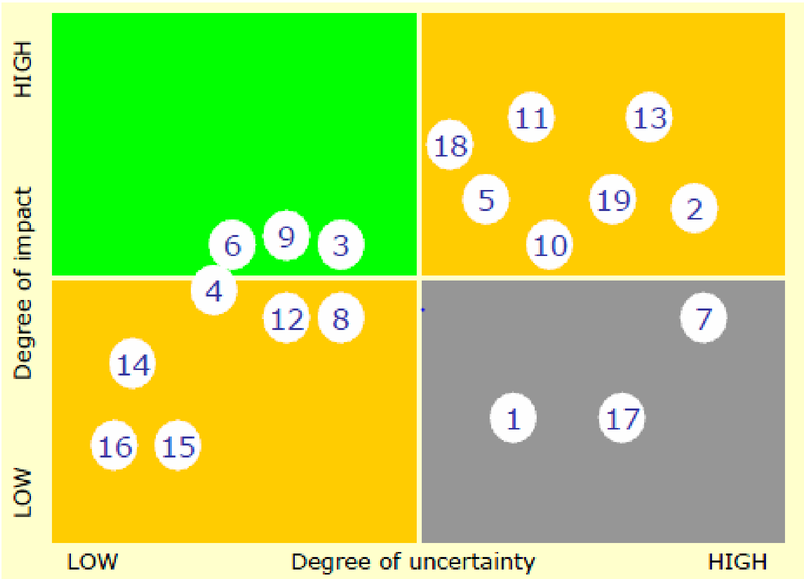
Demographics and poverty

ID 16: Ageing populations
ID 17: Migration of large populations

Economic power & growth

ID 18: Transition of economic power from US/EU to Asia
ID 19: Development in Russia

These drivers are classified along two dimensions: the degree to which the outcomes of the drivers are uncertain and the degree of impact the driver is likely to have on shipping.



SWOT analysis

In general the SWOT analysis reveals that there will be over supply in many shipping segments: good news for shippers, bad news for ship operators. No port capacity problems are expected for bulk handling. However, port capacity constraints for container handling are very much probable.

Year 2018 scenarios

Three basic scenarios are built:

Asian Phoenix

- Continued shift of economic and political power to Asia
- US domination challenged
- Piecemeal international efforts of CO_2 management

Break Point

- Oil supply difficulties and high energy prices
- Accelerated move towards alternative fuels
- Strong coordinated international focus on limiting CO_2 emissions

Global Fissures

- Anti-globalization and protectionistic moves
- Trade and political disputes and security concerns
- Low to no effort to limit CO_2 emissions

Two perspectives are examined for each basic scenario: 'EU policy stays as is' and 'EU policy changes'. So a total of six scenarios are established.

EU policy:	Asian Phoenix	Break Point	Global Fissures
Present	Money maker	Bunker price struggle	Seriously troubled waters
Pro-active	Money maker ++	Transition to sustainability	Short sea shipping opportunities

The 19 drivers are tested against these six scenarios according to if they are important for the scenario outcome and in what direction they affect shipping.

Driver	ID	Asian Phoenix		Break point		Global fissures	
		Money-maker	Money-maker ++	Bunker price struggle	Transition to sustainability	Seriously troubled	SSS opportunities
New materials	1	0 *	+ *	+ *	+ **	0 *	+ *
New sustainable energy	2	0 *	0 *	-- **	-- ***	0 *	0 *
ICT	3	+ *	+ **	0 *	+ *	- *	+ **
Availability and quality of crew	4	- **	+ *	0 *	+ **	0 *	+ *
Trade barriers	5	+ *	++ **	0 *	0 *	-- ***	- **
Role of multi-nationals, location of econ. activity	6	++ **	++ **	0 *	0 *	-- ***	0 **
Terrorism	7	+ *	++ *	0 *	+ *	-- **	- **
Regional conflicts	8	+ *	++ *	- **	0 *	-- **	- **
Global warming	9	++ *	++ *	-- **	-- ***	0 *	0 *
Consumers' perceptions of sustainability	10	++ *	++ *	- *	-- **	0 *	0 *
Greenhouse gas emissions	11	++ *	++ *	- **	-- **	0 *	0 *
Pollution, emissions	12	+ *	++ *	- *	- *	0 *	0 *
Transport mode taxation	13	- *	+ **	0 *	++ **	0 *	++ ***
Freight conferences	14	+ *	++ *	0 *	0 *	-- *	+ *
Safety and security	15	0 *	+ *	- *	0 *	-- *	- *
Ageing populations	16	++ *	++ *	0 *	0 *	-- *	-- *
Migration of large populations	17	++ *	++ *	- *	- *	-- *	-- *
Transition of econ. power from US/EU to Asia	18	++ ***	++ ***	0 *	+ *	-- ***	-- **
Russia	19	+ **	++ **	- **	+ *	-- **	-- **

Legend Driver development in scenario context
++ very positive
\+ somewhat positive
0 neither positive nor negative
\- somewhat negative
-- very negative

Driver influence on scenario outcome
* not very important to scenario outcome
** moderately influential on scenario
*** dominating influence on scenario

Strategic recommendations

It is clear that the current shipping policy with the adopted state aid guidelines has been working reasonable well so far. The challenges ahead are however plentiful. Some of these challenges can be met by policy changes, removal of existing policies or the introduction of new ones. The areas to address with policies are diverse: *External relations, Short sea shipping, Port infrastructure investment fast-track, Transition to sustainability, Availability and quality of crew, EU and the IMO, Transport policy, State aid, Competition in ports, Safety, ICT standards, Security***.**

The basic recommendations are listed in the 'Measures/changes suggested or introduced' section below and are not repeated here.

Relevance to green corridor development

The study is related to SuperGreen in terms of both its recommendations and its methodology regarding the identification and analysis of drivers for change.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Multi- and bilateral agreements and removal of trade barriers	IR	Improvements in efficiency of shipping operations
2	Expansion of short sea shipping network	PP	An expansion of short sea shipping activities is necessary to alleviate congestion and reduce the growth of emissions while still servicing growing transport volumes

3	Establishment of procedures that cut the overall lead time for port investments particularly for handling containers and liquefied natural gas (LNG)	ID	Improvements in efficiency, quality of service and emissions related to shipping operations
4	Use of LNG as an alternative fuel for ships	TD	Reduction of emissions from shipping and improving its environmental friendliness against the other modes
5	Launching a policy package addressing the availability and quality of crew	PP	Improvements in safety and quality of service
6	Work for a consensus presentation in the IMO, preferably via a permanent EU representation	IR	Doing so would enhance the chances of getting necessary and/or preferred decisions ratified in the IMO on safety, security and environmental impact
7	Device a tax system for the transport sector that creates a level playing field (internalization of external costs)	PP	The market mechanisms will find the optimal supply chains contributing to a sustainable economic development by delivering cost and energy efficient solutions in an environmentally friendly way
8	Open up competition in the provision of port services	PP	Improve quality and 'value-for-money' of services offered
9	Establish a global and, if not, a European standard for ICT applications in shipping	IR	Safe digital navigation and improved communication between ship and shore-based administrations

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
All modes, logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :**	**13**	**Partner :**	**NTUA**
Document identity		Field[1] :	MAR	Doc.date :	21.1.2009
Doc. number :	COM(2009) 10	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Communication and action plan with a view to establishing a European maritime transport space without barriers**				
Related doc's :					
Web address :	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0010:FIN:EN:PDF				

Objective(s)

The European maritime transport space without barriers is a concept which extends the Internal Market to intra-EU maritime transport by eliminating or simplifying administrative procedures in intra-EU maritime transport, the aim being to make it more attractive, more efficient and more competitive, and to do more to protect the environment.

Main findings / results achieved / summary of measures

The Commission puts forward a set of actions comprising legislative measures, measures requiring further preparation which will be proposed at a later stage, and recommendations to the Member States.

Short-term measures at EU level

1. *Simplification of customs formalities for vessels only sailing between EU ports*

Upon their arrival at an EU port, ships from another EU port transporting Community goods would not have to present a proof of Community status. The Commission will propose to amend the Regulation laying down provisions for the implementation of the Community Customs Code, in order to introduce the presumption that goods shipped between Community ports have the customs status of Community goods so that a documentary proof of Community status will not be required.

The presumption will apply to goods that have been shipped between ports in the Community customs territory on board a vessel that does not come from, go to or call at any ports outside this territory or in a free zone of control type I (as stipulated in the Implementing Provisions of the Community Customs Code), provided that they are carried under cover of a single transport document drawn up in a Member State. Non-Community goods carried on board these vessels will be covered by a transit procedure.

2. *Guidelines for speeding up documentary checks related to animal and plant products carried between EU ports*

The Commission will encourage more effective and faster clearance of animal and plant products in intra-Community maritime transport as described in Council Directive 89/662/EEC on veterinary checks, Council Directive 90/425/EEC on veterinary and zootechnical checks and Council Directive

2000/29/EC on protective measures for plants or plant products. The best practices of some ports offer opportunities for more effective controls, without compromising safety. These best practices will be introduced in guidelines on the procedure for animal and plant products carried by seaborne transport.

3. Rationalisation of documents requested under different bodies of legislations
The Commission will propose to the European Parliament and the Council for a directive replacing Directive 2002/6/EC on reporting formalities for ships arriving in and/or departing from ports. The proposal will require the use of electronic data transmission systems for data exchange and paper-based documents will be abandoned at the latest in 2013. It will pave the way for a single window arrangement, whereby all administrative procedures will be processed in a coordinated fashion amongst the various entities, using electronic data transmission.

Medium-term measures at EU level

1. Simplification of administrative formalities for vessels sailing between EU ports, but having a call in a third country or a free zone
The Commission has already foreseen a facilitation of Short Sea Shipping and the Motorways of the Sea for vessels making a call in a port located in a third country or a free zone by developing the electronic means identifying Community goods carried on board these vessels under the Modernised Customs Code and the implementation of a Single Window.

2. Enhanced electronic data transmission
The Commission announced in the action plan attached to its 2006 White Paper on transport policy that it would propose measures for the deployment of e-maritime systems.

3. Administrative single window
The Commission is preparing measures for "National Single Windows". A Single Window is a system that allows traders to lodge information with a single body to meet all import or export-related regulatory requirements.

4. Simplification of rules on carriage of dangerous goods by sea
Regulations on dangerous goods are less favourable for sea transport than for road transport. The IMDG Code and Directive 2002/59/EC contain specific provisions for the carriage of dangerous goods, setting up a special procedure, which entails early advance notifications and declarations, and which is much stricter than for road transport. One solution will be to simplify the regulations on dangerous goods for RoRo vessels carrying trucks complying with Council Directive 94/55/EC or the ADR regulation. The Commission intends to consult the stakeholders concerned with the transport of dangerous goods for all transport modes, with a view to presenting a proposal for harmonised simplified rules or to inviting Member States to adopt regional agreements similar to the Memorandum of Understanding already accepted by countries bordering the Baltic Sea.

Recommendations to Member States

1. Co-ordination of administrative inspections with a view to shortening turnaround times
Member States should encourage administrations at port level to plan their inspections (e.g. health and safety, environmental, veterinary, phytosanitary etc.) jointly, in order to reduce the negative economic impact on SSS without reducing the quality of the inspections.

2. Facilitate administrative communication
Member States are encouraged to assess the feasibility of using an agreed language or English as second language for all maritime administrative documents and procedures.

3. Issuing of Pilot Exemption Certificates (PEC)
Member States are invited to create a regulatory framework which would permit easier pilotage exemptions. This regulatory framework should allow shipmasters who do not speak the country's native language to obtain pilotage exemptions. The solution will be a simplification of the existing

regulations, allowing all operators carrying frequent shipping services to apply for PECs in a much easier way.

4. Rationalisation of flux and space in ports
Another recommended measure is the physical separation in ports of areas reserved for SSS for Container traffic and RoRo traffic. The benefit of this measure would be more rational management of port traffic and faster vessel turnaround times in ports.

Relevance to green corridor development

With its European maritime transport space without barriers, the Commission is seeking to boost the overall effectiveness of intra-EU maritime transport by removing major administrative obstacles to the development of SSS. This mode has an important role to play in helping the EU to honour its environmental commitments and address its energy challenge, through better competition conditions with road transport. As such, the document and the proposed measures are highly relevant to green corridor development.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Simplify customs formalities for vessels only sailing between EU ports	PP	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the environmental sustainability and social issues areas.
2	Draw up guidelines for speeding up documentary checks related to animal and plant products carried between EU ports	PP	As above
3	Rationalise documents requested under different bodies of legislations	PP	As above
4	Enhance electronic data transmission	TD	As above
5	Create administrative single windows	PP	As above
6	Simplify rules on carriage of dangerous goods by sea	PP	As above
7	Coordinate administrative inspections	PP	As above
8	Facilitate administrative communication	PP	As above
9	Facilitate issuance of Pilot Exemption Certificates (PEC)	PP	As above
10	Rationalise flux and space in ports	ID	Improvements in all KPI areas. Increased costs of infrastructure

SUPERGREEN Document Fiche		Number : 23		Partner : HSSA	
Document identity		Field[1] : MAR		Doc.date : Oct. 2007	
Doc. number :	SEC (2007) 1367	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Report on the Motorways of the Sea. State of play and consultation**				
Related doc's :	Accompanying document to the: COMMUNICATION FROM THE COMMISSION The EU's freight transport agenda: Boosting the efficiency, integration and sustainability of freight transport in Europe				
Web address :	***http://ec.europa.eu/transport/maritime/consultations/doc/ 2007_12_20_motorways_of_the_sea_working_document.pdf***				

Objective(s)

This paper has two purposes:

- it provides the state of play for the preparation of the Motorways of the Sea, which are part of the Trans-European transport network (TEN-T) and Marco Polo II program; and,
- it launches a consultation on possible new initiatives to broaden the concept of Motorways of the Sea within the wider development of high-quality Short Sea Shipping as a real alternative to road transport.

A wider range of private and public sources of investment can be mobilized to develop Short Sea Shipping connections, which offer services meeting the "Motorways of the Sea benchmarks" on a number of key performance indicators.

Main findings / results achieved / summary of measures

State of Play

Motorways of the Sea are indeed a new and ambitious initiative actively developed by Member States in co-operation with the public and the private sector. They represent a cost-effective, energy-efficient and climate-friendly alternative to extending motorway networks on land. Both energy consumption and emissions of greenhouse gases per ton-kilometer are lower than for any other mode of land-based transport and the investment costs for Motorways of the Sea are only a fraction of the cost of new terrestrial motorways.

Motorways of the Sea will succeed as an alternative to conventional motorways only if they deliver services, the quality and competitiveness of which, are comparable with alternatives offered by other modes, in particular road transport.

To do so, special attention should be paid in a number of areas for improvement:

- reducing bureaucracy,

- promotion and marketing,
- port capacity, accessibility and efficiency,
- availability of good and non-congested hinterland connections,
- co-operation between all the players in the chain, including between ports,
- seizing the benefits from the booming container traffic,
- establishing integrated information systems,
- ensuring availability of suitable vessels,
- integrating Motorways of the Sea into a broader transport planning perspective,
- coordinating the funding instruments,
- balancing incentives for various modes of transport,
- dealing with distortion of competition,
- providing adequate training and attracting young people to the maritime profession,
- improving energy efficiency and reducing (air) pollution.

Potential initiatives for the implementation of MoS, are recommended by the Commission services on three distinct directions:

- **Development of Key Performance Indicators** to improve performance in logistics chains while taking environmental and social considerations into account
- **Benchmarking of MoS links with other transport corridors** to be able to measure the relative performance of SSS-based intermodal chains and MoS in comparison to other modes so that stakeholders can make justified choices on the basis of economic, financial, environmental and social considerations
- **Awarding MoS status to existing SSS links,** so that a link that is well integrated to the door-to-door logistics chain and fulfils the criteria of viability, regularity, frequency, high-quality and reliability could receive EU recognition that it constitutes a Motorway of the Sea and thus a respective award.

Sources of Investment

Support for MoS has been substantially considered for the current financial programming period, with the integration of Motorways of the Sea into:

- the **trans-European transport network**,
- the **Marco Polo II program,** as a new specific action,
- the **structural funds and cohesion funds** as measures to be funded over a range of operational programs,
- the **European Investment Bank** and,
- in some regions can benefit from **state aid**.

The availability of all these instruments in combination with private sector funding presents opportunities but also major challenges in terms of financial engineering and synergies between the various instruments. The Commission services promote the combination of various EU and national instruments in support of Motorways of the Sea, as this may reduce the financial burden and risks associated with its implementation.

Relevance to green corridor development

The theoretical context developed for the MoS is highly relevant to the ongoing research effort on Green Corridors in the cases where shipping is involved. The question is whether the prescriptive type of reasoning adopted by the EU Commission is sufficient by itself to warrant the success of the MoS. One weak point of the MoS concept and perhaps the main reason for their slow progress so far, is the involvement of the member states in their creation and support. The public sector has generally shown

slowness in taking up the challenges despite ample funding provided by the above referenced sources. Nevertheless, after a decade of slow progress there are signs that the concept nears maturity and that its principles may become useful in planning and implementing green undertakings in the general area of transport and in particular in its parts which are shiftable from road to sea.			
Measures/changes suggested or introduced			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Integration of various funding instruments	PP	Implementing MoS is an efficient way to improve traffic safety and reduce energy consumption and emissions of greenhouse gases per tonne-kilometre for cargoes shifted from land to sea

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 22		Partner : HSSA	
Document identity		Field[1] : PORT		Doc.date : 2007	
Doc. number :	COM(2007) 616	Study :		Regulatory act :	
Author :	European Commission	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:	X	- In force :	
Title :	**Communication on a European Ports Policy**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/logistics/freight_logistics_action_plan/doc/ports/2007_com_ports_en.pdf				

Objective(s)

The study aims at a performing EU port system able to cope with the future challenges of EU transport needs; it sets an action plan for the European Commission. It follows up from an extensive consultation with the stakeholders in 2006-2007. This Communication on ports also follows up and implements the recently adopted Communication on an Integrated Maritime Policy which addresses all sea-related policies and activities in a joined-up way as a means to promote economic growth and jobs in a sustainable manner.

Main findings / results achieved / summary of measures

The Economic Context

Experts predict for 2010 an increase of 50%, half of which will be direct transport of full boxes, about 20% of empty boxes reflecting asymmetrical flows, and the remainder with one or more intermediate harbor transfers. Ships servicing direct lines are increasingly larger, and unload freight in transit ports with deep water depth; from there, one or more feedering steps with smaller ships ensure delivery through smaller ports closer to the final recipient. This development has to be encouraged as it allows a greater use of the maritime mode, a better diversification of unloading points, and a shortening of congested land transport.

Challenges for the European Ports System

Ports face the following challenges:

- A demand for international transport amplified by its low cost and growing quicker than economic growth
- A major technological change, marked by the development of container transport, more effective, faster, safer, and cleaner operation of ports
- The commitment to reduce greenhouse gases and the current problems with air quality
- The necessity to develop a recurrent dialogue on performance and development of ports between port stakeholders and within the city, the region, and beyond where necessary
- The need to reconcile ports' development and management with transparency, competition, and in general the Community set of rules

ISSUES AND ANSWERS

PORT PERFORMANCE AND HINTERLAND CONNECTIONS
The first options to cope with increased demand for port capacity should be:

- To increase port efficiency and productivity rates, in terms of output or movements per ha of existing terminals space and throughout the access routes
- To explore alternative transport routes as a means to achieve a more intensive use of all existing ports - some of which are operating under capacity levels - and to have them nearer to users

EXPANDING CAPACITY WHILE RESPECTING THE ENVIRONMENT
Development of new, or improvement of existing facilities
This need arises when:

- Ports require both adequate facilities and appropriate connections with the hinterland
- A new sustainable modal shift away from the road transport mode towards inland waterways or maritime navigation, such as a Motorway of the Seas, has been positively identified
- Adequate port infrastructure needs to ensure a better energy security of supply and enhance competitiveness of the related industries
- It is necessary to redevelop the port area of the city, and/or shift the port industry and related hinterland traffic, for environmental and security reasons, away from the city center

Ensuring adequate waste facilities
Based on the evaluation of the implementation reports of the Member States, of assessments carried out since the entry into force of the Directive 2000/60/EC and of the results of the European Maritime Safety Agency (EMSA) monitoring visits, the Commission will consult the interested factors on means to improve the existing mechanism of the Directive and its harmonized implementation and come forward with an appropriate proposal.

Proper management of water bodies and sediments
Together with other stakeholders, ports located along rivers or estuaries should be actively involved in the consultations on river basin management issues, inter alia, in the context of drafting the river basin management plans required by the Water Framework Directive (2000/60/EC). The same applies to maritime ports along the coastline in respect of the quality of coastal waters, sediment drift along the coast and the use of waterfronts, e.g. in the context of integrated coastal zone management. Similarly, the necessity to prevent soil pollution must be addressed at all times and in particular when improvements or new facilities are made or built upstream, and in ports.

Improve air emissions
The Commission is committed to reducing air pollution and greenhouse gas emissions from shipping and will contribute to establish measures aimed at reducing these emissions in ports, including through appropriate incentives.

MODERNISATION
Simplification of procedures for Short Sea Shipping
The Commission has proposed the creation of a paperless environment for customs and trade, including a single window for the submission of data. The Commission will present a legislative proposal on the creation of a European Maritime Transport Space without Barriers in 2008.

Development of an e-maritime approach
The Commission intends to publish in 2009 a policy document on the deployment of "e-maritime". This approach is directly related to "e-Freight" and the ongoing "e-Customs" initiatives and will fully benefit from the modern Information and Communications Technologies (ICT).

Improving Performance
The EU Research Framework Programmes, in particular FP7, support relevant research and innovation on port infrastructure and operations. The Commission also intends to develop with stakeholders, by the

end of 2009, a set of generic European indicators allowing further specification at local level.

A LEVEL PLAYING FIELD – CLARITY FOR INVESTORS, OPERATORS AND USERS

The role of port authorities

The set-up of port management varies considerably across the Community. The Commission does not intend to intervene in order to harmonize this heterogeneous scenario. In fact, it is at the national/local level that the best setting for port management can be shaped. However, the Commission recognizes that the important tasks of port authorities can be better fulfilled if they enjoy a sufficient degree of autonomy. As for financial autonomy, in particular, the Commission recalls that it is a prerequisite for allowing an efficient allocation of investments and, in the end, for allowing ports to develop.

Public Financing – Transparency

The Commission plans to take measures towards extending the provisions on transparency of Directive 2006/111/EC to all merchant ports, irrespective of their annual turnover. This will allow for a complete picture of financial flows from Member States' public authorities to ports.

Port Concessions

The Commission considers that provisions that can be introduced in concessions agreements aiming to ensure that the terms of the concession are respected and protect the legitimate interests of ports and local communities, notably with regard to overall quality and performance of port services, are acceptable, provided that they do not infringe the Treaty rules or Community legislation. A clarification is needed on the rights of workers in case of transfer of activity further to a selection procedure.

Technical-nautical services

Technical-nautical services are pilotage, towage and mooring. The Commission considers that granting exemptions from mandatory pilotage for frequent users, when safety is ensured, should be granted as it would reduce the costs of maritime transport and make it more attractive, in particular short sea shipping. Technological innovation should be taken into consideration when assessing this. In this respect, remote pilotage may become a valuable option in the future, to be developed in the framework of e-maritime. Where the free provision of mooring is not capable of undermining the pattern of the universal service, free access to this activity should be ensured.

Cargo-handling

Cargo-handling has significantly evolved during the last years. It has become a service based on advanced technologies and is now much less labour-intensive. Its role has also evolved, along with the role of ports, gateways in the logistic chain and not only the starting and ending points of a maritime trade. Cargo-handling is performed according to different settings across the Community and even within one Member State. Port workers are often directly employed by terminal operators, while in some ports they are contracted via "pools", entities in charge of recruiting and training port workers.

Port dues

When using ports, shipowners have to pay several fees, some for the use of the port as such, others for services provided by terminal operators, pilots, tug-operators, moorers, etc. Single billing windows would simplify users' operations. The Commission will help disseminating best practices on transparency in port charges.

Competition with third countries

Competition with Member States' ports by ports in third countries is a concern expressed by some European ports. This is especially the case of some EU ports close to non-EU ones, as well as in relation to hubs. Lower levels of environmental constraints and social rules, fiscal dumping, public financing for hinterland connections, discriminatory charging practices for the use of hinterland connections, can distort fair competition and put the continuity of deep-sea activities at risk in different parts of the EU. The Commission will make an inventory of the problems encountered with a view to addressing them in Community external relations when needed.

ESTABLISHING A STRUCTURED DIALOGUE BETWEEN PORTS AND CITIES

The Commission has proposed in its communication on the integrated maritime policy the enactment of a European maritime day which will launch a week of events aimed at raising the visibility and enhancing the image of the maritime sector. It wishes to further propose a European ports open day during that week which would give the occasion for the general public to assess, and understand better port community work. It will examine possible sources of finance for supporting the improvement of the integration of ports with cities within the existing envelopes.

In the context of ongoing work on maritime and port security, the Commission considers assessing the impact of security measures and providing guidance on how to reconcile the need for sound security measures with a fair degree of openness and accessibility to port areas. The review of legislation on maritime and port security will provide an opportunity to assess port access requirements and to examine the development of a European model for multi-purpose access cards.

WORK IN PORTS

Dialogue

The Commission will encourage the establishment of a European sectoral social dialogue committee in ports within the meaning of Commission Decision 98/500/EC. If such a committee is established, the Commission will promote an active contribution of the social partners to management of change, modernization and more and better jobs.

Training

The Commission will propose a mutually recognizable framework on training of port workers in different fields of port activities.

Health and Safety at Work

The Commission will closely monitor the implementation to ports of Community rules on safety and health of workers at work. The Commission will also closely follow the proper collection of statistics relating to accidents according to the ESAW and EODS methodologies established by the Commission (EUROSTAT).

Relevance to green corridor development

On the basis of the above mentioned European Port Policy, the Commission calls upon all public and private stakeholders to support this approach, and looks forward to a continuation of dialogue to ensure the most harmonious development of EU ports. Its relevance to green corridor development stands at the extent to which this policy calls for improved efficiency of EU ports, a decrease in harmful emissions and road congestion effects of each tone-kilometer transported, and for modal diversification towards rail, inland navigation and maritime transport.

Measures/changes suggested or introduced

All issues referred to above, constitute specific measures/changes suggested by the commission.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Explore alternative transport routes	PP	Improved efficiency of the transport chains through more intensive use of existing ports
2	Development of new, or improvement of existing facilities	ID	Improvements in all KPI areas
3	Modernization of procedures	PP	Direct improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas. Indirect improvements in the

			environmental sustainability and social issues areas.
4	Extend the provisions on transparency of Directive 2006/111/EC to all merchant ports, irrespective of their annual turnover	PP	Potential improvements in infrastructural sufficiency through attraction of investments
5	Disseminate best practices on transparency in port charges.	PP	Potential improvements in efficiency
6	Make an inventory of cases of unfair competition from third country ports	IR	Potential improvements in efficiency
7	Propose a mutually recognizable framework on training of port workers	PP	Potential improvements in efficiency, service quality and social issues

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :**	**54**	**Partner:**	**NTUA**
Document identity		Field[1] :	MAR	Doc.date :	13 Aug. 2010
Doc. number :	MEPC 61/INF.2	Study :	X	Regulatory act :	
Author :	The MBM Expert Group	Research proj.:		- Suggestion :	
On behalf of :	IMO Secretariat	Other doc.:		- In force :	
Title :	**Full report of the work undertaken by the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures**				
Related doc's :	MEPC 59/INF.10, MEPC 59/24 (annex 16); MEPC 60/4/57, MEPC 60/WP.7, MEPC 60/22 and MEPC 61/4/39				
Web address :	http://www.martrans.org/documents/2009/air/MEPC61-INF2.pdf				

Objective(s)

This document contains the report of the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures, established by the IMO Secretary-General as requested by IMO's Marine Environment Protection Committee at its sixtieth session (March 2010).

Main findings / results achieved / summary of measures

The IMO Marine Environment Protection Committee, at its 60th session decided to undertake a feasibility study and impact assessment of the market-based measure (MBM) proposals submitted in accordance with the work plan for further consideration of market-based measures. In order to undertake this study, the Secretary-General of the IMO established an Expert Group on Feasibility Study and Impact Assessment of Possible Market-Based Measures (the Expert Group). The Expert Group was made up of experts nominated by Member Governments and organizations, but each expert served in their own personal capacity[16].

Consistent with the terms of reference given by the Committee, the experts were to evaluate the various proposals with the aim of assessing the extent to which they could assist in reducing GHG emissions from international shipping. To guide its analysis, the Expert Group was given nine criteria: (1) environmental effectiveness, (2) cost effectiveness, (3) incentives to technological change and innovation, (4) practical feasibility, (5) need for technology transfer to Least Developing Countries and Small Island Developing States, (6) relation to other relevant conventions, (7) potential administrative burden for national administrations, (8) additional workload to ships and (9) compatibility with existing regulatory framework.

The following ten (10) MBM proposals were evaluated:

1. An International Fund for Greenhouse Gas emissions from ships (GHG Fund) proposed by Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA (MEPC 60/4/8).
2. Leveraged Incentive Scheme (LIS) to improve the energy efficiency of ships based on the International GHG Fund proposed by Japan (MEPC 60/4/37).
3. Achieving reduction in greenhouse gas emissions from ships through Port State arrangements utilizing

[16] The Project Manager of SuperGreen was a member of the group.

the ship traffic, energy and environment model, STEEM (PSL) proposal by Jamaica (MEPC 60/4/40).

4. The United States proposal to reduce greenhouse gas emissions from international shipping, the Ship Efficiency and Credit Trading (SECT) (MEPC 60/4/12).
5. Vessel Efficiency System (VES) proposal by World Shipping Council (MEPC 60/4/39).
6. The Global Emission Trading System (ETS) for international shipping proposal by Norway (MEPC 61/4/22).
7. Global Emissions Trading System (ETS) for international shipping proposal by the United Kingdom (MEPC 60/4/26).
8. Further elements for the development of an Emissions Trading System (ETS) for International Shipping proposal by France (MEPC 60/4/41).
9. Market-Based Instruments: a penalty on trade and development proposal by the Bahamas (MEPC 60/4/10).

There was no explicit recommendation by the Expert Group on which, among the above 10 MBM proposals should be selected, leaving this for the next phase of the process. To that effect, an intersessional working group is scheduled to meet end of March 2011 in order to continue the analysis and hopefully submit a recommendation for MEPC 62 (July 2011).

Relevance to green corridor development

A market based measure for shipping is relevant to green corridor development to the extent it will help internalize the external costs of GHG emissions by ships. Such a measure would provide economic incentives to ship owners to build ships that are more energy efficient and/or adopt operational measures (for instance, slow steaming, or other) that would reduce GHG emissions. However, utmost care should be exercised on the choice of the instrument and on its implementation scheme, so as to avoid carbon leakage, evasion/fraud and cargo shifts to land-based modes that could produce more GHGs. Another effect of an MBM system is to raise money to purchase offsets for other sectors, i.e. invest in wind farms, photovoltaic parks, or other technologies that would reduce GHG emissions elsewhere.

The EU (an observer to the IMO) has stated that although it hopes for the IMO to adopt some measures for GHGs from ships, it will have to take action to that effect if no IMO decision is made by the end of 2011. The IMO is also working on the Energy Efficiency Design Index (EEDI), which is described in a separate fiche.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Adopt (eventually) a market based measure for GHG emissions from ships	IR	Economic incentives to invest in green technologies for maritime transport

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number : 58		Partner: NTUA	
Document identity		Field[1] : MAR		Doc.date : 30 Sep. 2010	
Doc. number :	MEPC 61/WP.10	Study :	X	Regulatory act :	
Author :	Working Group on Energy Efficiency Measures for Ships	Research proj.:		- Suggestion :	
On behalf of :	MEPC, IMO Secretariat	Other doc.:		- In force :	
Title :	**Report of the Working Group on Energy Efficiency Measures for Ships**				
Related doc's :	MEPC.1/Circ.681, MEPC.1/Circ.682, MEPC 61/24				
Web address :					

Objective(s)

The document finalizes the regulatory text on the Energy Efficiency Design Index (EEDI) for new ships and on the Ship Energy Efficiency Management Plan (SEEMP). This text has been circulated by IMO MEPC and is slated for eventual adoption as an amendment of Annex VI of MARPOL at MEPC 62 (July 2011).

Main findings / results achieved / summary of measures

The EEDI index is provided by a complex formula, of which the numerator is a function of all power generated by the ship (main engine and auxiliaries), and the denominator is a product of the ship's deadweight (or payload) and the ship's 'reference speed', appropriately defined as the speed corresponding to 75% of MCR, the Maximum Continuous Rating of the ship's main engine. The units of EEDI are grams of CO_2 per tonne mile. The EEDI of a new ship is to be compared with the so-called "EEDI (reference line)," which is defined as EEDI (reference line) = $aDWT^{-c}$, where DWT is the deadweight of the ship and a and c are positive coefficients determined by regression from the world fleet database, per major ship category. If a ship's EEDI is above the equivalent baseline, the ship would not be allowed to operate until and unless measures to fix the problem are taken.

The Ship Energy Efficiency Management Plan (SEEMP) aims to establish a mechanism for a shipping company and/or a ship to improve the energy efficiency of ship operations. The SEEMP provides an approach for monitoring ship and fleet efficiency performance over time using the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool and serves as a benchmark tool.

After considerable debate, there is now a proposal before MEPC that EEDI reference lines be reduced by 10% by 2013, by 25% by 2018 and by 35% by 2023. All ships above 400 GRT will be included, although ro-ro ships will be excluded from the first phase of implementation, as some issues on these ships are still unresolved. There is also considerable detail on how the whole process will be implemented, as an amendment to Annex VI of MARPOL. MEPC 61 (Sept. – Oct. 2010) circulated the relevant guidelines and the final discussion on these issues, some of which are still open, is expected at MEPC 62 (July 2011).

As the impending finalization of the EEDI index would be a major milestone by the IMO on GHGs, it is still unclear how well this index will work in practice, and as a matter of fact there have been numerous concerns on its future use, some of them serious. Note that this index is an indirect one, as the data it assumes for its calculation may not necessarily represent those that will be encountered in a ship's life cycle, therefore reducing EEDI would not necessarily reduce CO_2. Note also that there is no equivalent index for a fleet of

ships, or for a maritime corridor. In addition, there are issues that merit discussion on the usefulness of the formula. A flavour of these caveats has been provided in Deliverable D2.2.
Relevance to green corridor development   It is our opinion that the usefulness of the EEDI index in the context of green corridors is limited, both because the index is defined on an individual ship basis and because of the concerns raised on the index. Market-based measures (described in a separate fiche) seem far more relevant.
Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Adopt EEDI as an amendment of Annex VI of MARPOL	IR	Technological measures to increase the energy efficiency of ships

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :**	**41**	**Partner:**	**NTUA**
Document identity		Field[1] :	MAR	Doc.date :	September 2010
Doc. number :	2411	Study :	X	Regulatory act :	
Author :	Lemper et al (ISL)	Research proj.:		- Suggestion :	
On behalf of :	VDR Union of German shipowners Central Union of German Ports	Other doc		- In force :	
Title :	**Die weitere Reduzierung des Schwefelgehalts in Schiffsbrennstoffen auf 0,1% in und Ostsee im Jahr 2015: Folgen für die Schifffahrt in diesem Fahrtgebiet** **(The further reduction of sulphur content of marine fuels to 0.1% in the North the East Sea by 2015: The consequences for shipping in these areas)**				
Related doc's :					
Web address :	http://www.zds-seehaefen.de/pdf/20101112_SECA-Studie_Endbericht.pdf				

Objective(s)

To study the financial and technical effects of the reduction of sulphur content of marine fuels to 0.1% by 2015.

Main findings / results achieved / summary of measures

Such a reduction can only be achieved by using diesel oil in place of heavy fuel oil, which in turn will increase the cost of sea transportation in SECAs and will also affect the traffic in the ports of the North and East Sea. Different ship types in various routes embedded in multi modal chains were studied and an estimation was made about the decrease of the seaborne transportation as well as the lower traffic of the ports.

The operational cost of shipping within the SECAs will inevitably increase in relation to shipping outside SECAs but also in relation to trucks and rail transportation. This will affect primarily medium to long sea voyages within the North and East Sea, producing a shift from sea to land or even minimising the sea transportation part in multimodal chains. As a consequence, some lines will have to cease operations and some ports may have to close.

Relevance to green corridor development

The end result of this regulation will be a 'back-shift' from short sea shipping to land-based modes along the area's corridors, with adverse effects on their overall environmental performance.

Measures/changes suggested or introduced

Alternative measures suggested include:

- the use of secondary emissions reduction methods (scrubbers),
- measures reducing fuel consumption, and
- the use of alternative clean fuels (e.g. LNG, which is feasible only for new buildings).

However, the most important and viable suggestion is to increase the upper limit on sulphur content of the fuel for ships sailing in SECAs from 0.1% to 0.5% as from 2015. This measure will have practically no environmental effect and in parallel will minimize the additional cost for marine fuel.			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Increase limit on sulphur content of fuel for SECAs from 0.1% to 0.5%	IR	Improvements in efficiency and GHG emissions (through avoiding the 'back-shift' from SSS to road transport). Limited adverse effects on SOx emissions.

[1]*Field*				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number : 51**		**Partner : HSSA**	
Document identity		Field[1] : MAR		Doc.date : April 2009	
Doc. number :		Study :	X	Regulatory act :	
Author :	Policy Research Corporation	Research proj.:		- Suggestion :	
On behalf of :	European Commission	Other doc.:		- In force :	
Title :	**The impact of 100% scanning of U.S.-bound containers on maritime transport**				
Related doc's :					
Web address :	http://ec.europa.eu/transport/maritime/studies/doc/2009_04_scanning_containers.pdf				

Objective(s)

The study analyzes the impact of the obligation of 100% scanning of U.S.-bound containers before shipping:

- on port facilities and ports, including their competitiveness,
- on transport towards ports and on adjacent regions, and
- on the U.S. production using components shipped via European ports.

Main findings / results achieved / summary of measures

Current security measures

- Customs-Trade Partnership against Terrorism (C-TPAT)
- Container Security Initiative
- Megaports Initiative
- Security and Accountability For Every Port Act
- Secure Freight Initiative

This review of security measures already in place confirms the multi-layered and international response to acts of terrorism from the international community.

Additional measures required for 100% scanning

The 100% scanning obligation implies the deployment of radiation and NII equipment, already operational in some ports within the Megaports and/or CSI Initiative, to scan all U.S.-bound containers regardless their potential risk or the size of the port.

Impact of scanning on port and terminal operations and on hinterland transport

The study on the impact of implementing the 100% scanning rule on port and terminal operations and on hinterland transport has revealed the impossibility to come to a uniform assessment of general validity for all (European) ports. The potential impact of scanning all U.S.-bound containers is to very large extent decided by local conditions such as:

- the lay-out of the port and container terminal,
- the availability of green field areas,

- the split between the various transport modes of the transported container volumes from the hinterland to the port,
- the number, profile and location of the road and rail accesses to the port,
- the volume of U.S.-bound containers handled,
- the importance of the transshipment throughput and,
- the prevailing liability regime and labour laws.

With regard to both SFI Pilot ports and the European ports investigated by Policy Research Corporation, the following conclusions can be drawn in relation to the impact on port and terminal operations as well as on hinterland transport:

- scanning of U.S.-bound containers is presently only possible on a limited scale, based on a risk analysis,
- the installation of (extra) scanning equipment could be difficult to achieve due to the inherent space constraints in ports and on terminals,
- 100% scanning of feeder and barge traffic will be a major challenge; also scanning of containers delivered by rail could pose problems,
- if scanning takes place outside the terminal, 100% scanning of U.S.-bound containers will require additional movements for the transfer of containers from the terminal to the scanning site and vice versa, which could result in inflated transfer costs,
- if scanning takes place at the terminal gate or on the terminal, valuable terminal area will be taken up which in turn will reduce the terminal's throughput capacity,
- scanning at extended gateways is an alternative that could be considered for barge and rail traffic, but operational and legal questions would then arise regarding the container's integrity,
- because some European ports facing inherent congestion problems, particularly regarding their road accesses, the situation would significantly be worsened by the full application of the 100% scanning rule.

Direct transport costs

The imposition of 100% scanning carries economic cost consequences. These are of two types. First there is the direct transport related costs supported by the cargo interest and thus ultimately borne by the consumer. Secondly, there are the indirect costs resulting from the less than optimal functioning of the supply chain.

Indirect economic costs

The impact of 100% scanning will not only generate additional direct economic costs, but also indirect economic costs. The more apparent and significant of these are:

- a reduction of the handling capacity of the container terminals as a consequence of increased container dwell time,
- an increase in the turnaround time of feeder vessels,
- an increase in the turnaround time of the inland transport means (trucks, trains, barges) delivering containers to the port terminals,
- an increase of the external costs consequential to a shift from rail and barge to truck mode,
- an increased cargo inventory cost as a consequence of the extended transit times of the goods destined for the United States.

Critical issues, pertinent views and conclusions

- In international commerce the control on the movement of goods takes place at the import point. Hence all existing procedures, regulations and routines have been developed and implemented starting from this principle. The 100% scanning of outbound containers therefore creates a need to

reconfigure ports and terminals, find more space to accommodate the extra facilities required, re-design the established procedures and introduce revised regulations.
- The value of 100% scanning has as yet not been proven.
- Critical is the impact of 100% scanning on smaller ports.
- The position of container terminal operators with regard to the implementation of the 100% scanning rule is far from uniform. It is mostly inspired with what the terminal operating company sees as its priority objectives and determined by the specific local port and terminal conditions.

Impact on port facilities and ports and on their competitiveness

The impact of the 100% scanning rule on ports and terminals depends to a large extent on the specific lay-out of a given port and/or a given terminal and on the particular conditions prevailing there.

Impact on transport towards the port and on indirect costs

Almost all stakeholders that were contacted and interviewed agree that there would be no major capacity problem for the different inland transport modes.

Impact on the U.S. production using components shipped via U.S. ports

With the signing into law of the 9/11 Act, an extra burden has been added to the already cumbersome process of trade with the United States.

In the final analysis, the most critical question that needs to be asked is whether the application of 100% scanning which, as shown in this study carries a number of negative cost implications, can be justified by a greater impregnability of the international supply chain. The conclusion arrived at is that 100% scanning does not have any added value in terms of a reduction in the security risk. It adds nothing to the risk management approach supported in the CSI and C-TPAT initiatives and in the WCO SAFE Framework of Standards. On the contrary scanning all containers increases the work load on the CBP and other Customs greatly and may well induce the national Authorities into a false sense of security and lower their vigilance, thereby achieving exactly the opposite of what the law was intended for.

Relevance to green corridor development

As green corridor development requires the implementation of an action plan concerning handling of containers, this study helps us understand the issues that need to be addressed so that such an action plan is assessed in terms of:

- its effectiveness,
- the feasibility of its execution,
- the cost of the required changes in the set-up and organization of container terminal operations,
- its impact on the choice of port of call with a risk of concentration on centrally located ports and a loss of service level and frequency to peripheral ports,
- the possible changes in sourcing patterns,
- the effects on export competitiveness of the trading partners of the U.S. and more specifically on the negative impact on transatlantic flows between Europe and the U.S. and,
- the bearing on the global supply chain.

Measures/changes suggested or introduced

This study constitutes a “long-term assessment of the impact of 100% scanning of US-bound containers” agreed on European Commission level in order to be ready for the discussion with the new U.S. Congress and administration. Thus, apart from the main conclusion opposing to this regulation, no other changes were proposed.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	100% scanning of US-bound containers	IR	It will negatively affect transport efficiency, while the potential improvement in security is not fully justified.

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number :** 43		**Partner:** DNV	
Document identity		Field[1] : MAR		Doc.date : June 2009	
Doc. number :		Study :		Regulatory act :	
Author :	Madsen et al (DNV)	Research proj.:	X	- Suggestion :	
On behalf of :	DNV, R&I	Other doc.:		- In force :	
Title :	**Pathways to Low Carbon Shipping, Memo to IMO Secretary General**				
Related doc's :					
Web address :	http://www.dnv.com/industry/maritime/publicationsanddownloads/publications/dnvcontainershipupdate/2010/2-2010/Pathwaystolowcarbonshipping.asp				

Objective(s)

This document explains how shipping can reduce its emissions in a cost-effective way, providing abatement curves for alternative measures of GHG emissions reduction and based on actual experience from energy management studies of DNV with individual shipping companies. The document focuses on what can be achieved with technical and operational measures for the existing fleet.

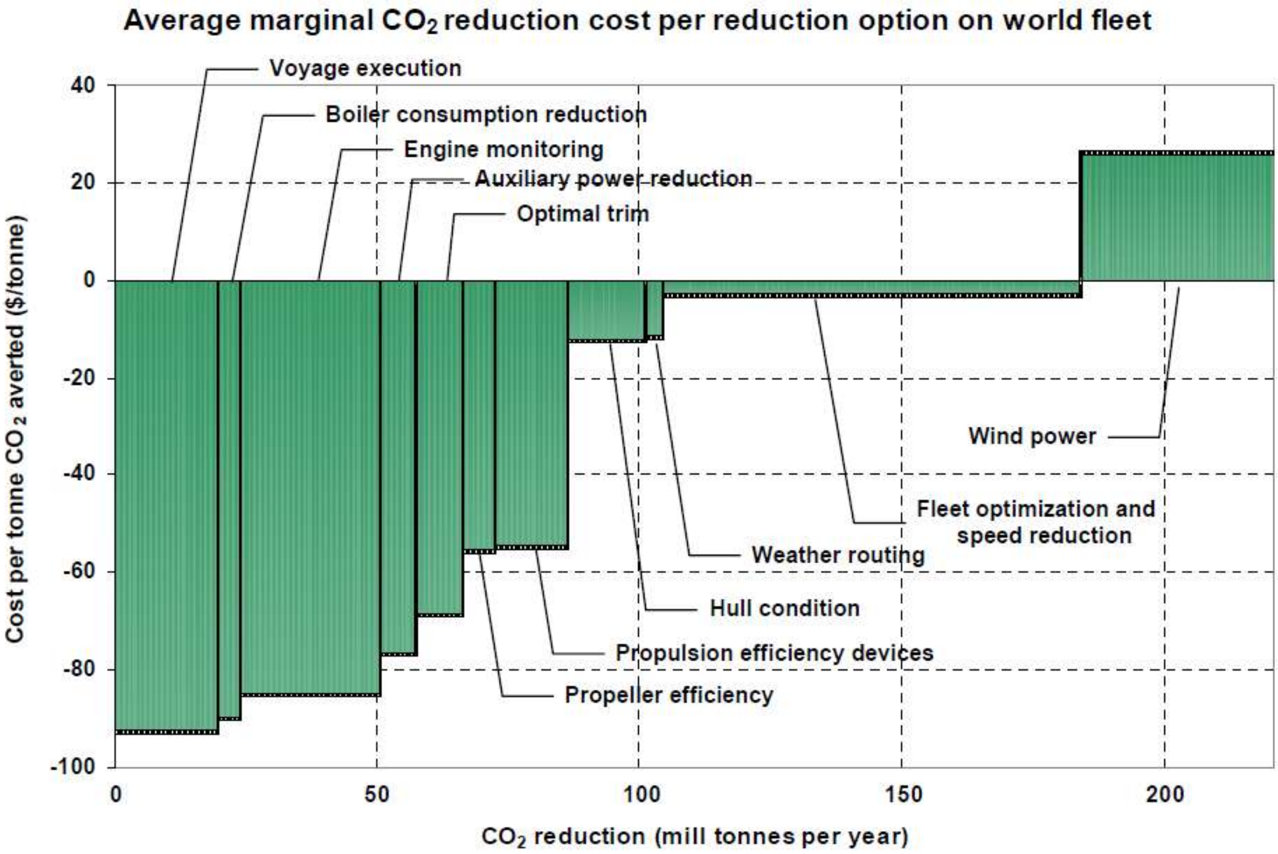
Main findings / results achieved / summary of measures

The document illustrates the potential cost-effectiveness and the GHG emission reduction capability of 11 measures applied to the existing world fleet. The most important measures are included and studied on their effect by 2020, but further ones could be tackled in the same way.

What is presented is a method that can aid policy makers to promote the adoption of operational and technical measures to reduce maritime GHG emissions up to 2020, and beyond, to 2030 and towards 2050. As stated in the document, in DNV's paper to IMO MEPC 58, it is demonstrated that, up to 2030 and 2050, a 50% and 70% maximum GHG emission reduction in shipping could be achieved via using the current technology and gradual switch to lower carbon fuels. The attached figure illustrates the maximum CO_2 reductions that can be achieved by selected emission reduction measures and their estimated cost-effectiveness. The total cost-effective saving potential of the 11 emission reduction measures was estimated at 230 million ton (MT) of CO_2. To come up with the illustrated results, a fleet model from the IMO GHG study has been used for the baseline.

In the abatement curves the width of each bar represents the CO_2 emissions reduction potential of an abatement measure, compared to a "business as usual" scenario, while the height of each bar represents the average marginal cost of avoiding 1 ton of CO_2 emission by making use of an abatement measure, on the assumption that all measures to the left are already applied. The cost per tonne CO_2 averted is increasing from left to right. At the point where the bars cross the x-axis, the measures give a net cost instead of a net cost reduction. Future carbon costs are not included in the performed calculations, but, in case that such a tax is considered, the cost-effectiveness of the measures will be improved.

Figure 1 – Average abatement curves for Shipping – Existing world fleet in 2008



The document concludes that there is a significant potential for emissions reduction for the existing fleet, which is estimated up to 15% maximum in a cost-effective way. Moreover, it states that a future price on emissions could increase the cost-effective reduction potential.

Relevance to green corridor development

The abatement curves illustrated in this document summarise technical and operational opportunities to reduce the GHG emissions of the existing shipping fleet. Several green technologies and/or operational measures are illustrated towards their cost-effectiveness and their capability to achieve GHG emission reduction. The implementation of similar schemes to pre-screen the cost-effectiveness and the environmental impact of emission reduction technologies can aid policy and decision makers to implement a safe strategy towards cleaner shipping. Thus, the results of this study have a straightforward relation to the future greening of a corridor, either due to emissions reduction or to potential efficiency improvement, i.e. by saving fuel.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Reduction of boiler consumption	TD	Implementation of green technologies has a straightforward impact on the greening of a corridor, either due to emissions reduction or to potential efficiency improvement, i.e. by saving fuel.
2	Engine monitoring	TD	As above
3	Reduction of auxiliary power	TD	As above

4	Optimal trim	TD	As above
5	Propeller efficiency	TD	As above
6	Propulsion efficiency devices	TD	As above
7	Hull condition	TD	As above
8	Wind power	TD	As above
9	Voyage execution	OP	As above
10	Weather routing	OP	As above
11	Fleet optimisation and speed reduction	OP	As above

[1] ***Field***				[2] ***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3] ***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

<table>
<tr><td colspan="2">SUPERGREEN Document Fiche</td><td colspan="2">Number : 8</td><td colspan="2">Partner : DNV</td></tr>
<tr><td colspan="2">Document identity</td><td colspan="2">Field[1] : MAR</td><td colspan="2">Doc.date : August 2009</td></tr>
<tr><td>Doc. number :</td><td></td><td>Study :</td><td></td><td>Regulatory act :</td><td></td></tr>
<tr><td>Author :</td><td>Eide et al</td><td>Research proj.:</td><td>X</td><td>- Suggestion :</td><td></td></tr>
<tr><td>On behalf of :</td><td>DNV, R&I</td><td>Other doc.:</td><td></td><td>- In force :</td><td></td></tr>
<tr><td>Title :</td><td colspan="5">Cost-effectiveness assessment of CO₂ reducing measures in shipping</td></tr>
<tr><td>Related doc's :</td><td colspan="5"></td></tr>
<tr><td>Web address :</td><td colspan="5"></td></tr>
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Objective(s)

This document presents a methodology to assess the cost-effectiveness of technical and operational measures to reduce maritime CO_2 emissions based on a decision variable, the Cost of Averting a Tonne of CO_2-eq Heating (CATCH), and evaluating it for several measures for reducing CO_2 emissions in shipping. A number of such technical and operational measures is analysed towards their cost effectiveness within the study.

The paper states that the notion of CATCH is in line with the Intergovernmental Panel on Climate Change (IPCC) and with regulatory work on safety and environmental protection issues using Formal Safety Assessment at the IMO. It also discusses the applicability of CATCH in regulations and suggests its use in the ongoing international policy making. Results suggest that CATCH 50 $/tonne of CO_2-eq should become a decision criterion to invest in emission reduction measures for shipping.

Main findings / results achieved / summary of measures

In the context of EU's target to stabilize a 2^oC level of temperature increase as a goal, GHG emissions need to have been reduced by 50%–85% in 2050 compared to today's level. However, the goal set is challenging since all scenarios indicate significant increase in GHG emissions up to 2050.

The document states that the key questions to be answered are: how much emissions must be reduced, what regulations (IMO, UNFCC, regional level, i.e. EU) must be imposed, which reduction measures are effective, how a global scheme can be implemented and how shipping emissions compare with other sector's emissions. To facilitate future policies in this direction, the study establishes a new decision parameter for emission reduction: the CATCH (Cost of Averting a Tonne of CO_2-eq Heating) [$/tonne], expressed by the following formula:

$$CATCH = \frac{\Delta C - \Delta B}{\Delta E}$$

where:

ΔE is the expected reduction of CO_2-eq emissions during the expected operational lifetime of a ship due to the implementation of a measure [tonnes]

ΔC is the cost of implementing a measure on a ship [$]

ΔB is the benefit (other than emission reduction) during the operational lifetime of a ship, due to the implementation of a measure [$].

Thus, the CATCH refers directly to the cost-effectiveness of a measure, considering the present value of the sum of the discounted current and future benefits and costs arising from the implementation of this measure on board.

To evaluate the CATCH for several abatement technologies and measures, first of all it is important to know what is expected to pay per tonne abated emissions to help reach the targeted emissions level and prevent the projected ones in the future. To answer that, a set of stepped considerations / calculations is followed; from determining a stabilization target level, a future (2030) baseline, the cost of reaching stabilization level for the given 2030 baseline, to modelling the examined cases, i.e. combinations of vessel types and measures. The study applies a first approach on the cost-effectiveness of CO_2 reducing measures for shipping, focusing on a well-selected set of measures to be implemented on the new buildings of two types of vessels. For each of the two ships the following measures are analysed with respect to the CATCH value. The measures examined are: Optimized hull design, The weather routing system, The Kite system, Silicon based coating, Pre-swirl stator, Propeller polishing, Electronically controlled engine, Waste heat recovery, Fuel cells, Solar panels, Speed reduction. For all measures an operational life of 25 years, an activity profile of 210 and 230 days per year at sea and a risk free discount rate of 5% were assumed.

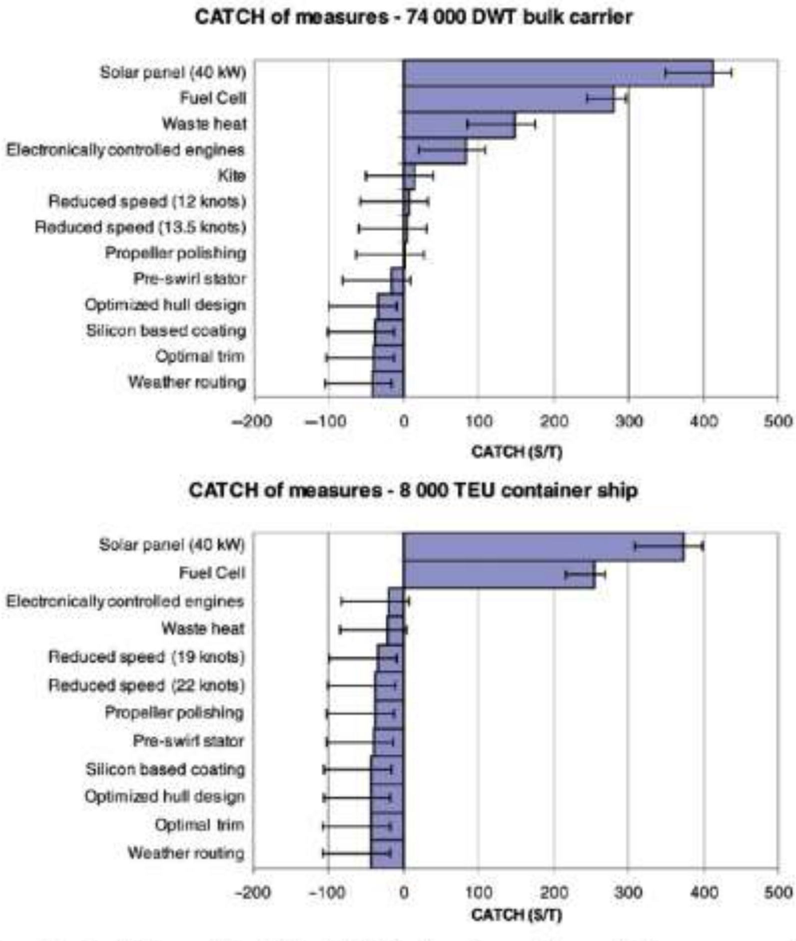


Figure 4. Sensitivity analysis of the CATCH values for emission reduction measures, using a fuel price of 243 $/T fuel (blue bars), but also the recalculated CATCH values using fuel price of 600 $/T fuel (left error-bar mark) and 100 $/T fuel (right error-bar mark).

From the cases selected and investigated in this study, an important conclusion for regulating emissions and aiding the policy makers is raised. A short-term CO_2 reduction potential of 40% could be achieved by fleet optimization, routing and speed reduction. The potential of technical measures to reduce CO_2 emissions has been estimated at up to 30% in new ships, including less resistance hull designs, more efficient aft-ship, propeller and rudder arrangements, shift from oil to natural gas as main fuel, zero or minimum ballast configurations, marine fuel cells (longer term) and hybrid ships.

As stressed in the study, policy making and emissions regulation can be handled by making use of a cost-effectiveness decision variable (CATCH) coupled with a decision criterion (CATCH 50$/T CO_2-eq). CATCH is directly applicable to international regulations (i.e. IMO) that concern explicit measures for ships, such as described in the modelling cases, for instance the mandatory use of silicon coating for ships in certain segments.

The authors bring examples from earlier IMO regulations to reveal the applicability of this notion: A first example of how the cost-effectiveness approach can be used to justify a prescriptive regulation is the decision to make ECDIS (Electronic Chart Display and Information Systems) mandatory for large segments of the world fleet.

Another regulatory option raised by the authors is the use of cost-benefit to regulate levels of performance, meaning that any technology that can meet the required performance level is allowed, like IMO's mandatory standard for ballast water discharge concentration and the suggested new performance-based regulations for damage stability for passenger vessels.

The authors state that the adoption of a criterion that reveals both the cost-effectiveness and the necessary reduction in GHG emissions for a candidate technical or operational measure ensures the optimal use of resources. The difference to the Kyoto protocol is that the latter implicitly expected that the CATCH should be established by market mechanisms rather than the analysis. Moreover, it is due to the global nature of the industry and the domination of non-Annex I countries among the flag states that the application of market based mechanisms to the shipping sector has been extensively debated. In this context, the analysis using the CATCH criterion is proved to be viable in the current shipping industry, avoiding the introduction of complex market based mechanisms as a means for regulation and following the traditional approach, i.e. IMO regulations.

Relevance to green corridor development

The paper is strongly related to the adoption of new technologies and operational measures to green transport corridors. It presents a methodology for estimating the potential cost-effectiveness of a candidate measure, considering the present value of the sum of the discounted current and future benefits and costs arising from the implementation of this measure on-board. The article is referred to maritime applications, but the character of the presented idea is not restrictive exclusively on the maritime sector.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Policy making and emissions regulation using a cost-effectiveness decision variable (CATCH) coupled with a decision criterion (CATCH 50$/T CO2-eq)	IR	Emission reduction, possible energy savings
2	Usage of cost-benefit analysis to built performance-based regulations	IR	Emission reduction, possible energy savings

SUPERGREEN Document Fiche		Number : 7		Partner : DNV	
Document identity		Field[1] : MAR		Doc.date : December 2009	
Doc. number :		Study :		Regulatory act :	
Author :	Deggim Heike	Research project :		- Suggestion :	X
On behalf of :	International Maritime Organisation (IMO)	Other doc.:		- In force :	
Title :	**International requirements for ships operating in polar waters**				
Related doc's :					
Web address :					

Objective(s)

This document presents an overview of IMO, SOLAS, MARPOL, STCW and Torremolinos Protocol requirements for ships that operate in polar waters in the Arctic and Antarctic areas. Issues such as stability, life-saving appliances, navigation, guidelines for ships operating in polar waters, special area status, carriage requirements for heavy grade fuel oil, certification of ice navigators, and fishing vessels are discussed. In addition, the document also presents relevant provisions of the United Nations Convention on the Law of the Sea (UNCLOS) and other international requirements/activities. It is a concentrated document that reveals the importance of the existence of an international polar water shipping regulatory framework, towards safer and cleaner polar shipping.

Main findings / results achieved / summary of measures

The International Maritime Organization (IMO) has been developing requirements, guidelines and recommendations regarding navigation in polar ice-covered waters (Arctic, Antarctic areas) for over 20 years. IMO's requirements cover: maritime safety (i.e. safe design and construction, search and rescue, navigation, life-saving, etc.); protection of the marine environment (designation of special areas, heavy fuel oil, etc.); certification of seafarers on ships operating in polar areas. This document gives an overview of the current IMO provisions, the so-far achieved and the future IMO developments for polar areas.

In particular, requirements as contained in the following IMO Conventions and in related codes, guidelines and recommendations are introduced and briefly explained:

1) International Convention on the Safety of Life at Sea (SOLAS), 1974;

2) International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL);

3) International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978;

4) Torremolinos Protocol of 1993 to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977 (Torremolinos Protocol);

Provisions for ice-covered areas as contained in the United Nations Convention on the Law of the Sea (UNCLOS) are also included.

SOLAS requirements concerning polar waters
The document reviews the Safety of Life at Sea (SOLAS) Convention requirements related to shipping in polar waters. These are contained in chapter V (Safety of Navigation) and refer to: (a) the need of meteorological services and warnings on the purpose of aiding a safer navigation and (b) the existence of Ice Patrol Service in the North Atlantic contributing to safety of life at sea, safety and efficiency of navigation and protection of the marine environment in that area (as an example, ships transiting the region of icebergs are guarded by the Ice Patrol during the ice season). In addition, regulation 31 includes requirements on the communication of messages towards dangerous phenomena. As an example, the master of every ship which meets dangerous phenomena is obliged to communicate the information to ships in the vicinity and the authorities. The existence of such requirements reveals the need of capable ICT applications and relevant technologies to preserve a capable communication network at dangerous waters. Concerning the stability requirements for ships operating in areas with ice accretion, the 2008 IS Code has been adopted by IMO's Maritime Safety Committee (MSC) and became mandatory under the SOLAS Convention. The code is divided into two parts: part A includes mandatory codes, providing stability criteria and safe operation measures, and part B contains recommendations for certain types of vessels and additional guidelines.

By nature, the polar environment imposes hard constraints and demands on ship systems, i.e. navigation, communication, life-saving appliances, machinery, protection and damage control. In that sense, the guidelines for ships operating in polar waters were adopted to mitigate the risk due to the harsh environmental and climatic conditions in polar waters. The guidelines were first issued in 2002, but came out to be finalized for both the Arctic and the Antarctic areas at 2009, which was approved by MSC 86 and MEPC 59. Given the increasing interest of sailing in the polar waters and the importance of safely and clearly dealing with the unique natural difficulties, the aforementioned guidelines are used as a basis for new work towards the establishment of a mandatory code for ships operating in polar waters, the Polar Code, which is expected to be finished until 2012. The Code will cover ship design, construction, equipment, operational, training, search and rescue facilities and environmental protection issues relevant to ships operating in polar waters. This movement reflects the need of an international regulatory framework for traffic in polar areas.

Further guidelines concerning cold water survival, contingency planning guidance for passenger ships operating in areas remote from SAR facilities and guidelines on voyage planning for passenger ships operating in remote areas are also presented in the document.

MARPOL requirements concerning polar waters
Concerning polar areas, the MARPOL Convention includes particular regulations for the control of discharge of oil and reception facilities in Annex I for the Prevention of pollution by oil, the disposal of garbage in the Annex V for the Prevention of pollution by garbage from ships and the control of discharge of residues of noxious liquid substances in the Annex II for Discharges in the Antarctic Area. Also, special requirements for the use or carriage of oils in the Antarctic area have been adopted in March 2010. However, in the revised MARPOL Annex II (October 2004), the Antarctic area, is considered as a zero discharges area, but this is not applied for the Arctic.

The document continues presenting IMO's Standards of Training and Watchkeeping (STW) Code towards the training requirements for personnel on ship operating in ice-covered waters and the requirements for fishing vessels operating in areas with ice accretion (Torremolinos Protocol of 1993), on Torremolinos International Convention for the Safety of Fishing Vessels, 1977, Code of safety for fishermen and fishing vessels, 2005, as well as Voluntary Guidelines for the design, construction and equipment of small fishing vessels.

Relevance to green corridor development			
This document was selected for reviewing under Task 2.3 of the SuperGreen project, since it includes material relevant to the KPI areas of Safety, Security and Environment and reveals the existing international recommendation platform. Our scope was to review it and highlight the parts that are highly related to the KPI areas of the project and reveal the effects of changes in the regulatory framework to the shipping transport sector. Knowing the regulatory framework that covers shipping at polar waters, we have a strong indication on the levels that key performance areas, such as safety, environment protection and security, are regulated. These aspects could provide the greening potential of a transport corridor.			
Measures/changes suggested or introduced The document reviews on the requirements contained in the following list of IMO Conventions and in related codes, guidelines and recommendations:			
No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Establishment of a mandatory Polar Code for ships operating in polar waters	IR	Preserve security and safety in shipping in polar waters, while protecting the sensitive marine environment

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

Appendix VIII. Inland waterway transport

Planco Consulting GmbH et al. (2007). *Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Schiene und Wasserstraße – Schlussbericht.* Report on behalf of the German Federal Water and Shipping Administration, November 2007.

European Commission (2006b). *An Integrated European Action Programme for Inland Waterway Transport.* Communication from the Commission on the Promotion of Inland Waterway Transport "NAIADES", Brussels, 17.1.2006.

European Parliament & Council (2005). *Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonised river information services (RIS) on inland waterways in the Community.* Strasbourg, 7.9.2005.

European Parliament & Council (2006). *Directive 2006/87/EC of the European Parliament and the Council of 12 December 2006 laying down technical requirements for inland waterway vessels and repealing Council Directive 82/714/EEC.* Strasbourg, 12.12.2006.

European Parliament & Council (2008b). *Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods.* Strasbourg, 24.9.2008.

Europe Economics (2009). *Impact Assessment and Evaluation Study "Proposal for a Legal Instrument on the harmonisation of boatmasters' certificates in Inland Waterway Transport".* London, 4.2.2009.

Visser J.A. (2008). *Study on Administrative and Regulatory Barriers in the field of Inland Waterway Transport.* NEA study R20080210/30555000/JVI/CWI, Zoetermeer, September 2008.

SUPERGREEN Document Fiche		Number : 50		Partner : VIA	
Document identity		Field[1] : IWT		Doc.date : November 2007	
Doc. number :		Study :	X	Regulatory act :	
Author :	Planco Consulting GmbH Essen in co-operation with Bundesanstalt für Gewässer-kunde	Research proj.:		- Suggestion :	
On behalf of :	Federal German Water and Shipping Administration represented by the Water and Shipping Directorate East	Other doc.:		- In force :	
Title :	**Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Schiene und Wasserstraße – Schlussbericht** **Economical and Ecological Comparison of Transport Modes: Road, Railways, Inland Waterways**				
Related doc's :	Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße – Zusammenfassung der Untersuchungsergebnisse (summary in German) Economical and Ecological Comparison of Transport Modes: Road, Railways, Inland Waterways – Summary of Findings (in English)				
Web address :	http://www.wsd-ost.wsv.de/service/Downloads/Verkehrstraegervergleich_Gutachten_komplett.pdf http://www.wsd-ost.wsv.de/service/Downloads/Verkehrstraegervergleich_Kurzfassung.pdf http://www.ebu-uenf.org/fileupload/SummaryStudy_engl.pdf				

Objective(s)

Available studies and publications comparing the transport modes under the perspective of transport economics and of ecology are generally neither comprehensive nor sufficiently differentiated regarding the system of inland shipping and waterways. Due to unrealistic assumptions the relative position of inland shipping is not assessed adequately. Based on an initiative of the Association of European Inland Shipping and Waterways (Verein für europäische Binnenschifffahrt und Wasserstraßen VBW) the German Federal Water and Shipping Administration (WSV), represented by the Water and Shipping Directorate East, has commissioned this study. The aim of the study is to present an up-to-date comparison of transport modes which is sufficiently differentiated and substantiated.

Main findings / results achieved / summary of measures

Infrastructure networks

Length of infrastructure networks

In Germany the total length of inland waterways is significantly smaller than the one of roads or railways. The length of the railway network is five times the one of inland waterways. The factor for long-distance roads (federal highways and roads only) is more than seven.

Age structure
Total gross investments into German waterways were not only far lower than for roads and railways, but also developed at lower growth rates: While the total growth of investments in the period 1991 to 2004 was +12.4% for waterways (coastal and inland), it was +32.4% for railways and +38.4% for long-distance roads. As a consequence the age structure of waterways is clearly less favourable than of railways and roads. There is a risk that this quality disadvantage impacts intermodal competition to the disadvantage of waterways. Where this quality disadvantage affects operational safety, negative consequences for waterways transport can be significant: While road transport can often shift to other routes, such alternatives are usually not available for waterways.

Recovery of infrastructure costs
Detailed calculations for the year 1987 for freight transport show that for all three inland modes only part of the infrastructure cost is recovered. The value of unrecovered costs, per 1,000 ton-km, was € 11.53 for inland shipping. This is significantly better than for rail transport (€ 41.80).

Percentage-wise, road freight transport had the highest cost recovery ratio in 1987 (56.3%). For railways and waterways, respective ratios were 13.7% and 8.5%. More recent figures are not available. It is to be assumed that the cost recovery ratio for road freight has further improved due to the step-wise increase of fuel taxes (as part of ecological taxation) and due to the introduction of a truck toll on highways. In this context it is important to note that, different from other modes, waterways have significant non-transport-related functions and benefits.

Furthermore, infrastructure costs represent only a fraction of total social costs which are more relevant for defining optimum user charges which achieve the highest social welfare. To give an example: The social costs of road accidents alone in Germany clearly exceed total infrastructure costs of inland waterways.

Capacity utilization of infrastructure
Traffic loads on many sections of German highways have reached a level which does not allow undisturbed flows. In 2005, 1,050 km of highways showed bottlenecks leading to significant disturbances of truck movements. Most affected highways are in the agglomerations of Hamburg, Berlin, Rhine-Ruhr, Frankfurt and Munich, furthermore the A1 (Hamburg-Bremen and long sections of its continuation to Cologne), A5 south of Gießen, A3 (section Frankfurt to Nürnberg), A6 (Heidelberg to Nürnberg) and A8 (section Karlsruhe to Munich). Over the next decade, similar growth rates of traffic loads on German highways are expected as during last 10 years. Therefore, a general improvement of traffic conditions may not be expected. On the contrary, a further deterioration at large sections of the highway network must be assumed, even if further network extensions and improvements as planned according to the BVWP 2003 are taken into consideration.

On the railway network, too, freight transport is not undisturbed. According to information from the Network Council of DB Netz AG, of May 2007, critical sections exist e.g. on the lines Hamburg - Hannover, Karlsruhe – Basel, and Emmerich – Duisburg. Furthermore, many nodes are overloaded. This conclusion is in line with results of an enterprises survey arranged by the Association of German Transport Companies: Alone in the long-distance network and in metropolitan regions the DB-AG network includes 53 sections where capacities are overloaded. Overstrained nodes include Bremen, Hamburg, Hannover, Hamm, Cologne, Frankfurt (Main), Leipzig, Nürnberg/Fürth and Munich. Currently planned network extensions and capacity improvements according to BVWP 2003 will relieve a number of overloaded sections. But even on the major routes, a high number of sections will remain with capacity utilisation rates between 80 and 110 %, with negative impacts on freight trains. For the latter, current plans do not include any network extensions or improvements. Transit times for freight trains start to grow progressively due to extended waiting times, if capacity utilisation rates exceed 80%. Utilisation rates between 80 and 110% of nominal capacities therefore indicate a low service quality. For example, transit time at a utilization rate of 95% is by 20% longer than for a route with a low capacity utilisation level.

Contrary to roads and railways, inland waterways have significant reserve capacities in all major corridors. According to recent calculations, this applies not only for the current situation, but also for 2015, with due consideration of expected increases in traffic volumes. Of 21 analysed locks, the lock of Lauenburg at the Elbe-Lübeck Canal had the lowest reserve capacity based on traffic volumes of 2005. But even this reserve capacity (of + 2.5 million freight tonnes) would allow an increase of traffic volumes by a factor of 5.

Taxation

In freight transport, competition disparities for German companies competing internationally are caused by different social insurance contributions, motor vehicles tax rates and specific subsidies (particularly for fuel). Dutch tax regulations are generally more favourable than the German ones.

The German motor vehicle tax is double the Dutch one, fuel tax is 11 Cents higher. As a result, in Germany the annual tax load for a 40-tons truck performing 135,000 km p.y. is 30% higher than in the Netherlands.

Similarly, for rail freight transport, German companies are disadvantaged compared to their Dutch competitors. While in Germany the full fuel tax is charged, Dutch railway operators are fully exempted from this tax. Similar disparities at the European level exist for electricity taxation.

For inland shipping, too, German companies are burdened with competition distortions at the European level. Numerous taxation and financing privileges helped companies in the Netherlands and in Belgium over the 90s to modernise their vessel fleets significantly faster than their German competitors, leading to a major advantage in market strength.

German Railways often declare a competition disadvantage compared to inland shipping due to the latter’s exemption from fuel charges. Indeed, in Germany 269,000 tons of tax-privileged diesel fuel was supplied to inland vessels. Considering the normal tax of 47 €-Cents per litre, the total saving amounts to € 144 million. This corresponds to a competitive advantage of 0.22 €-Cents per ton-km.

This tax disadvantage of rail transport must be seen in the context of significantly higher differences in external costs. Comparative calculations show an average advantage of inland shipping compared to railways transport of €-Cent 0.85 per ton-km of bulk cargo. In other words, the difference in fuel taxation offsets only 25% of the opposite differences in external costs which would have to be charged according to the user-pays principle.

Transport volumes and forecasts

Current forecasts indicate a further significant growth for freight traffic volumes in Germany.

For example, the German Federal Transport Infrastructure Plan (BVWP) 2003 is based on an expected increase of freight transport performance (ton-km) in Germany by 63% in the period 1997 to 2015 (does not include short-distance freight). High increases are foreseen for international freight. While domestic performance will grow by 34%, cross border performance, including transit, will almost double (+97%). For inland shipping only cross-border freight is expected to grow (+61%), while domestic freight will slightly decline (by 4%). This will result in a growth of total performance by 44%.

For road transport, recent years showed a high conformance with the forecast of BVWP 2003. Total traffic volumes in 2004 were just 3% below the forecast. A breakdown by commodity groups shows major deviations. Some commodities developed faster than expected (cereals and foodstuff, iron &

steel & scrap metal, gravel and stones). Others developed slower, e.g. machinery & equipment, containers.

In rail freight, too, volumes of transported machinery & equipment as well as containers developed at slower rates than expected. 2004 volumes remained 10% below expectation. The same applies for bulk cargo. Higher-than-expected growth was noted for iron ores, for iron & steel & scrap metals, and for mineral oil products. Slower-than-expected developing products were cereals and animal foodstuffs, gravel and stones, chemical products and fertilisers.

Regarding inland shipping, similar as for railways, forecast volumes could not be reached generally. This is particularly true for bulk commodities such as mineral oils, iron ores, iron & steel & scrap metal, gravel & stones, chemical products and fertilisers. Minor differences occurred for cereals and animal feed. In contrast, coal transport in 2004 was significantly above expectations. Particularly for consumer goods, machinery & equipment and containers, inland shipping accounted for much higher increases than forecast (with a difference actual/forecast in 2004 of +32%). This demonstrates that inland shipping is not negatively affected by commodity composition of freight transport, as was expected some years ago. On the contrary, the development was much better, e.g. in the container market, than forecast – different from competing modes where real figures did not meet expectations.

Seaport hinterland transport, amounting to 130 million tons in 2004 is the most important market for inland shipping. Besides bulk cargo where inland shipping absorbs 53% of total volumes, container shipping has gained importance. In 2004 more than 29% of all containers to and from seaports were carried by inland vessels (road: 54%; rail: 16%). In this market, the quality of waterways decides on the modal share of inland shipping. Transport relations linked excellently to the ARA ports (Amsterdam, Rotterdam, Antwerp) on the Rhine river provide much better chances for inland shipping than hinterland links to German seaports. As a consequence, inland shipping has gained a market share of 63% (bulk cargo) resp. 49% (containers) in the hinterland regions of ARA ports, but only 19% resp. 2% in the hinterland regions of German seaports.

An important segment for inland shipping is the transport of hazardous goods. Here, inland shipping being the safest transport mode has a prominent role. Particularly for highly flammable liquid goods - the leading commodity in this context - inland shipping absorbs the major part of the market.

Significant growth potentials for inland shipping, apart from containers, exist for imported coal. Continued price increases for oil combined with the termination of domestic coal mining are expected to generate +52 million tons (+52%) increase of seaport hinterland transport volumes of this commodity until 2030. Other segments with good perspectives for inland shipping include: passenger cars, scrap metals, heavy lift cargo as well as biomass.

Energy consumption

Sound calculations of energy consumption by different transport modes must consider the specific conditions of transport. This includes: technical characteristics of vehicles, load factors of these vehicles, infrastructure characteristics and specific traffic conditions.

As to the future development of diesel fuel consumption by trucks/ truck-trailers, several estimates have been prepared. In TREMOD 2005 it is assumed that heavy trucks will, on the average, reduce their specific energy consumption by 18% in the period 2002 to 2020. In contrast, the handbook on emission factors of road traffic, assumes a slight increase of energy consumption per vehicle-km for 2020 compared to 2005, averaging all road types and all traffic situations.

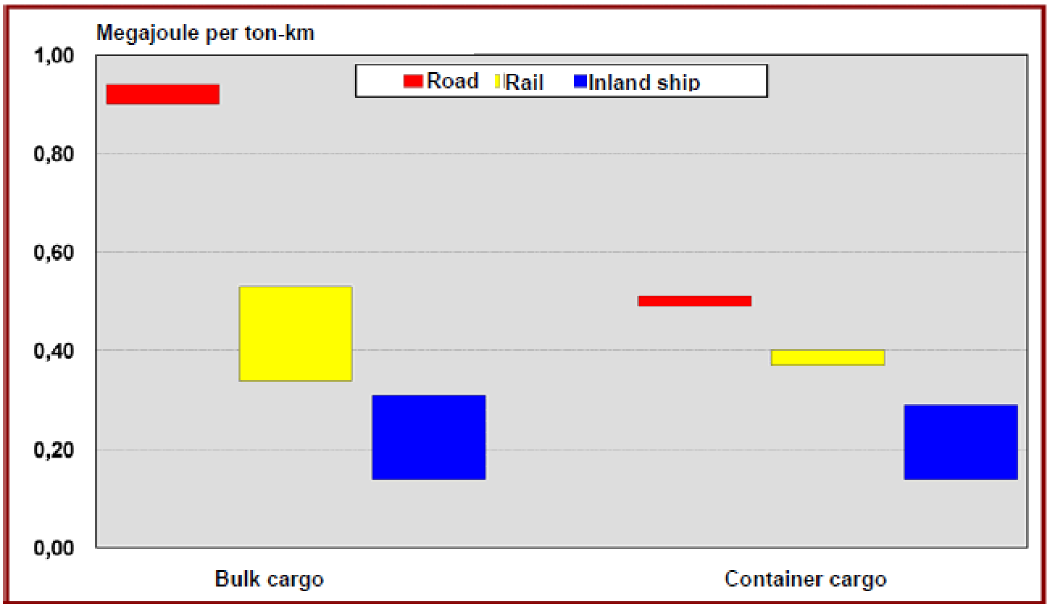
Aggregated values for the specific energy consumption in railway freight transport are available from various sources, for different definitions and dimensions. Specific conditions of different transport cases are not adequately reflected by such average figures. This is particularly relevant for purposes of comparison with inland shipping in bulk freight transport where applicable train weights are between 1,700 and 5,000 tons. Calculations of final energy consumption in railway freight transport, prepared in this study for selected origin-destination (OD) pairs, used the programme package Train Check which allows reflecting conditions of specific transport cases. Such specific conditions include: technical specifications of locomotives, number of wagons per train, train length, train gross weight, ratio of net to gross train weight, and train speed. Furthermore, specific conditions of selected routes (e.g. topography) and number of stops can be considered. As regards future specific energy consumption, TREMOD 2005 expects that new rolling stock will allow further savings. An average reduction by 1% per 5-years period is assumed averaging all types of trains and of operations. For the period 2005 to 2020 this corresponds to a total saving by 3%.

For inland shipping, too, it is essential to base energy consumption figures on differentiated calculations. Many publications have over-estimated these figures, particularly for bigger vessels. Such over-estimations are due to too simplified assumptions and averages. It is essential to base energy consumption calculations for inland shipping on realistic profiles of ship performance and velocity according to conditions of specific waterways. The interrelationship between energy input and vessel speed is reflected by a performance-speed diagram. A comparison of the Big Motor Vessel GMS (length 80-110m, width 11.45 m) with the vessel type Johann Welker (length 67-80m, width 8.2m) shows that the energy demand decreases for larger vessels, for a given draft, water depth and vessel speed. This is also valid for the specific energy consumption per freight ton. Assuming a uniform vessel draft of 2.5m, the Big Motor Vessel carries 490 resp. 790 tons more than smaller vessels of Johann Welker resp. Gustav Koenigs types, while needing less energy. Thus, there is a multiple advantage of bigger vessels. If waterways allow a draft of more than 2.5 m, then the advantage of bigger to smaller vessels per freight ton increases further. The additional freight more than outweighs the required additional energy input.

Existing studies also underestimate the potential for future reductions of specific energy consumption in inland shipping. The future structural change of the vessel fleet alone (with growing shares of more energy-efficient Big Motor Vessels) will allow a reduction of specific energy consumption until 2025 by 9%.

According to such differentiated comparative calculations for selected routes (O-D pairs), today’s inland shipping has the lowest specific energy consumption of the three considered modes. On seven of eight selected bulk freight routes, and on all chosen container routes, inland ship transport has a lower energy consumption than railway transport. The highest energy consumption occurs generally with truck transport.

Figure 6: Spread and Averages of Primary Energy Consumption on Selected Transport Relations



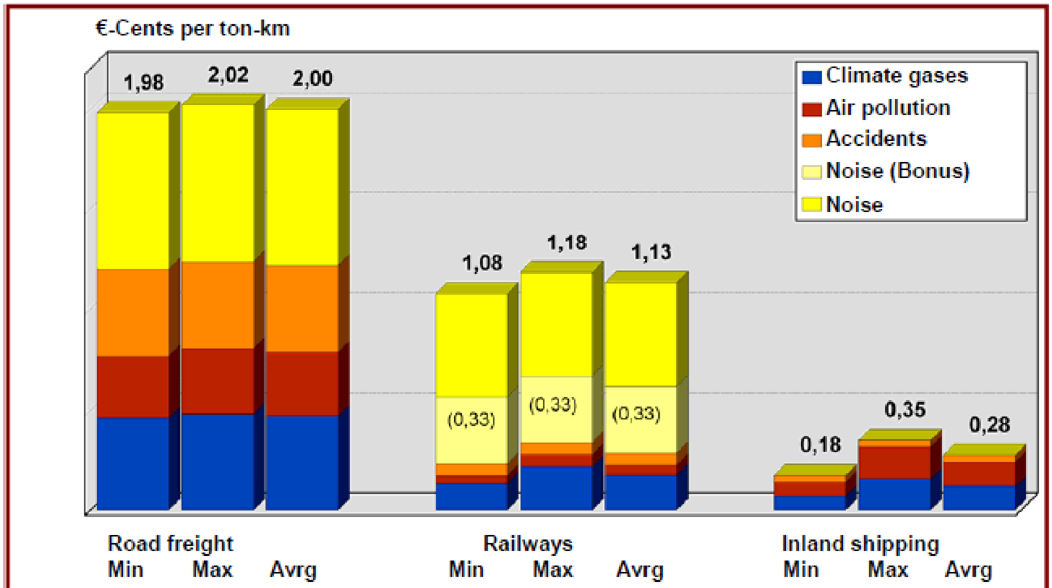
MAX	0,94	0,53	0,31	0,50	0,40	0,29
AVRG	0,92	0,43	0,23	0,50	0,39	0,22
MIN	0,90	0,34	0,14	0,49	0,37	0,14

External costs

When summarising the external costs from traffic noise, accidents, climate gas and air pollution, a clear advantage of inland shipping becomes obvious for all selected routes, for bulk freight as well as for containers. This advantage remains valid even if a bonus is assigned to railways regarding noise pollution.

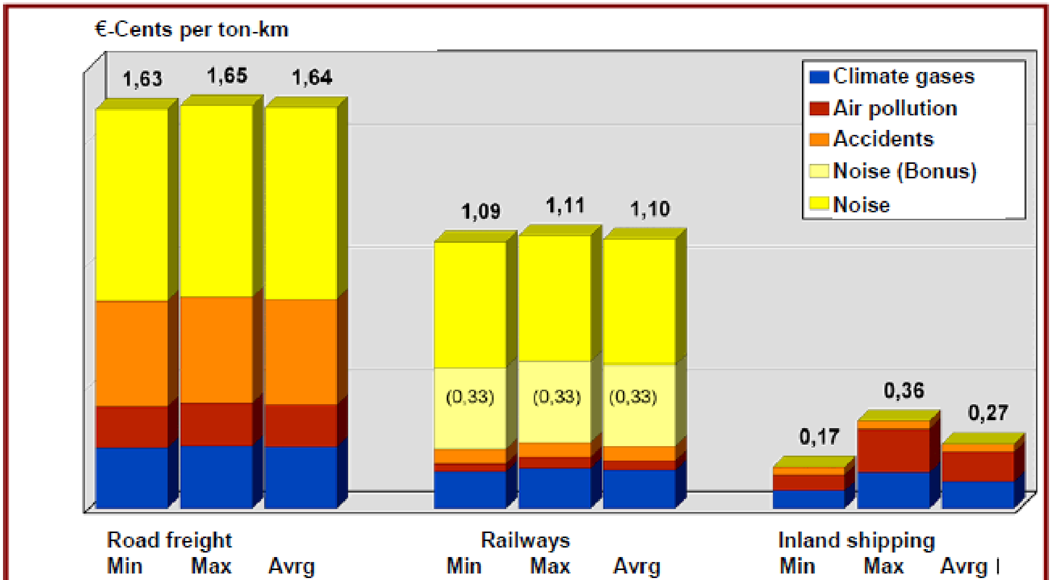
On bulk freight routes, the external costs of inland shipping are on the average by 83% lower than those of road transport, and by 70% lower than for railway transport. The spread of external costs, with minimum and maximum values, confirms this clear advantage of inland shipping. A similar picture results for container transport. Here, average total external costs of inland shipping are by 78% below those of road and by 68% below those of railway transport.

Figure 13: Spread and Average Values of All External Costs (Noise, Accidents, Climate Gases, Air Pollution) for Bulk Freight on Selected Routes



	Road freight Min	Road freight Max	Road freight Avrg	Railways Min	Railways Max	Railways Avrg	Inland shipping Min	Inland shipping Max	Inland shipping Avrg
Accid.	0,43	0,43	0,43	0,06	0,06	0,06	0,03	0,03	0,03
Noise	0,79	0,79	0,79	0,84	0,84	0,84	0,00	0,00	0,00
Air	0,31	0,32	0,32	0,04	0,06	0,05	0,07	0,16	0,12
Climate	0,46	0,48	0,47	0,14	0,22	0,18	0,07	0,16	0,12

Figure 14: Spread and Average Values of All External Costs (Noise, Accidents, Climate Gases, Air Pollution) for Container Freight on Selected Routes



	Road freight Min	Road freight Max	Road freight Avrg	Railways Min	Railways Max	Railways Avrg	Inland shipping Min	Inland shipping Max	Inland shipping Avrg
Accid.	0,43	0,43	0,43	0,06	0,06	0,06	0,03	0,03	0,03
Noise	0,79	0,79	0,79	0,84	0,84	0,84	0,00	0,00	0,00
Air	0,17	0,17	0,17	0,03	0,04	0,04	0,07	0,18	0,12
Climate	0,25	0,26	0,26	0,15	0,17	0,16	0,07	0,15	0,11

Transport costs

Comparative calculations were prepared for 13 selected routes. Those routes were defined so as to reflect a sufficient variety of real-life transport tasks and to allow meaningful conclusions. Both container and bulk freight cases are included. For bulk freight both liquid and dry commodities are considered. For all chosen routes, these different commodities play a typical role. As concerns inland shipping, the chosen routes permit to include all relevant categories of waterways, from unrestricted natural rivers to canals.

The calculations show for all selected bulk routes the highest cost for road transport compared to railways and waterways. The average road cost rate of € 36.29 per ton exceeds those of railways resp. waterways by a factor of 3.7 resp. 4.9. Even if - unrealistically – 100% return freight would be assumed for trucks, this disadvantageous position would not be lost.

When comparing railways and waterways transport, shipping has a, sometimes significant, cost advantage on 5 routes. For three routes railway transport is more advantageous, with a cost difference of 8.8% (for coal Rotterdam – Großkrotzenburg), of 10.9% (mineral oil products Hamburg – Hannover) and 32.8% (iron ore Rotterdam – Dillingen). On the average for all considered bulk freight routes the cost advantage of inland shipping compared to railway transport amounts to 25%.

Also with respect to the transportation of containers road transport shows disadvantages in comparison with rail and inland waterway transport. On average the costs associated with road transport are about 50% and 100% higher than the ones associated with rail and inland waterway transport, respectively.

When comparing different transport modes, not only the financial costs are of interest but also the economic costs from the national economy perspective. In this study, the term economic cost comprises both the transport cost to the economy and the external costs due to noise, accidents, climate gas emissions and air pollution. The calculation of economic transport costs uses the same basic data as for financial costs. But now, these financial costs are converted into economic rates according to the methodology of the German Federal Transport Investment Plan (BVWP) 2003. Mineral oil taxes, road or railway or canal tolls are now excluded.

To summarise, inland waterway transport has lower economic costs than the competing modes for all analysed routes, for bulk freight and for containers. Though having higher (external) costs of air pollution, this disadvantage is more than offset by lower other external costs. On only three of the analysed routes, waterway transport while having lower economic costs displays higher financial costs.

Figure 20: Financial Transport Cost of Transport Modes for Selected Bulk Freight Routes

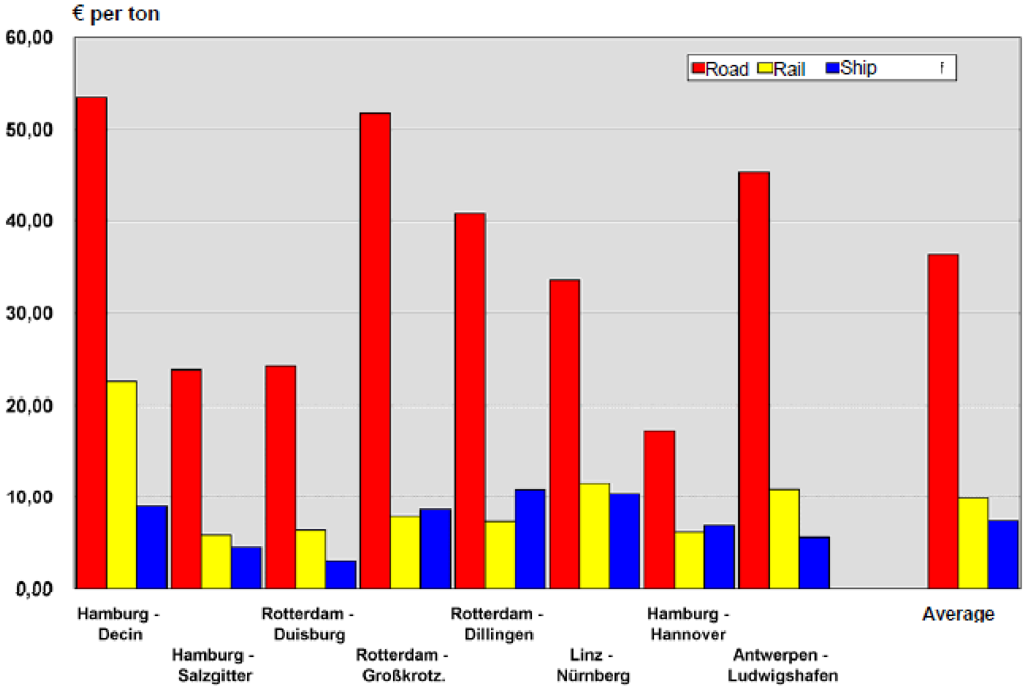
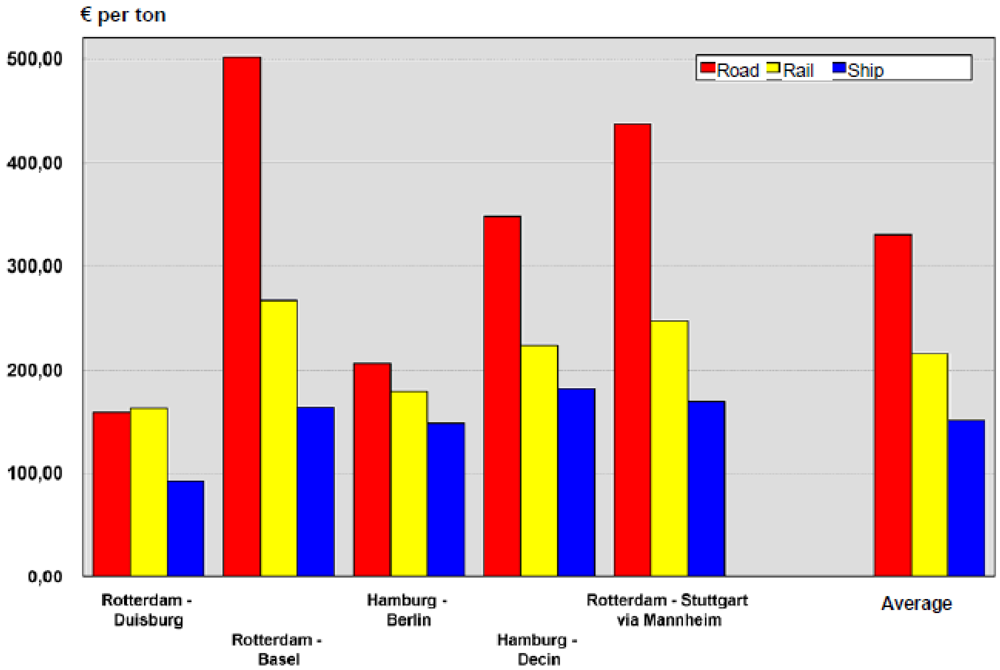


Figure 21: Financial Transport Cost for Selected Container Routes, by Modes of Transport



Specific aspects of inland shipping

Multiple use of waterways

The dominant use of waterways is for the transport of people or freight at low cost and without delay. While roads and railways have no important other functions, waterways also serve other purposes: flood abatement, potable water supply, wastewater disposal, irrigation, cooling water for power plants, fishery, support of ecological biotopes, recreation.

In contrast to asphalt bands of roads or permanent ways of railways, waterways can be habitat of multiple and valuable natural life, depending on their level of technical sophistication. This applies for natural waterways, but can also be the case, with restrictions, for artificial waterways (canals). This is substantiated by the high number of waterside registered FFH and EU bird protection areas, as parts of the European protected areas system NATURA 2000, and by the dense network, along waterways, of nature or landscape protection areas. Different from roads and railway lines, waterways are among the last retreats for protected and endangered species.

In the past, waterways played an important role for the development of industry, and hence of welfare, in many cities and regions. Still today waterways have a positive impact on regional development. This is also due to the manifold potentials of waterways to be used for waterbound tourism and recreation. In view of growing domestic tourism (with a recent growth rate of 2%) and of an increasing tendency to activate port and other waterside areas for recreation purposes, water tourism (esp. boat tourism and passenger shipping) has become an important factor for regional development. Municipalities located along waterways develop diverse recreation opportunities with a view at improving their location attractiveness. Waterways provide attractive opportunities for boat tourism, offering connections to European neighbour countries to the East and to the West, to the Mediterranean Sea and to the Black Sea. Several German regions offer waterway networks which are placed in beautiful landscapes and which offer excellent conditions for water sports and tourism. The German Federal Association of the Water Sports Industry (Bundesverband Wassersportwirtschaft e.V. BWVS) estimates that in Germany around 7 million people practice active water sports. The estimated number of people in Germany to develop such interest, due to their stated sport preferences, is even close to 32 million. Therefore further growth of this sector can be expected. Water sports generate new opportunities for employment and income. For several regions, water sports and tourism have become an important factor in economic development.

Angling and sometimes also professional fishing occur on practically all federal waterways. A socio-economic study concluded that the economic benefits from angling in Germany amount to € 6.4 billion per year. Approximately 52,000 jobs depend directly or indirectly on this activity.

Water management deals with water supply and distribution, wastewater treatment, water quality control, construction and maintenance of water bodies, and flood protection of societies. Technical tasks comprise construction works and operation, while water management is based on natural and socio-economic sciences. Federal waterways play an important role in the management of water basins. Households, industry, agriculture and other users are supplied annually with more than 17 billion m³ of water taken from waterways. Almost the same quantity - 16 billion m³ - is fed each year into the waterways. These figures do not include quantities supplied to small users. Therefore, real totals will be higher. Even so, the registered water quantity accounts for about half of total water intake and discharge in Germany.

Climate change and flood protection

Rivers and river basins as well as coastal regions are the object of multiple and sometimes conflicting uses. The use of waterways by the shipping industry is only one of these. This use requires reliable conditions for a safe, smooth and economical operation of vessels. This includes fairways which are as stable as possible and which offer sufficient depth and width at only moderate currents. Forecasts of regional climates and water flows indicate that climate change may lead to far reaching changes of hydrological and shipping conditions. This includes not only changes in water levels, but also in carried solid materials and temperature of river waters. Independent of how the probability of such scenarios and forecasts is assessed, there is a need for an early assessment of potential consequences. This is particularly necessary for federal waterways, because adaptive measures involve long-lived infrastructure requiring high investment volumes and therefore need early decisions. Today, technical changes at rivers only get the acceptance by societies if considering the needs of different interest groups. They must be based on inter-disciplinary cooperation. Construction measures taken by the water and shipping administration aim at improving navigation possibilities with low to normal water levels. Generally, they are planned and executed so as to at least maintain the existing level of flood protection. The impact from any physical changes of waterways on hydraulic and morphological conditions for flood discharge is analysed scientifically in order to find solutions which maintain the level of flood protection. Where necessary, this includes compensation measures, e.g. by reactivating retention potentials (de-sealing, removing dikes further away from rivers) or by deepening the river bed.

Relevance to green corridor development

The document contains a well described evaluation of the economical and environmental performance of road, rail and inland waterway transport, using a case-by-case approach accounting for the specific characteristics of inland waterway transport in Germany. The document may serve as valuable input for benchmarking of transport solutions in Germany. In particular, the document contains widely accepted information on emission factors for inland waterway transport. Further, the document describes several options in order to improve the environmental performance of inland waterway transport as well as specific aspects related to inland waterway transport to be taken into account in respective development activities.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Provision of improved fairway conditions	ID	Improvements in efficiency and environmental sustainability.
2	Improve fuel quality (low sulphur fuel)	IR	Reduction of exhaust gas emissions, precondition for the application of several emission reduction technologies.
3	Use diesel-water emulsion	TD	Reduction of exhaust gas emissions.
4	Use less carbon-intensive fuels	TD	Improvements in environmental sustainability. Effects on efficiency depend on costs of new fuels. Bio-fuels may increase NOx emissions and are not suitable for usage in existing engines.
5	Delay of fuel injection	TD	Reduction of NOx emissions at increased fuel consumption and PM emissions.
6	Optimisation of combustion chamber and injection system	TD	Reduction of either NOx or PM emissions.

7	Engine management	TD	Reduced NOx emissions at lower fuel consumption.
8	Exhaust gas recirculation	TD	Reduction of NOx emissions at increased PM emissions.
9	Humidification	TD	Reduction of NOx and PM emissions.
10	Selective non-catalytic reduction	TD	Reduction of NOx and PM emissions.
11	Selective catalytic reduction	TD	Reduction of NOx emissions.
12	Diesel oxidation catalyst	TD	Reduction of HC, CO and PM emissions.
13	Particulate matter filter	TD	Reduction of PM emissions.
14	Optimisation of hull form and propulsion system	TD	Reduction of fuel consumption and emissions.
15	Enlargement of hull dimensions	TD	Improvements in efficiency and environmental sustainability; only meaningful if suitable fairway conditions are available.
16	Optimisation of vessel utilization	TD	Improvements in efficiency and environmental sustainability.
17	Optimisation of vessel utilization	OP	Improvements in efficiency and environmental sustainability.
18	Energy efficient sailing (eco-sailing)	OP	Improvements in efficiency and environmental sustainability.

[1]***Field***				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 27		Partner: NTUA	
Document identity		Field[1]: IWT		Doc. date: 17.1.2006	
Doc. number:	COM(2006) 6	Study:		Regulatory act:	
Author:	European Commission	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:	X	In force:	
Title:	**An Integrated European Action Programme for Inland Waterway Transport**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0006:FIN:EN:PDF				

Objective(s)

The document sets out NAIADES, an integrated action programme that aims at bolstering the advantages of inland waterway transport and tackling a number of obstacles that may deprive it of certain opportunities.

Main findings / results achieved / summary of measures

The programme focuses on five interdependent strategic areas. These areas and their objectives are presented below, while the specific actions suggested are listed in the last section of this fiche:

- Markets
  - Attract new markets
  - Encourage entrepreneurship
  - Improve administrative and regulatory framework
- Fleet
  - Improve logistics efficiency, environmental and safety performance of IWT
- Jobs and skills
  - Attract workforce
  - Invest in human capital
- Image
  - Promote inland navigation as a successful partner in business
  - Set up and expand European IWT promotion and development network
  - Monitor trends and developments within the IWT market
- Infrastructure
  - Improve multi-modal network
  - Implement River Information Services

These key areas are rounded off by considerations for modernising the European organisational structure. However, all 4 options suggested were later on found ineffective and the idea was abandoned.

Relevance to green corridor development

Inland navigation is probably the most environmentally friendly surface transport mode. This fact, combined with the large free capacity of Europe's waterway infrastructure, renders IWT a valuable means of greening freight corridors.

However the sector faces a number of challenges: The fragmented market structure and strong competition have resulted in limited reinvestment ability. Combined with the longevity of vessels, this forms a high threshold for the modernisation of vessels. Because working conditions on board and career perspectives may not seem as attractive as in other areas, the sector faces a lack of skilled labour. Public authorities and even the transport and logistics industry are often unaware of the advantages of inland waterway transport. It is often not reflected in local and regional planning processes. The inland waterway and transhipment infrastructure still faces a limited number of strategic bottlenecks and suffers from a backlog of maintenance. Construction measures meet growing environmental concerns. Information and Communication technologies such as used in River Information Services still require further development.

NAIADES addresses these challenges, and as such is relevant to green corridor development.

Measures/changes suggested or introduced

The most important of the actions proposed are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Draw up State aid guidelines for support schemes	PP	The enhanced competitiveness of IWT against the other modes might lead to modal shift in favour of IWT
2	Reassess the potential of the Inland Waterway Reserve Fund and examine the possibility of additional sources of financing	PP	As above
3	Develop administrative one-stop-shops and IWT focal points	PP	Potential improvements in the efficiency, service quality and infrastructural sufficiency (in relation to administrative bottlenecks) KPI areas.
4	Screen for barriers in existing and new European and national legislation	PP	Direct improvements in infrastructural sufficiency (through addressing administrative bottlenecks), and indirect improvements on all other KPI areas
5	Harmonise manning requirements, vessels and boatmasters' certificates, intermodal documentation, liability, and loading units	PP	Improvements in efficiency, service quality and infrastructural sufficiency (through addressing administrative bottlenecks)
6	Improve environmental and safety legislation (incl. engine and cargo emissions, waste disposal, fuel quality, transport of dangerous goods)	PP	Improvements in safety and environmental sustainability
7	Support research & development	PP	Potential improvements in all KPI areas
8	Develop common framework for education and training standards	PP	Improvements in efficiency, service quality and social issues

9	Develop and support specific training programmes for IWT needs	PP	As above
10	Promote recruitment campaigns	PP	As above
11	Draw up an updated EU regulation on statistics of goods transport by inland waterways	PP	Support transparency and decision making by businesses and authorities
12	Establish a European Market Observation System	PP	As above
13	Create a Development Plan for improvement and maintenance of waterway infrastructures and transhipment facilities	ID	Potential improvements in infrastructural sufficiency
14	Assign a European Coordinator for TEN-T IWT projects	ID	As above
15	Issue a Directive on RIS	PP	Improvements in all KPI areas
16	Create a framework for internalising external costs of all transport modes	PP	The expected enhanced competitiveness of IWT against the other modes might lead to modal shift in favour of IWT

[1]Field				***[2]Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]Remember that the basic criteria for a green corridor are efficiency, quality and sustainability				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 34		Partner: NTUA	
Document identity		Field[1]: IWT		Doc. date: 7.9.2005	
Doc. number:		Study:		Regulatory act:	
Author:	European Parliament & Council	Research project:		Suggestion:	
On behalf of:	European Parliament & Council	Other doc.:		In force:	X
Title:	**Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonised river information services (RIS) on inland waterways in the Community**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:255:0152:0159:EN:PDF				

Objective(s)

The River Information Services (RIS) concept, which represents the most substantial change in the sector to date, is aimed at the implementation of information services in order to support the planning and management of traffic and transport operations. The RIS promise to transform inland waterway transport into a transparent, reliable, flexible and easy-to-access transport mode. Together with cost-effective and environmentally friendly logistics operations, the development of RIS makes inland waterway transport more attractive.

The Directive aims at a Europe-wide framework for the implementation of the RIS concept in order to ensure compatibility and interoperability between current and new RIS systems at European level and to achieve effective interaction between different information services on waterways. The Directive applies to all waterways of class IV or higher across the European Union.

Main findings / results achieved / summary of measures

RIS comprise a variety of services such as:

- Traffic information services: these consist of tactical traffic information (display of the present vessel characteristics and movements on a limited part of the waterway) and strategic traffic information (display of vessels and their characteristics over a larger geographical area, including forecasts and analyses of future traffic situations);
- Information on fairways: the information systems contain geographical, hydrological and administrative data that are used by boat masters and fleet managers to plan, execute and monitor a voyage (e.g., water levels, traffic signs, opening hours of locks.);
- Traffic management: this is aimed at optimising the use of the infrastructure as well as facilitating safe navigation. Currently, the "VTS centres" (vessel traffic service centres) are designed to improve the safety and efficiency of vessel traffic and to protect the environment;
- Calamity abatement services: these services are responsible for registering vessels and their transport data at the beginning of a trip and updating the data during the voyage with the help of a ship reporting system. In the event of an accident, the responsible authorities are capable of providing the data immediately to the rescue and emergency teams;
- Information for transport management: this information includes estimated times of arrival (ETAs) provided by boat masters and fleet managers based on fairway information making it possible to plan resources for port and terminal processes. Lastly, the information on cargo and fleet management basically comprises two types of information: information on the vessels and the fleet

and detailed information on the cargo transported;
- Statistics and customs services: the RIS will improve and facilitate the collection of inland waterway statistical data in the Member States;
- Waterway charges and port dues: the travel data of the ship can be used to automatically calculate the charge and initiate the invoicing procedure.

In order to set up RIS, the Member States must take the necessary measures to implement the River Information Services and the principles for their development. They must:

- supply to RIS users all relevant data concerning navigation on the inland waterways referred to in the previous paragraph;
- ensure that electronic charts suitable for navigational purposes are available to RIS users;
- enable, as far as ship reporting is required by national or international regulations, the competent authorities to receive electronic ship reports on the voyage and cargo data of ships;
- ensure that notices to boat masters, including water level and ice reports for the inland waterways, are provided as standardised, encoded and downloadable messages; the standard message must contain at least the information needed for safe navigation;
- establish RIS centers according to regional necessities;
- make available the VHF channels for the purposes of automatic identification systems as determined in the Basel agreement;
- encourage boat masters, operators or agents of vessels navigating on their waterways, shippers or owners of goods carried on board such vessels to make full use of these new services.

In order to ensure harmonised and interoperable implementation of RIS, guidelines and technical specifications need to be established. The guidelines will cover the technical principles and requirements for the planning, implementing and operational use of RIS and related systems.

Technical specifications are envisaged in particular for the Electronic Chart Display and Information System for Inland Navigation (Inland ECDIS), electronic ship reporting, notices to boat masters and vessel tracking and tracing systems such as AIS (Automatic Identification Systems).

Relevance to green corridor development

The wide spectrum of RIS services addresses all aspects of a green corridor. The traffic management services optimise the use of infrastructure and lead to more efficient and safer services. The exchange of transport management information assists integrating IWT in the transport chains and tackles a number of administrative bottlenecks. The fairway information allows optimising voyage planning, which in turn results in shorter transport times and less emissions. The calamity abatement services lead to safer services and reduce the adverse effects on the environment in the event of an accident. The statistics and customs services will enhance the monitoring of the corridor performance and lead to more effective decision making by both businesses and authorities.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Setting up of a harmonized, interoperable and integrated RIS system	TD, PP	Improvements in all KPI areas

SUPERGREEN Document Fiche		Number: 33		Partner: NTUA	
Document identity		Field[1]: IWT		Doc. date: 30.12.2006	
Doc. number:		Study:		Regulatory act:	
Author:	European Parliament & Council	Research project:		Suggestion:	
On behalf of:	European Parliament & Council	Other doc.:		In force:	X
Title:	**Directive 2006/87/EC of the European Parliament and the Council of 12 December 2006 laying down technical requirements for inland waterway vessels and repealing Council Directive 82/714/EEC**				
Related doc's:	Directive 2006/137/EC, Directive 2008/59/EC, Directive 2008/87/EC, Directive 2008/126/EC				
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:389:0001:0260:EN:PDF				

Objective(s)

This Directive is intended to promote European river transport by improving the technical harmonisation of vessels. It is designed to lay down a high level of safety equivalent to that for shipping on the Rhine. To achieve this, it provides for the introduction of a Community certificate for inland waterway vessels in each Member State, to be issued by the competent authorities, authorising them to operate on Community waterways including the Rhine.

Main findings / results achieved / summary of measures

The coexistence of various technical regulations on navigable waterways in the Community has long obstructed the free movement of vessels. This Directive is designed to strengthen the harmonisation of the requirements for issuing navigation certificates by the Member States.

The Directive applies to vessels of a length of 20 metres or more and a volume of at least 100 m^3. It also applies to floating equipment, tugs and pushers, and vessels intended for passenger transport carrying more than 12 passengers in addition to the crew. Ferries, naval vessels and warships are excluded from its scope of application.

The Community waterways concerned are classified in four navigable zones plus a zone R – the Rhine – which is covered by a special convention. The list of Community inland waterways characterised as Zones 1, 2, 3 and 4 is provided in Annex I to the Directive. Any Member State may change the classification of its waterways, subject to their being notified to the Commission at least six months in advance.

The minimum technical requirements applicable to vessels on inland waterways of Zones 1, 2, 3 and 4 are given in Annex II to the Directive. These include shipbuilding, engine design, electrical equipment and other technical requirements.

Exceptions are allowed: any Member State may, after consulting the Commission, authorise a reduction of the technical requirements of Annex II for craft operating exclusively in certain zones. Derogations are also possible in the case of vessels operating on waterways not linked to the waterways of another Member State or making limited journeys of local interest or in harbour areas. However, the Member States may also, under certain conditions, lay down additional technical requirements for vessels operating on their waterways.

Craft operating on Community waterways must also carry a Community certificate. Where they operate in zone R, they must have either a Community certificate or a certificate issued in accordance with the Revised Convention for Rhine Navigation. Community certificates are to be issued for craft laid down from 30 December 2008 onwards, following a technical inspection carried out prior to the craft being put into service and intended to check whether it complies with the technical requirements laid down in Annex II to the Directive. If the competent authorities find any infringements of the requirements, the craft may, provided that it does not constitute a manifest danger, continue to operate until such time as the non-compliant components or areas of the craft are replaced or altered. After that, the components or areas must meet the requirements of Annex II. Community certificates may be issued by the competent authorities of any Member State. It must draw up a list of its competent authorities and notify them to the Commission.

Relevance to green corridor development

The Directive's main contribution to green corridor development is in the safety and service quality of navigation operations through the harmonisation of standards for vessels sailing in the inland waterways of Member States. Furthermore, the harmonisation is expected to improve the efficiency of IWT, as it allows the free movement of vessels.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Obligation for vessels sailing in Member States inland waterways to carry an inland navigation certificate	PP	Improvements in efficiency, service quality and social issues.
2	Rules for issuing of the certificates (competent authorities) and carrying out of the technical inspections	PP	As above

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 32		Partner: NTUA	
Document identity		Field[1]: IWT		Doc. date: 30.9.2008	
Doc. number:		Study:		Regulatory act:	
Author:	European Parliament & Council	Research project:		Suggestion:	
On behalf of:	European Parliament & Council	Other doc.:		In force:	X
Title:	**Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:260:0013:0059:EN:PDF				

Objective(s)

The directive establishes a common regime for all aspects of the inland transport of dangerous goods, by road, rail and inland waterways within or between Member States. It includes the activities of loading and unloading, the transfer to or from another mode of transport and the stops necessitated by the circumstances of the transport.

Main findings / results achieved / summary of measures

The international transport of dangerous goods is regulated by the international agreements:

- ADR: the European Agreement concerning the International Carriage of Dangerous Goods by Road, concluded at Geneva on 30 September 1957,
- RID: the Regulations concerning the International Carriage of Dangerous Goods by Rail, appearing as Appendix C to the Convention concerning International Carriage by Rail (COTIF) concluded at Vilnius on 3 June 1999, and
- ADN: the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways concluded at Geneva on 26 May 2000.

The Directive extends these rules to national transport in order to harmonise across the Community the conditions under which dangerous goods are transported and to ensure the proper functioning of the common transport market. The Annexes of the Directive refer to the texts of these agreements.

The ADR, RID and ADN have drawn up a list of dangerous goods, indicating whether their transport is prohibited or not and defining the requirements for their transport if it is authorised. EU countries may request temporary derogations under certain conditions.

The directive shall not apply to the transport of dangerous goods:

- by vehicles, wagons or vessels belonging to or under the responsibility of the armed forces;
- by seagoing vessels on maritime waterways forming part of inland waterways;
- by ferries only crossing an inland waterway or harbour;
- wholly performed within the perimeter of an enclosed area.

EU countries have the right to regulate or prohibit, strictly for reasons other than safety during transport, the transport of dangerous goods within their own territory. They may also set down specific safety requirements for the national and international transport of dangerous goods within

their own territory with regards to: • the transport of dangerous goods by vehicles, wagons or inland waterway vessels not covered by this directive; • the use of prescribed routes, where justified, including the use of prescribed modes of transport; • special rules for the transport of dangerous goods in passenger trains.
Relevance to green corridor development
Harmonisation of the regulatory framework is desirable not only along green corridors, especially when it concerns safety and environmental protection matters.
Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Harmonisation of internal rules concerning the transport of dangerous goods with international agreements	PP	Improvements in cargo safety and environmental sustainability

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		**Number:**	**35**	**Partner:**	**NTUA**
Document identity		Field[1]:	IWT	Doc. date:	4.2.2009
Doc. number:		Study:	X	Regulatory act:	
Author:	Europe Economics	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Impact Assessment and Evaluation Study "Proposal for a Legal Instrument on the harmonisation of boatmasters' certificates in Inland Waterway Transport"**				
Related doc's:					
Web address:	http://ec.europa.eu/transport/inland/studies/doc/2009_harmonisation_of_boatmasters_certificates.pdf				

Objective(s)

The primary objective of this study is to assess a number of possible policy options concerning the harmonisation of boatmasters' certificates throughout the Inland Waterway Transport (IWT) network of the EU.

The main objectives of such intervention are summarised as follows:

- fostering access to the whole IWT network by suitably qualified EU boatmasters;
- reducing administrative costs and the duplication of resources linked to the lack of harmonised requirements;
- reinforcing the unity of the internal market with regard to IWT activity, with the aim of fostering properly functioning markets and effective competition;
- fostering labour mobility; and
- strengthening IWT as a viable mode of transport in the EU.

The report includes an inventory of the current situation, a gap analysis, the final results of the impact assessment (quantitative and qualitative), and findings on the comparison of the policy options.

Main findings / results achieved / summary of measures

The main findings show that the IWT sector in the EU suffers from a rather fragmented legislative and institutional framework. The main regulatory actors in the sector are the CCNR (Rhine Commission), the EU, the DC (Danube Commission) and the UNECE (United Nations Economic Commission for Europe), who each have a different (but to an extent overlapping) geographical scope, and whose legislation/resolutions set different requirements for boatmasters' qualifications.

Of the main actors, the CCNR has the smallest geographical scope but the highest harmonised requirements, whereas the UNECE has the biggest geographical scope but the lowest level of harmonisation.

Besides the different geographical scope, the different regulators also have different mechanisms to implement their decisions. For example, the CCNR Regulations and EU Directives are binding, whereas Danube Commission Recommendations and UNECE Resolutions are not.

Access to the Rhine is found to be the most critical issue with regards to boatmasters' activity in the

IWT sector. The current regime results in significant entry barriers in the most important river for IWT, the Rhine.

The following policy options were examined by the study:
- Option A: maintenance of the current situation – non EU action/intervention;
- Option B: the promotion of voluntary action;
- Option C: mandatory action through new or revised EU legislation – Directive – distinguished between:
  - C(a) "harmonisation at the highest standards" and
  - C(b) "modular approach";
- Option C1: directive to enforce the mutual recognition of boatmasters' certificates; and
- Option D: mandatory action through new EU legislation – Regulation.

The main impacts considered were:
(a) Economic impacts: competitiveness of SMEs, competition in the internal market,
(b) Social impacts: labour market impacts, especially in terms of job opportunities, and safety impacts
(c) Environmental impacts: changes in emissions and effects on local environment

The following table summarises the impacts of the options examined. Impacts are indicated as very positive (++), positive (+), neutral (=), negative (-), and very negative (--). As promotion of voluntary action is currently under way, option B was defined as the "counterfactual" scenario against which the impacts of the other options were assessed.

Options	SME's competitiveness	Annual Cost	Competition	Safety	Job Opportunities	Environment
A	(-)	(=)	(-)	(=)	(-)	(-)
B						
C(a)	(+)	(-)	(+)	(+)	(+)	(+)
C(b)	(+)	(=)	(+)	(=)	(+)	(+)
C1	(++)	(-)	(++)	(=)	(++)	(++)
D	(+)	(--)	(+)	(+)	(+)	(+)

Source: Europe Economics

The study recommends option C1, i.e. to amend Council Directive 96/50 to enforce the mutual recognition of boatmasters' certificates across the entire EU inland waterway network.

Relevance to green corridor development

The suggested harmonisation is expected to reduce administrative costs and foster competition and labour mobility adding to the efficiency of IWT, which in turn might contribute to increased shares of inland navigation vis-a-vis the other transport modes. It is therefore positive towards green corridor development.

Measures/changes suggested or introduced

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Amend Council Directive 96/50 to enforce the mutual recognition of boatmasters' certificates across the entire EU inland waterway network	PP	The impact analysis shows very positive implications for competition, SMEs' competitiveness, job opportunities and the environment.

SUPERGREEN Document Fiche		Number: 57		Partner: NTUA	
Document identity		Field[1]: IWT		Doc. date: September 2008	
Doc. number:	R20080210	Study:	X	Regulatory act:	
Author:	Visser J.A. (NEA)	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**Final Report for the "Study on Administrative and Regulatory Barriers in the field of Inland Waterway Transport" – Part A**				
Related doc's:	Final Report for the "Study on Administrative and Regulatory Barriers in the field of Inland Waterway Transport" – Part B				
Web address:	http://www.naiades.info/platina/downloads				

Objective(s)

The main objective of the study was to make a comprehensive assessment of administrative and regulatory barriers that currently exist in the European Inland Waterway Transport (IWT) industry and obstruct the proper functioning of the market and the entry of new businesses. More specifically the study aimed to:

1. detect and identify the main regulatory, administrative and other constraints which restrain companies active or planning to become active in the fields of inland waterway transport, from developing their activities;
2. analyse the barriers which have been identified and make an assessment with regard to the reason, justification and necessity; and
3. propose general directions for solutions and future actions, as appropriate, of the European Commission, the Member States and regional/local authorities to remove/mitigate the detected barriers.

Main findings / results achieved / summary of measures

Administrative barriers arise in particular from the information requirements imposed upon market parties by the enforcement of regulations. When such requirements are particularly burdensome or obstructive or otherwise hamper operators or shippers in business activities they are called administrative barriers.

Regulatory barriers are barriers arising from existing rules and regulations that currently hamper the functioning of the EU internal market in inland waterway transport. This means that barriers are obstacles that interfere with basic freedoms and rights of parties in a free market or with equal competition in the market. In this study the terms rules and regulations are taken in a broad sense, i.e. they are not confined to types of legislation or rules imposed by authorities but may also refer to types of regulations that market parties impose on themselves (e.g. forms of self-regulation in the market).

It turned out that respondents were not always able to separate administrative and regulatory barriers from other types of barriers. All together in the field well over 180 barriers (182) were identified. It was found however that only a subset of these (136 to be precise) could be characterised as either "administrative" or "regulatory", the rest consisted of other types of problems with markets, enforcement, legislation or infrastructure. In general the perception of many operators and shippers was that the barriers have increased in the past few years.

While there has been a substantial reduction of barriers as a consequence of freeing the market in the 1990s, many new types of barriers have emerged again. In particular the category of problems related to various developments in society (increased environmental, food safety, security concerns etc) has increased in the past few years. Amongst others, ten new barriers encompass quality systems, waste transport requirements, dangerous goods treatment etc. In many cases the rules/ administrative requirements in this new category are to a large extent of a commercial nature (forms of self regulation of other market parties).

The most important barriers (problems) identified are summarised below:

1. Financing of investments

It was found that in almost all country studies barriers were identified related to the financing of investments in vessels and also in a number of countries barriers seem to exist with regard to insurance of vessels. Problems mentioned with respect to financing were amongst others:

- Lack of harmonization of the conditions of financing and insurance between countries;
- Problems with convincing banks of profitability prospects;
- Limited experience of banks on IWT industry;
- Lack of support of authorities (e.g. with regard to taxes, to subventions, to state guarantees etc.).

2. Inland ship certification

Related to inland ship certification, it was found that in a number of countries companies are not satisfied with the performance of the inspection authorities. Instances of long delays in obtaining certificates, mistakes and errors were noted in various countries. These problems are considered to be a significant barrier in a market that has occasionally shown signs of overheating.

3. Lack of competent personnel

In most countries the lack of competent personnel is mentioned as a significant barrier to the industry. It is interesting to observe that countries in Western Europe sometimes think that migration of staff recruited from new Member States might be a solution to the problem in the future, while it is clear that these new Member States have an equal, if not even worse problem with staff shortages (because of the "drain" of staff to Western Europe).

4. Lack of standard/ harmonised job profiles

The lack of standard/harmonised job profiles corresponding to manning/crew requirements was also seen as a barrier in some countries and, also related to type of barriers, the problem of non-compliance with regulation on resting and sailing times was mentioned by a number of countries to be a significant barrier. This is also a barrier which tends to make competition between companies unfair.

5. Infrastructure

Although many barriers were mentioned related to infrastructure, few qualified as regulatory or administrative. The most important ones which do so and which are common barriers are problems with local or port authorities: port dues, limiting opening times of ports or facilities in port and reducing the number of facilities (e.g. rest areas in ports) and problems with infrastructure planning processes.

6. Cargo

Many barriers that were mentioned in the country studies are related to cargo. They refer e.g. to the "burdensome" requirements which operators have to fulfil in the transport of liquid cargo (EBIS, ISO systems, animal feed (GMP) and waste transport (differs per country)) in order to be put on a list of companies out of which the transport companies are selected with which shippers negotiate contracts.

Overview of 1st category barriers

The table below provides an overview of barriers which do affect the entire European IWT sector and all market segments, and therefore considered as the most important barriers (named 1st category barriers within the study). In the Type column, R is for the Regulatory and A for the Administrative barrier.

Table: List of 1st category barriers

Barrier	Type	Effects	Solution
1. Procedures to obtain and keep necessary certificates are time consuming and inefficient	A	Time consuming and cost increasing	8, 14
2. Differences in implementation and interpretation of legislation	R	Unequal./ unfair competition and cost increasing	8
3. Existence of different regimes for boat masters' licences, crew size and composition and qualification; Current rules are too costly and inflexible with respect to staffing.	R	Time consuming, cost increasing and limited labour market mobility	2
4. Differences between countries with regard to loading and unloading conditions and outdated low water tariffs	R	Time consuming, cost increasing and a lack of transparency	8
5. New types of engines that comply with emission norm are not available in time and/ or are very expensive.	R	Cost increasing	10
6. There is a lack of a harmonized language within IWT	A	Time consuming, cost increasing and safety risks	
7. Procedures and processes in ports (European-wide) are time consuming	A	Time consuming and cost increasing	3
8. Non- compliance with existing working and resting time regulations by a significant number of enterprises.	R	Safety risks and unequal competition	14, 15, 16
9. Large differences in port dues canal fees, and calculation is not transparent	R	Cost increasing	4
10. Interest of IWT in local infrastructure planning +erosion/ disappearance of port activities and berths		Loss of market share (reversed modal shift)	
11. Unequal conditions for the purchase of vessels/ modernization of the fleet	R	Cost increasing and unequal competition	1

Overview of 2nd category barriers

The next table provides an overview of the barriers which affect only certain market segments across the EU. Because their smaller 'market scope' compared to the previous ones (it generally does not cover the entire EU but only specific geographic areas), the following barriers are considered as 2nd category barriers.

Table: List of 2nd category barriers

Barrier	Type	Effects	Market segment	Solution
12. The process to obtain a GMP certificate and differences in procedures with other European countries	A	Time consuming, cost increasing and unequal competition	animal feed	8
13. Certificate, confirming that ship owner is an EU citizen for cabotage has to be renewed every 12 months	A	Cost increasing	cabotage	17
14. Obligatory cargo documents in transport of non hazardous goods, especially container transport	R	Time consuming and cost increasing	containers	8
15. Introduction of security measures based on ISPS	A	Time consuming and cost increasing	dangerous goods and container transports	3, 6, 14, 15
16. Recovery of VAT/ difficulty in reclaiming VAT-taxes from European countries.	A	Time consuming, cost increasing and unequal competition	international	5
17. Discrepancy in legislation as tank vessels are obliged to follow ADNR-regulation while landside installations are not obliged to follow ADNR	R	Cost increasing, inconvenient working conditions and safety risks	tankers	18, 19
18. Phasing out of mono hull tankers by double hull tankers	R	Cost increasing and pressure on tariffs by creating overcapacity in the market	tankers	19
19. Market prospects tanker shipping in view proposals to reduce the consumption of fossil fuels	R	Future decrease of revenues, low value of vessels and low market entry	tankers	
20. Non-harmonized procedures for allowance of waste transport by inland vessels and a lack of clarification in the 'waste materials of vessels agreement'	A	Time consuming, cost increasing and unequal competition	waste transport	1 and 8

Overview of 3rd category barriers

The next table provides an overview of the barriers which do affect certain river basins or group of countries. These barriers can be considered as 3rd category barriers as the geographical scope is relatively small, however with an influence on all market segments.

Table: List of 3rd category barriers

Barrier	type	Effects	Geographical scope	Solution
21. Loading and unloading in Danube ports requires very much time	R	Cost increasing and time consuming	Danube	3
22. Imbalanced requirements applied within the licensing procedure along the Rhine versus Danube (i.e. Slovak papers are not valid in the Rhine area)	R	Competitive disadvantages	Danube countries	1
23. Old vessels that not comply to Rhine shipping rules will be difficult to sell in 2010	R	Cost increasing	Rhine corridor	6
24. Use of recognised list of doctors for medical certificates for crew/ not allowing Eastern European doctors to sign certificates	R	Cost increasing	Rhine corridor	8
25. Delays because of control procedures and administrative hindrances at the borders	A	Time consuming and cost increasing	Borders with Austria, Serbia, Croatia, Hungary, Romania, Ukraine	3, 7, 9

Additional country barriers have been identified for France (4 barriers) and Germany (3 barriers). Among them, the 35 hours law of France is pointed out as limiting the normal work duration per week and resulting in high costs and unequal competition between and within modes and countries.

A number of actions/measures that could be taken to solve or at least mitigate the impact of problems are possible and have been proposed in the last part of the study. The most important of them are listed in the last section of this fiche and are not repeated here.

Relevance to green corridor development

The removal or mitigation of administrative and regulatory barriers, which is the subject of this document, is probably the fastest and least expensive means of greening a corridor. In general, the abolishment of administrative bottlenecks results in better use of existing infrastructure, which in turn leads to improvements in efficiency, service quality and environmental performance, all of which are key indicators of a green corridor.

Measures/changes suggested or introduced

The most important of the measures suggested are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Harmonise certificates	PP	Improvements in efficiency, service quality and environmental performance through better utilisation of vessels
2	Harmonise rules on loading and unloading conditions	PP	Improvements in all KPI areas through better use of infrastructure and better integration of IWT in transport chains
3	Introduce an EU-wide transparent	PP	Improvements in efficiency and possibly environmental performance through setting

	scheme of low water tariffs		prices that reflect actual costs
4	Agree on uniform crew requirements across the entire EU, e.g. including domestic markets and waterways currently exempted.	PP	Improvements in efficiency through enhanced competition
5	Agree upon broader (e.g. worldwide) standards for IWT-engine specifications	TD, IR	Improvements in environmental sustainability through enabling a more rapid implementation of clean engine technologies in IWT
6	Introduce a uniform and transparent EU scheme for port dues and canal fees, i.e. based on marginal costs pricing principles	PP	Improvements in efficiency and possibly environmental performance through setting prices that reflect actual costs
7	Introduce security measures based on ISPS	PP	Improvements in security
8	Harmonise rules on border procedures	PP	Improvements in all KPI areas through reduction of administrative bottlenecks that hamper IWT's competitive position in relation to the other modes of transport.
9	Transform frequently used documents into an international multilingual database	PP	Improvements in efficiency and service quality through reduction of administrative costs and transport time respectively
10	Lengthen terminal opening times and reduce preferential treatment of sea transport vessels	OP	Improvements in all KPI areas through better use of infrastructure. Adverse effects on the performance of sea going vessels in case of changing priority rules.
11	Accelerate expansion plans of ports and increase the number of terminals	ID	Improvements in all KPI areas through addressing infrastructure capacity problems. Adverse effects on land-use in case of expansions of port facilities.

[1]*Field*				[2]***Nature of measure / change***	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
[3]***Remember that the basic criteria for a green corridor are efficiency, quality and sustainability***				Operations	OP
				Other (please specify)	OTH

Appendix IX. Urban transport

European Commission (2009d). *Action Plan on Urban Mobility*. Communication from the Commission, COM(2009) 490, Brussels, 30.9.2009.

Allen, J. et al. (2007). *BESTUFS Good Practice Guide on Urban Freight Transport*. BESTUFS II project, 2007.

STRATEC S.A. et al. (2005). *CITY FREIGHT: Inter - and Intra - City Freight Distribution Networks.* Final report of CITY FREIGHT project, April 2005.

SUPERGREEN Document Fiche		Number: 14		Partner: NTUA	
Document identity		Field[1]: URB		Doc. date: 30.9.2009	
Doc. number:	COM(2009) 490	Study:		Regulatory act:	
Author:	European Commission	Research project:		Suggestion:	
On behalf of:	European Commission	Other doc.:	X	In force:	
Title:	**Action Plan on Urban Mobility**				
Related doc's:					
Web address:	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0490:FIN:EN:PDF				

Objective(s)

This Action Plan sets out a coherent framework for EU initiatives in the area of urban mobility while respecting the principle of subsidiarity. This is done by encouraging and supporting the development of sustainable urban mobility policies that help to achieve the general EU objectives, for example through fostering the exchange of best practice and providing funding.

Main findings / results achieved / summary of measures

The Action Plan proposes short and medium-term practical actions to be launched progressively until 2012, addressing specific issues related to urban mobility in an integrated way. The actions proposed in the Plan, centred on six themes, are listed below:

- Theme 1 — Promoting integrated policies
  - ✓ Action 1 — Accelerating the take-up of sustainable urban mobility plans
  - ✓ Action 2 — Sustainable urban mobility and regional policy
  - ✓ Action 3 — Transport for healthy urban environments
- Theme 2 — Focusing on citizens
  - ✓ Action 4 — Platform on passenger rights in urban public transport
  - ✓ Action 5 — Improving accessibility for persons with reduced mobility
  - ✓ Action 6 — Improving travel information
  - ✓ Action 7 — Access to green zones
  - ✓ Action 8 — Campaigns on sustainable mobility behaviour
  - ✓ Action 9 — Energy-efficient driving as part of driving education
- Theme 3 — Greening urban transport
  - ✓ Action 10 — Research and demonstration projects for lower and zero emission vehicles
  - ✓ Action 11 — Internet guide on clean and energy-efficient vehicles
  - ✓ Action 12 — Study on urban aspects of the internalisation of external costs
  - ✓ Action 13 — Information exchange on urban pricing schemes
- Theme 4 — Strengthening funding
  - ✓ Action 14 — Optimising existing funding sources
  - ✓ Action 15 — Analysing the needs for future funding

▪ Theme 5 — Sharing experience and knowledge ✓ Action 16 — Upgrading data and statistics ✓ Action 17 — Setting up an urban mobility observatory ✓ Action 18 — Contributing to international dialogue and information exchange ▪ Theme 6 — Optimising urban mobility ✓ Action 19 — Urban freight transport ✓ Action 20 — Intelligent transport systems (ITS) for urban mobility
Relevance to green corridor development Most long-distance freight transport starts and ends in urban areas and passes through several urban areas on its way. The provision of efficient interconnection points for the trans-European transport network and efficient 'last mile' delivery is then important to the competitiveness and sustainability of the entire transport chain, which is the overall objective of green corridors.
Measures/changes suggested or introduced The measures that are more likely to have a direct or indirect affect on the Green Corridor development are the measures under Theme 1, Theme 3, Theme 4, and Theme 6.

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Incorporate freight transport in urban planning	PP	Improvements in all KPI areas through more efficient and environmentally friendly 'last mile' delivery
2	Develop and deploy ITS applications in urban areas	TD	As above
3	Support research and technological development aiming at market introduction of lower and zero emission vehicles and alternative fuels	TD	Improvements in environmental sustainability
4	Analyse needs for future funding of urban mobility improvements	PP	Improvements in all KPI areas through more efficient and environmentally friendly 'last mile' delivery

[1]*Field*				[2]*Nature of measure / change*	
Strategic issues	STR	Maritime	MAR	International regulation	IR
Policy issues	POL	Ports	PORT	Public policy	PP
Infrastructure	INFR	Inland waterways	IWT	Infrastructure development	ID
Logistics	ALL	Urban	URB	Technology development	TD
Rail	RAIL	Non-EU, all modes	NEU	Trend in logistics	TL
Road	ROAD			Business environment	BE
				Operations	OP
				Other (please specify)	OTH

SUPERGREEN Document Fiche		Number: 1		Partner: NTUA	
Document identity		Field[1]: URB		Doc. date: 2007	
Doc. number:		Study:		Regulatory act:	
Author:	Allen, J. et al.	Research project:	X	Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**BESTUFS Good Practice Guide on Urban Freight Transport**				
Related doc's:					
Web address:	http://www.bestufs.net/download/BESTUFS_II/good_practice/English_BESTUFS_Guide.pdf				

Objective(s)

The European Commission established the Co-ordination Action (CA) on BEST Urban Freight Solutions II (BESTUFS) in 2004 as a follow-up initiative to the Thematic Network (TN) BEST Urban Freight Solutions (2000-2003). BESTUFS II had a duration of 4 years (concluded in 2008) and aimed to maintain and expand an open European network between urban freight experts, user groups/associations, ongoing projects, the relevant EC Directorates and representatives of national, regional and local transport administrations and transport operators in order to identify, describe and disseminate best practices, success criteria and bottlenecks of urban freight transport solutions.

Main findings / results achieved / summary of measures

The main results achieved within the BESTUFS II on urban freight transport are listed below:

- ✓ Policy and research recommendations relevant to:
    1. Urban Consolidation Centres
    2. Last Mile Solutions
    3. Urban freight in small and medium sized cities
    4. Urban waste logistics
    5. Port cities and innovative urban freight solutions
    6. Managing urban freight transport by companies and local authorities
- ✓ Best Practice Handbooks on:
    1. Waste transport logistics in urban areas
    2. Experiments and incentives for environment-friendly vehicles
    3. Control and Enforcement in Urban Freight Transport
    4. City Access Restriction Schemes
- ✓ Data collection, modelling approaches and application fields for urban commercial transport models
- ✓ BESTUFS II Good Practice Guide (in 17 languages)
- ✓ Quantification of Urban Freight Transport Effects

The project identified a variety of best practices (best solutions) with regard to urban freight transport. Among these solutions there are many which promote the efficiency and quality of urban freight services and may also have environmental benefits.

The Good Practice Guide on Urban Freight Transport which is available in 17 languages (all version can be found in the project's website) identifies the best practices for urban freight transport and presents them in the following categories:

1. Goods vehicles access and loading in urban areas;
2. Last mile solutions; and
3. Urban consolidation centres.

There is an extended list of solutions provided within this document the vast majority of which has some contribution to corridor greening. The most representative of these solutions are presented in the last section of this fiche and are not repeated here.

Relevance to green corridor development

The document provides a number of practical solutions to problems associated with 'last mile' deliveries in dense urban areas. As such it contributes to the implementation of green corridors, most of which involve such an operation.

Measures/changes suggested or introduced

The most representative of the solutions proposed by the document are listed below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Install urban transhipment platforms (Nearby delivery areas – street spaces dedicated to (un)loading light trucks serving nearby shops)	ID	Reduction of congestion, noise and pollution associated with deliveries at areas of dense traffic.
2	Create Low Emission Zones	PP	Improvements in environmental sustainability and social issues (noise), if combined with rigid enforcement
3	Promote night freight deliveries	PP	Reduction of day time congestion and the associated emissions, and gains in efficiency (through the need for smaller fleets), provided that the measure is accompanied by new noise standards for night time operations
4	Deploy ITS applications for urban goods transport	TD	Improvements in all KPI areas
5	Home shopping via e-commerce	BE	Increase in direct deliveries, increase of demand intensity in terms of frequency, decrease of consignment size, increased demand for flexible and agile transport services
6	Create Urban Consolidation Centres (UCC)	ID	Efficiency, environmental and social benefits through better utilization of more suitable and less disturbing vehicles concerning 'last mile' deliveries. Potential cost (and time) penalty from introducing an additional point into the supply chain.

SUPERGREEN Document Fiche		Number: 53		Partner: NTUA	
Document identity		Field[1]: URB		Doc. date: April 2005	
Doc. number:		Study:		Regulatory act:	
Author:	STRATEC S.A. et al.	Research project:	X	Suggestion:	
On behalf of:	European Commission	Other doc.:		In force:	
Title:	**CITY FREIGHT: Inter - and Intra - City Freight Distribution Networks**				
Related doc's:					
Web address:	http://www.cityfreight.eu/Site-fichiers/Project_results/CF_WP9_Finalreport.pdf				

Objective(s)

The document is the final report of the CITY FREIGHT project, funded by the European Commission under FP5. The main objective of the project was to carry out a comparative analysis of urban freight effects on different cities and situations in Europe and evaluate their socio-economic and environmental impacts with a common assessment methodology. The project examined 23 initiatives developed in 14 cities of 7 countries (Belgium, Finland, France, Italy, The Netherlands, Spain and the U.K.). Apart from a description of the existing problems and the selected solutions, benefits and drawbacks per initiative are also described. Best practice guidelines are drawn and recommendations are made.

Main findings / results achieved / summary of measures

Among all urban freight related problems studied by the project, the following are the most relevant to green corridor development:

- ✓ Congestion;
- ✓ Lack of adequate (un)loading and parking places for goods vehicles;
- ✓ Fragmented goods flows increasing traffic;
- ✓ Historical city centres with narrow streets and other obstacles;
- ✓ Neglect of freight transport issues in town and traffic planning;
- ✓ Environmental impacts of freight transport.

One of the objectives of the project was to develop a decision-support tool to help cities select the best/most successful initiatives for the urban freight problems and challenges they experience. Concerning the best practice selection process, the project pointed out the following:

- Best or Good Practice could be defined as “the customers’ satisfaction with the highest profit”.
- Best Practice also has to consider aspects like environmental protection and natural resources conservation.
- There is no absolute Best Practice; Best Practice often depends on the framework conditions which can make the transferability of results difficult.

The most important lessons learned from project are the following:

- The solution chosen for a certain problem related to urban freight distribution influences, and therefore should take into account, the interrelationships that exist between actors, the urban context and the distribution model.

- There are no best practices solutions for problems related to urban freight, however there are recommendations for a best practice project and process approach.

Relevance to green corridor development

The document provides a number of practical solutions to problems associated with 'last mile' deliveries in dense urban areas. As such it contributes to the implementation of green corridors, most of which involve such an operation.

Measures/changes suggested or introduced

A collection of some characteristic measures that were proposed for the cities under examination is presented below:

No	Description of measure/change	Nature[2]	Effects on greening transport corridors[3]
1	Create Urban Distribution Centres	ID	Efficiency, environmental and social benefits through better utilization of more suitable and less disturbing vehicles concerning 'last mile' deliveries. Potential cost (and time) penalty from introducing an additional point into the supply chain.
2	Introduce clean vehicles for city freight	TD	Improvements in environmental performance
3	Employ low noise vehicles and cargo handling equipment	TD	Reduction of noise levels
4	Restrict access to goods vehicles (per tonnage)	PP	Improvements in environmental sustainability and social issues (noise), if combined with rigid enforcement
5	Introduce off peak and night deliveries	PP	Reduction of day time congestion and the associated emissions, and gains in efficiency (through the need for smaller fleets), provided that the measure is accompanied by new noise standards for night time operations
6	Designate unloading places for delivery vehicles	ID	Reduction of congestion, noise and pollution associated with deliveries at areas of dense traffic
7	Deploy ICT applications in city freight	TD	Improvements in all KPI areas

Appendix X. More KPIs

The corridor benchmarking methodology presented in SuperGreen Deliverable D2.2 [Pålsson et al (2010)] foresees the possibility of identifying further input on methodological issues and indicators during the extensive literature survey of Task 2.3. This appendix presents additional references to methodologies and indicators used for benchmarking transport operations, which have not been covered in previous project deliverables. It mainly draws from work that NTUA has performed in the context of the Centre of Excellence in Ship Total Energy-Emissions-Economy, supported by The Lloyds Register Educational Trust ("Track 3: Modelling of emissions along the intermodal supply chain").

1. The MTCP report on performance benchmarking of freight transport across modes

This report deals with benchmarking service performance in the area of freight transport across modes from the perspective of transport users. Based on desk research on existing literature, studies and projects, the report makes an inventory of existing tools for the benchmarking of different modes, i.e. short sea shipping, rail and inland waterways from a multimodal door-to-door perspective, and road from a unimodal perspective.

The report presents the KPIs extracted from the following five studies:

A. FTA Study "Service Performance Indicators for Short Sea Shipping (2001)

Eight service performance indicators (SPIs) for SSS were chosen in this study:

- The booking
- Pick-up shipment
- Deliver shipment to terminal
- Terminal handling and the voyage I
- Terminal handling and the voyage II
- Collect shipment from terminal and deliver to consignee I
- Collect shipment from terminal and deliver to consignee II
- Collect shipment from terminal and deliver to consignee III

However, they are considered insufficient because important aspects like costs, external costs or safety are not regarded.

B. Performance Indicators in the Netherlands

The following lists show indicators which were proposed in the Netherlands by various target groups:

Policy makers:

Aggregate performance indicators	Journey time index Average cost index Reliability index
Environmental performance of different modes / modal combinations	Emissions (NOx, CO_2) Fuel consumption

Efficiency and use of infrastructure	Average use of road, IWT and rail network Length of road, IWT and rail network Average travel speed on road, IWT and rail network Growth and growth potential of road, IWT and rail network Congestion/risk Costs of maintenance and repair of the road, IWT and rail network
Safety per mode	Number of deaths/accidents
External costs (per mode)	Infrastructure costs; safety; noise; emissions

Shippers:

Relative performance of the intermodal chain	Total logistic costs (production, sales, collection, storage, transport) Transit time from true origin to final destination Reliability; flexibility; risk of damage

Semi-public organizations:

Terminal efficiency	Handling time per container Number of container cranes TEU per container crane Movements per hour Crane-intensity Movements per crane-hour Net crane-productivity
Use of space	Stackable height Deposit area Total container area in hectares
Handling cost and revenue	Cost per container per handling Cost per container for stacking Cost for renting the container Revenue per container
Service level	Reliability Facilities (Quayage, maximum draught, deposit area, container-cranes) Average waiting time Level of technology / EDI Number and frequency of connections (to other terminals)

Transport industry and logistic service providers:

Transport company performance	Return on assets Return on equity Trading margin etc.

Degree of utilization of vehicle	In volume: measured by payload of weight, pallet numbers and average pallet height In distance/empty running: measured as the number of miles the vehicle travelled empty and the number of miles the vehicle travelled with only returnable items In time: measured on hourly basis as one of seven activities (running on the road, rest period, loading or unloading, preloaded and awaiting departure, delayed or otherwise inactive, maintenance and repair, and empty stationary) over a 48-hour period
Schedule adherence and deviations from schedule	Problem at collection point and/or delivery point Own company actions Traffic congestion on major corridors and at border crossings Equipment breakdown Lack of personnel Availability of required infrastructure (terminals, access roads, right-of-way, highways, short-line rail services) Availability of appropriate equipment at terminals Operating procedures at ports and terminals
Fuel efficiency	Measured as km per litre Measured as ml. fuel needed to move one standard industry pallet 1 km
Relative performance of the intermodal chain	Timing: transit time, frequency of service and on time reliability The total logistics costs and service in relation to the level and quality of logistics services Efficient, seamless transfers between modes Use of integrated enterprise systems Compatibility of technology in different global regions Use of ITS to speed transport, improve connectivity, reduce congestion High asset utilisation, leading to lower cost of operation, leading to lower freight rates
Harmonisation/regulation	Harmonised vehicle weights and dimensions Harmonised safety regulations Harmonised labour regulations Immigration policies (leading to such issues as trucking companies not able to hire drivers from other countries during periods of driver shortage) Conflicting policies between government departments leading to tensions in transportation system

C. INTERMODA - Integrated Solutions for Intermodal Transport between the EU and the CEEC

In the first step of this project a set of ideal performance indicators was developed, from which a selection was made for reasons of practical feasibility.

The ideal performance indicators were:

- time (e.g. the total length of time between when the load unit is ready for transport and when it is delivered);
- reliability (the absence of unforeseen lowering of performance);
- flexibility (the ease with which the system adjusts to an unexpected change in logistic requirements);
- qualification (the capability of personnel to cope with complex logistic requirements);
- accessibility (the ease with which the intermodal transport system can be used);
- monitoring (how well the status of the loading units can be tracked);
- safety and security (the risk of losing equipment and goods).

In a second step the project uses the following categories for the classification of the final selection of performance indicators:

- time
- reliability
- flexibility
- safety
- capacity
- tariff
- accessibility
- utilization
- monitoring

D. IQ – Intermodal Quality

The project proposed performance indicators for terminals and investigated the main technological developments (hardware, software) in order to measure their impact.

The performance indicators refer to:

- load unit moves per hour
- dwell time of load unit or vehicle
- reliability, maintainability, availability
- flexibility and automation
- safety and security.

E. TRILOG – Europe

Commonly used indicators measuring the performance of the core logistics function can be classified as follows:

	External performance indicators	Internal performance indicators
Business perspective	Delivery time Sales Price Customer satisfaction	Result vs. budget Inventory value Customer service
Engineering perspective	Sustainability Availability Reliability Quality	Cycle time Turnover rate Productivity Asset utilization

General indexes have been developed in order to compare different logistics items in various countries and in several industries. The TRILOG consortium uses the taxonomy proposed by Andersson et al. They define the external performance according to the following indicators:

- availability
- reliability
- quality
- lead time
- customer service
- price.

After considering the results of previous studies, the project selected the following KPIs for benchmarking across transport modes:

KPI	Definition	Unit
Transport costs	Total freight cost to the customer	€ per load unit
External costs	Costs to the public because of emissions of (CO_2, NOx, SO_2) and noise	€ per ton-km
Time	Average total time of regular service including transport, handling and waiting	Hours
Delay	Average time resulting from delays including congestion and equipment breakdown (additional to total transit time)	Hours
Availability	Minimum time required between booking and start of transport	Hours
Flexibility	Reaction to special requests of customers and reaction to hold-up of transport	Ranking
Safety	The risk of financial damage expressed by insurance premiums and security fees	€ per load unit
Regulations	Framework conditions	n.a.

A number of interesting ideas result from the above analysis. The following topics have been selected as deserving further consideration:

- the capability of personnel to cope with complex logistic requirements,
- accessibility (the ease with which the intermodal transport system can be used),

- customer satisfaction,
- compatibility of technology in different regions, and
- harmonisation of regulations in different regions.

The merits of the Dutch approach of specifying different indicators for each target group are also evident for the implementation phase of green corridor projects.

2. The World Bank 2010 Logistics Performance Index

The 2010 Logistics Performance Index (LPI) is a web-based interactive benchmarking tool created by the World Bank to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance.

The Logistics Performance Index (LPI) is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries with which they trade, and experience of global logistics environment.

Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work. Data have been collected for nearly 130 countries.

The LPI consists therefore of both qualitative and quantitative measures and helps build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a country and offers two different perspectives: International and Domestic.

The **International LPI** is a single index with a numerical value equal to the mean value of the following 6 qualitative indicators (their values ranging from 1 to 5), as they have been evaluated by a country's trading partners (logistics professionals working outside the country):

- *Customs* [efficiency of the clearance process (i.e. speed, simplicity and predictability of formalities) by border control agencies, including customs]
- *Infrastructure* [quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology)]
- *International shipments* [ease of arranging competitively priced shipments]
- *Logistics competence* [competence and quality of logistics services (e.g. transport operators, customs brokers)]
- *Tracking and tracing* [ability to track and trace consignments]
- *Timeliness* [how often do shipments reach the consignee within the scheduled or expected delivery time].

There is a seventh indicator in the international group, named 'Comparison to year 2005', which evaluates answers to the question 'Is it easier or more complicated to comply with the cargo security requirements (i.e. screening, advance information) when arranging shipments?' The value of this indicator is not included in the LPI calculation.

The LPI 2010 index is available for 155 countries.

Domestic logistics are not described by a composite indicator like LPI. The relevant indicators provide both qualitative and quantitative assessments of a country by logistics professionals working inside it. They include detailed information on the logistics environment, core logistics processes, institutions, and performance time and cost data, organized in two themes:

The first one, named ‘Environment & Institutions’, provides qualitative indicators on the following:
- Level of fees and charges
- Quality of infrastructure
- Competence and quality of services
- Efficiency of processes
- Sources of major delays
- Changes in the logistics environment since 2005.

The second one, named ‘Performance’, provides quantitative estimates on the following:
- Clearance time
- % of cargo physically inspected (single and multiple inspections)
- Number of agencies involved
- Lead time (median case) for a typical shipment for which only distance is reported
- Typical charge for a 40” container or a semi-trailer (for the typical shipment).

Information on domestic logistics is available for nearly 130 countries.

The LPI survey, used for the collection of the necessary information, is designed and implemented by the World Bank International Trade and Transport Departments, with Finland's Turku School of Economics (TSE). It is endorsed and promoted by the Global Facilitation Partnership for Transportation and Trade (GFP) and has been actively supported by the International Federation of Freight Forwarders Associations (FIATA) and the Global Express Association (GEA).

World Bank conducts the LPI Survey every two years to improve the reliability of the indicators and to build a dataset comparable across countries and over time.

A careful examination of the indicators entering the International LPI reveals that all are covered by KPIs proposed by SuperGreen, with the exception of ‘Logistics competence’, an aspect that should probably be considered in the future by the management of green corridors in their implementation phase. It is further noted that the emphasis placed on efficiency of customs is due to the nature of the World Bank institution. This is not the case with SuperGreen, dealing basically with EU member states.

3. TML report on trans-European transport network planning methodology

This recent document [De Ceuster Griet et al (2010)] aims at defining a methodological approach of the TEN-T planning network, and in particular the “core network”, as defined in the European Commission’s Green Paper on the TEN-T policy review. The study provides analyses of transport development options which lead to solutions and recommendations, anchored in policies and institutions.

The part of the report that is most relevant to SuperGreen is the section dealing with quality criteria. It is noted that these criteria have been selected for network design and not for the performance of a physical network.

The study first identifies the following seven objectives pursued by TEN-T policy:
- Internal market, social and economic cohesion
- Territorial cohesion
- Sustainable development
- Specific objectives aiming to achieve a multimodal and interoperable network

- Climate change
- Globalisation and international dimension
- Transport policy development

It then translates these objectives into quality criteria for the network connections. “Quality” is defined in a broad way, and can be translated into three views:

- The view of the society: This boils down to the overall sustainability goals, in their three dimensions: economy, environment and social quality.
- The view of the users: They want a fast, cheap and comfortable connection.
- The view of the network owner as the service provider: They want an easy and cheap exploitation, and a large flexibility and interoperability.

The study concludes with the following performance criteria:

- **Mean speed:** It includes average congestion, access time and delays, cross-border delays, service frequency (in case of public transport, air transport), and geographical detours.
- **Reliability:** It describes the ability of the transport network to cope with transport demand peaks and includes congestion on the road network and punctuality in rail and air connections.
- **Environmental hindrance (air quality, noise):** Emissions include CO, NOx, PM, SOx and VOC, and their calculation is based on the kilometres covered per road type. Quantification of noise nuisance is based on load per stretch of road, composition of the traffic, speed of the traffic, distance of road axis from building facades, and building density (number of premises/residents along the side of the road).
- **Climate change:** Impacts can be measured by transport emissions of greenhouse gases by mode and by type of gas, expressed in CO_2-equivalent.
- **Landscape:** This effect is difficult to quantify generically; each case will largely have to be examined on its own merits. One way of calculating the effect is to determine which remediation measures (investments) are desirable to retain the original situation.
- **Safety:** The kilometres on the network are multiplied by risk factors that indicate the possibility of an accident with (fatal) injury as a function of the distance covered.
- **Security:** It is hard to measure security by indicators. Some existing indicators are the number of vehicle thefts and other vehicle related crimes per inhabitant, and the number of security incidents on public transport per year per inhabitant. The relevance for TEN network design is however small.
- **Interoperability and harmonisation:** It can include technical aspects as curve radii, gradient, cross-section (number of lanes or tracks), legal regulations (e.g. speed limits), traffic control harmonisation (all modes), harmonisation of operational procedures and practices, rolling stock standards, rail electrification and track widths.
- **Operational costs:** They include cost of traffic management, maintenance costs, safety costs etc.
- **Costs to the user:** They include the costs of vehicle acquisition, operational costs (fuel cost, parking, …).

A careful examination of these ‘quality criteria’ shows that they are all covered by the SuperGreen indicators with the exception of operational costs, landscape and interoperability/harmonisation. Operational costs, in the way they have been defined above, are in most cases internalised through tolls and user charges. Therefore, we are of the opinion that there is no need for a separate indicator with such content.

Landscape costs relate to habitat loss, habitat fragmentation and habitat quality loss due to a certain infrastructure. Maibach et al (2008) propose the repair cost approach for their calculation and provide average cost figures (in €/km/year) only for Switzerland. It is mentioned, in addition, that these costs are basically related to the construction of infrastructure and not its use, and that the relevant marginal costs are negligible. We accept this view and we will not further pursue this type of costs.

However, the interoperability/harmonisation criterion is a proposition that probably deserves further investigation. Unfortunately the nature of these issues does not allow adequate description by a single or even a small number of indicators. In SuperGreen we try to capture this dimension through what we call ‘bottlenecks’, a qualitative indicator that takes into consideration both technical and administrative aspects. More input on the technical aspects is further expected from WP3 (green technologies) and WP4 (smart ICT applications)

4. Conclusions

The following conclusions can be drawn in relation to the additional KPIs identified in the course of Task 2.3:

- The SuperGreen KPI structure does not cover the capability of personnel to cope with complex logistic requirements or the ‘logistics competence’ according to the World Bank (WB) terminology. The potential use of the relevant component of the WB’s LPI is constrained by the fact that the indicator is country- rather than corridor-specific. However the construction of a similar index at corridor level could be considered by the management of green corridors in their implementation phase.
- The SuperGreen KPI structure does not cover the accessibility of the network or the ease with which the intermodal transport system can be used. A possible way to correct for this omission is to include in the ‘transport time’ KPI a component expressing the time that elapses between ordering a transport and the time the cargo is picked up, transforming this indicator from ‘transport time’ to ‘lead time’.
- Neither customer satisfaction is covered adequately by the SuperGreen KPIs. The only relevant feature included in the KPI structure is the cargo tracking and tracing capabilities. Customer satisfaction is suggested by a number of previous works and also by the Regulation on freight-oriented corridors, as mentioned in Section 5.11 of this report. It should, therefore, be considered for the implementation phase of green corridor projects.
- Another missing dimension is the one referring to interoperability/harmonisation. The nature of these issues does not allow adequate description by a single or even a small number of indicators. In SuperGreen we try to capture this dimension through what we call ‘bottlenecks’, a qualitative indicator that takes into consideration both technical and administrative aspects. However, the topic deserves more attention.
- The merits of the Dutch approach of specifying different indicators for each target group, as presented in ISL (2006), should be considered for the implementation phase of green corridor projects.

As a concluding note, it is mentioned that only the comment on lead time could have been applied in the context of the SuperGreen project[17]. All other suggestions concern issues that can only be dealt with at the implementation phase of a green corridor due to their

[17] At the time of writing this report, the data collection process of Task 2.4 (Corridor benchmarking) is already completed. Nevertheless, the switch from ‘transport time’ to ‘lead time’ is not considered as a potential problem in future applications.

very detailed (micro) nature, which requires the existence of authorised data collection mechanisms at corridor level.

Neither could these additional KPIs be used in assessing the effects of the identified changes in the operational and regulatory environment, as most of them, namely those referring to customer satisfaction, interoperability/harmonisation and special target groups, have to be precisely defined first. For the remaining ones, it can be said that:

- Logistics competence should be viewed as a prerequisite for the introduction of intermodal solutions. The existence of competent logisticians can facilitate the penetration and effectiveness of changes such as the promotion of freight villages and UDCs, the application of ICT solutions, the integration of supply chains, the development of freight-oriented and green corridors, the introduction of combined transport solutions, and the responsiveness to customer requirements. The opposite causality is not evident. In other words, changes like the abovementioned can have only a minor impact on 'logistics competence' (due to induced demand), should the latter was used as a KPI. Changes that would have a significant effect on such an indicator, are only those related to training and education.
- The effects of changes on 'transport time', as they have been presented in this report, are not expected to be differentiated, should this indicator was altered to 'lead time'. This is because green corridors refer to long-distance freight transport and in these cases any improvements in the time between transport order and cargo pick-up are not sufficient to make total 'lead time' switch category (e.g. from significant to moderate).