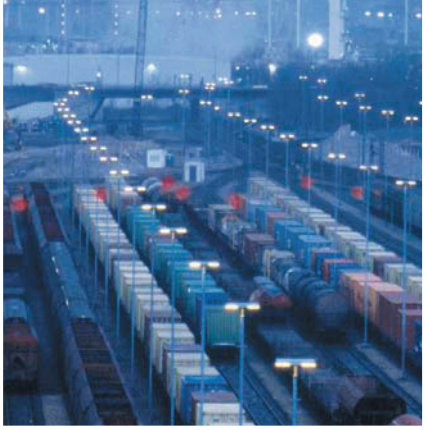
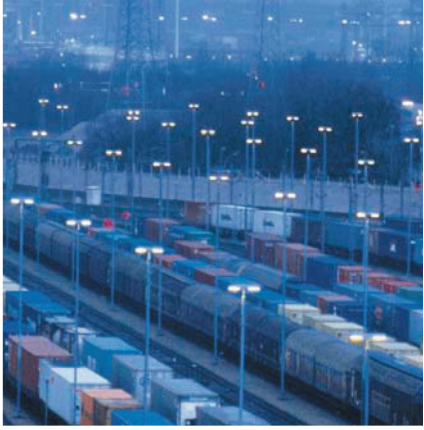
New OPERA





NEWOPERA

THE RAIL FREIGHT DEDICATED LINES CONCEPT

FINAL REPORT

NEWOPERA

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FINAL REPORT

NEWOPERA is a transport research project entirely financed by the European Commission under the FP6 Framework Program. The Project has been developed by a market driven consortium led by the European Freight and Logistics Leaders Forum (F&L) during a period of 45 months under the scientific supervision of DG Tren and of an indipendent scientific committee constituted by eminent university professors.

- **Publisher:**
  THE EUROPEAN FREIGHT AND LOGISTICS LEADERS FORUM(F&L)
  270 Avenue de Tervueren – 1150 Brussels – Belgium -
  www.europeanfreight.org
  Tel + 32 2 7418660
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- **Title:**
  NEWOPERA - THE RAIL FREIGHT DEDICATED LINES CONCEPT

- **Editor:**
  Franco Castagnetti

- **Design:**
  UNIFE The European Rail Industry
  221 Avenue Louise – 1050 Brussels – Belgium –
  www.unife.org
  Tel + 32 2 6261260
  Fax + 32 2 6261261

- Printed by Drifosett, Brussels
  Layout by Orangemetalic

- **Orders:** F&L

- **Depot:** Septembre 2008 in Belgium

- **ISBN:** 978-3-00-025700-1

Achieving integrated and sustainable mobility in Europe requires the promotion of a competitive rail system throughout the Union. The New Opera research project, which the European Commission has contributed to funding under its Framework Programme for Research, has managed to involve numerous transport experts for three years in the analysis of the problems which international rail freight is facing and in drawing up proposals to address them.

This book, which summarises thousands of pages of research in a format intended for a wider readership, presents the results of this long and fruitful work. Not only does it describe the width and breadth of the research, but it also offers a vision to public and private decision-makers which, once turned into practice, will definitely contribute to revitalise the role of rail in the carriage of goods and, more than it is the case today, will make of rail transport an essential partner along the logistic chains across our continent.

This research represents an important contribution to the work in progress on the creation of a European rail freight oriented network. For several years, the European Community has been working to encourage the development of international corridors on which freight trains will be able to travel smoothly and freely, without any technical or administrative barriers at the internal borders of the EU.

NEWOPERA has brought a precious insight on this issue. This book is therefore addressed to all those who wish to learn more about the present and future challenges of mobility for Europe.

Dr. Matthias Ruete
Director General

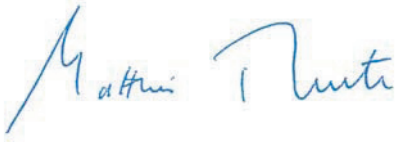


TABLE OF CONTENTS





THE **NEWOPERA** "RED THREAD"

The **NEWOPERA** "Red Thread" objective is to provide a synthetic explanation of the **NEWOPERA** Rationale which is instrumental for a better understanding of this Final Report.

This book represents the conclusive document of the **NEWOPERA** project summing up innovations discoveries, findings, best practices, charts, figures and graphs resulting from a research which lasted nearly 4 years. However in order to correctly perceive the value of this project and its future influence on the European freight mobility evolution, it is necessary to explain all the elaborated dimensions from the project start up to its end.

Methodology and project structure. The Project origin was totally market driven since a group of logisticians representing leading European shippers, logistics service providers and transport operators clearly perceived that the existing European freight mobility model based on road transportation was becoming unsustainable in the medium-long term. Starting from this very basic consideration it was thought necessary to think of practical alternatives for generating additional transport capacity capable of complementing and supplementing existing modes and by so doing allowing the European economies to continue their developments for the wellbeing of the European citizens. Another basic consideration was the awareness that the European Economies were progressively moving from an industrial into a post industrial stage where the services in general both to individuals and goods were assuming a much greater importance. Manufacturing facilities relocation in China and South East Asia with logistics chains becoming longer and more complex made this changing scenario particularly evident.

The choice of how to revitalise the European rail freight system which is accounting for about 6% of the supplied carrying capacity became an obvious one. The environmental pressures, the congestion, the safety, the emissions and ultimately the climate change brought into the general public perception the message that something needs to be done in order to make future freight mobility more sustainable. Rail freight and intermodality contains within themselves the main characteristics for this to be possible.

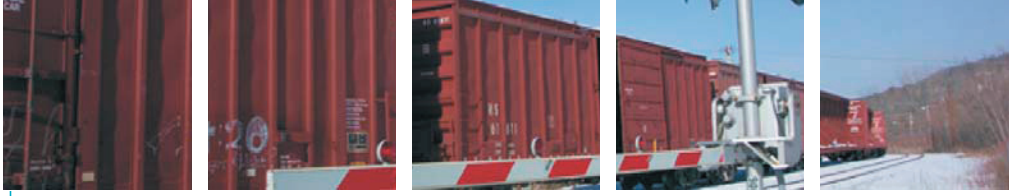
The very recent upsurge in fossils fuel costs and their anticipated growing difficulties to access existing and new sources of supplies made **NEWOPERA** project particularly attractive, up to date and visionary in very many aspects.

The easy going detractors will continue to use the argument that colossal investments will have to be mobilised for creating a European rail network predominately dedicated to freight. This is clearly not the case since a lot can be achieved investing in new soft/hardware technologies and de-bottlenecking/ upgrading existing and secondary infrastructures. In any case both citizens and politicians have realised that the **"IF NOT STRATEGY"** which has been prevailing in the last decades, is no longer an option.

The methodology, the drivers, the market forces, the objectives and the project structure have been described in details. (Chapters 1 to 5).

During the project development 6 main dimensions have been researched and elaborated which are summarised in this **NEWOPERA** Final Report Book.

1. State of innovative experiences. In this WP the global and European market variables have been researched. The new trade patterns and the future trends within supply chain have set the framework which the future freight mobility need will be confronted with. Global



challenges and new emerging service needs, dictated by a fierce competition game with longer and more sophisticated supply chains, are the prevailing common denominators. The new traction patterns, the migration strategies and stepwise scenarios, opened a window looking at rail freight mobility evolution from the inside. The necessary changes for facing this new competitive business environment with a more modern and optimistic outlook were suggested. (Chapter 6.1).

2. NEW Operating and technical systems/aspects. This dimension addressed all technologies aspects both hardware and software the issue of longer and heavier trains has been developed together with the signalling and management systems necessary for allowing the increased measures to be adopted. The software technologies chapter addressed a variety of other management and bureaucratic barriers preventing the rail system from being one uniform rail space in Europe. The cross border rail free circulation is still in its infancy. A lot of conflicts interfering with optimisation are still in existence. A showcase corridor has been taken as example for its complexity. The training and new operating rules dealt with harmonization principles and the need of operating on a recognised and accepted sets of guidelines assuming the value of contract between partners. The driver here being the attribution of costs and responsibilities to the non performing entity. The interoperability dimension has been elaborated with particular attention to the ERTMS level 1,2,3 cost effectiveness assessment. (Chapter 6.2).

3. Network Perspective. A complex market research was conducted under this heading. Modelling methodologies have been applied in order to establish the European traffic origin and destination matrix as well as the entry points into the Union for the Extra-EU traffic. All this work was instrumental for assigning the rail freight network including hubs, gateways and connections coherent with the European traffic demand zones. The intermodal traffic is of particular relevance. It is unitised and projection up to year 2020 are based on good ground with the various sources giving coincidental projections. The ports of entry for maritime traffic provide a cross reference giving substance to the traffic projections. The analysis per transport modes is also made for national and international traffic. (Chapter 6.3).

4. NEW Product-Services. The market actors realised that investments in additional capacity generation either by means of technologies or infrastructure will have to be paid for. Consequently a marketing research was conducted on new product/services. Given that today rail freight is positioned on a mono-product it is imperative to offer the market place a variety of product/services based on the market segmentation approach. Eight different rail products have been identified warranting higher value added compared to the basic mono-product. These products should be distributed via different distribution channels. The intermodal Interindustry dimension was researched making projections on future volumes and future service needs. Likewise the ports interconnections and flows made a full assessment of major European ports together with their investments plans. Such investments are dictated by their traffic projections brought about by the massive increase in maritime containers traffic discharged by giant containers vessels. The emerging actors and visions for new products dealt with the capital intensive and less capital intensive new actors who are progressively populating the market. New relationships and interfaces are arising reflecting the new market requirements. (Chapter 6.4).

5. Network approach - Socio Economic Evaluation. Towards the project conclusion, research was concentrated on dealing with the socio economic and environmental dimension.

The assessment of the reference scenario for establishing cost benefit analysis was made. A specific Berlin-Madrid corridor was taken as a reference and a methodology to apply a significant cost model based on scientific measures was selected. The approach used was to achieve the capacity increase by means of introducing new technologies and correcting bottlenecks. The socio economic and environmental assessment has been made on the selected corridor attributing an economical value to the savings in pollutants and also indicating the other environmental and socio economic chapters on which international economic parameters can be attributed for evaluation. Moving freight from road to rail will generate substantial varieties of long term benefits. These appear even more important in the light of escalating cost of oil. Mapping of the rail freight network has been accomplished as well as an implementation plan has been described. (Chapter 6.5).

6. Cooperation, dissemination and Evaluation. The **NEWOPERA** project has been disseminated everywhere in Europe and beyond. All the tools for dissemination have been used such as newsletters, internet, conferences, workshops, presentations, articles on the press, circulars, debates etc. **NEWOPERA** has become in Europe a synonym for rail freight modernisation initiatives. (Chapter 6.6).

Conclusions. In fact the provision of a completely new European infrastructure dedicated to freight would not appear either a concrete option in the short-medium term or an economical investment. Such an option like many others adopted in the past and also being adopted now for long term strategic decisions, belongs to the politicians and not to the market actors. These must however supply the analysis, the data, the trends and the vision for allowing the decision-makers, Governments and European Institutions for taking the correct decisions in the interest of us all. (Chapter 7).

Franco Castagnetti
The Editor

1. INTRODUCTION AND ACKNOWLEDGEMENTS

The main driver leading to the **NEWOPERA** project originated from DG Transport White Paper Time to Decide. This important document set out objectives to be achieved in the future towards a freight mobility more sustainable over time both for costs generators as well as for environmental aspects. **ERRAC** and its **SRRA** provided further useful strategic indications.

It became apparent that for achieving these objectives a rejuvenation of freight on rail was necessary for recovering the market share lost in the last two decades, and conquering new additional traffics. For this to happen it was necessary for rail freight to becoming attractive once again to the European users through the offer of total quality products services capable of satisfying the customers sophisticated supply chain needs. These in addition will have to be competitive on costs and consistent over time for regaining the market space occupied meantime by other competing modalities.

Other additional European problems made the above objectives not only desirable but absolutely necessary, since raising costs of fuel made road transportation more expensive and vulnerable. Negative effects from accelerating climate changes called for more urgent measures limiting emissions on the atmosphere. Additionally sudden changes on world trade patterns emerging from the Far East and the EU enlargement, generated substantial traffic volumes increases which road modality found more difficult to cope with in the industrial scale which was needed.

All of a sudden it was realized that the recovery to total efficiency and effectiveness of the European Rail Freight system, became paramount for rebalancing the use of different transport modalities and achieving a better integration between them. Years of neglect in rail freight infrastructure investments had to be recovered for providing the rail system with the necessary tool and becoming a vital European freight transport resource. Rail freight capacity must be generated through the creation of a rail freight dedicated or priority network capable of absorbing the impact of additional traffics. New volumes are already materializing inside Europe not only on the already congested **NORTH/SOUTH** corridors but also on the **WEST/EAST** corridors, on the European ports of entry, and on the modality interchanges of inland terminals. It became obvious that the old rail infrastructure, already congested and affected by the conflict with passengers, was no longer adequate for accommodating the future European needs. New vision, new business philosophy, new management concepts, new technologies, new marketing approaches, new products services are the necessary ingredients for making the changes which are based on rail freight dedicated or priority lines. **NEWOPERA** was born.

NEWOPERA project represent the result of a research, business cases, market solutions and recommendations resulting from the intense co-ordination between 25 European partners. **NEWOPERA** originated from market needs and consequently the project partners could only be leading European market actors. During the course of the three and half years Project duration the activity in terms of research working groups and tasks meetings, was immense. Whenever the Partners and their Experts needed further support, research and information for completing their deliverables, specific knowledge sources were activated through renown Universities and Technical Institutes. The entire project was managed by Franco Castagnetti Vice President of THE **EUROPEAN FREIGHT AND LOGISTICS LEADERS FORUM** - Brussels, from a dedicated office in Milano.

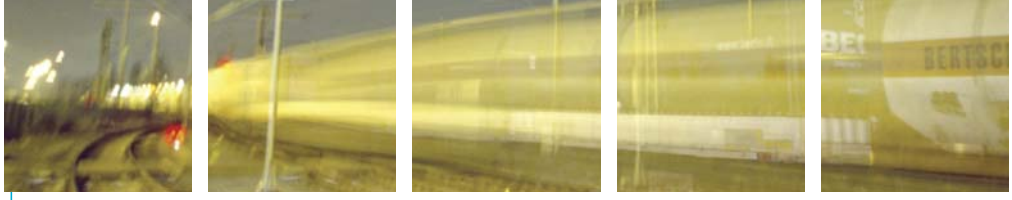
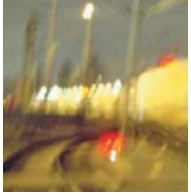


Fig. 1: Companies and Representatives involved

N°	Company	Country	Representative	Work Package						
				0	1	2	3	4	5	6
1	Train	Italy	Valerio Recagno Sergio Mitrovich Daniele Bassano Laura Summa	X			X	X	X	X
2	F&L	Belgium	Franco Castagnetti	X	X			X		X
3	Alstom	France	Pierre Dersin			X			X	X
4	Nestear	France	Christian Reynaud		X	X	X	X	X	X
5	Transfesa	Spain	Julian Gacimartin Oscar Verdu		X		X	X		
6	Rail4Chem	Germany	Matthias Raith Claude Fiquet Pierre Tonon		X			X		X
7	Ansaldo Breda	Italy	Filippo Giorgetti			X			X	X
8	LKW Walter	Austria	Horst Kubek		X			X		X
9	Cemat	Italy	Maria.A.Zocco Silvia Rivolta		X	X	X	X		
10	Stora Enso	Germany	Stefan Sundin Anders Clason Yannick Le Gars		X		X	X		X
11	Rail Tract.Co.	Italy	Francesco Grotti			X		X		X
12	Bombardier Tr	Germany	Christina Larsson Jessica Lagerstedt		X	X			X	
13	A.Port.Genova	Italy	Pietro D.Oddone		X			X		X
14	Gysev	Hungary	Imre Torok Laszlo Jakab					X		
15	Siemens	Germany	Ralf Kaminsky Frank Gemeiner			X				X
16	Kombiverkehr	Germany	Rainer Mertel Christoph Buechner		X	X	X	X	X	
17	DB Netz	Germany	R. Hennecke H. Heusner T. Schneider		X	X	X		X	
18	RFF	France	Christophe Keseljevic Benoit Rossi Emilie Gouton Lise Mermillod		X	X	X		X	X
19	RFI	Italy	Barbara Morgante Andrea Pepe		X	X	X	X	X	
20	UNIFE	Belgium	Magali Merindol Helene Koepf			X				X
21	Sogemar	Italy	Sebastiano Grasso Stefano Lontano		X			X		X
22	Ermewa	France	Bruno Dambrine Armand Toubol		X			X		
23	DHL	Germany	Peter Sonnabend		X			X		X
24	Volkswagen	Germany	Bernard Lux		X			X		
25	Port du Havre	France	Thierry Vaillant Jean P Ternon					X		X



NEWOPERA could avail itself right from the start of the advice provided by a Scientific Committee composed of the following Experts and University Professors.

Fig. 2: The Scientific committee

N°	Company University	Country	Expert Professor	Work Package						
				0	1	2	3	4	5	6
1	Ermewa	France	Eng. Armand Toubol		X	X	X	X	X	
2	Royal Institute Of Technology Stockholm	Sweden	Prof. Bo-Lennart Nelldal		X	X	X	X	X	
3	Bocconi University Milano	Italy	Prof. Bruno Busacca		X	X	X	X	X	
4	Karlsruhe University Karlsruhe	Germany	Prof. Werner Rothengatter		X	X	X	X	X	
5	Montreal University Montreal	Canada	Prof. Marc Gaudry		X	X	X	X	X	
6	AAchen University of Technology AAchen	Germany	Prof. Ekkehard Wendler		X	X	X	X	X	
7	La Sapienza University Rome	Italy	Prof.Antonio Musso		X	X	X	X	X	

2. FRAMEWORK AND METHODOLOGIES

In submitting the **NEWOPERA** proposal it was said that "modal shift will not take place automatically", but it will have to be induced by offering in the market place products services that the customers will want to buy.

All deliverables produced by different subjects and organisations all accessing different sources, have identified common denominators which are hindering the development of rail freight services. These main common denominators amongst others, are:

- The presence in incumbents of a mono product culture
- The lack of customers orientation
- The lack of ITC technology and virtual networking in customers service relationship
- The lack of service reliability and service consistency
- The lack of tailor made solutions suitable to customers needs.

The existing rail freight operators are offering a basic "mono product", totally unsuitable for satisfying differentiated market needs. These market requirements become every day more sophisticated because of the growing complexities of the customers' supply chains. Additionally due to lower labour costs compared to Europe, industries are relocating their manufacturing facilities elsewhere either in the East of Europe or more frequently in China or South East Asia. Supply chains are becoming longer both in space and time requiring hence force regular and reliable services coupled with managing ERP and ICT tools for controlling the system at all times. Consequently the creation of additional rail freight capacity by itself will not be sufficient for inducing the customers to come back to rail. This new availability of carrying capacity must be coupled with the ability by rail freight operators of interpreting their role in a more innovative way correcting the old weaknesses by applying a new business model based on a New Service Culture. The Service Culture means that the customers requirements must be put at the centre of rail freight business activity. New marketing tools, intelligent applications, and the creation of a differentiated service product range giving the customers the choice between different services and prices, are the pre requisites for rail freight rejuvenation.

Likewise on the technical side, it was soon to be discovered that the creation of a rail freight dedicated network was the original and necessary tool for inspiring the changes. In a borderless European Union the national rail system and the parochial protection secured also by local Governments became obsolete hindering full European integration. A number of barriers had to be removed at crossing border points, interoperability between national networks made effective, standardisation and harmonisation of safety rules fully implemented. Cross acceptance of equipments and regulations between member states through recognised protocols had to become the norm. Any new initiative or investments, both in Infrastructure Hardware Software Signalling etc, must be effected according to newly accepted European standards and with the approval of the European Rail Agency "ERA".

By so doing in 2020 a backbone constituted by several corridors combining themselves into a new rail freight dedicated network will be in place according also to ERRAC-SRRA recommendations.

The **NEWOPERA** objectives were to research, study, analyse, elaborate all these dimensions through its Work Packages and specific Tasks Groups. These focused on:

- Setting sound methodologies for the traffic flows distribution on the network.

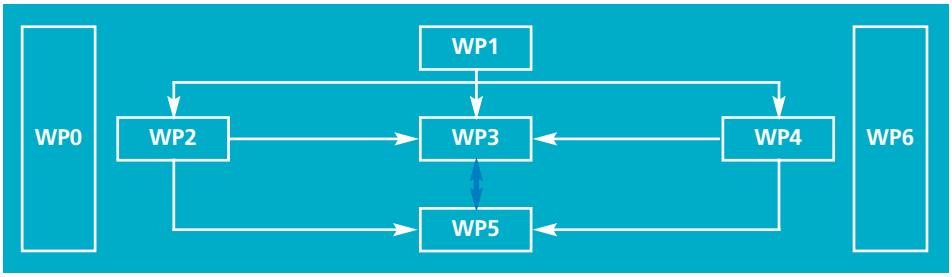
- Localising traffic flows in the European area in order to give development forecasts.
- Providing a sound analysis of transport supply and demand.
- Establishing simulation and traffic flows modelling tools on medium and long term perspectives.
- Providing an efficient decision making tool
- Allowing for the introduction of the rail freight dedicated network concept supported by socio-economic and environmental assessment.

2.1 METHODOLOGY OF WORK AND DATA SOURCES

The Opening of the European Rail Freight Space, induced by the introduction of EU Railways Packages 1, 2, and 3, changed substantially the rail freight playing field reversing the old and obsolete monopolistic approach. Because of this, new entrants appeared on the market and their pace of penetration gained momentum. These new actors conquered an important market share, and whenever liberalisation policies have been more aggressive, traffic which was previously lost, started to come back into rail modality. This proved that modal shift is not "wishful thinking" but can become reality provided proper commercial activities are undertaken for promoting the validity of new rail products.

The **NEWOPERA** activities developed the following Work Packages:

Fig. 3: Work Packages graphic



- **WP1**: State of Innovative Experience
- **WP2**: NEW Operating and Technical System/Aspects
- **WP3**: Network Perspective
- **WP4**: New Product – Services
- **WP5**: Network Approach – Socio Economic Evaluation
- **WP6**: Cooperation, Dissemination, and Evaluation

The **NEWOPERA** management was concentrated into **WP0**.
In order to fulfil these work objectives for arriving at the definition of a European rail freight dedicated network including the socio-economic evaluation provided in **WP5**, the most appropriate research sequence adopted was:

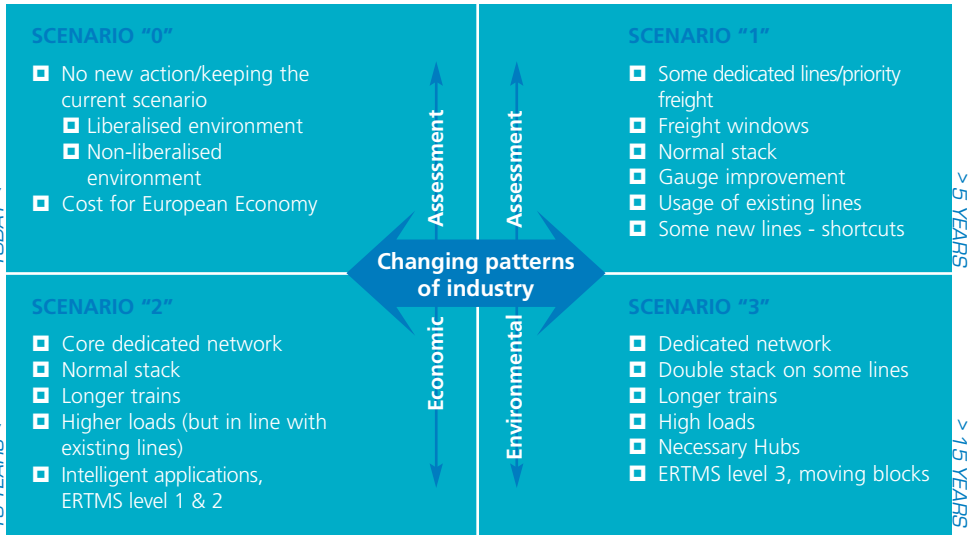
- Starting from the market situation **WP1**
- Elaborating the technical aspects **WP2**
- Envisaging a network concept from a combination of corridors **WP3**
- Planning a new rail freight economy based on product segmentation and new marketing/distribution concepts including its implementation **WP4**

- Disseminating the results achieved during and after the project **WP6**

A stepwise migrating process was envisaged for implementing the structural and management changes necessary for moving gradually between the old system into the new one.

- Fig. 4: Migration Path of NEWOPERA

Migration path for New Opera



European and United Nations sources were consulted as well as information from World Bank, EIB and IMF. Additionally previous results from other programs such as **EUFRANET** were used, however due to the different **NEWOPERA** project timings, fresh market researches were necessary. These new market findings were particularly evident in **WP1**, **WP3** and **WP4** and proved to be important for comparing the new results with the old ones. **NEWOPERA** being a market driven project constituted by 25 leading European partners, could access important information directly from the traffic generators and operators. These findings were achieved through fresh questionnaires and interviews giving **NEWOPERA** researchers the benefit of first hand results originating from market needs. By so doing it was possible to put in evidence the discrepancies or consistencies with the existing work allowing **NEWOPERA** to draw important conclusions.

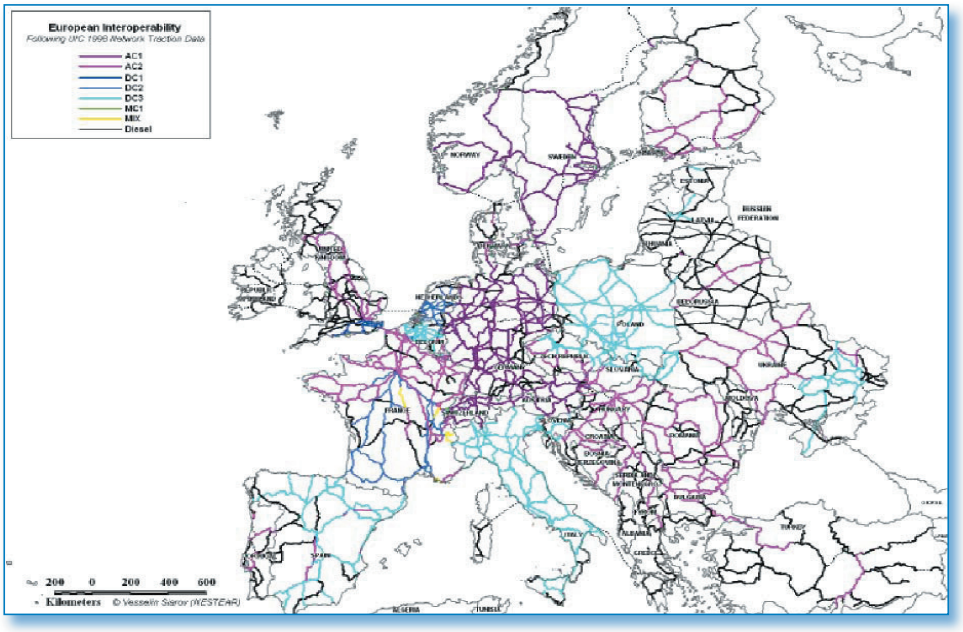
2.2 THE NETWORK CONCEPT

In an enlarged Europe an improved rail system should play a major role. In this way part of the resulting increase of traffic could be transported by rail reducing considerably the negative impact on environment.

The European economy development goes in parallel with an increased participation to commercial world exchanges. The European ports which are the natural gateways between our continent and the rest of the world must have an efficient and effective distribution system for penetrating inland. An industrial distribution system based on rail intermodality becomes a

decisive advantage when massive quantities of containers are handled to and from giant containers vessels.

Fig. 5: The European Interoperability chart



Moreover Europe is densely populated and is full of natural barriers. The crossing of the Alps and Pyrenees for example requires industrial solutions which are possible through the use of intermodality. This is demonstrated by the intermodality success on two major rail corridors which cross the Alps linking Italy to North Europe. One across Switzerland, the other across Austria and Germany. The rail corridors across the Pyrenees had not the same success because of the congested lines in France and the gauge barrier.

In addition to the rail freight corridors on the North/South direction overcoming the Alps and Pyrenees natural barriers, one has to plan for the additional traffics generated by the new EU accessing countries and their neighbours. The huge and fast growing development of China and Russia and their investments in new rail infrastructures accelerated considerably the possibility of commercial use of the Transiberian rail line as well as the Eurasia across Kazakhstan.

Also in Europe considerable investments have been made towards the establishments of a rail freight dedicated or priority network. In particular the Betuwe line in the Netherlands has been opened to commercial use during 2007. Similarly in Switzerland the Loetchberg tunnel has been opened during the same year with the new Gothard tunnel planned for completion in year 2015. Other major investments are in progress both in Germany, Switzerland and Italy on the Genoa/Rotterdam corridor for increasing substantially its rail freight capacity.

The need of rail freight dedicated lines has been supported by other European projects such as **TREND**, **REORIENT**, **FERRMED**. All these projects advocated the need of several rail freight corridors where cargos should have priority. These freight corridors confirmed both the traditional ones as well as the need of new ones reaching the developing countries towards East. It becomes more than obvious at this stage that a combination of European corridors interconnecting with each other in the North/South and East/West directions constitute a network which is the **NEWOPERA** principle.

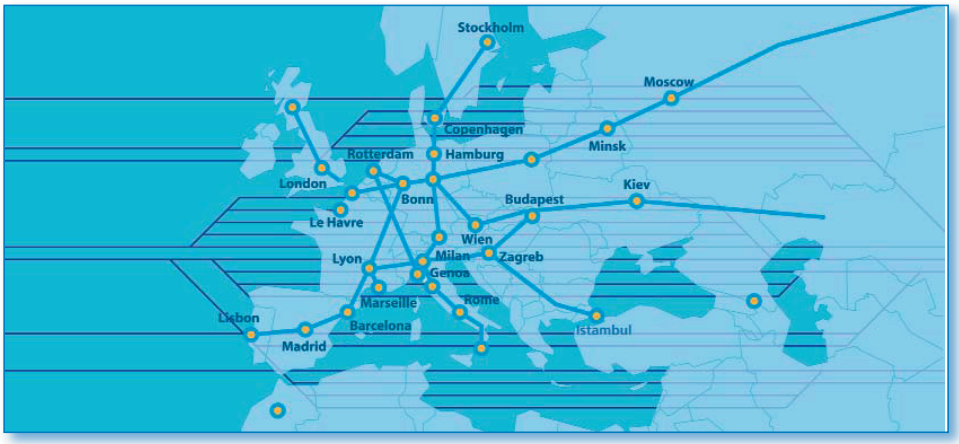
At the end also the rail establishment through their European associations like UIC and CER have themselves promoted projects like DIOMIS and ERIM which introduced and reinforced the principle of rail freight dedicated network. They called it PERFN which stands for " Primarily European Rail Freight Network".

The most recent environmental evolutions such as:

- Rapid climate changes
- Emissions in atmosphere
- Traffic congestions
- Green house effects
- Melting glaciers and polar cap
- Safety and security hazards,

have brought a strong message to Governments and European Authorities, that the existing overland cargo mobility system based almost exclusively on road modality is no longer sustainable. Consequently rail freight must recover its lost efficiently and effectiveness through the gradual development of a dedicated network. This can be achieved either by investments in new infrastructures, by bottlenecks elimination or by upgrading unused or less used rail lines. This migrating phase will be facilitated by the considerable investments being made in Europe for achieving interoperability. The progressive introduction of ERTMS standards will be offering a fresh opportunity to infrastructure managers creating the basis for new management approaches. This is a chance not to be missed for allowing the emergence of the future new rail freight economy based on rail freight dedicated lines concept.

- Fig. 6: The Network concept




SECURITAS

3. THE PROJECT'S OBJECTIVES AND STATE OF THE ART

The centrality of rail in a Pan-European dimension is the ultimate goal of the European Transport Policy encouraging long-term sustainable mobility and promoting a competitive environment.

In order to achieve this goal a modal shift towards rail is necessary reverting the rail freight market share erosion.

The **NEWOPERA** project will contribute to this goal by assessing ways for:

- Implementing the **ERRAC** Strategic Rail Research Agenda 2020 by capturing the threefold increase in freight volumes by 2020.
- Providing grounds for the establishment of 15.000 km of new and existing lines predominantly dedicated to freight.
- Revitalising the Rail business by applying NEW business models and a NEW service culture through the use of freight dedicated rail infrastructure.
- Envisaging transitions from the existing Rail business model based on rail infrastructure dual use, to one more capable of capturing market demands achieving productivity and efficiency gains based on rail freight dedicated network.

The applied methodologies imply step changes for achieving a long-term scenario 2020 of a core network predominantly dedicated to rail freight.

A number of key players in the rail and transport freight value chain (Shippers, Intermodal Operators, Logistics Operators, New Rail Traction Companies, Infrastructure Companies, Major Ports, Wagons Owners, Trucking Companies, Manufacturers of rail systems and equipment) are deeply providing their expertise to fulfil the **NEWOPERA** objectives.

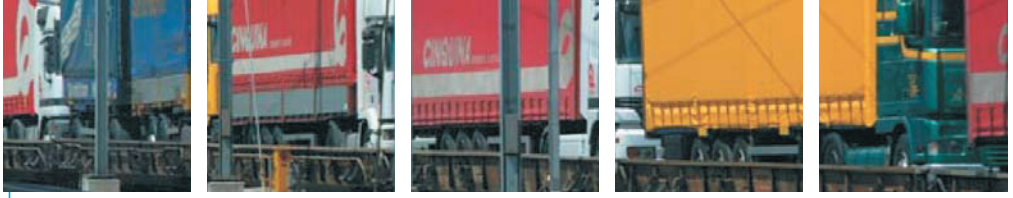
The **NEWOPERA** objectives will be assessed through a Scenario Exercise:

- **Scenario 0** represents the reference situation at start, where only market forces are at play on existing network.
- **Scenario 1** already introduces better infrastructure and operations management options, by using intelligent applications and introducing freight priority on certain lines as well as bottleneck-related investments.
- **Scenario 2** introduces new initiatives and technologies such as longer trains, heavier axle loads, **ERTMS** implementation.
- Scenario 3 assesses the option for a fully dedicated freight network, introducing double stack where possible, heavier loads, long trains, radio commanded locomotives, necessary hubs and intelligent applications for the information management.

The methodology applied will embrace the development of four gradual steps:

1. Technical solutions,
2. Demand, economic and environmental assessment,
3. Commercial and marketing requirements for new rail service products,
4. Phased migrations, evolutions, interoperability aspects, possible re-use of dismissed and unused rail tracks.

Difficulties, scepticism and opposition from long established interests will accompany such a step change. However, these resistances will be offset by large environmental benefits and greater



safety and security achievements deriving from a rebalancing of modal share. Further benefits will be extracted from better integration between different modalities given that such integration will allow the users to gain efficiency by enjoying the advantages that each modality will be capable of delivering.

3.1 **NEWOPERA** GOALS

NEWOPERA goals can be set from different points of view, the macro economic level of European model equilibrium, and the micro economic level of rail operations. From the macro economic level in a trend scenario hypothesis of potential traffic growth, the objective of doubling the rail market share by 2020 from 8% to 16% will require a tripling of rail freight volumes (15% was the rail freight modal share in 1980 and 11% in 1990).

In the **EUFRANET** study trend scenario the rail modal share was expected to decline down to a critical level below 6%; the development of a "core" dedicated freight network of about 15.000km would be the only way to stabilize or increase this modal share. In parallel costs must be reduced and service quality improved. Under these conditions rail freight could once again reach the 1990 level of 11% or more by 2020. But in addition to the **EUFRANET** study **NEWOPERA** also analyses commercial rail products for European services.

From the **NEWOPERA** partners market experience the modes rebalancing will not take place automatically. Consequently the following goals can be set:

- Significant increase of commercial speed on the main European corridors of up to 100 %. Measurements made on railway networks (RFF) show that the most critical point is the time lost on nodes for leaving priority to passengers trains rather then the freight trains speed itself.
- Increase rail services reliability and consistency competitive with those offered by road (hypothesis taken from **EUFRANET**).
- Important costs reduction due to increased rotation of rolling stock, increase in "effective" driving hours for drivers and possible increase in trains length. These measures are expected to lead a reduction from 30% up to 50% of operating costs.
- Very significant increase in rail network capacity due to more homogenous trains speed by removing bottlenecks.
- Better combined utilization of old lines and the new infrastructure for High Speed Trains. This will lead to an improved combination of lines respectively dedicated to freight or to passengers avoiding conflicts between these two types of traffic.

3.2 **NEWOPERA** OBJECTIVES

NEWOPERA will contribute to invert the EU railways declining trend by:

- Setting sound methodologies for traffic flows distribution over the railways network,
- Localizing traffic flows in the EU area producing development forecasts,
- Providing transport supply and demand analysis over the rail network,
- Establishing traffic flows simulation and modelling tools on medium and long-term perspectives,
- Providing an efficient decision-making tool,
- Allowing the introduction of rail freight dedicated network concept backed by a sound socio-economic and environmental assessment.

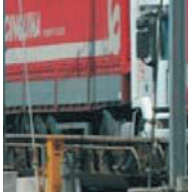


Fig. 7: Project Relevance within the selected topics

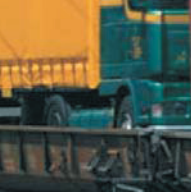
Objective of the selected topic **Implementation of change in the European Railway System (Focus on Proposal Part C)**	**Contribution of NEW Opera project**
There is lack of true European interoperability in the rail sector. To overcome this - and to make the railway systems open for seamless transport services - is the objective of this work. Part C of the topic deals with the definition of a dedicated rail freight network on a European level, considering: ▪ major constraints and obstacles and suggest solutions in a short, medium and long-term perspective. ▪ Define the tools for the monitoring of services (e.g. by GIS) on the network. The expected outcome is a detailed concept for developing a dedicated freight network.	*Increase in volumes for rail freight transport in Europe in 2020:* **+300%** (ref. ERRAC SRRA) *Increase Capacity:* **50%-100%** (depending on Scenarios) *Increase of Commercial speed in corridors:* **+100%** *Railway freight Market share:* **16%** *Decrease of road haulage market share:* **6%** *Decrease in operational costs:* **30-50%** *Impact on EU GDP:* **Sensible increase** *Impact on peripheral areas:* **Relocation; intra-industry trade; know-how transfer** *Benefit to final consumers:* **Sustainable mobility; decrease of production cost; price transparency** *Positive network effects:* **Enlarged economics of scale** *Possible cost-saving in transport supply-chain:* **Improved just-in-time logistics**

The above chart illustrates how the development of innovative concepts for freight transport will contribute to improve mobility of goods and to promote a safer and cleaner transportation system in Europe.

3.3 **NEWOPERA** VALUES

The **NEWOPERA** project and its implementation will generate for the European citizens and for the European Union as a whole a considerable number of values such as:

- Network values based on the Economic Society needs driven by globalisation where physical and virtual networks are paramount,
- Economic values based on costs efficiency and effectiveness,
- Service values based on quality and market response consistency,
- Environmental values based on better life quality for the citizens and protection of existing environmental resources,
- Safety and security values based on reduction and elimination of accidents and hazards,
- Sustainability values based on better use of energy and transport modalities over time,
- Planning values based on the individual States needs for long term planning of national infrastructures coherent with European objectives,
- Interoperability values based on shared recognized technical standards that must integrate into each other,



- Research and innovation values based on the application of new and higher technical systems and discoveries,
- Scientific values based on necessary cooperation with academia for comparing theoretical and empirical findings with practical implementation,
- Human resources values based on training and retraining needs of all human resources necessary for making the new system fully operational,
- Integration values for Europe based on the driving force that these Pan-European projects will be exercising in all countries involved. Such integration will affect positively the management, the administration, the technical aspects, the operating systems abating the existing barriers and conflicts,
- Disseminating values based on communication strategy by means of promotions through conventional or virtual network channels,
- Marketing values based on a variety of products services to be offered in the market place through differentiated distribution channels,
- Competition values based on securing equal and transparent access to the infrastructures facilitating new market entrants.

4. A CHANGING MARKET ENVIRONMENT

Freight transport markets cannot be seen as staying an homogeneous entity for a long time. Carriers and LSP cannot remain competitive with a restricted range of undifferentiated services. The customers are developing several needs according to market evolution and these needs require specific products capable of representing an adequate response in terms of cost and service. Markets evolve because of a variety of reasons amongst which one can indicate: higher competition, globalization, technology improvements, people's perceptions and behaviours, changing strategic/operational philosophies together with available means, resources, infrastructures.

4.1 CHANGING ENTERPRISES' NEEDS

In a highly competitive environment on one hand, and a sophisticated demanding customers' base on the other, it is not only important to be capable of producing a good and competitive product, but it is absolutely vital to be able to deliver this product in the place, shape and time desired by the final customer. Consequently reliable, flexible and affordable transports modes are crucial for any business to grow and make progress. Rail modality will be no exception. Therefore any old or new enterprise must be prepared to be assessed with the same criteria applicable to other transport modes. This principle which appears to be fairly obvious, needs continuous reinforcement. The prevailing monopoly situation which has been affecting the rail sector in the past years has prevented benchmarking against other available alternatives in the market place.

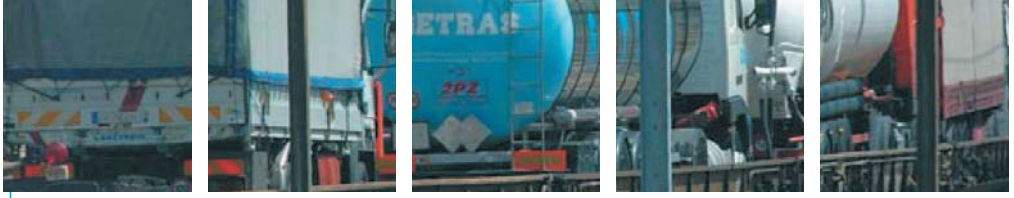
For instance car manufacturers will see their competitive edge impacted by whether binding commitments versus the customers will be honoured or not. In the past, when competition was less fierce, this point was not so critical and a margin of error was tolerated. Now these commitments will add complexity and sophistication to the logistic chain from order entry to final delivery. Current market expectations do not accept any deviation from the original promise.

The efficiency of the rail system can be enhanced by integrating itself with road modality. The old paradigm of opposing one modality against the other is obsolete and anti-economic. Seamless interplay with road transportation will be a necessity in a modern society. Reality indicates that the last mile to the final customer will be performed in most cases by trucks since only few establishments have direct access to private rail sidings. Intermodality started its foundations from this very principle.

This car manufacturer example can be easily replicated for a producer of consumer domestics, whose challenge is to make sure that its products reach the supermarket's shelves on time. Should this not be the case, an alternative product from a competitor will be sold, cancelling in one moment all the efforts made during the supply chain and most probably cancelling also the investments in publicity. The same would also apply to all other industrial sectors.

In a business environment where profit margins per unit produced are low, and globalization forces industries to scrutinize their cost structure, the reliability and consistency of service performance, become a matter of life or death. Rail services engaged in inventory movements, are key actors in helping their customers achieving stock targets in line with existing business practices.

The whole European economy under siege from both East and West needs to regain the full use of rail increasing its competitive profile and defending with improved logistics performances its own industrial achievements.



4.2 THE TECHNOLOGY AND ITS REVOLUTION

The technology and IT revolution has affected in the past and will be affecting in the future five macro areas:

1. Network and infrastructure,
2. Hardware,
3. Software,
4. Communications,
5. Finance,

individually or interconnected with each other.

If one passes to analyze the developments taking place or about to take place on each macro area one discovers infinite possibilities of improvements which are driven both by productivity, efficiency and effectiveness, and by environmental considerations for a better quality of life of the citizens.

The necessity of achieving interoperability on rail infrastructure is a motor for many changes. These will occur in the field of electrical supply, signalling, gauge, technical equipments, dimensions, braking, traction, safety and security, etc. in order to harmonize the various standards applied by each country. The idea of achieving a recognised and uniform European standard allows the users to imagine a seamless rail mobility, contributing to barrier free movements. In addition to these technological changes it will be necessary to manage the changeover of the human element where, at the moment, is lying the hardest resistance to changes. Once the technology evolution and the human resources are combined and integrated with each other, the emerging scenario will be equivalent to the road modality. Here the truck drivers can take their vehicles from origin to final destination without any interruption. Train's stopovers at the borders will then be a reminiscence of a distant past.

Shunting operations for less than unit train loads, will be made more efficient and effective by using remote controlled units, or even self propelled railcars similar to the ones already existing in Cargo Mover system. Technology innovation in this field will probably open up the rail market to the individual wagons which is a segment almost lost by incumbents because of very high movement costs.

This technological revolution will allow fully synchronized and integrated transportation schedules in line with the lead-time required by the customers.

The network and infrastructure evolution will be a driver for equipment modernization. Private rail wagon owners are already seizing the opportunity of understanding the dramatic changes and making significant investments adapting their specialised fleet to the new market requirements.
ICT development combined with satellite technology (Galileo) and specialised software, will allow availability of railcars and cargo real-time status. This on-line information will be comparable if not better than what road modality is already doing. This technological evolution, will improve the rail performance on equipment availability and software development will ensure an immediate response of cargo in transit. What today appears to be difficult to be achieved will be possible in the near future when reliable information on ETA (Expected Time of Arrival), will become regular practice. In addition vital reporting on damages and accidents which are part of any quality procedure, will be introduced by then, pre-empting negative reaction at destination.

Last but not least the technological evolution is already affecting the financial dimension of the rail business. New actors are emerging creating new important companies active in leasing rolling stock like locomotives (Angel Trains), wagons, lifting gears, etc. making it easier for new entrants to compete with incumbents.

4.3 EFFECTS OF A HIGHER COMPETITION

The fundamental basis for a new rail economy, is the establishment of a new rail business model based on a new service culture. Amongst the endogenous reasons why rail freight declined over the past few years there is the inability of rail undertakings of offering services in line with market expectations.

This inability amongst other difficulties, could be attributed to the complacency of not being forced to face daily competition because of monopoly situation. Rail undertakings have been operating for too long on a closed system and hence force, both market innovation and service evolution brought about by globalisation, made little inroads in rail transportation. The European Commission, through progressive legislation, contributed significantly to the opening of the European rail market. Particularly with the rail packages one two and three, the EU Commission laid down the basis for permanent long term restructuring and sector modernisation.

Thanks to this new European approach and to the separation of the rail infrastructure management from the transport business, competition is becoming everyday a reality, moving progressively from a theoretical principle to a practical one. Some European countries have been able to implement competitive conditions and open access, faster than others, but the public opinion, the business community and also the management, are convinced that this is the correct way to proceed. New entrants have obtained licences and safety certificates to operate on the European rail network. Some failed and some succeeded as one would have expected.

The day, these new entrants will have successfully challenged the monopolistic position of the traditional rail undertakings, will mark both the turnaround and a major milestone for the rail business rejuvenation.

The current service pattern featuring lack of flexibility and responsiveness is expected to improve dramatically. At long last, the true customers needs will be satisfied. It is very important to note that in all those instances where a newcomer has been operating successfully on a certain line, delivering better service levels, also the incumbents have improved dramatically their performance. This stands to demonstrate that whenever a pluralities of commercial offers are available in the market place, all operators are challenged for improving their position increasing the total market share carried by rail. The final objective of the European policy to induce modal shift towards rail for a better balance within the transport means, is exactly that.

One stop shop (O.S.S.) commercial approach, will allow rail to be more efficient and customer friendly by making the process of purchasing freight much simpler. In addition the response necessary for satisfying the new market oriented services, will dramatically improve the rail providers' reactivity towards the customers. By so doing a new approach and awareness of the evolving transport needs will be generated.

If all these changes are seen in the context of a borderless European Union, with a higher degree of rail interoperability, a considerable barrier limiting today rail transport, will also disappear.

Cross border traffics will no longer represent a problem. The single point of contact synonymous of O.S.S. will allow the customer to identify the contact capable of satisfying all his business requirements. This market oriented approach and friendly business environment will become common place. Considering all the above one would be inclined to be very optimistic towards the establishment of a new rail freight economy based on a new service culture. In fact increasing road tolls and fuel costs, growing environmental awareness, safety concerns, road congestion affecting many highways, are conducive factors in favour of the rail alternative.

Increased competition and the effects of rail deregulation will become two facets of the same coin. These combined with a higher standard of service at lower cost, will contribute to generate the alternative that the market has been waiting for, for so long. The whole of the European Economy will benefit from these changes enhancing the European competitive profile of manufacturing industries.

Another key element of the new rail economy is the gradual change from the dual use of infrastructure shared between passengers and freight in conflict with each others, to a new one based progressively on a rail freight dedicated network. A rail network dedicated predominantly to cargo will be a decisive factor for boosting the current share of rail traffic of around 7% to levels more in line with past percentages.

In the US rail freight commands a 40% plus market share of domestic transportation, and this should represent a long term European target.

The new rail economy based on a new service culture should involve in its restructuring not only traction improvement and efficiency but all the other connected activities. New comers will also favour changes in fields like rolling stock, shunting operations, terminals, intermodal operators, optimisers, consolidators, leasing companies, infomediaries, etc. These new actors are likely to find their space in the market during the privatisation process, introducing new professional figures in specialised market niches. The whole modernisation process will favour the expansion of the specialised rail car fleet, which is a significant component of the new commercial proposals.
One additional expected advantage will be for rail customers to obtain better value for money not only in terms of improved service levels, but also in terms of better pricing likely to be heavily impacted by the new competitive environment.

Last but not least, unlike the current situation, effective competition will give rail customers more commercial power. This is particularly important in the event of poor service performance. The customers in a much stronger commercial situation having the right of choice between competing offers, will be able to hold liable rail undertakings for any loss, damage, accident or vandalism occurred while goods are in transit. The commercial damages and missed business opportunities resulting thereof, will finally be recognised and will compel rail undertakings to seriously address security related issues.

4.4 MARKET ORIENTED STRATEGIES AND MARKETING MANAGEMENT

In a modern industrial and competitive context, it is obvious that products' offer, including transports and logistics, must be market oriented and developed by professional marketing management.

Like in any prevailing situation, there are some exceptions to the rule:

- Local small scale businesses, often based on individual skills,
- Products and services offered in a monopolistic environment.

However these two situations will hardly be found in the rail freight of the future which will be totally opened to competition.

National railway undertakings have considered for a long time local and small flows of traffic too labour intensive and of no interest. Regarding the monopoly situation, the opening of the European rail freight space by European legislation created the conditions for true market competition.

The transition from an old style rail economy into a new one has not taken place yet, and a lot of organisational problems are still unresolved including the strategic options yet to be chosen by incumbents. The refusal of smaller flows and other conventional traffics has been and still is the main reason of the rail freight decline. In addition rail undertakings are under threat also on traffics which by tradition should be theirs. Large volumes on long distances are being attacked by other modalities, delivering better overall services.

Nowadays large scale volumes available in an open and competitive market can be acquired only by applying a strong market oriented approach, based both on sound competitive bases and modern marketing approach.

Rail modality has the advantage of offering significant environmental benefits, proposing a much safer system to avoid road congestion. Notwithstanding these positive factors the need to improve the rail freight market position, constitute a real challenge for rail operators. In fact on one hand rail undertakings are all engaged in reducing their operating costs while on the other hand these measures taken to concentrate the network, are responsible for loss of traffic.

This paradigm must be reversed. The efforts should be concentrated on those segments which can be effectively attacked by rail modality and which present conditions where the rail distribution channels could deliver value to the customers. Hence the need of adopting market oriented strategies and marketing management totally absent until now in the incumbents' commercial approach.

Other parts of **NEWOPERA** (Task 1.2) evidenced the need of satisfying the supply chain requirements. Rail freight companies in their market approach must find the solution for responding to these necessities by creating value for themselves and their customers. The prevailing attitude to wait for the customers asking for the supply of rail freight services without any commercial structure must be completely changed. Other competing modalities have on the road everyday thousands of commercial people acquiring traffic. Certainly rail companies for their very nature will never be in a position to reproduce directly this type of situation but could certainly, through agreements, create a sophisticated product distribution network capable of placing on the market a differentiated products' offer.

The modern marketing management must consider that value added goes hand in hand with transport complexities, and that the commercial approach to the users is directly linked to the market positioning and distribution channel differentiation. These concepts will be elaborated in

other parts of this research (Task 4.1)but it is evident that the undifferentiated service is driving rail operators to disaster with the total loss of their residual market share.

Flows of traffic either conventional, intermodal, industrial, must be categorised according to their transport complexities and the customers' needs driving the transport choice. These categories become segments where every modality used has a number of advantages and disadvantages. The ability to identify those peculiarities of particular value for the customers, represents the key to success. In a new rail economy based on the premise of additional capacity being available on rail and in a modern service driven society, rail operators must become market oriented champions.

The transition from a transaction philosophy, the monopoly approach, to a relation philosophy where the focus is on the clients, must be accomplished by adopting the collaborative approach typical of a free market. Choices based on the trade off to make or buy will be paramount to stay competitive. Many new actors have surfaced on the rail market originating from the old incumbents restructuring processes. Collaborative and horizontal partnership will be necessary to offer the services variety, the information tools, the best practices, and the management techniques that the customers want.

4.5 STRATEGIC VS. OPERATIVE DIMENSIONS

The major difference between the **NEWOPERA** project and other operating projects conducted so far, is the strategic vision to create a new rail environment in a borderless Union from now up to 2020. The opening of the European rail space promoted by European Authorities with the implementation of rail packages 1 2 and 3, created the favourable conditions for a step change in rail freight.

Whereas national incumbents adopted so far a reactive approach to local sectorial needs, the new European rules require the implementation of a new corporate strategy for becoming key actors of the European rail freight space. In this new situation the short term operating measures, which have not been capable to stop the continuous erosion of rail freight market share, must be overcame by more strategic choices which involve the very essence of the business. Rail companies have started to ask themselves what kind of role they want to play in the European economy of the future. This approach forces strategic choices and favours the shift from an operational level into a totally new dimension. Issues like:

- What vision, what mission,
- Which business to be in,
- Future business models,
- Service products,
- Corporate efficiency and effectiveness,
- Productivity,
- Marketing approach,
- Competition,

become the new rules of the game. The ERRAC SRRA 2020 scenario with 15.000 km of new and existing lines dedicated to freight, require a new aggressive approach to promote the much needed modal shift. The need to double rail market share by 2020 from 8% to 16%, will require a tripling of existing rail freight volumes. This can be possible only by applying a new business model based on a new service culture induced by the use of rail freight dedicated lines.

The competition exercised by new entrants will make sure that only the most efficient and cost effective companies will be able to survive and prosper. New collaborative approaches have to be tested between market players together with the choice to make services inside, or buy them through outsourcing. At the same time a profound restructuring of existing rigid practices will have to be achieved, providing the market with the flexibility that the research carried out in WP 1 has clearly surfaced.

4.6 THE EXISTING AND THE POTENTIAL: THE WAGONS DIMENSION

The traditional rail companies according to their history, were suppliers of a comprehensive range of services, and part of these services were coherent with their original mission of having to satisfy also a public function. Consequently each national incumbent took steps to build up a fleet of wagons according to the expected requirements of its geographical region. The market development and the service sophistication, favoured over time the creation of a new space for private rail wagons owners, capable of providing more technologically advanced equipment. These private wagons owners were quick in perceiving the changing needs of an evolving scenario and were more capable of satisfying customers requirements than incumbents. Additionally intermodal companies positioned themselves both in their national and international market and assumed in more recent times an industrial dimension. They provide their customers with a complete service including the wagons' supply. The intermodal companies either own or lease from private wagons owners, the wagons they need for their block trains, and buy more and more only the traction from rail operators. This evolution has contributed to create a situation whereby traditional rail companies have an obsolete wagons fleet, and the private wagons owners a more modern and technologically advanced one. Nonetheless the wagons fleet belonging to traditional rail companies or their subsidiaries remains very substantial. In WP 1, Task 1.2 deliverable, major customers have indicated that not only intermodal services must be expanded, but above all single wagons or group of wagons must be given a new dimension. At present this market segment which still constitutes an important percentage for many incumbents, is not satisfactory from a service stand point. In certain countries it looks like this market has been deliberately abandoned by incumbents due to their inability to compete with road both in terms of costs and services.

It must be noted that the single wagons dimension is the only one having the possibility for its own nature, to compete with road trucks. However the old technology used in the marshalling yards for the trains formation together with priority given to passengers, are elements which have prevented the reliability of the performance. Therefore the single wagons market must be reinvented by offering new service characteristics and new operating rules. This is an area of great opportunity for growth for old and new rail operators. What is missing today in this area is a new professional figure which is the "optimiser". He should be capable of bundling together freight originating from different customers identifying a common denominator in terms of rail corridor and distance, where a full train can be assembled. The economy of scale so created is vital for providing competitive cost and competitive service. The optimiser can be any existing or new rail operator, consolidator, forwarding agent, integrator, logistics operator, capable of satisfying the above requirement. In the single wagons' market it is necessary to create the same conditions prevailing thirty years ago in the eve of intermodality. One must say that it is not necessary to wait for so long for this process to take place, since the experience of the past should be good enough to undertake the changes for the future. So much so that major international forwarding agents, logistics operators and consolidators, have seen the opportunity for optimising point to point the

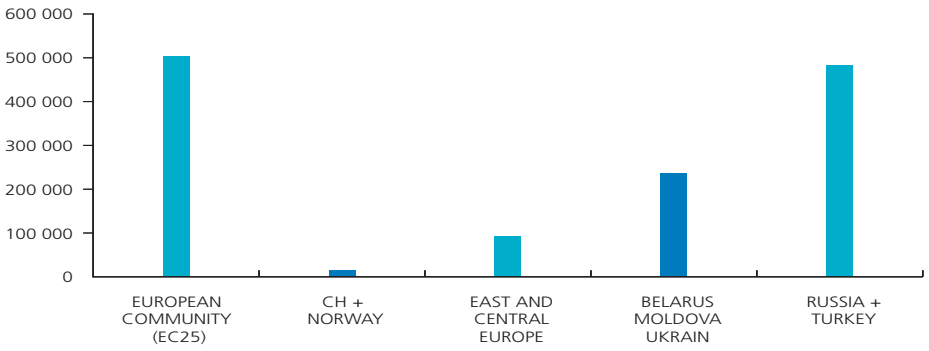
full trains in both directions buying wholesale the full trains from incumbents and selling them retail. The concept of inland dry ports, logistics platforms can be rejuvenated. A new industrial dimension can be generated opening enormous opportunities for new rail freight services and new logistics products.

This will be the new frontier of rail freight cargo mobility capable of offering in the market place, several macro families of rail products:

- Overland intermodality
- Maritime intermodality
- Conventional trains
- Mixed conventional/intermodal trains
- Liner trains
- Specialised traffic (chemicals, steel, fresh, etc.)
- Raw materials
- Optimised single wagons + group of wagons to constitute full trains from point to point (inland ports, container bases, logistics platforms, etc.)
- New intermodal products

The starting point for defining these new fields of opportunities, must be the assessment of the freight wagons' fleet circulating all over Europe. This fleet will provide a macro dimension of existing and future opportunities. A specific research conducted has put in evidence the following picture:

- Fig. 8: Total Wagons per zone
- Fig. 9: Grand Total wagons



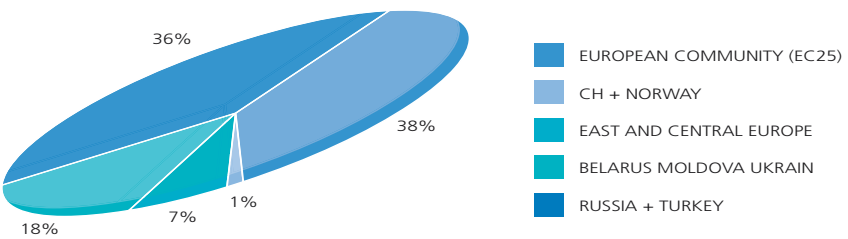


Fig. 10: Total Wagons EU 25

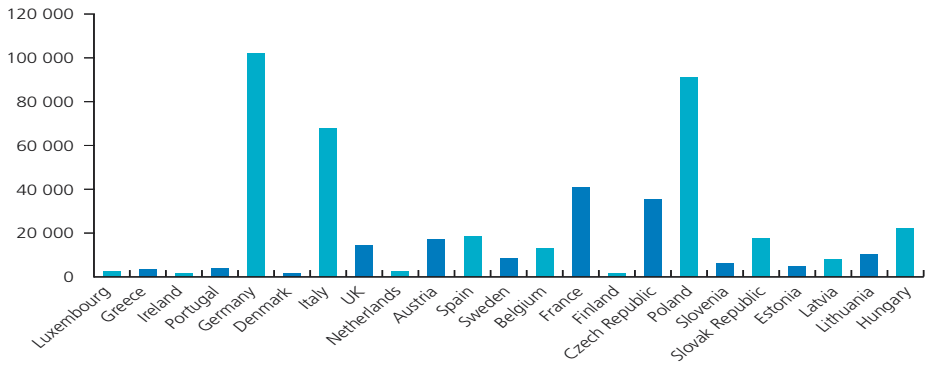
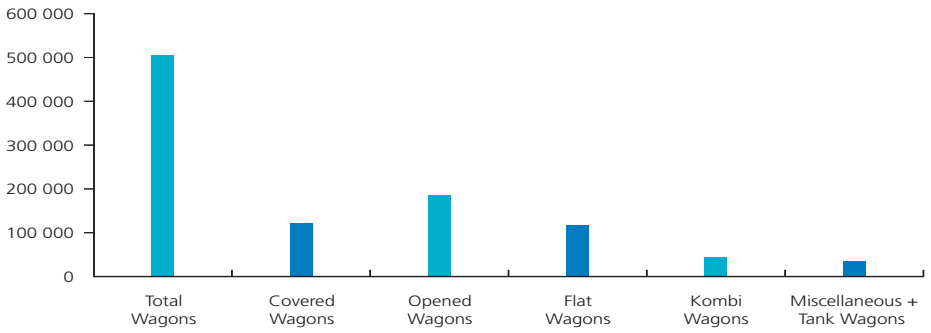


Fig. 11: Type of Wagons per EU 25



This huge fleet of wagons some of which very old and obsolete, will gradually have to be replaced to incorporate the new technologies which should allow: higher axle load, standardised loading gauge, new bogies design, braking technology, automatic coupling together with any other hardware and software innovation, conducive to longer and heavier trains as well as double stack for intermodality whenever applicable. This will constitute undoubtedly a challenge for the migration path to **NEWOPERA**, but the long term objective of creating a new rail economy based on rail freight dedicated lines, must be achieved through the gradual steps of Scenario 1 2 and 3. Technical solutions together with a much improved interoperability must be implemented for responding to the market increased sophistication.

4.7 THE CLIMATE CHANGE

Without wanting to approach this issue from a scientific stand point since this is a technical document, one cannot avoid to register the growing apprehensions emerging at EU level and on the general European public at large on the negative recent climate changes effects.

There is a growing perception that human activities might play a role because of emissions in the atmosphere and the green house effect. Should this be the case, road congestion, urban traffic, CO2 emissions, heat and particulate, become relevant culprits. The pace of European climate change accelerated in the last few years assuming extreme dimensions. Torrential rains, floods

opposed to long drought periods, melting glaciers, shrinking polar cap, heat waves are becoming more evident every year. These effects are influencing negatively the quality of life of European citizens introducing new elements of discomfort and insecurity. The environment all of a sudden has become a limited resource to be protected. This is representing an important change on people perceptions considering that only few years back the environment seemed to have unlimited potential.

The demand for additional freight mobility generated by new market conditions described in the previous paragraphs, cannot be satisfied only by road modality. The revitalization of the rail system becomes absolutely necessary if Europe wants to achieve a better integration of the available transport modalities for a more sustainable mobility over time. The sustainability is a pre-requisite both for providing cost efficiency and effectiveness as well as for answering in a positive way the environment friendly requirements.

The **NEWOPERA** project is addressing all the above aspects in a positive way. It proposes an environmentally friendly freight mobility sustainable in the years to come, giving significant contributions towards achieving the Kyoto protocol objectives.

5. THE PROJECT STRUCTURE, THE WPS AND TASKS DEVELOPMENT

In order to achieve the **NEWOPERA** objectives, the various work packages described in Chapter 2 have been divided into tasks. This for making the research focused on the things to be done and on the results to be obtained.

At the same time it was necessary to have the contributions of a permanent scientific committee composed of various Academia members to make sure that these **NEWOPERA** objectives set out at project conception, were fulfilled. This Scientific Committee was able to supervise the final work of each task and suggesting corrective actions whenever necessary.

- Fig. 12: The Project management structure

5.1 THE WPS AND TASKS DEVELOPMENT

Here below are indicated the Work Packages which characterised the project development together with the specific tasks that each WP was called to research, elaborate and develop.

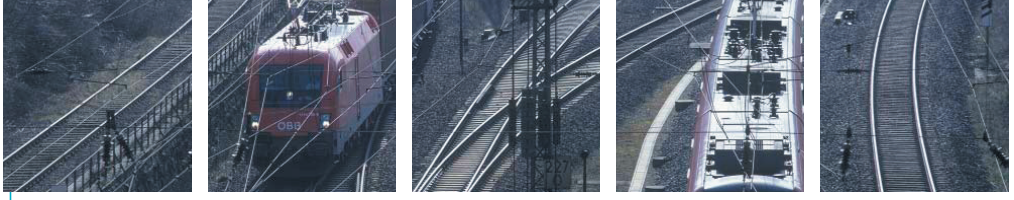
5.1.1 WP0- Project management

has been divided into 2 tasks

- 1 Scientific co-ordination
- 2 Administrative co-ordination.

These tasks had:

- To manage and co-ordinate all WP leaders in the fulfilment of their tasks both on the scientific and technical stand point
- To control the project results and the deliverables timings
- To report and keep regular contacts with the European Commission scientific officer
- To administer the project co-ordinating the partners
- To collect and distribute the project' funds
- To make sure that everything is carried out according to the quality plan and that the partners relationships are regulated by proper agreements.



5.1.2 WP1- State of innovative experience

has been divided into 4 tasks
1.1 New trade patterns
1.2 Future trends within supply chain development and philosophy
1.3 New traction patterns
1.4 Migration strategies and step-wise scenarios.

These tasks had:

- To assess and describe the existing state and structure of the RAIL industry, defining Scenario 0 (base scenario) as described in Figure 4
- To assess and describe the RAIL supply and demand environment and its evolutionary trends both for endogenous and exogenous reasons such as EU enlargement, industrial relocation, trade globalisation etc.
- To assess, describe, and compare emerging situation with ERRAC SRRA 2020 and **NEWOPERA** migration towards step-wise Scenario verifying its level of sustainability
- To assess and describe innovative experiences related to:
  - New entrants and their best practices in terms of hardware, software, ICT and other new technologies
  - New traction patterns for service and productivity improvement
  - Standardisation and Industrialisation
  - New traffic flows and their characterisation
  - Quality and service standards applicable
  - Safety and Security issues
  - Success stories and lessons to learn
  - Environmental considerations adopted.

5.1.3 WP2- New operating and technical systems/aspects

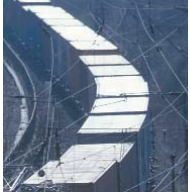
has been divided into 4 tasks:
2.1 Hardware technologies
2.2 Software technologies
2.3 Training and new operating rules
2.4 Interoperability.

These tasks had:

- To perform cost and performance assessment of the four **NEWOPERA** scenarios depicted in Chapter 2, Figure 4 in terms of:
  - Complete systems
  - Rolling stock equipment
  - Signalling / ICT systems
  - Automated solutions for railway applications
  - Modelling of traffic flows
  - Environmental impact assessment of required technology
  - Interoperability requirements, migration times and technical solutions.

5.1.4 WP3- Network Perspective

has been divided into 3 tasks:
3.1 Demand and supply assessment



3.2 Network assignment
3.3 **NEWOPERA** scenarios: projections and modal split.

These tasks had:

- To provide a framework which stresses the interactions between the different components of the rail system, i.e.:
  - Between technical performances and development of new opportunities for commercial products
  - Between different markets segments within the European market considering Corridors vs. Network strategies and evolution from the present situation to a long term perspective

- To progressively implement the dedicated freight network on a GIS including:
  - A demand model which is used for demand assessment (final users and operators)
  - A supply model which updates on technical improvements (rail undertakings and infrastructure managers)
  - A network assignment tool which will be used by all stakeholders including public bodies concerned with socio economic assessment results.

5.1.5 WP4- New product-services

has been divided into 4 tasks:
4.1 Market segmentation and logistics services
4.2 Intermodal/ Interindustry
4.3 Port interconnections and flows
4.4 Emerging actors and vision for new products.

These tasks had:

- To draw a NEW Pan European Rail market approach based on One-Stop Shop philosophy
- To apply the selling-driven principle to the rail marketing
- To estimate volumes of cargo to be carried on main Rail corridors
- To assess, describe Rail Market segments according to their drivers for offering the rail customers a larger choice
- To evaluate the market potential by applying the segments approach
- To calculate market share thresholds needed to achieve optimum services productivity, as well as satisfactory return on investments
- To evaluate Rail geographical accessibility to existing and potential customers consistent with marketing objectives
- To compare existing volumes and potential volumes in coherence with the NEW Opera Step-wise Scenario and its economic viability
- To evaluate the potential of intermodal services both for overland traffic and maritime port traffic
- To assess the impact of new emerging actors both for their own activities and for cooperation/ joint venture activities with existing operators.

5.1.6 WP5- Socio Economic Evaluation

has been divided into 4 tasks:
5.1 Assessment of scenarios
5.2 Socio-economic and environmental assessment

5.3 Mapping and monitoring the rail freight network
5.4 Implementation plan.

These tasks had:

- To describe the scenarios and the migration process with their main economic dimensions taking into account the competitive factors such as pricing and tariff policies, the development of freight volumes along specific corridors and at network level. Alternative hypotheses related to tariff policies towards long-distance road transport with their effects on rail freight competitiveness, will also be taken into account
- To develop a mapping instrument (GIS) for the rail freight-dedicated network at European level
- To assess economically the scenarios for the main rail freight transport actors such as shippers, operators, railway undertakings, infrastructure managers. This is necessary for evaluating the transition process viability towards a new rail freight system and for drawing the balance of advantages/disadvantages for the various categories involved
- To assess from a socio-economic and environmental stand point the same scenarios for the European society at network level based on results from WP2, WP3 and WP4
- To make recommendations for the implementation and management of the migration process such as choice of priorities for network development investment strategies based on socio-economic assessment results taking into consideration the prevailing EU transport policies.

5.1.7 WP6- Cooperation, Dissemination, Evaluation

has been divided into 3 tasks:
6.1 Tools for dissemination
6.2 Cooperation
6.3 Evaluation

These tasks had:

- To organise and hold five events (conferences / workshops) approximately at month 6, 12, 24, 36, and 42 of the project lifetime, to inform on achievements and to gather suggestions, impressions, and contributions from potential **NEWOPERA** stakeholders.
- To set up and run the **NEWOPERA** Internet tool to be used both as a web page for disseminating information to a wide audience and as an internal management tool
- To prepare and issue the **NEWOPERA** Newsletter following each event and to make it available both over the web and on paper
- To prepare and issue the **NEWOPERA** Press Release at the project start
- To cooperate with TREND and REORIENT and to report on cooperation
- To evaluate and self assess the project development and results.

5.2 CONCLUSIVE REMARKS ON PROJECT DEVELOPMENT

All the above tasks, integral part of their WPs, were developed referring to the scenario exercise depicted in Fig.4 Chapter 2. The progressive development of this research was monitored and managed through a fixed time table for each deliverable and through a milestone list which set the timing for each deliverable and event.

This research was developed in a proper sequence starting from the new market situation to the new customers needs and the migration process for satisfying such dynamic and evolving needs. In the middle of this very basic concept **NEWOPERA** had to identify the causes which are responsible for the gap existing between supply and demand. At the same time **NEWOPERA** had to deal with a variety of dimensions which played a vital role for eliminating this gap or part of it. In fact the lack of investments and best practices, the lack of benchmarking, the service deterioration in absence of competition, have been lasting for too long. The amount of rail sector restructuring had to involve the very nature of the activity as a whole, from its roots up to the planning of a new business model.

6.1 WP1 STATE OF INNOVATIVE EXPERIENCES

6.1.1 New Trade Patterns

This work package deals with all facets relating to innovative experiences affecting European rail freight. Very interesting findings emerged from the research performed under Task 1.1 New Trade Patterns. The research was carried out per Group of Products and per Zone analysing the trends of world trade keeping distinction between:

- World trade with EU
- Intra EU trade
- EU and new member states
- EU with new neighbours
- MEDA countries and CIS.

An important element of evaluation for calculating future transport needs and consequently infrastructure capacity requirements, is the concept of Elasticity between GDP and emerging trade developments. The study has put in evidence that:

- Trade grows faster than GDP
- Such growth based on GDP is different per country and trading zone
- The growth is faster in extra EU compared to intra EU countries.

- Fig. 13: Elasticity GDP/TRADE

Elasticity 95-2002	Intra EU	Extra EU	USA	Japan	China
Output	2.9	3.4	2.3	4.3	1.9
Input	2.9	3.7	3.6	5.4	1.9

Once calculated the international trade from the GDP according to the above figure, it is possible to elaborate both the percentage increase of tons transported of physical units and also of transhipments. This concept is better explained by looking at the following scheme:

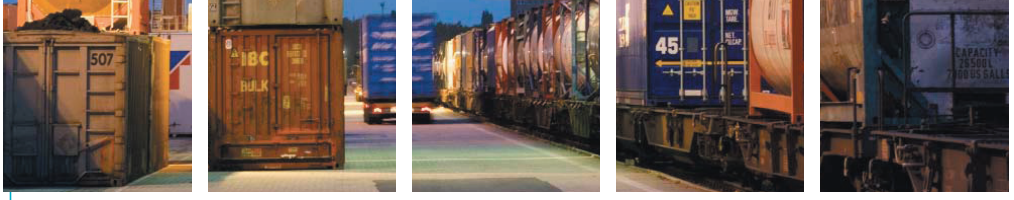
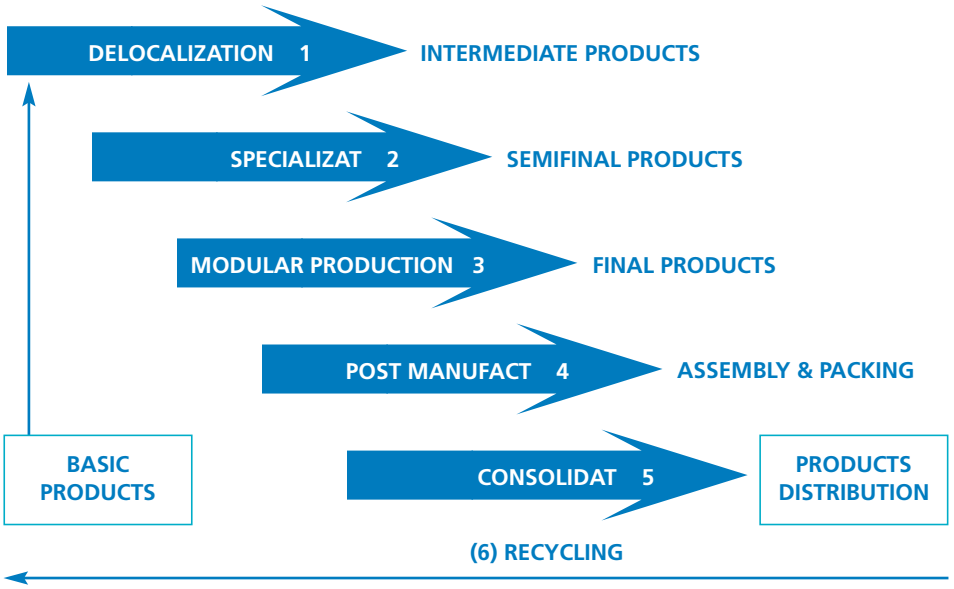


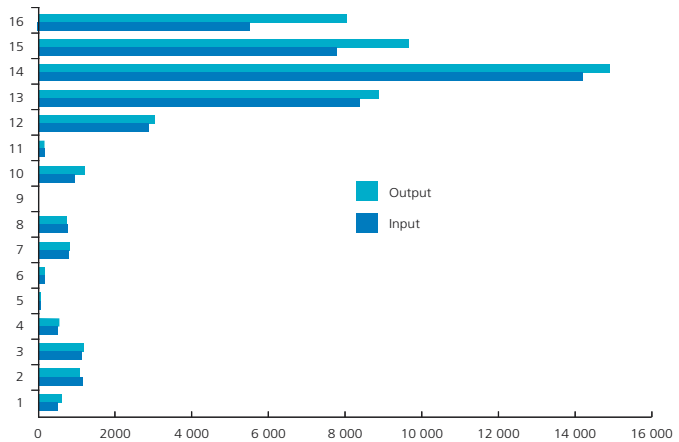
Fig. 14: Multiplying effects on transports



In sector 1 of the above figure one start from the manufacturing facilities delocalization because of much reduced production costs. In sectors 2 and 3 trip numbers increase between the same families of industries. In sectors 4 and 5 additional transport can take place for assembly and packing operations. In the distribution phase trip numbers increase between industries and logistics centres and between logistics centres themselves for costs optimisation and transport industrialisation. The sector 6 of "recycling" relates to a new transport demand connected to "reverse logistics". This last type of demand is a relatively new one and will be increasing substantially in the coming years.

In the following charts one tries to reproduce some ratios indicating both the trade patterns, the spatial patterns and future trends.

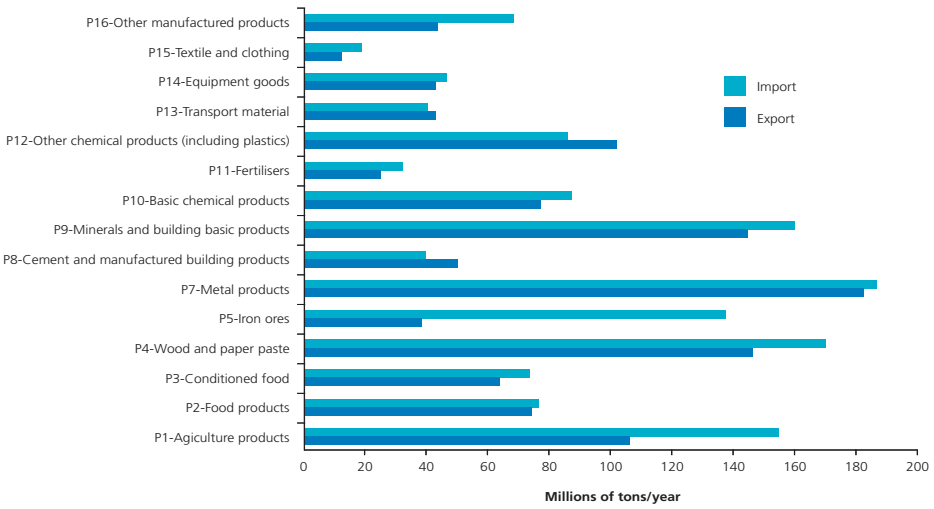
Fig. 15: Trade Patterns: Values per ton per region



Reporter: EU25 Partner: World

In the above chart the classification reproduced in the scale from 1 to 16 represents different types of goods as indicated in the next figure.

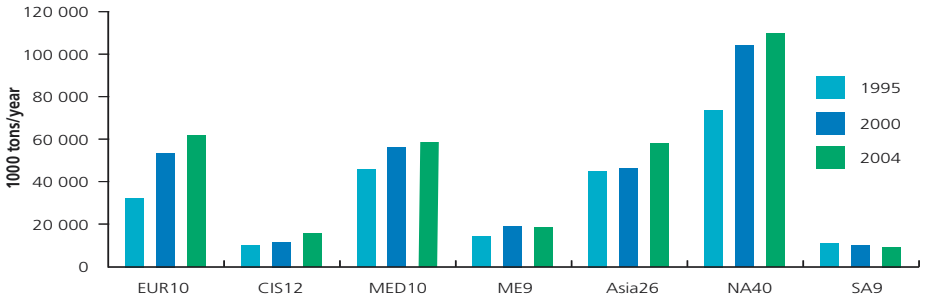
Fig. 16: Importation and Exportation of the EU15



Reporter: EU15 Partner: World

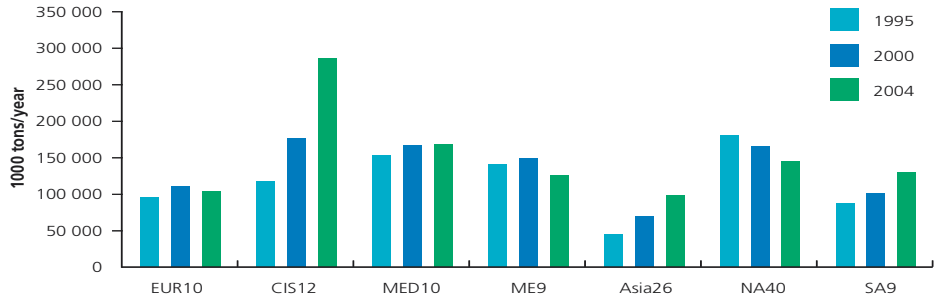
The next four charts describe the spatial patterns of exports and imports as well as the export and import in the unitised dimension.

Fig. 17: Spatial Pattern Export



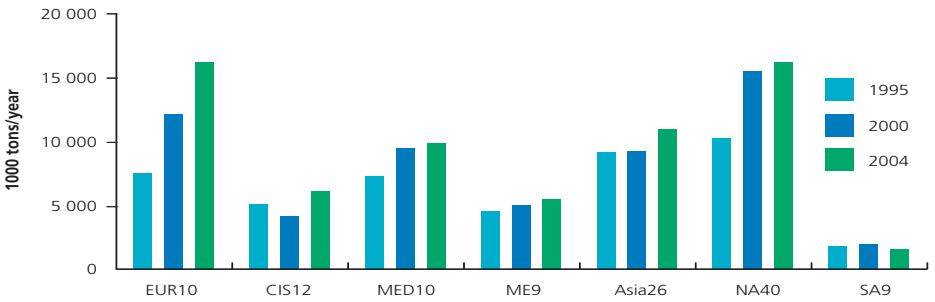
Reporter: EU15 Partner: World

Fig. 18: Spatial Pattern Import



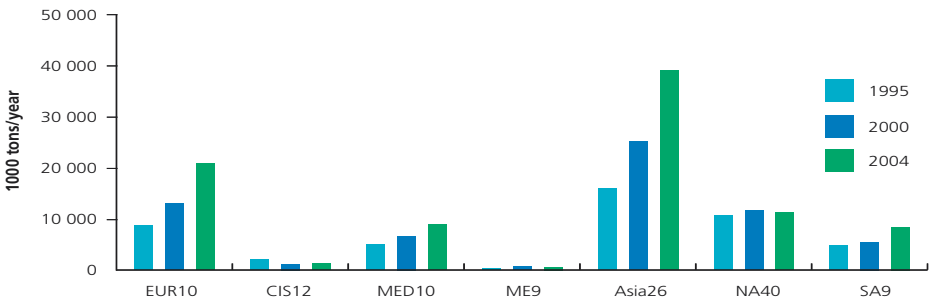
Reporter: EU15 Partner: World

Fig. 19: Spatial Patterns Export Unitised



Reporter: EU15 Partner: World

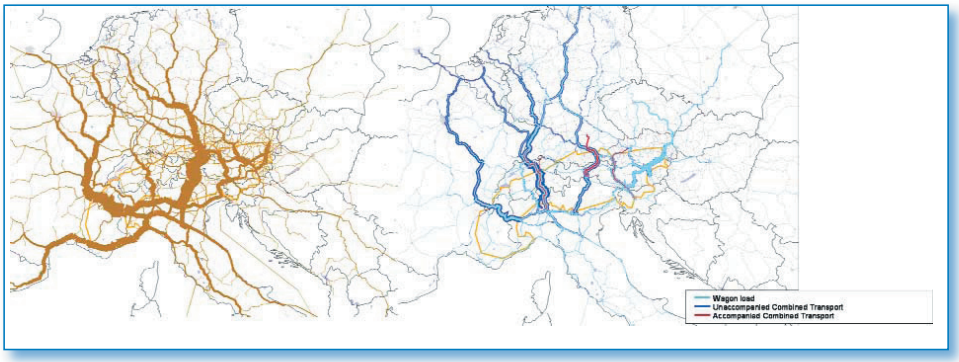
Fig. 20: Spatial Patterns Import Unitised



Reporter: EU15 Partner: World

The following chart reproduces the trade flows by road and rail in central Europe.

Fig. 21: Spatial Pattern: Trade Flows by Road & Rail



Source : CAFT Survey 1999

The next two charts describe the annual growth rate of import and export between EU 15 member states and the world.

Fig. 22: Annual Growth Rate: Import EU 15/World

Group	Partner								
	EU15	EU10	CIS12	NA40	SA9	ME9	Asia26	MED10	TOTAL
P1- Agriculture products	1,7%	7,0%	15,5%	-7,2%	5,2%	2,6%	3,0%	5,9%	1,3%
P2- Food products	5,6%	5,9%	-3,9%	-0,6%	6,5%	10,5%	3,0%	2,2%	5,1%
P3- Conditioned food	2,6%	2,7%	-9,2%	0,2%	5,7%	-0,5%	1,1%	2,9%	2,3%
P4- Wood and paper paste	3,5%	5,5%	5,4%	-1,9%	3,8%	20,1%	5,4%	7,1%	3,6%
P5- Iron ores	-0,3%	-5,5%	2,9%	-4,9%	2,9%	-19,2%	-0,9%	5,3%	0,5%
P6- Petroleum products and coal	4,4%	-1,0%	11,9%	-1,6%	10,2%	-1,1%	9,1%	-0,4%	3,2%
P7- Metal products	3,1%	2,6%	6,5%	-3,6%	4,7%	14,3%	13,4%	13,5%	3,8%
P8- Cement and manufactured building products	2,5%	-2,3%	-0,8%	1,0%	14,6%	39,6%	17,3%	11,7%	3,4%
P9- Minerals and building basic products	0,0%	-14,6%	12,2%	-1,2%	8,1%	10,3%	8,6%	9,6%	0,3%
P10- Basic chemical products	3,7%	1,2%	3,7%	2,9%	11,5%	8,9%	7,9%	2,8%	3,7%
P11- Fertilisers	-0,7%	-0,4%	1,2%	-8,9%	-1,2%	37,4%	22,0%	-0,8%	-0,5%
P12- Other chemical products	4,8%	8,9%	-4,4%	3,5%	9,9%	17,6%	9,7%	10,0%	5,2%
P13- Transport materials	5,8%	14,2%	-6,8%	4,2%	2,4%	8,3%	12,6%	29,1%	7,1%
P14- Equipment goods	3,7%	18,9%	1,5%	0,8%	13,0%	13,3%	16,0%	19,5%	7,3%
P15-Textile and clothing	1,5%	5,1%	-7,2%	-1,1%	-1,9%	7,1%	8,1%	6,5%	3,5%
P16-Other manufactured products	20,8%	20,2%	6,9%	8,3%	12,1%	5,9%	16,3%	19,7%	19,5%
TOTAL	**3,4%**	**1,2%**	**10,3%**	**-2,5%**	**4,0%**	**-0,9%**	**8,5%**	**1,3%**	**3,2%**

Reporter: EU15 Partner: World

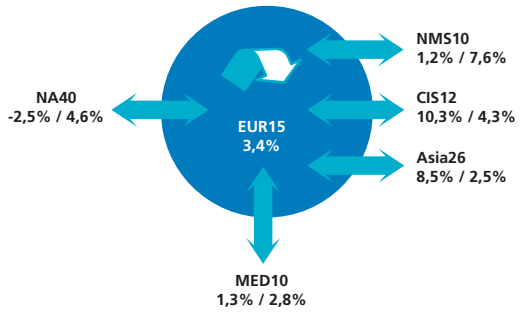
Fig. 23: Annual Growth Rate: Export EU 15/World

Group	Partner								
	EU15	EU10	CIS12	NA40	SA9	ME9	Asia26	MED10	TOTAL
P1- Agriculture prod.	2,0%	6,6%	0,7%	0,9%	-5,8%	-10,6%	-9,7%	-1,5%	0,9%
P2- Food products	4,6%	1,7%	-10,8%	3,8%	-8,9%	-4,7%	3,8%	-0,8%	3,5%
P3-Conditioned food	2,2%	4,6%	4,3%	-0,5%	-10,5%	-1,8%	6,2%	4,9%	2,3%
P4- Wood and paper paste	3,6%	12,2%	18,4%	12,3%	2,7%	8,4%	14,3%	5,4%	5,1%
P5- Iron ores	0,0%	10,4%	0,2%	12,7%	-9,4%	2,7%	-7,2%	7,3%	0,8%
P6- Petroleum products & coal	3,6%	-2,9%	-10,3%	5,1%	-12,9%	-2,2%	0,5%	6,3%	3,5%
P7- Metal products	3,5%	14,1%	7,5%	2,7%	0,9%	9,2%	1,4%	-0,8%	3,5%
P8- Cement and building products	2,1%	10,0%	15,3%	8,7%	-1,3%	4,0%	-4,5%	1,2%	2,9%
P9- Minerals and building basic products	1,0%	11,5%	9,8%	0,1%	-13,7%	-7,8%	6,1%	-3,8%	1,0%
P10- Basic chemical products	4,0%	5,4%	-1,9%	-1,9%	6,7%	4,6%	3,7%	5,6%	3,8%
P11- Fertilisers	-0,8%	5,1%	36,3%	3,7%	8,6%	12,9%	-8,7%	0,5%	-0,3%
P12- Other chemical products	5,3%	13,1%	16,5%	6,5%	5,3%	7,1%	7,2%	8,8%	6,2%
P13- Transport materials	5,7%	12,2%	15,7%	6,9%	-4,8%	20,7%	-0,6%	11,4%	6,2%
P14- Equipment goods	5,2%	12,4%	12,8%	5,2%	0,1%	9,2%	1,3%	6,4%	5,5%
P15- Textile & clothing	-0,1%	5,7%	6,3%	0,8%	-1,4%	1,9%	2,6%	6,0%	1,2%
P16-Other manufactured products	14,7%	20,0%	1,9%	7,3%	12,0%	9,8%	7,6%	14,0%	13,9%
TOTAL	**3,2%**	**7,6%**	**4,3%**	**4,6%**	**-1,4%**	**3,1%**	**2,5%**	**2,8%**	**3,4%**

Reporter: EU15 Partner: World

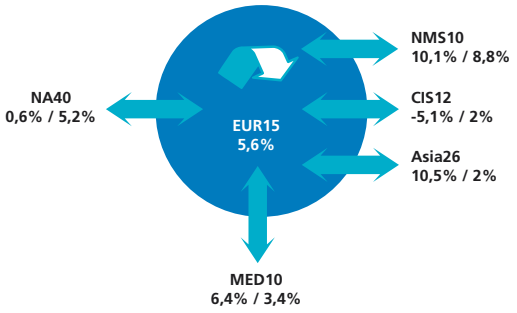
The charts number 24 and 25 reproduced here below indicate the dimension of the annual growth rate import and export in general and import and export unitized.

Fig. 24: Trend per zone: Annual Growth Rate 95-2004 Import/Export



Source : COMEXT 2004. Beauchet B. NESTEAR

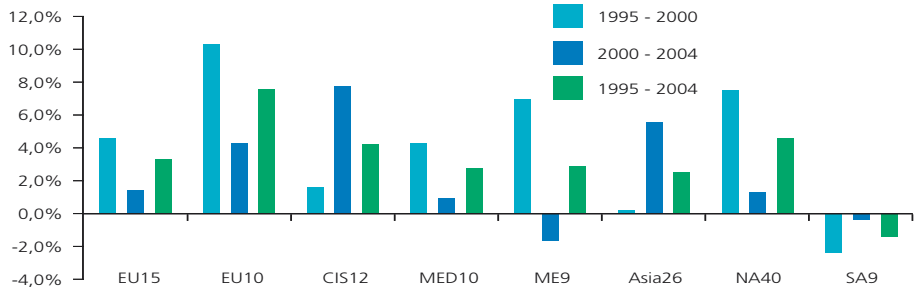
Fig. 25: Trend per zone unitized: Annual Growth Rate 95-2004 Import/Export



Source : COMEXT 2004. Beauchet B. NESTEAR

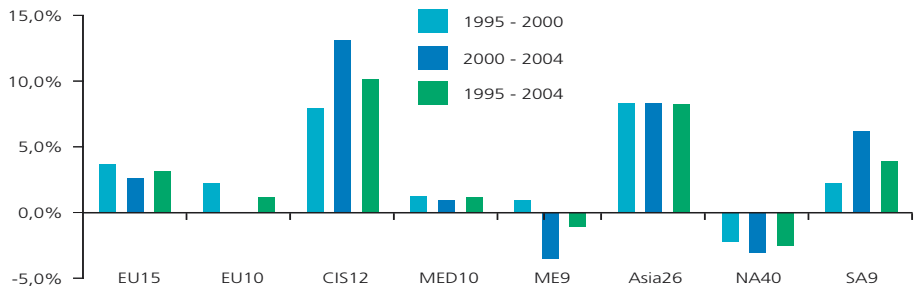
The next set of charts are the most important since they are able to reproduce in synthesis the breaks in trends involving Europe and the other trading zones. The emerging changes are significant.

Fig. 26: Breaks in Trends: Annual Growth Rate Export



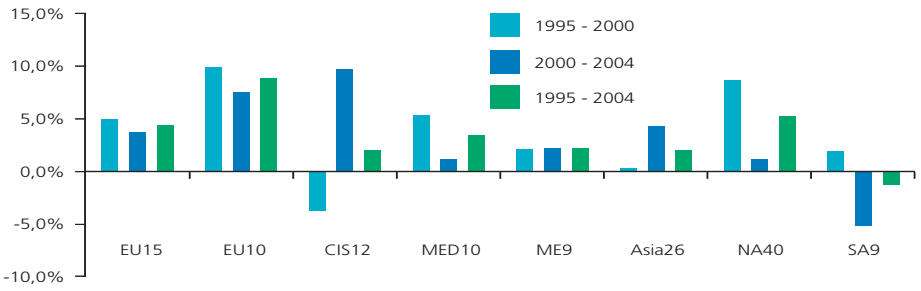
Reporter: EU15 Partner: World

Fig. 27: Breaks in Trends: Annual Growth Rate Import



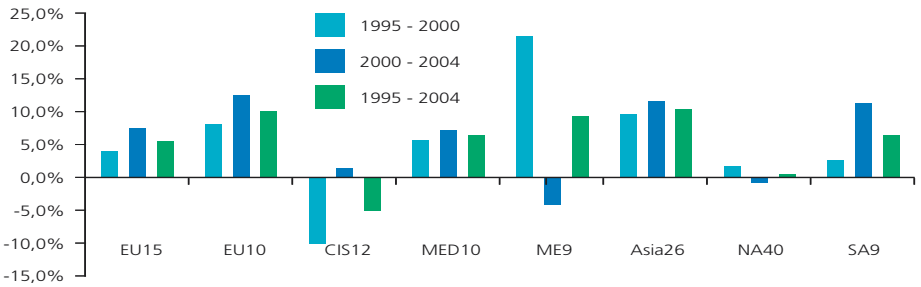
Reporter: EU15 Partner: World

Fig. 28: Breaks in Trends: Annual Growth Rate Export Unitised



Reporter: EU15 Partner: World

Fig. 29: Breaks in Trends: Annual Growth Rate Import Unitised



Reporter: EU15 Partner: World

The analysis of the above charts bring to the following conclusions:

- The trade tables in tons and percentage increases per market segment indicate the size and growth potential of the segment
- Since year 2000 important structural changes became visible. Break in trends are noticeable delivering the message of substantial changes in trade patterns
- Tonnage and cargo movements associated to unitised deliveries are increasing faster than values of products reflecting complex delocalization processes
- EU enlargement: faster growth of trade is taking place with NMS and between NMS. In particular the increase of NMS imports is fast and noticeable. The impact of the EU enlargement to all EU members is relevant
- EU opening: Trade with extra EU countries is growing faster than intra EU ones. EU domestic traffic is impacted substantially for volumes to and from major EU ports.
- New EU neighbours: there is a strong attraction for trade with EU but also a strong impact is noted on non EU trade particularly between CIS and MEDA countries excluding oil
- China and South East Asia: The exchanges with this area of the world are very rapid and very substantial. Although better standards of living in these countries stimulate import from the EU of high value goods, the trade imbalance in tons or units imported into the EU is colossal and therefore structural. This situation is likely to continue in the foreseeable future.

6.1.2 Future Trends within Supply Chain Development and Philosophy

The purpose of this paragraph is to introduce the research in outlining the task's goals the reasons why such research is important and the adopted methodology. Moreover in section 1.1. some of the driving concepts are mentioned. In section 1.2 the idea is to present the phases carried out according to the EC Basic Format the amount of questionnaires sent and received by type of sector and the interviews which have been conducted.

The report describes the long term trends and expected consequences within Supply Chain Development and Philosophy. In particular the final goal is to assess and describe the Rail Supply and Demand Environment its evolutionary trends both due to endogenous and exogenous determinants. The research carried out in this report is set to respond to the variables known as market trends. In the last few years the following concepts have affirmed themselves in the market place and these are likely to prevail in the foreseeable future:

- From space to time premium is speed of reaction
- From stock to flows premium is efficiency and effectiveness
- From price to value premium is service quality
- From product to market premium is supply chain demand
- From push to pull premium is flexibility and ability to change

The above principles are the very essence of Logistics from the service provider's standpoint and the supply chain development and philosophy from the shipper/customer's one. Service culture is becoming predominant in commercial transactions on what used to be known as Production Culture. Service becomes part of the Product quality and can determine its success or failure. In addition other intangible individual elements like the quality and the service perception become paramount. This means that these vital elements not only must be delivered together with the product but must also be communicated to the Customer for him to be sure that the product will be arriving in the desired conditions, at the time expected, safe and secure through a seamless logistics chain.

Considering the above the research work had four major goals:

- To examine the drivers of supply chain development
- To identify the tools sustaining the SC evolution
- To assess the infrastructure role in terms of Rail network in a market driven by Supply Chain trends
- To evaluate the new needs best practices and their sustainability applying the Step Wise Scenario Philosophy.

The result of the research is based on a survey conducted during Spring/Summer 2005 amongst leading European companies representing many industrial clusters in different countries.

Fig. 30: Participants by Region

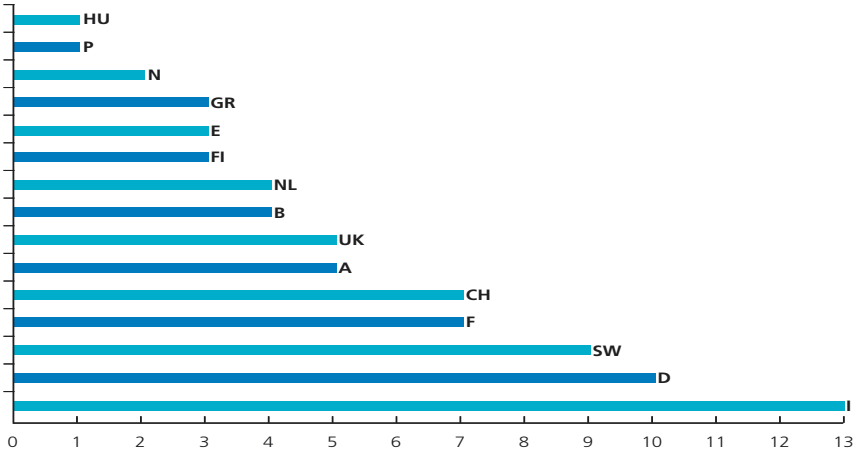
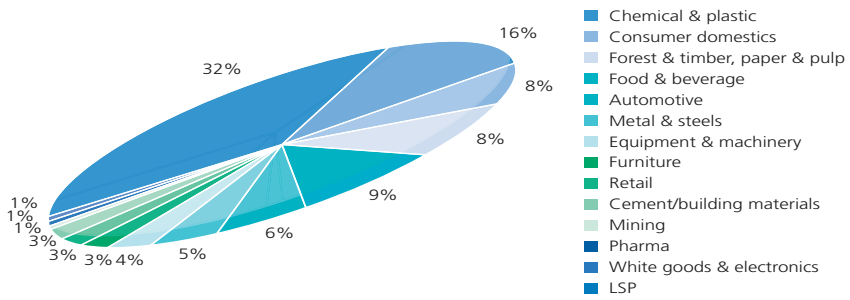


Fig. 31: Participants by Industry



A parallel research was commissioned to CERTET which is the official transport research centre of the Bocconi University in Milan.

In order to make the results of Task 1.1 immediately applicable to the unitised dimension which is characterising modern world trade, the following charts are reproduced. They give the percentage increase confronting the shipping industry and reflecting present and future containers demand. This in turn will also affect the overland demand for containers transportation to and from the ports.

Fig. 32: Growth in Demand for Containers

Period	Change
2000/2001	+ 3.5%
2001/2002	+ 11.6%
2002/2003	+ 15.2%
2003/2004	+ 11.0%
2004/2005	+ 11.5%

Fig. 33: Changes in Trade Balances between Major Trade Blocks

Source	Destination	1997 M. TEU	2003 M. TEU	Change
Europe	**USA**	1.5	2.2	+ 47%
USA	**Europe**	1.5	1.6	+ 7%
Far East	**Europe**	2.9	5.2	+ 79%
Europe	**Far East**	2.4	3.2	+ 33%
Far East	**USA**	4.8	9.4	+ 96%
USA	**Far East**	3.5	4.3	+ 23%

Source: Drewry Shipping Consultants

There are many driving forces pushing towards globalization. These forces may be grouped under four principal headings:

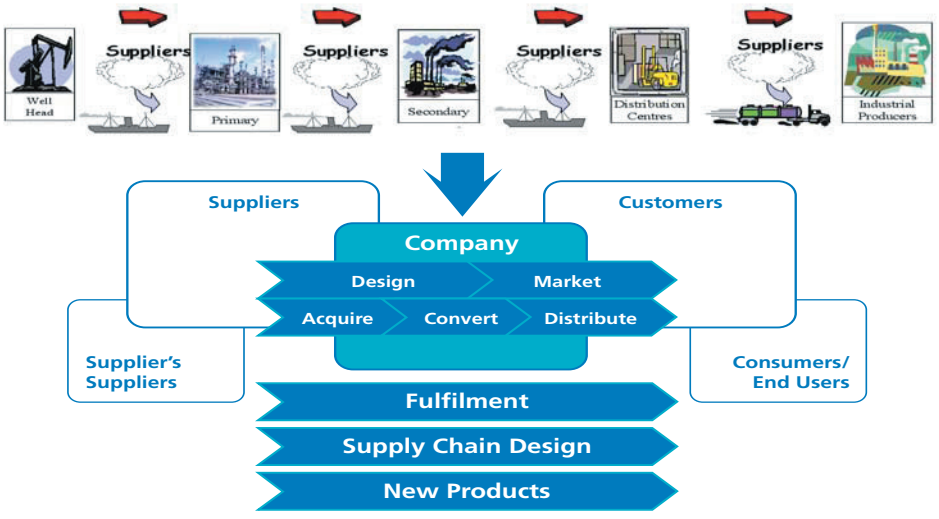
- Margins and costs pressures
- Trade liberalization
- Decreasing consumers xenophobia
- Improvements in information technology.

Because of the above manufacturing trading and service companies are synchronising their supply chains strategies and structures by linking into each other and connecting their enterprises. Connectivity collaborative approach and information sharing become vital elements for managing supply chains. The companies' organisations change from functions to processes and from a vertical structure into an horizontal one.

A process chart has been analysed as an example.

Fig. 34: World Class Chemical Supply Chain

World class chemical chains will require shift from function to process



Source: LCP Alan Braithwaite at EPCA 2002

The classical functional organisation operating in vertical silos generate inefficacies because of lack of interaction between functions. World class supply chains can eliminate these wastes but do require high level of interactions in structural operational and technological processes. They are illustrated in the next diagram.

- Fig. 35: Supply Chain Trends

Trends to World Class Supply Chains ...

Consolidation & sector focus	Consolidated inbound logistics	E2E visibility and telemetry
Internationalisation	Rationalise logistics providers	Advanced planning systems
Capacity rationalisation	Collaborative back haulage	Collaborative systems
Global low-cost sourcing	Collaborative planning (CPFR)	Integrated front office (e)systems
Fresch focus on distributors	Integrated planning	Back office e-integration
4PL / Lead Logistics Providers	Changeover time reduction	Contract based e-procurement
Supply chain organisations	E2E flow management	Cost-to-serve strategy systems

Source: LCP Alan Braithwaite at EPCA 2002

In order to survive in global competition it will no longer be sufficient to be good in a single component of the supply chain but it will be necessary to be better than the competitor in the whole supply chain. The concept of entire supply chain includes the merging of the corporation physical network with the virtual network, such as:

- Physical network
- Suppliers
- Logistics
- Technology
- Information
- Order entry
- Customer service
- Quality and assistance
- Customers
- Customers relationship mgmt.

In order to achieve in practice the above approaches the leading corporations had to restructure the:

- Management processes involving: Customer and supplier relationship, Organisation and human resources, Change management, Information and knowledge technologies
- OSS- One Stop Shop or single point of contact has been implemented for providing a more efficient response to customer needs
- Customers relationship management is a marketing evolution of the customer service management for implementing a market oriented approach
- Supply chain in/out sourcing for deciding either to make or buy the services required
- Transport vs. distribution logistics according to their core business activities
- IT virtual networking integrating their IT capabilities into platforms, exchanges and global networking for governing their extended supply chain and managing their logistics solutions.

At this stage it was necessary to verify through the results of the research carried out as described at the beginning of this chapter, whether the policies above indicated found practical implementation in the real world.

In the area of performance management it has emerged from the research that a great majority of the respondents is managing and controlling properly the logistics budgets and results.

Fig. 36: Logistics Budget and Analysis

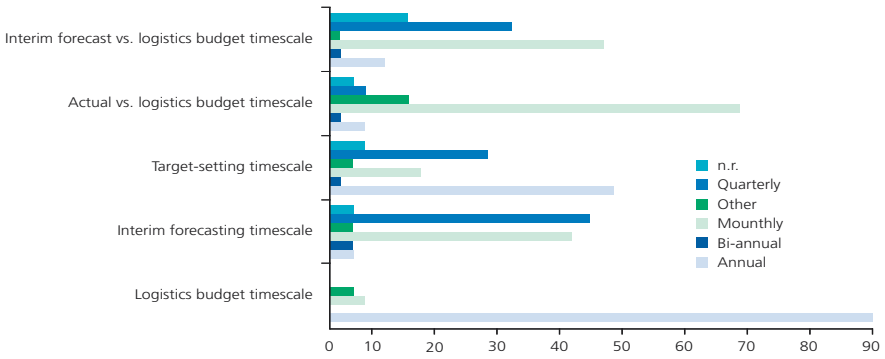
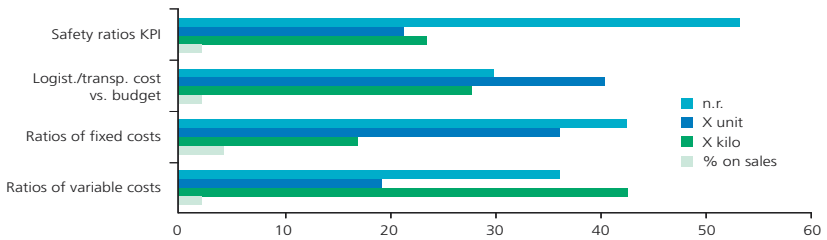
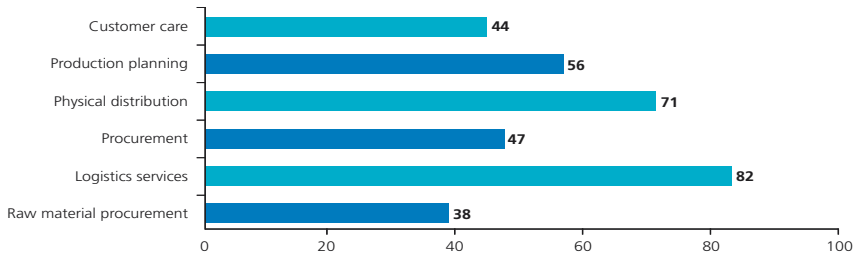


Fig. 37: Logistics Cost Ratio



The next chart describes the supply chain extension when the supply chain is a proper organizational entity inside the corporation.

Fig. 38: Supply Chain Extension



In the area of purchasing cycle many companies 85% of them have a procurement corporate policy and 92% of them have a proper environmental policy in place. It is important to note that 72% of cases monitor the suppliers performance through environmental criteria evaluation. Most companies qualify their suppliers and high percentages of them conduct business either through strategic agreements 19%, long term agreements 47% and partnership agreement 26%

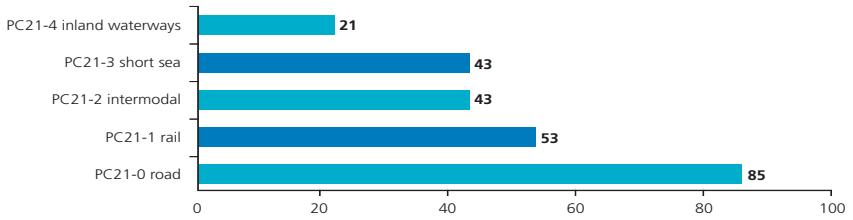
These selection criteria are a combination between least costs 55% and quality 23% or both 15% being the difference non respondents.

These evaluation criteria are based on actual performance 60%, quality benchmark 19%, performance benchmark 9%, deliveries 2%, a combination of them all 9% being the difference non respondents.

On types of contract there is a good level of sophistication considering that many companies share benefits on continuous improvements 43%, on increased volumes 38% and rewards 2%. The difference being non respondents.

The following chart is putting in evidence the modal split for inbound traffic. All modalities are used with road prevailing.

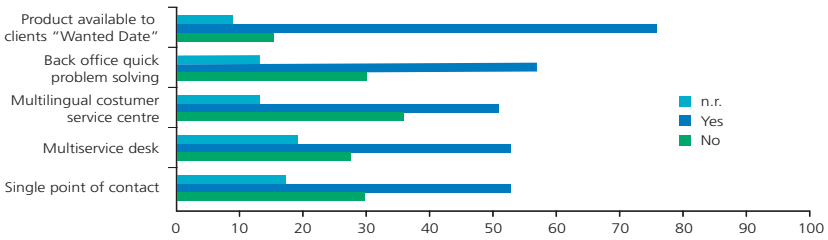
Fig. 39: Modal Split of Inbound Traffic



The modal split emerged from the **outbound traffic** research is not significantly different compared to the inbound one as per previous graph.

In the area of revenue cycle the research wanted to establish the level of best practices adopted and to verify if these were consistent with OSS, customers orientation, quality management together with the applied technologies. The following set of charts indicate that indeed a high percentage of respondents adopt best practices coherent with modern management trends.

Fig. 40: One Stop Shop Adoption



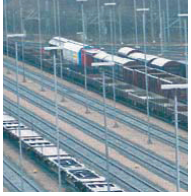


Fig. 41: Process Automation

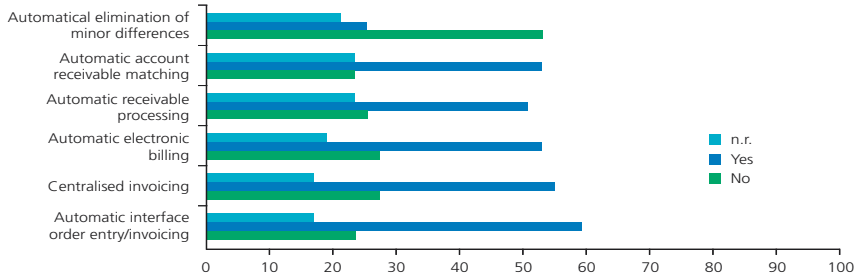
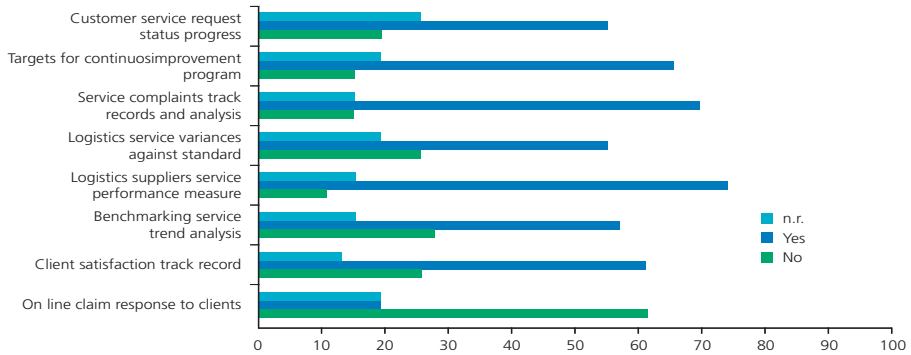
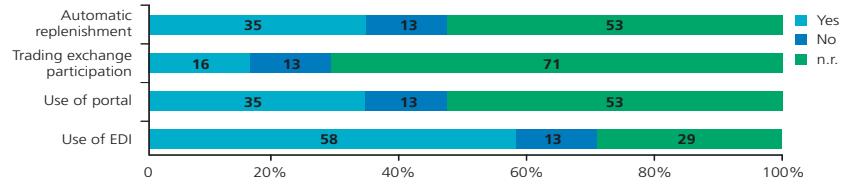


Fig. 42: Customer Satisfaction Components



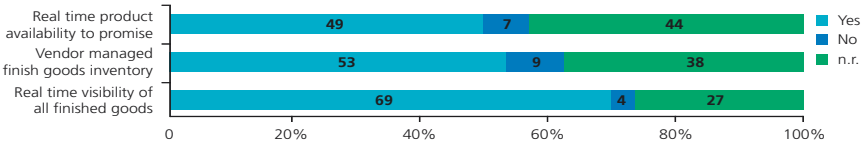
In the area of order management process a 58% declare to use EDI over dedicated network for customer orders and 35% declare the use of portals and adopt automatic replenishment as per graph below.

Fig. 43: Order Management Process



In the area of inventory management process 69% have a real time visibility of their products and about half of the respondents declare to manage their customers inventories and offer real time products availability as per graph below:

Fig. 44: Inventory & Warehouse Management Process

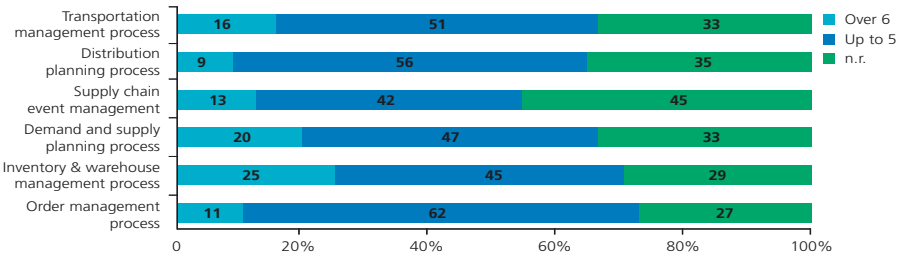


In the area of demand and supply planning processes advanced best practices regarding horizontal integration with customers and suppliers, seem to be implemented by a minority of companies. The same applies to the supply chain event management which indicates that despite a great deal of talking about truck and trace, this best practice is still implemented by a minority of companies.

In the area of transport management processes only about 1/3 of companies use advance technology for transportation calls and still very few are integrated into the carriers transportation scheduling tools. Low percentages apply also to use of shared portals for carriers selection optimisation.

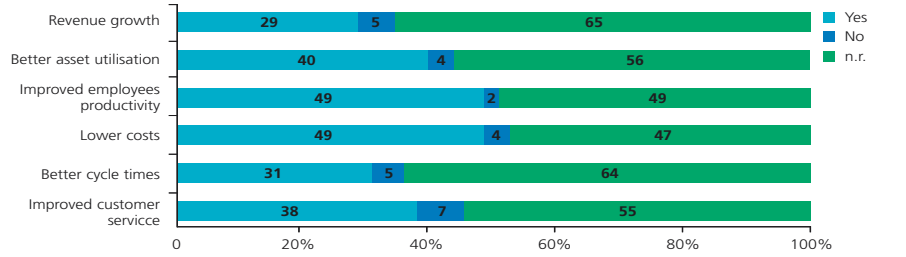
In the area of process and performance measurements by KPI best practices have a wide spread utilisation in leading companies as evidenced in the next graph.

Fig. 45: Process & Performance Measured by Process



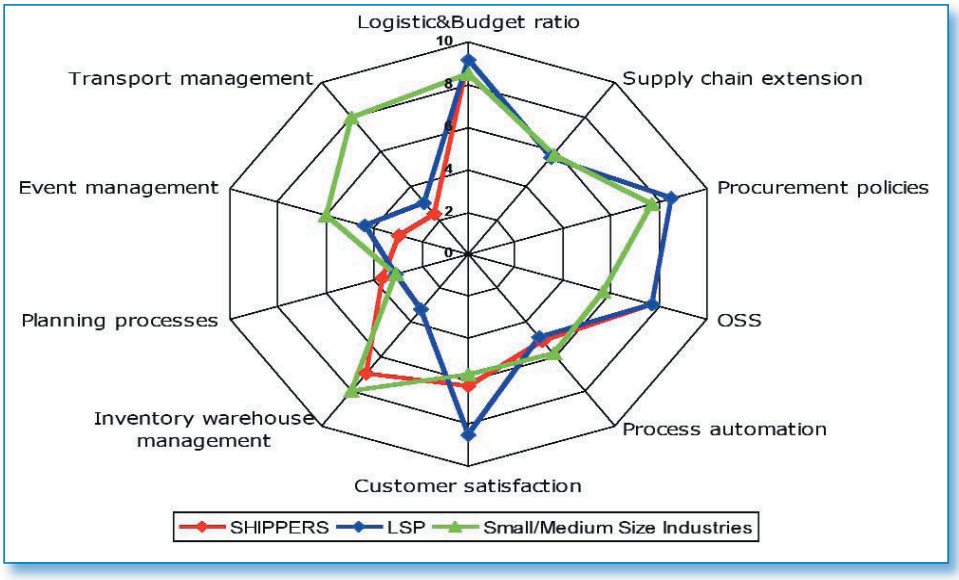
Major benefits are gained by use of advance processes and technologies. The companies adopting them realised improved customer service, better cycle time, lower costs, improved productivity, better assets utilisation and revenue growth. This is confirmed by the next chart:

Fig. 46: Major Benefits because of Advanced Processes/Technologies



The research was also extended to the LSP- Logistics Service Providers through the use of a parallel questionnaire and also to the small/medium size industries through a specific research conducted by CERTET the transport research institute of the Bocconi University in Milan. The end result showed some differences particularly on the small/ medium size industries. These not having transport and logistic structures of their own, purchases the services from LSP. Because transports and logistics represent the LSP' s core business, they seem to be implementing better practices in event and transport management. This indeed is an expected result. The following spider web graph is confirming this situation.

Fig. 47: Some Best Practices Comparisons



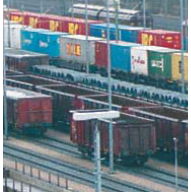
The customers and the LSP are both aware of major benefits that innovative management processes and technologies bring to their performances in terms of lower costs, improved service, better productivity and asset utilisation.

NEW RAIL FREIGHT PARAMETERS EMERGING FROM THE RESEARCH

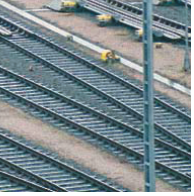
Exogenous Reason

- **New business culture:**
  - Supply chain development and philosophy
  - KPI
  - TQM, quality and customer satisfaction
  - Performance management
  - JIT
  - Travelling Inventories Deliveries (TID)
  - On line/real time
  - Market orientation and market response
  - Customization and standardization
  - Punctuality/reliability
  - Flexibility/availability
  - Consistency of performance
  - Single point of contact, SPOC-one stop shop, OSS
  - CRM
  - Partnership
  - Outsourcing
  - Transport versus distribution logistics
  - City logistics

- **New corporate organizational processes:**
  - Vertical and horizontal integration
  - Planning processes
  - Transport management processes
  - Inventory warehouse management processes
  - Event management processes
  - New customer - supplier relationship
  - Type of organization and human elements
  - Continuous change - change management
- **New European rail research and legislation:**
  - Rail Packages 1, 2 and 3
  - Separation of infrastructure from operations
  - ERRAC, BRAVO, INTEGRAIL, etc.
  - **NEWOPERA**
  - TREND
  - REORIENT
  - Modality change
  - Integrated project
  - Railways freight corridors
  - Intelligent mobility
- **New business environment:**
  - EU enlargement
  - Competitive challenge
  - New markets
  - Higher service components
  - New trade patterns
  - Far East + South East Asia trade lanes
  - Opening of rail freight market to competition
  - Privatization and new entrants
  - Intermodality
  - Accessibility
  - Safety and environment protection
  - Kyoto protocol and climate change
  - New private leasing companies
  - New equipment and rolling stock owners
- **New technology evolution:**
  - Virtual networking
  - Internet/intranet/extranet
  - E-commerce
  - EDI, CAFM, PDT, PDM, etc.
  - On line/real time
  - Portals and shared portals
  - ERP + intelligent applications
  - Specialized software
  - Trade exchanges
  - Satellite – Galileo
  - ERTMS



	◘ **New rail investments:** ▫ New investments for interoperability ▫ Van Miert European rail priority corridors ▫ New rail infrastructure companies ▫ Gothard-Loetchberg Swiss tunnels ▫ New Brenner tunnel ▫ New Mont Cenis tunnel (Turin-Lyon) ▫ New investments for bottlenecks' corrections ▫ New port connections and capacity ▫ New ports infrastructures
Endogenous Reason	◘ **Market oriented:** ▫ Customer satisfaction ▫ Service reliability ▫ Timetables ▫ Service perception – service expectation ▫ Seamless interoperability ▫ Track and trace ▫ Customer connectivity and integration ▫ Problem solving on complexities ▫ Empowered organization ▫ Cargo visibility and control ▫ International network and multilingual accessibility ▫ Transport performance management ▫ Service Quality ▫ Incentive based, shared benefits, agreements ▫ Best practices management ▫ Continuous improvement management ▫ Capabilities on LCL as well as FCL ▫ Inventory and warehouse management ▫ Event management ▫ Technological capabilities to facilitate transport management process ▫ Intermodality as viable innovative alternative ▫ Logistics solutions ▫ Stand alone or through optimizers ▫ Sustainable mobility ▫ Single wagons capabilities
Service Evaluation	◘ **Competitiveness** ▫ Customer satisfaction ▫ Rate stability and transparency ▫ Reliability and consistency of performances ▫ Market reactivity and response ▫ SPOC – OSS ▫ IT connectivity ▫ Outsourcing capabilities ▫ Information accessibility



Service Requirements	Pricing (cost/service competitiveness)
	Transit time Punctuality Regularity - Consistency of performance Safety and security Service differentiation and segmentation Network extension and accessibility Flflexibility Accountability – liability Environment friendly Responsiveness Track and trace

The result of this research contributed to highlight that most European companies consider rail and intermodality a viable alternative in terms of costs compared to road but not in terms of service quality. If rail or intermodality were able to offer services in line with market expectations, there will be no bias attitude against rail since every company would be prepared to use rail instead of other modalities. Environmental concerns and road congestion are becoming significant factors in the companies decision making process.

Consequently it would be reasonable to assume that once a rail enterprise be it an incumbent operator, or intermodal operator, new entrant, optimiser, integrator or logistic operator, or an industrial cargo consolidator, is capable of addressing and resolving the issues indicated in the above table, such operator would achieve total success.

It goes without saying that the existing rail business model based on the dual use of the rail infrastructure sharing it between passengers and freight together with the emerging service problems, has been totally unable to meet market expectations condemning rail freight to unavoidable decline. To reverse this negative trend it is necessary as confirmed by the research to rethink and readdress various dimensions of the existing business model migrating into a new one where rail freight could exploit the vast development opportunities.

A number of business cases have been reported to substantiate the research results. These business cases were:

- The Volkswagen business case
- The Transfesa business cases; one and two
- The StoraEnso business case
- The F&L business case describing Polimeri Europa Innovative Supply Chain Approach.

The strength of these five business cases was founded on different geographical areas of Europe different business models and different products to be transported.

The research highlighted a number of fields where significant improvements on costs savings and performance are possible enhancing profitability, and here below some of them are indicated as example (not exhaustive):

- Intelligent planning/production program systems
- Supply chain extension

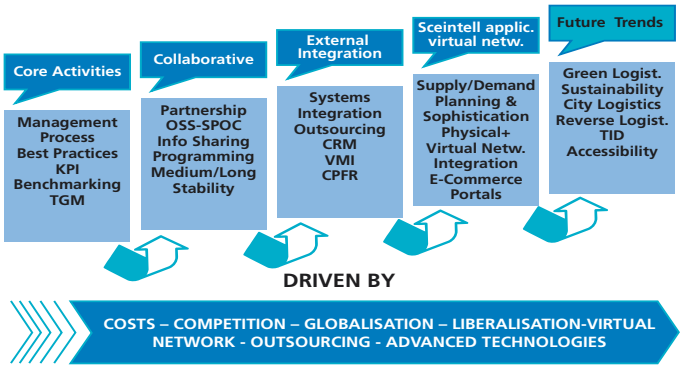
- Numbers of suppliers
- Innovative procurement techniques
- Process automation
- Customers satisfaction control
- Transport management process.

At the same time the research also evidenced some overriding trends which will continue to develop and evolve in the future:

- Service and performance level
- Supply chain as organisational entity
- Supply chain real time and visibility
- Suppliers horizontal integration
- Partnership and outsourcing
- OSS adoption
- Customers' satisfaction components
- CRM
- Rail and intermodality widely used in addition to road
- Technology and IT as enablers delivering major benefits
- Transport and event management, KPI
- FCL still important with LCL increasing.

A supply chain trend and evolution has been reproduced here below into a synthetic diagram describing the various phases characterising the supply chain management model.

- Fig. 48: Supply Chain Trend/Evolution



Rail freight can respond to the above supply chain trends and evolution through 3 dimensions:

- The intermodal dimension
- The full conventional trains dimension
- The single wagons or group of wagons dimension.

The product market segmentation of these 3 dimensions is the object of another task. Then a major issue remain unresolved which is the logistics issue. In fact supply chain needs are addressed by logistics in its entirety. Transportation is only a part. Also the role of logistics and the actors populating this market is the object of a separate task so much so that from the research conducted it has emerged that incumbents are not perceived as supply chain partners.

The questionnaire used for the market research was enclosed as an annex in D.1.2.

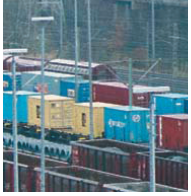
6.1.3 New Traction Patterns

From the methodology stand point the research is based on the results on a survey conducted during spring/ summer 2005 through a questionnaire tool as well as market interviews. The objective of this task is to assess and report the traction pattern evolution resulting from the arrivals on the European traction market of new players following the opening to competition of the European rail freight space.

The result of this research is based on the findings from 14 companies, 8 incumbents and 6 newcomers. At the time this market survey was completed it represented very well the true market picture. This is here below described.

Fig. 49: New Traction Patterns: Different Strategies/Market Approaches

Items	Historical Railways	New Actors
Freight Business	National coverage Comprehensive service	Point to point, Full Train Pure traction – Long Term
Strategies	Become European Transport Actor or LSP	Provide Pan-European Point to Point Traction
Targeted Customers	All Potential Customers	Shippers, LSP, Operators Consolidating Ind. Flows
Services' Range	All integr. Rail Services Incl. Single Wagons	Partnering + Cooperating with Other Actors
Orders Methodology	Open Shops Waiting for Customers	Medium/Long term Full Train Scheduled Services
Contract Relationships	Industrial Risk Assumed Train Filling + Wagons + Terminal	Exclude Industrial Risk on Train Filling, No Wagons
Safety Certificates	They have automatic safety certificates on existing services	Complex – Long Procedure for getting Safety Certificates
Infrastructure Managers Rel.	Purchase Wholesale for Overall Transport Plan	Purchase Selected Corridors paths
Locomotives' Availability	Own Property and Own Maintenance	Rented Maintenance Incl. To Fit Corridors/Contracts
Drivers' Availability	Own Drivers+Replt. No Freight Dedicat.	Own Drivers+ Crew Replt. outsourced Freight Dedicat.
Drivers' Work Pattern	Rigid rules and jobs Drivers Grade Scale	Mutually Agreed Working Pattern



Items	Historical Railways	New Actors
Wagons' Supply	Own Wagons Fleet, Single Wagons Supply	Rent Private Wagons for F/Trains on Request Only
Operating Instructions Management	Centralised to Optimise Production. Drivers Go On Duty in Depots/Stat	Instruct. Sent to Drivers Homes or by GSM. Go on Duty at Terminals
Information Technologies	Own Systems to Suit Their Operating Pattern Often Complex Solution	Instruct. Sent to Drivers Homes or by GSM. Go on Duty at Terminals
Drivers' Training	Own Training Schools Some Outsourced Solutions (SBB)	Drivers Must Be Trained by Historical railways (Safety Directive) but some have training schools
Drivers' Salary	Wage Package Based Experience+ Seniority, unclear allowance system Drivers Hours Rigidity	Wage Package Modulated Towards Maximum Driving Productivity
Services	Comprehensive	Full Trains on Corridors Long Term Contracts
Organisation	Structured – Complex – Strict Roles-Own Equip.	Slim and Flexible
Partnership & Cooperation	Vertically Integrated Inside Their Corporat.	In Partnership with Others Sharing Same Objectives
Customers Relationship	Open Shops for All Kinds of Services	O.S.S. for Personalised Customers Service
International Traffic	Tend to Establish Own Links – Own Image	Own Image in Cooperation with Other Traction Comp.
Single Wagons	Still Accounting for 40/60% but Decreasing	Only Through Optimisers if Full Trains Achieved
Organisation Evolution	Restructuring Service Shutdown Operate beyond borders by subsidiaries Companies	Expansion Via Alliances EUROPEAN BULLS
Best Practices	Known but Difficult to Implement - Rigidities	Obsessive on Best Practice to Achieve Results
Interoperable Locomotives	Big Investments starts for Freight Dedicated	Select Right Locomotives to Fit Corridors Involved
Specialised Transport	Expanding & Profitable Lacking Reliability	Subject to Industrial Dimension
Marketing	All product offer; try to wipe off peak traffics	Segment Approach
Improvement in Operations	Too Slow; creation of clients service centres	Follow Up Teams for Problem Solving

Fig. 50: New Traction Patters: Progress

NEW RAIL FREIGHT PARAMETERS EMERGING FROM THE RESEARCH

Reliability	Modify contractual relationship with drivers
Congestion of the network impacting the respect of the schedule	Increase freight trains priority - improve traffic management and speed control around bottle necks- create rail by-pass and a dedicated freight network
Congestion of the network	Introduce longer trains saving network capacity
Traction cost	Lengthening trains implies reduction in drivers costs and toll per wagon; optimise locomotives movements
Serving Scattered Traffic	Develop short lines and concentrate numbers of departures if possible
Peak Traffics	Try to smooth traffics all over the week by commercial incentives
Time spent in terminals	Improve terminal efficiency with research results in IT and in transfer techniques

In order to substantiate the findings resulting from the survey a number of best practices and business cases were reported in the deliverable D.1.3. The questionnaire was enclosed as an Annex.

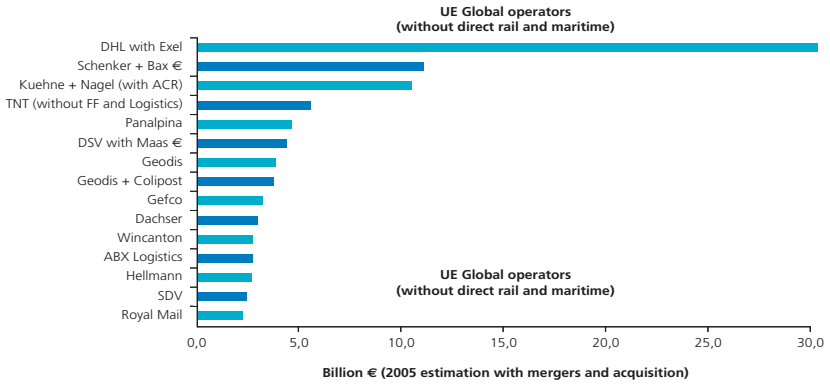
6.1.4 Migration Strategies and Step-Wise Scenarios

The objective of this work is to assess and report a new business model sustaining a new rail economy based on a borderless rail freight dedicated network. The evolutionary changes necessary to migrate from the current system into the new one are major drivers of this process.

Most of the market variables and the driving forces brought about by globalization and open competition have been largely researched in Tasks 1.1, 1.2 and 1.3.

The demand side and the supply side of the rail freight business are changing originating new roles and responsibilities. Global transport and logistics groups want to combine their geographical extension with a wider services integration. Amongst the biggest 35 global freight operators producing each one of them more than 2 billions euro revenues, 15 of them are European.

Fig. 51: EU Global Operators



These groups are playing a strategic role on the new market field. Most of them have now a rail strategy.

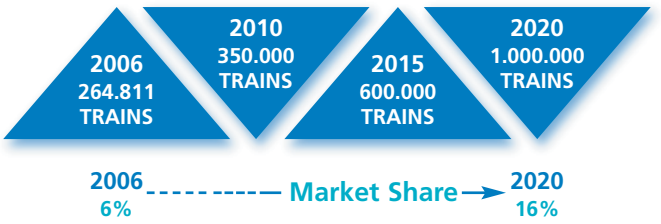
The new rail strategy adopted by incumbents, new actors and existing global logistics operators is driven by a changing business environment where the rail traffic from a mature activity is perceived now as offering growing opportunities. The major factors affecting this changing business environment are:

- The new changing pattern of trade and industries
- The new volumes
- The new applied technologies and management systems
- The new interoperability
- The new operating procedures the technology adjournment and the necessary training and re-training
- The new role of hubs and terminal network
- The new role of ports, dry ports, terminals, freight villages
- The new service culture
- The new service driven approach induced by rail freight dedicated network.
- The new perceived environment protection and conservation needs.

All the above driving forces need the creation of market conditions for them to develop their full potential. The opening of the European Rail freight space is not enough for this potential to be exploited. To prove that a research was conducted in Europe for verifying the residual capacity existing on the rail tracks. Both UIC through their project **DIOMIS** and **NEWOPERA** counted the number of intermodal trains operated in Central Europe.

As an order of magnitude both researches arrived at a similar number of about 250.000 trains per year equating to the existing intermodal market share. For sake of consistency the number supplied by DIOMIS of 264.811 was adopted.

- Fig. 52: Phased Migration by objectives for intermodal trains



The above chart stand to demonstrate that intermodality in order to support rail freight traffic achieving a 16% market share, must be capable of operating one million comparable intermodal trains by year 2020. From this research it appears that there is no sufficient tracks capacity for this to happen. Hence the necessity to generate new capacity on rail tracks. This research is to be combined with a similar one made for conventional trains. The counting of conventional trains is much more difficult since they are running on a wide spread coverage of the network. Additionally local trains and repositioning trains are contaminating the meaningful data. However the number of conventional trains is a very large one maybe in the order of magnitude of 1.5 million. Also this huge number should be multiplied fourfold according to the same market share logic. This would

generate a colossal number of 6 millions conventional trains and 1 million intermodal trains. There is no doubt that such number would not be compatible with the existing rail network capacity. Consequently the conclusion to be drawn from the above logic is that either the market share objective indicated in the EU Commission White Paper for achieving a more sustainable mobility in 2020 is completely unrealistic, or important investments will have to be made in order to increase the network capacity for accommodating these new volumes.

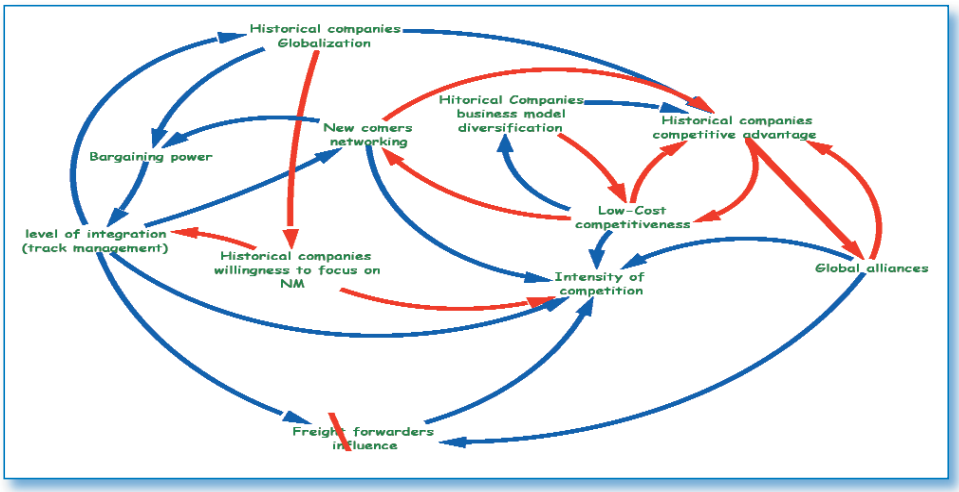
Then the next step in the migration path from the existing situation into the new situation envisaged by **NEWOPERA** a research work was conducted on four corridors and for each of them evaluations were made in three steps: 5-10-15 years from now. The four corridors evolution could be different from one another. the four corridors were taken from the ERIM project and they were:

- Rotterdam- Genoa
- Antwerp- Lyon- Basel
- Rotterdam- Warsaw
- Part of Lisbon- Budapest

From the above corridors analysis it has emerged that a lot of work and investments will have to be done involving both software and hardware for achieving a sufficient level of interoperability and de bottlenecking.

In addition to the corridor approach and to the rail network existing and future capacity, the market dimension was surveyed by assuming evolving business models and the external factors influencing such business models.

Fig. 53: Casual Diagram



Blue arrows are positive links, that is to say the increase of the first variable influence positively the second. Red arrow are negative links. The diagram is not exhaustive.

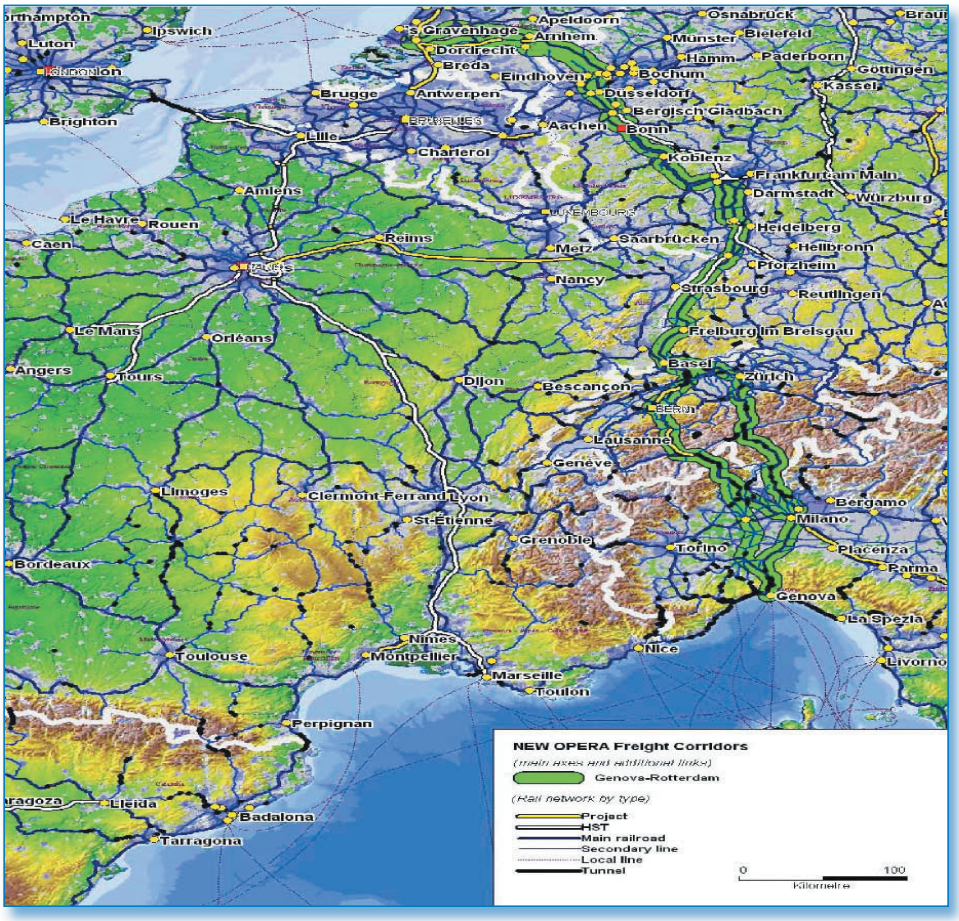
The chart includes different loops of different length indicating the variables.

The success scenario must consider integration between the various national systems which are disjoint. The standardization and integration of systems is a "Must" in the long run. In technical terms this means:

- Standardization of current
- Minimum gauge B+ and more
- Minimum axle-load of 22,5 tons or more
- Minimum trains length of 750 meters or more
- Common maintenance strategy
- Common capacity and priority management
- Common emergency management
- Common toll and pricing system
- Common ERTMS Level 2 & 3 by 2015-2020.

For the success in the migration strategy and the step wise scenario, it has been established that the key actors in this process are the infrastructure managers. As an example of this migration strategy 2 corridors have been taken into consideration. These 2 corridors are Rotterdam- Genoa and Antwerp- Mannheim- Barcelona as per following graphs.

Fig. 54: Corridor Rotterdam- Genoa



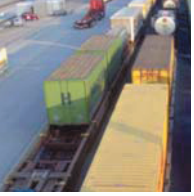
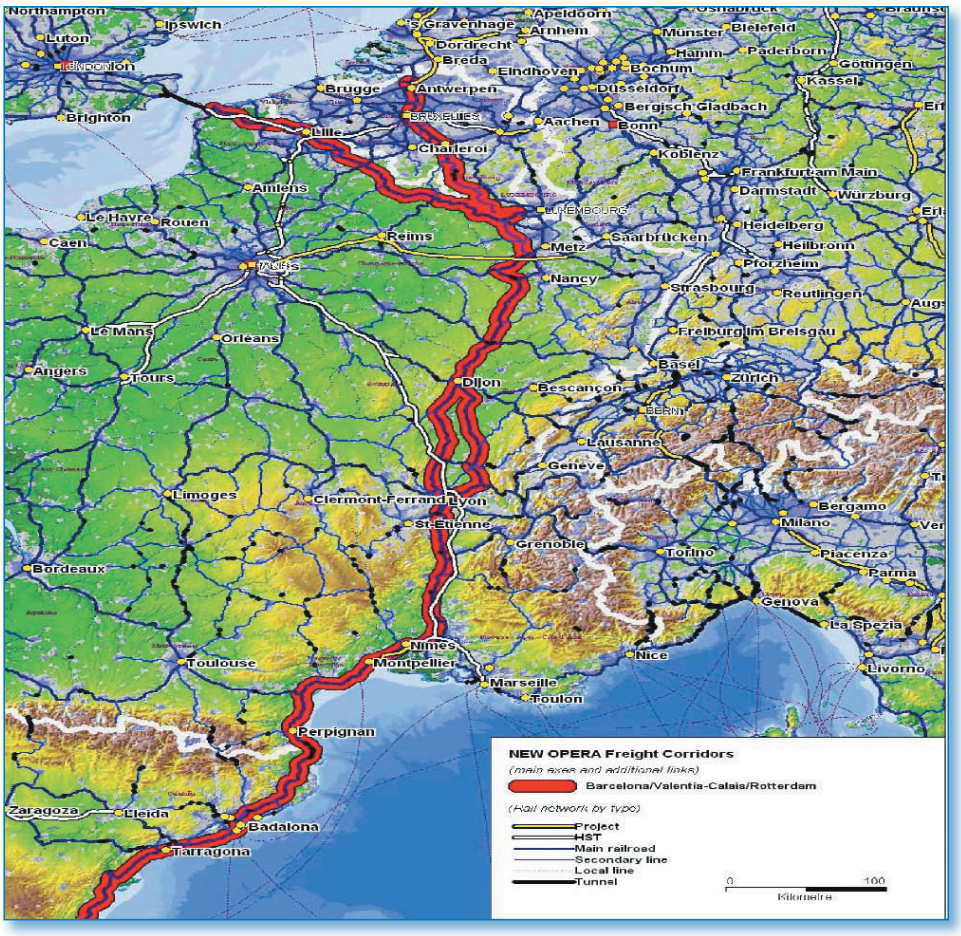


Fig. 55: Corridor Antwerp- Mannheim- Barcelona



On both corridors a full evaluation was made in terms of improvements through investments, time horizon likelihood in execution and expected outcome from a freight perspective.

The conclusion of the research was that these corridors and consequently their integration in the rail freight network is a realistic and material perspective both on the physical as well as on the technical stand point. However the above conclusions were not judged to be sufficient for achieving the expected results. For achieving the full benefits and the expected results it was necessary to implement the following innovations:

- Corridors management; intended as Corridor Ownership Management implementing the corridor One Stop Shop Strategy
- Corridor pricing; intended as coherent and transparent corridor tariff system
- Barriers elimination; intending the technical administrative and cultural barriers elimination generated over time by the individual member States.

Successful business cases were described as supporting evidence.

6.2 WP 2 NEW OPERATING AND TECHNICAL SYSTEMS/ ASPECTS

Under this WP a survey on the "State of the Art" technologies was made to identify needed developments in a costs effective way for increasing existing infrastructure capacity. At the same time from such survey the objective was also to draw conclusions on solutions to be adopted in future with the vision towards a progressive use of a rail freight dedicated infrastructure. With these objectives in mind both hardware and software technologies were addressed.

6.2.1 Hardware Technologies

Increased capacity on existing infrastructure is achieved either by enabling infrastructure to accommodate more trains per unit of time "infrastructure capacity" or by having the trains transporting more payloads "payload capacity". This latter issue is being addressed under Task 2.1 hardware technologies while the former will be addressed through Task 2.2 software technologies.

In order to increase payload capacity three avenues have been explored:

1. Longer trains
2. Heavier trains (which can imply double stack)
3. A combination of situation 1 & 2.

These possible developments are then evaluated together with propulsion technologies "Electric vs. Diesel" and their environmental impact. Last but not least the infrastructure maintenance strategy is evaluated being a key aspect of cost effectiveness. In order to make the above a realistic practical opportunity it is necessary to adopt shared policies on breaking regimes where four main solutions are applicable:

- EOT(End of Train Device)
- Distributed traction power (combined with EOT)
- ECP(Electronically Controlled Brake)
- New rolling stock equipment.

In terms of applicability to longer and heavier trains the following table will be of help for understanding the area of improvements.

Fig. 56: Currently available components

Brake control		Traction/ Braking	Bogies		
End of Train	ECP Brake	Draw-Gear	Brake Unit	WSP	Improvement for freight
X			X	X	Loading capacity
X	X	X		X	Heavier trains
(X)	X	X			Longer trains
(X)	X				Increase of speed
X	X		X	X	Overall maintenance costs
	X	X			Cost for operating the train
	X				Communication capability

Further benefits can be obtained by adopting automatic couplers for longer and heavier trains, as well as friendly bogies equipped with discs brakes.

Fig. 57: Comparative analyses of currently available solutions associated with brake system.

Technical solution	End of train EOT	Distributed power	Electronically Controlled Pneumatic	Automatic coupling
	Self acting	EOT associated with distributed locomotive (-s)	(ECP)	
Applicability of the technical solution	All freight trains up to 1100 m length	All freight trains up to 1500m. Only locomotives have to be equipped	All freight trains 1500 m or more. Locomotives and wagons have to be equipped	All freight trains (of practical interest for longer trains)
Brake application	Important shorter response time			No effect
Brake release (No effect of EOT)	With UIC performances Maximal train length 1000 - 1100m	1200m to 1500m	Up to 2250 m (Tested on test bench)	No effect
Braking distance	Save 30 to 150 m		Shorter by about 100 to 200 m	No effect
Braking dynamics	Longer train up to 200 to 300 m therefore ~ length 1100m	Longer train up to 700 to 800 m therefore up to 1500m	Theoretically not limited for braking	Huge improvement for braking (L C E)
Traction dynamics	Non affected	Facilitate the traction function		Huge improvement for traction (L C E)
Safety	Complete	Need for particular safety analysis for brake and communication	Needs a safety particular analysis for brake and communication	Improvement of safety and derailment risks
Further research	None or small	Safety and RAM studies to be validated Specific locomotive fleet to be created	All vehicle (wagons and locomotives) have to be modified. Need for validation and experimentation in operational conditions	Well designed and tested. Cost to be integrated for new built rolling stock

Technical solution	End of train EOT	Distributed power	Electronically Controlled Pneumatic (ECP)	Automatic coupling
Costs	Low	Low on locomotives if not designed at manufactur.stage	Many costs to be shared between all rail actors. All vehicle have to be modified	Very important on locomotives and wagons if not designed at manufacturing & cost
Availability of the technical solution	Immediate	Short term But safety and RAM studies to be validated Specific locomotive fleet to be created	specifications are available, feasibility is validated, industrial design to be developed and validated	Availability in short term Long term .
Introduction of the technical solution & dissemination	Very simple	Mid term with the installation of remote control on locomotives	Long term except on fixed composition "shuttle trains"	Application only to rolling stock dedicated to long trains

Further technological options have been researched combining them with economical calculations and further benefits deriving from standardization. The economical dimension of increasing "payload capacity" either by longer and heavier trains, is **substantial**.

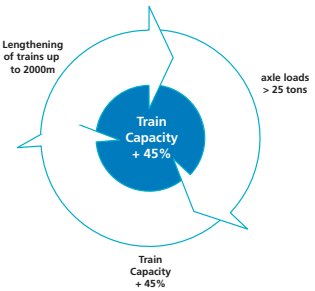
Traction cost increase of 1,2% generates a 50% increase in payload possible, whereas the increase in train length alone generates a 100% increase in payload with only a 20% increase in infrastructure access charges. This would draw towards the conclusion that the return on investments and technologies for increasing "payload capacity" looks very **attractive**.

Environmental considerations have been assessed for electromagnetic fields and noise reductions.

A research was made on "double stack" possibilities in various European countries particularly in the areas where traffic volumes are likely to saturate the corridors by 2010-2012. Together with volumes estimations the "double stack" impact on logistics chain was researched on the USA experience where a new intermodal business environment for maritime traffic was created.

Cost benefit assessment of moving from single to double stack in terms of increased productivity is **massive**.

Fig. 58: Efficiency of the USA railway system



Considering this massive increase in train capacity as one of the inputs of the double stack system, it seems difficult to create effective double stack operations in Europe if train parameters such as train length, total weight and axle load stay unchanged.

Comparison of train capacity in TEU

- U.S.A. (double stack): 400 – 600 TEU
- Europe (one level)
  (max. 700 m long trains, 22,5 tons axle load): 80 – 100 TEU
- Europe (double stack)
  (max. 700 m long trains, 22,5 tons axle load): 150 – 170 TEU

Fig. 59: Example of USA cost sharing for improving infrastructure to "double stack" specifications

Shipping companies	Railyards & Terminals Rolling stock	Infrastructure for double stack was established as a joint project of several partners
Ports	Railyards & Terminals, other rail and highway infrastructure improvements Intermodal traffic control systems to govern all inbound and outbound train movements	On the basis of the given information it is not possible to understand how infrastructure costs are calculated in an overall cost-benefit contemplation
Communities, counties, states, central gov.	Gauge clearance projects: Replacement, separation, reconstruction of street-bridges Major railway capacity improvements like "Alameda corridor"	
Railway companies	Gauge clearance projects: Tunnels (just a few), -> no over-head wire adjustment necessary Participation in some railyards, extension of sidings (few) Rolling stock	

"Double stack" infrastructure improvement study on North-South corridor between Hamburg and Mannheim was made but this would require massive investments with benefits difficult to be justified in the short term. So this could be only a very long term option. Alternatively in Germany the train lengthening is the preferred solution for the existing network compared to "double stack".

A comparison of wagons technology and design was also made assuming a "European double stack" wagon. Higher axle loads than the existing 22.5 tons is a pre- requisite. This together with a gauge and catenaries constrains make it difficult to imagine "double stack" being introduced on the existing European network. **However shuttle operations to and from ports or between these and major freight terminals connected with new rail tracks built to "double stack" specification are reasonable assumptions.**

Before dealing with "Electric vs. Diesel tractions" in rail freight, an assessment was made in European regulatory and environmental aspects. Also geographical aspects and natural barriers were evaluated. The Bio-Fuel and natural gas dimensions were also taken into consideration for gas emissions, green house effect and other polluting particles. A comparison of GHG emissions was made between all modalities and their negative contribution to air pollution. Finally engines lifetime aspects were considered.

All this taken into consideration electrical locomotives are the best choice from an environmental point of view, depending on how electricity is produced. Because infrastructure investments with the goal of a common electrified European rail network are slow, **diesel traction will therefore continue to play an important role in providing rail services in the future.**

Even though diesel traction is much more polluting than electrical traction, diesel traction offers more flexibility to interoperability specially for cross-border traffic. Another important benefit can be secured by using mixed traction (electrical and diesel) whenever this is necessary for using secondary lines or alternative corridors where full electrification might not be available.

Further research was conducted on emission abatement equipment particle filters and catalysts and hybrid energy storage concepts.

The conclusive remarks on traction were that rail is an energy efficient mode of transport and rail uses less energy than road. Rail however is losing importance in the transport market versus other transport modes. This is in fact the most critical aspect from an environmental point of view since less efficient modalities are being utilised.

Recommendations with the highest potential for the environment are therefore:

- Invest in as much **electrified** traction as possible and select renewable energy sources for generating the electricity. Upgrade existing lines and when building new lines choose electric traction
- Use diesel-electrical locomotives where parts of the lines are non-electrified; running on diesel when needed and switching to electricity where possible
- Optimise the energy consumption using regenerative braking and energy efficient driving.

For **Diesel** traction the recommendations are:

- Upgrade and replace old locomotives
- Mix the diesel with liquefied bio fuels to "high contents as possible"
- Continue to improve the engines combustion and injection system in order to reduce emissions
- Prepare for use of after-treatment equipment for exhausts
- Optimise the energy consumption using regenerative braking and energy efficient driving.

Finally the maintenance dimension was properly considered and evaluated taking into consideration type of maintenance, level of maintenance, maintenance services, maintenance strategies, and maintenance data recording. Innovative maintenance concepts and collaboration between railways undertakings were surveyed from a general cost stand point. Conclusive remarks were made by realising substantial benefits through the adoption of standardised maintenance strategies.

6.2.2 Software Technologies

The development of this chapter originated from a market research conducted on the field with particular reference to the cross border transport corridors universally recognised as future European transport backbones. The examined processes considered two layers of problems:

1st problem layer	▫ **Surface processes:** Timetable dispatching in irregular situations, locomotive dispatching in case of failures, cross-border traffic management ▫ primary importance for TSF
2nd problem layerr	▫ **Background processes:** Timetable construction, maintenance of locomotives and rolling stock, national (domestic) traffic management ▫ secondary importance for TSF

The results of the findings contributed to put in evidence that problems and perturbations originate both outside and inside the area covered by railway undertakings. The problems originating outside the railways undertaking's control refer to operations but mainly to lack of information. This in itself stands to indicate a lack of knowledge, know-how and training by the front office which is comparing negatively with other modalities. Such shortcomings will have to be addressed in a very serious way but in this research the attention is focused on the area of direct influence by railways undertakings.

The main shortcomings which have been identified by the field research are the following:

- Insufficient cross-border co-ordination for slot re-assignment
- Train numbering, tracking/tracing, handling not harmonised
- Lack of supporting tools to manage traffic
- Lack of knowledge of trains priorities
- No fleet management tools existing for empty wagons optimisation. Dispatchers manually distribute wagons according to fleet usage experience
- Incumbents have trains/wagons tracing systems of some sort. They are restricted to national borders and incompatible with each other
- Incumbents traffic control centres consider trains as data units. They ignore shippers and cargo peculiarities. Larger countries have more than one traffic control centre adding to complexities.

Regarding punctuality or rather the lack of it the causes are multi-fold: here below the most important one are indicated.

- No European railway company is able to calculate expected train's time of arrival
- Trains delayed +10 minutes loose their slot. National Infrastructure Managers find solutions up to their border. Bordering Infrastructure Managers unprepared to find short term slots
- A train pre-announcing system for international freight does not exist in Europe
- In emergency, most control centres have no intelligent tools for deciding trains priorities.

After having identified the main areas of problems it is necessary to consider the software technologies to be implemented in Decision Support Systems(DSS) that can help dispatchers managing the traffic in real time. Different algorithms that can be used to help managing traffic in real time are explored and described. Their impact on trains conflicts are considered in details and through the production of diagrams.

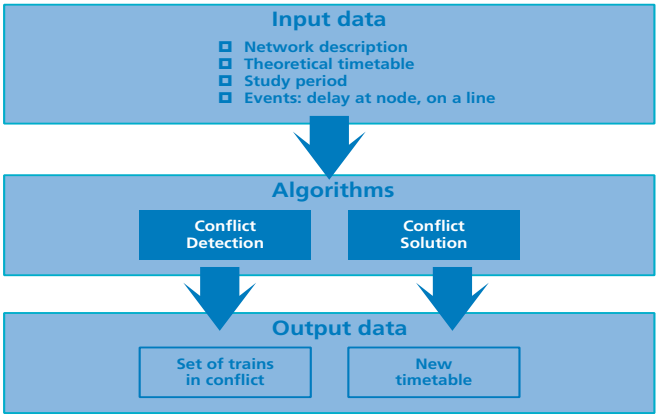
The work of the dispatcher can be divided into two parts:

- The detection of future conflicts
- The resolution of these identified conflicts.

In both cases the dispatcher needs to take into account the following information:

- A description of the network structure(stations, tracks, platforms…)
- A time period
- The list of trains for the given time period
- The characteristics of the trains:
  - physical characteristics such as the length
  - priority
- The theoretical timetable
- The current timetable.

Fig. 60: Conflict Detention and Solution



For optimizing conflict detection and solution, two methodologies have been described and reported:

- Optimization methods
- Rule based methods

The optimization methods have the advantage of optimizing an objective and a disadvantage of no time optimization. On the contrary rule based methods have the advantage of optimizing time and the disadvantage of no objective optimisation. After considering both methods and their modelling implementation the future perspective is that both methodologies must be used in combination for obtaining optimal results.

The study continued by assessing the impact of traffic management policy on capacity in the four **NEWOPERA** scenarios. A general method has been developed for line capacity assessment. This method is detailed in the method tool book given in the Annex. It provides more advanced capacity assessment methods than the existing UIC code 406. The idea is to compare and contrast the capacity of the different **NEWOPERA** scenarios such as the applied train control system, the trains priorities and modifications of the rolling stock.

The capacity assessment is executed on the showcase corridor Béning – Ludwigshafen because of its complexity and is carried out by the capacity assessment tool ANKE, based on a queuing model. Besides the queuing approach, the capacity consumption is calculated by the method recommended in the UIC code 406 "capacity" respecting the supplements of the method tool book. In addition to the capacity for each scenario the scheduled and unscheduled waiting times as a second parameter are calculated.

Thirteen scenarios are set up in correspondence to the definition of the general **NEWOPERA** scenarios 0 to 3. Furthermore assumptions derived from traffic management algorithms are taken into account as far as possible.

The examined showcase corridor Béning (France) – Ludwigshafen (Germany) has an overall length of 110 km, on which the line passes the major junctions of Saarbrücken, Homburg, Kaiserlautern and Neustadt.

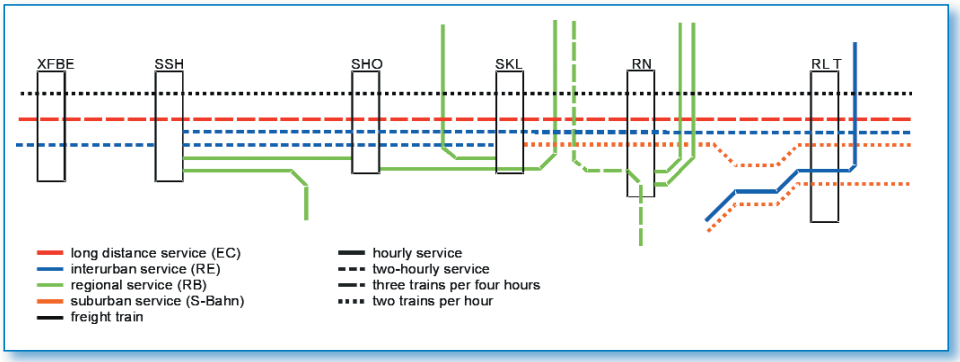
Fig. 61: Showcase Corridor

Under the scope of freight traffic the chosen line represents the main connection between France and Germany, linking the important marshalling yards of Woippy and Mannheim.

On the showcase corridors all possible variables have been taken into consideration section by section and different train categories. In addition the 4 **NEWOPERA** scenarios have been incorporated. ETCS level 1, 2 & 3 have been considered. Rolling stock, priorities, distribution of delays and performance indices have also been evaluated. Scheduled and unscheduled waiting times have been accounted for.

In conclusion the capacity of a railway line is heavily influenced by the trains control system and delays. Whilst dispatching strategies and modification of the rolling stock have a negligible effect. Just the harmonisation of speed causes a slight gain of capacity. Nevertheless dispatching strategies are important to spread the waiting times over the different train categories.

Fig. 62: Corridor Characteristics and trains



The above conclusive remarks tend to confirm the **NEWOPERA** long term approach that different categories of trains having each category its own characteristics and priorities dilute the corridor productivity, generate delays, offer little scope for improvement and do not offer long term solution to the European freight mobility requirements. Consequently the only answer is to arrive at a progressive separation of trains categories through either a **rail freight dedicated infrastructure, primary rail freight network, or an effective implantation of rail freight windows.**

6.2.3 Training and new operating rules

Deliverable Task.2.3 aims at proposing new operating rules fostering rail freight.

The task development has been described in D.2.3 made up of three parts:

- Part 1- presents an inventory and evaluation of current prevailing rules in selected European countries;
- Part 2- Personnel Training- contains a set of recommendations in terms of operating and priority rules. In particular, it proposes a set of Key Performance Indicators that could be implemented to bring transparency and consistency in the way international freight trains are handled. These new operational rules require barriers elimination which can only be achieved by personnel training. Such training will have to involve several fields including operations and communications.
- Part 3-consists of a simulation run by RWTH and Alstom assessing the impacts of new priority rules in a particular corridor.

- Part 1-Outcomes-
  - Overall railway activity management is historical with regard to each country. It came to this because of different cultures. Decisions were taken for economic interests and each country approach to its own development. This historical significance is now still predominant.
  - It is visible through the differences between the national networks in terms of equipment, operating methods safety rules and priorities. This has created major constraints, to begin with, for the infrastructure, because of a lack of interoperability.
  - In the course of time national strategies have been set up, some directly or indirectly favorable to freight such as the development of high sped lines dedicated to passenger trains.
  - For the Rail Networks it is necessary for UIC, CER, RNE, ERA or other technical or commercial associations to think and act together. Failing this there is a risk for them not finding adequate solutions when a synthesis is required.
  - When methodologies are applied at national level the overall result may prove to be barely optimized.
  - It will be too long to describe all the operating differences prevailing in each national network. For synthetic reasons the various categories where such differences exist are here below reported:
    - Train paths allocation
    - Operational management involving: organization, priority rules, decision making, corridors and information management
    - Contracts either between infrastructure managers and railways undertakings and between the latter and their customers
    - Performance indicators
    - Future directions.

- Part 2-Outcomes-
  - The major problems facing Rail Freight Traffic Operational Management were identified in the 1st part of this report. In this section recommendations have been developed setting up new rules valid for resolving conflict situations giving priority to rail freight
  - These recommendations are based on the emerging problems as described in the 1st part in areas such as operations, general organisation, definition of trains on time, priority rules, unforeseen events management (localising trains, computerised follow-up system, principles and assistance with decision-making, information to Railway Undertakings and their management)
  - All the points described in the previous paragraphs have been researched and detailed. Here below some key conclusions are drawn.

- Fig. 63: New Operating Rules Approach

Operating Rules
- **Infrastructure Managers to adopt the regular time-headway scheduling system for increasing corridors capacity.**

Priority Rules
- **Freight trains and more so the international ones should not be discriminated against passenger trains.**
- **Priority rules must be the same throughout Pan-European Rail Freight corridors.**

Implementation Recommendation
- **An independent European body must be set-up on RNE experience. Its role is managing freight train-paths to ensure consistency and transparency.**

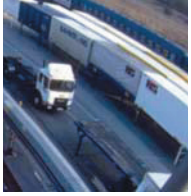
- Fig. 64: New Operating Rules Approach

Contractual Rules
- **Performance management contracts to be established between IMs and RUs.**
- **These contracts to be based on KPIs. Example:**

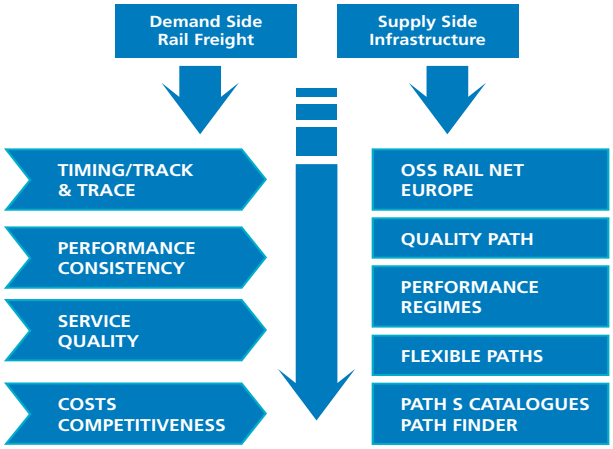
$$\text{KPI} = \frac{\text{\% Number of trains arriving on-time (+/- preagreed interval)}}{\text{Total number of trains}}$$

- **Penalties must be applied in case of non-performance.**
- **Penalties to be borne by the non-performing parties. Hence the necessity to have a corridors management neutral body.**

Implementation Recommendation
- **This new operating regime to be experienced on one show-case corridor before wider EU implementation.**



- Fig. 65: Operation/Communication Challenge between interfaces



In extreme synthesis some of the innovations to be introduced need a new approach on personnel training.

- The application of all these Rules to the European Corridors requires a common vision regarding their setting up and management. It means eliminating any borders that still exist by changing the Network so that the Railway Undertakings and the Shippers/Customers have a single vision of their trains-paths and traffic. This will lead to better service quality and to substantial claims reduction.
- Both the Infrastructure Managers and the Railway Undertakings are concerned by the personnel training for the application of all these rules.

It will be necessary to establish an agreed and validated job specification process starting from the existing up to the newly modified versions.

- On this basis training modules will have to be established for dispensing them in approved Railway schools. These should be placed under the effective control of an independent European organisation guaranteeing the basic elements to be taught. It would also be desirable for them to be enterprise independent (IM and RU) in order to guarantee transparency from any possible interference when subcontracting
- As regarding real time application of these rules the recommendation is that a single contact should be implemented from each parties in charge of a corridor. This simple concept will be a tremendous facilitator. Even now Railway Undertakings are organised as to be represented by one entity along a corridor when the trains traffic would require otherwise. Similarly it is strongly advised that the Infrastructure Managers organise matters in the same way with one "Manager" for each corridor. These single contacts become guarantors of the established rules application and this approach to be taught as such in the training schools. The Training Schools must also introduce the new rules and their knowledge transfer to the personnel. The end results can then be verified during examinations.

- Part 3-
  - The simulation carried out by RWTH and its conclusions have already been reported in page 66 of this document. However this simulation reinforces the principle that on mixed lines giving slightly higher priority to freight trains total system punctuality increases. Increasing punctuality means increasing capacity.

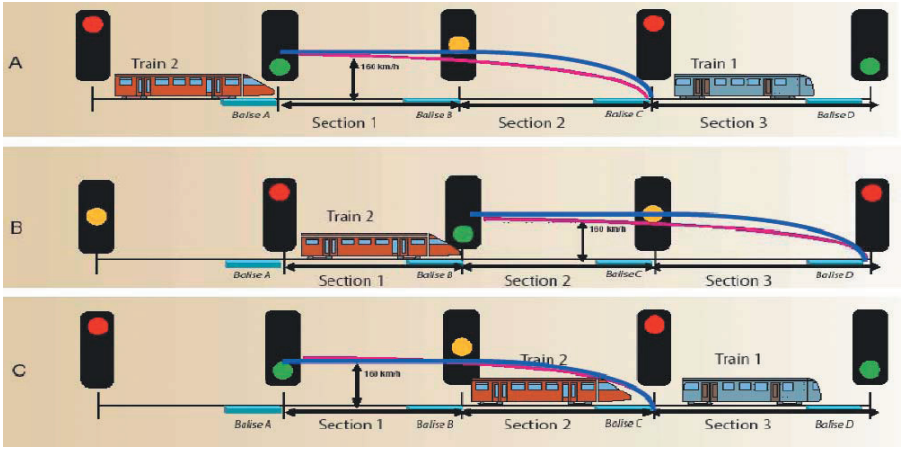
6.2.4 Interoperability: ERTMS cost effectiveness assessment

ERTMS, the European Railway Traffic Management System, has been designed by the European railways and the supply industry supported by the European Commission for meeting the European Railways traffic needs. ERTMS has two basic components:

- ETCS (European Train Control System) is the part relevant to the signalling.
- GSM-R: (Global System for Mobile communications-for Railways) is the radio system for exchanging information between the train and the ground.

ETCS is divided in three possible levels depending on the way information is exchanged between the train and the track.

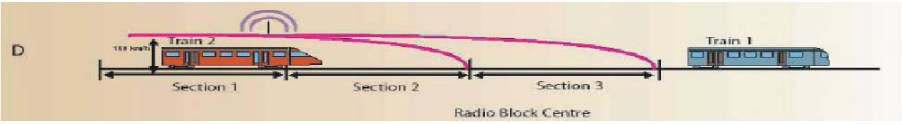
Fig. 66: ETCS Level 1



Level 1 is designed as an add-on device to a conventional line having line side signals and train detection equipment locating the train. Balises are installed on the track and linked to the signalling system via the LEUs. The balises also contain pre-programmed track data. The train detection equipment sends the train position to the interlocking and the control centre. Based on this the control centre will issue routes which will be handled by the Interlocking determining the new movement authorities, sent to the trains via the LEUs and the balises. The train passes over the balise receiving the new movement authority and track data. The on-board computer then calculates these speed profiles for the movement authority. This information is displayed to the driver on the ETCS MMI (Man Machine Interface).

In order to improve the level 1line capacity, additional balises (infill balises) or loops can be added ahead of the main balises at the signals. In this case, information from the next main balise is sent into the loop or infill balise and transmitted to the train as it passes over the loop or infill balise. The on-board computer can therefore receive much quickly new information for signal improvement. This infill information improves journey time.

Fig. 67: ETCS Level 2



Level 2 does not require line side signals but still needs train detection equipment on the track. It also needs an on-board radio system allowing the on-board computer to communicate with the Radio Block Centre. The balises on the track become autonomous (no LEUs needed anymore) and are simply electronic position markers. The track characteristics are pre-programmed into the RBC and sent to the trains with the movement authorities. The train detection equipment sends the train position to the interlocking and the control centre. The control centre will issue routes which will be handled by the Interlocking to determine the new train movement authorities and sends them to the Radio Block Centre. The RBC forwards them to the train via the GSM-R. The on-board computer then calculates the speed profile corresponding to the movement authority. This information is displayed to the driver on the MMI. In order to ensure safe travel the on-board computer continuously determines the train position and checks if the current speed is correct to the distance travelled.

- Fig. 68: ECTS Level 3

Level 3 differs from level 2 in the following way: it has an on-board train integrity system which monitors that the train is complete. The train position is sent together with this train integrity information to the track ensuring in a safe way where the train is located and that it is complete (no wagons left behind). Therefore there is no need for a separate train detection equipment which can be removed from the track. The possibility of frequent train position updates through radio transmissions enables trains to run closer so that the line capacity is significantly increased. This kind of signalling is also called 'moving block' as the signalling blocks are no longer fixed by signals block markers or train detection equipment, but by the rear end of the preceding train as shown in the figure.

The conclusions can be summarized as follows:

- ETCS 1- Capacity increase 1%
- ETCS 2- Capacity increase 16%
- ETCS 3- Capacity increase 50%
- Levels 2 and 3 have the greatest impact on capacity
- Levels 2 and 3 decrease significantly waiting times improving service
- Shifting trains priority does not lead to capacity gain
- The total waiting time does not decrease
- Higher rank of freight trains causes delays in passenger services
- If deterioration in passenger service quality is not acceptable then in the long run adaptations to the infrastructure is necessary for removing conflict with passengers.

6.3 WP 3 NETWORK PERSPECTIVE

The WP3objectives are, the definition of various dimensions affecting the Rail Freight system such as, technical performances, development of new opportunities, exploiting different market segments and the progressive implementation of the dedicated rail freight network through modelling application. This model will be constituted by a demand and supply assessment part and a network assignment tool. Considerations will be given to corridors vs. network strategies and the evolving scenarios migrating from the existing situation into a long term future situation including modal split assumptions.

6.3.1 Demand and Supply Assessment

Based on existing EUFRANET model this Task provides data for estimating freight transport DEMAND & SUPPLY in Europe. This **NEWOPERA** concept model follows a pragmatic approach taking into consideration:

- Operational reality
- Generation of traffic demand.

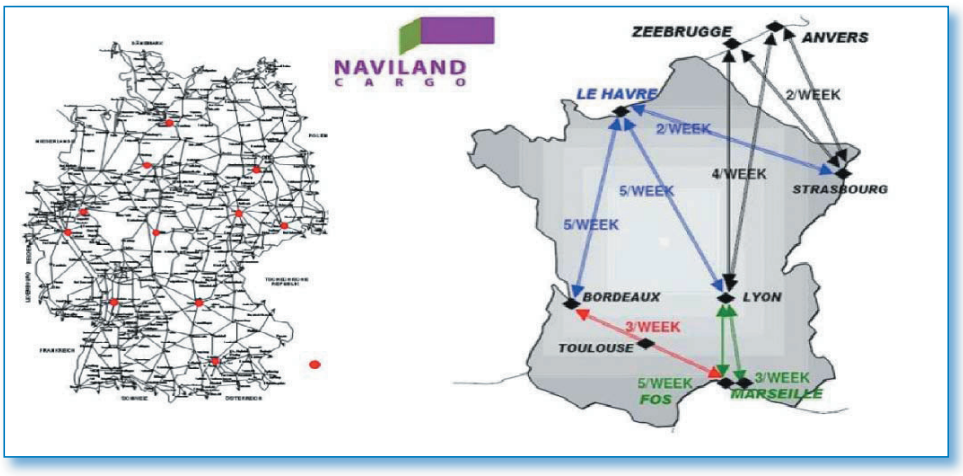
This **NEWOPERA** model will be capable of simulating intermodal and single wagon or group of wagons traffic identifying the infrastructures necessary for Rail-freight development in a dedicated lines concept.

A detailed data research on European Rail transport services has been carried out with particular reference to:

- Single wagon traffic
- Traffic between ports and inland terminals
- Intermodal traffic.

A detailed research assessment has been carried out in each EU country for establishing the mostly used intermodal corridors and the existing rail network for conventional traffic. In particular for the intermodal services, the two dimensions of overland intermodality and maritime intermodality have been assessed. For the purpose of providing a concrete example of the adopted methodology two maps are reproduced here below relating to, Germany and France network.

- Fig. 69: Maps of Germany and France



Another map has the purpose of evaluating the Central European Network serving the most traffic congested area of our Continent.

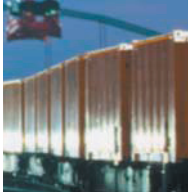
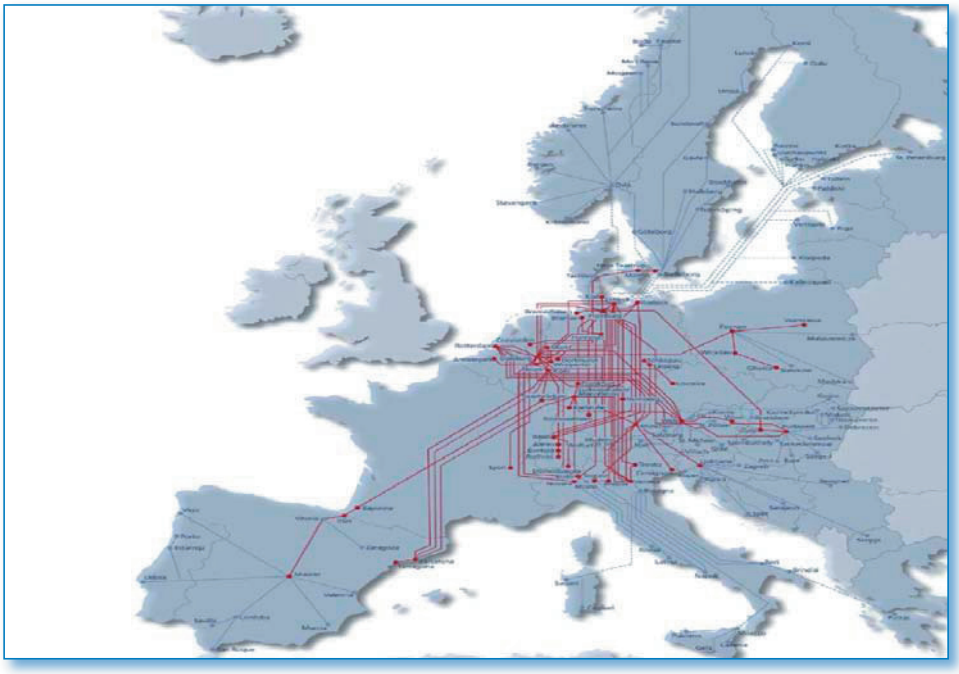


Fig. 70: Evaluation of Central European Network



The Spatial dimension of the demand generation model is evaluating not only the intra EU traffic but also the extra EU traffic. For the latter the traffic generators point of adoption are the ports or other points of entry into the European Community.

For this objective a detailed research was carried out to provide the necessary data for this demand assignment model. The basis for these data are constituted by the traffic demand generation which originates from the quantities moved to and from each European country and for the extra EU traffic the volumes at the points of entries.

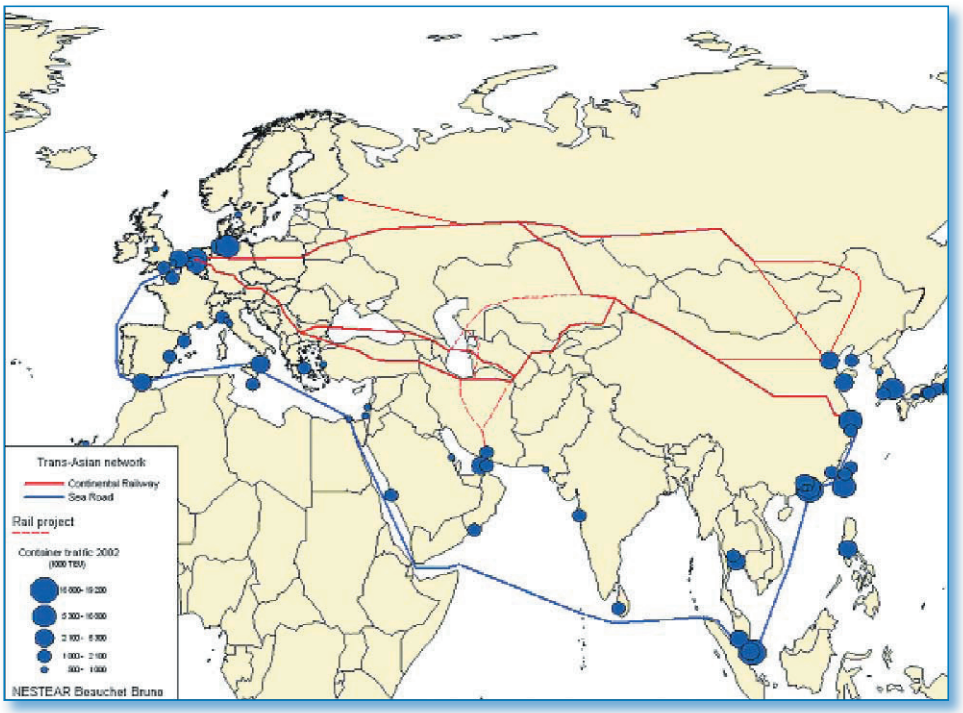
Fig. 71: List of Countries and volumes

Country	Volume in ton per Country
Oesterreich	1,545,550,00
Belgie	3,990,661,00
Belarusija/Belorussia	170,669,00
Swizze/Svizzera	128,979,00
Ceska Republika	366,043,00
Deutschland	26,855,805,00
Danmark	405,274,00
Espana	44,396,960,00
France	16,412,469,00
Ellada	46,106,473,00
Hrvatska	685,809,00
Italia	7,094,041,00
Nederland	4,490,919,00
Norge	3,624,733,00
Polska	16,530,792,00
Portugal	11,687,313,00
Sverige	630,550,00
Ukraina	153,294,00
United Kingdom	46,360,832,00
TOTAL	**231,637,166,00**

For the Intra-EU trade a detailed analysis at regional level was accomplished. This assessment took into consideration Freight flows to be operated by rail with high traffic density and long distances. For the Extra-EU trade the analyses considered the traffic to be assigned at the Trans -European Network points of entry such as, ports, airports, border points etc. As an example a map of the land and sea routes between Europe and Asia is here below reproduced.

The introduction of an extra-EU model is a **NEWOPERA** Innovation compared to the existing **EUFRANET** model.

Fig. 72: Land and Sea Routes between Europe and Asia



All this work for researching the demand model's data, assessing the existing network, evaluating the available services, was necessary for applying the demand and supply model. In EUFRANET a modal split formula after assignment has been made. **NEWOPERA** has gone a step further adding elements of sophistication. In fact traffic assignment to the network will be done according to the best routes or "minimal path" including also door to door "Road routes" concepts. This new approach will supplement the modal split EUFRANET abstract application used so far. The **NEWOPERA** model will consider new concrete market elements adapting them to the practical traffic exchanges reality.

6.3.2 Network Assignment

This task is heavily interconnected with the other **NEWOPERA** tasks. It plays a central role in the project since it deals with the routes assignment for the **NEWOPERA** Rail Freight Dedicated Network with particular reference to the international flows.

The principles developed in WP1 and WP4 have been fully integrated in this modelling, taking into account organisational and commercial aspects. This could be considered as the **NEWOPERA** added-value compared to other studies and projects.

The rail networks descriptions and all traffic information collected in task 3.1 have been standardised and geo-coded proposing a relevant coherent network in Europe. To this effect new innovative models and methodologies have been introduced conducing to the network traffic assignment and at the same time providing a tool suitable for facilitating the migration into the new market situation.

The next step to be developed in WP5 is to forecast in the next 15 years from now the evolution of international traffic flows through this **NEWOPERA** Rail Freight Network. This will have to be done based on the four **NEWOPERA** migrating scenarios.

With the objective of fulfilling the purpose of this task, it was considered that the **NEWOPERA** rail freight dedicated network had to satisfy five major requirements judged to be of fundamental importance:

1. A Demand Driven Network
2. A Service Driven Network
3. An Operative Network
4. A Multi-Level Network
5. An Evolutional Network.

Each one of the above dimensions was surveyed in details. In particular for satisfying the prerequisite of a demand driven network it has been necessary to:

- Evaluate existing traffic demand and estimate the new one according to "break in trends" (WP1)
- Survey the routes concentration, traffic flows and consolidation of shipments
- Make reference to the Origin/Delivery matrix
- Identify the major corridors involved in this traffic demand assignment
- Consider alternative routings to existing major corridors with the objective of reducing infrastructures investments.

After considering the demand side the service dimension was properly researched. To this effect several types of different traffics service/quality performances were evaluated such as:

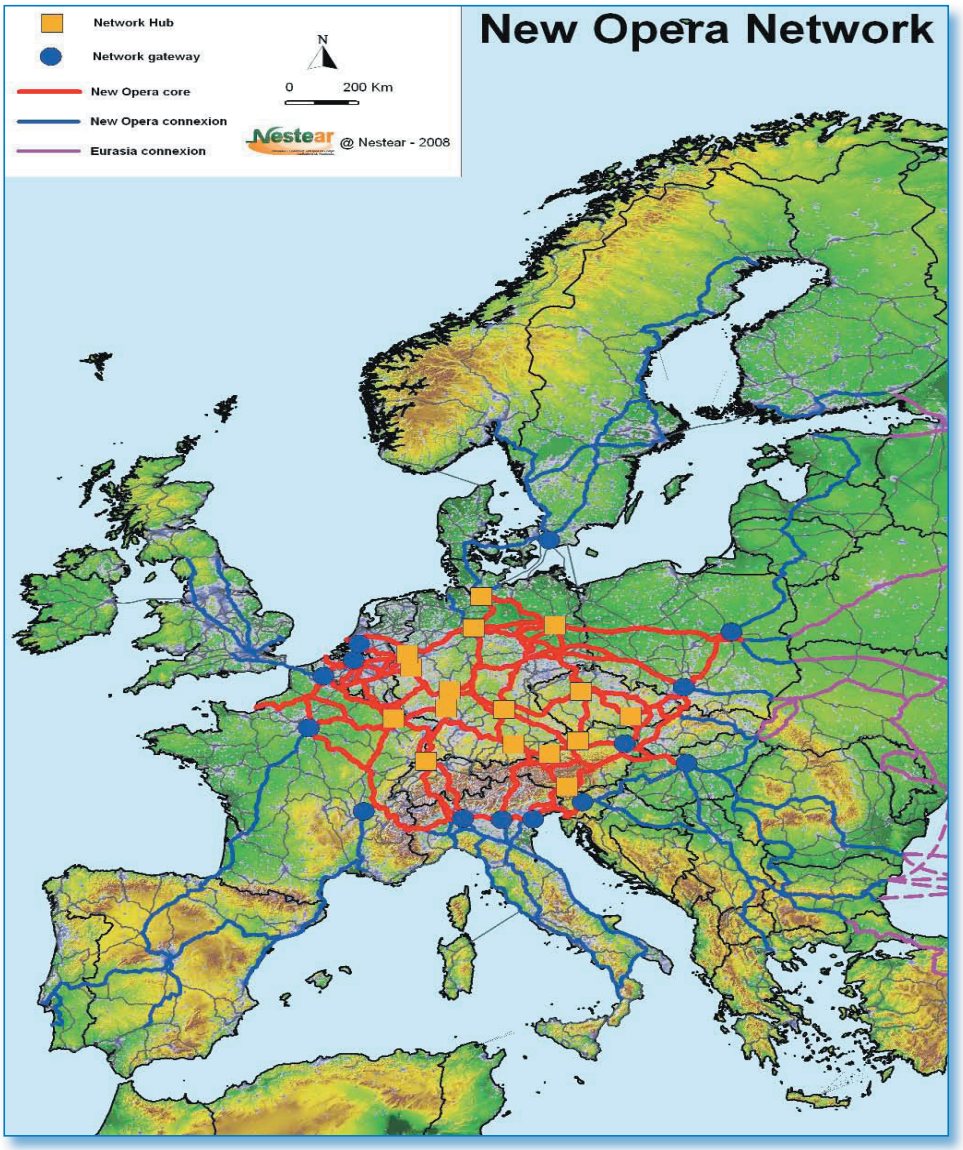
- Overland combined
- Maritime containers
- Short-sea shipping
- Ro/Ro combined for motorways of the sea
- Links with inland waterways
- Rolling motorways
- Conventional.

In order to verify the prerequisites of multilevel and operational network it has been necessary to:

- Survey the existing ports hubs and terminals network together with the new requirements
- Survey links nodes and rail lines where different operations are carried out according to service levels required for traffic segmentation
- Geo-code Origin/Delivery traffic information for multi-level network requirements such as Local- National- European- Intercontinental with Asia.

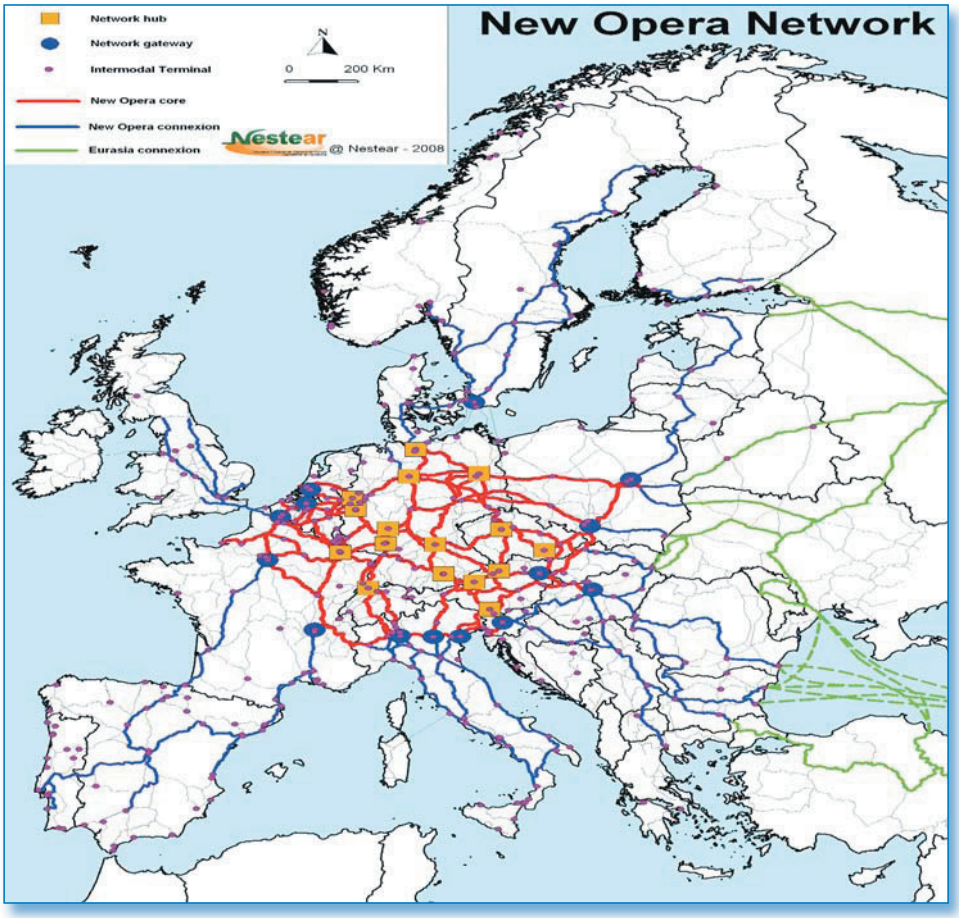
After having surveyed and considered all the above dimensions, the next step was to foresee the evolution of such network both according to the **NEWOPERA** migration process and to the changing market trends. The task 3.2 main result can be summed up in the two maps shown hereunder, depicting the proposed **NEWOPERA** network.

Fig. 73: Network Assignment 1



The above map indicates the Central European Rail Network, Network Hubs, Gateways and Connections.

Fig. 74: Network Assignment 2



This map indicates the Central European Rail Network, Network Hubs, Gateways, Connections and Intermodal Terminals. As one can notice these Intermodal Terminals are scattered all over Europe and do not appear to be connected to the assigned network. This is one of the expected effects of a borderless Union.

6.3.3 **NEWOPERA** Scenarios, Projections And Modal Split

This task develops **NEWOPERA** modelling tools for traffic projections and scenarios evaluation. These modelling tools had to be adapted to **NEWOPERA** objective which is the identification of a dedicated freight network in Europe able to concentrate rail transport flows with high quality of service in order to compete with road. By so doing **NEWOPERA** objective focuses more particularly on intermodal international flows across Europe.
This task is organized in two major parts for traffic projections and network assignment.

1. Definition of a generation model with detailed desegregation of traffic flows in 16 types of products in order to better identify market for bulk, conventional (direct and wagon load trains), and unitized traffic.

In this task, origin/destination traffic flows have been projected at different **NEWOPERA** horizons, 2015 - 2020, using socio economic scenarios of DG TREN as reference. A differentiation is made between extra EU and intra EU trade. A desegregation split is made differentiating international EU 27 member states traffic and national one. These different markets have different growths perspective with more rapid progression of international traffic versus the national one.
The extra EU containers traffic, which is concentrated on major EU ports is also reported with rail routes identification serving these ports.

2. Definition of an assignment model using GIS techniques(ACHEMINE) with its direct application to the European intermodal network. By so doing the contribution of modes to the European traffic can be directly estimated and assessed including door to door road solutions.

All different operating systems had to be taken into consideration including direct trains, wagon loads, intermodal transport both continental and maritime. The various models applied in this research have evidenced a number of important sensitivities. The **NEWOPERA** project impacts on the regional traffic with 25% of Tons transported between regions realized in 300 km or more. On international traffic this percentage growth to 64%. On maritime CTS traffic an improvement of 30% on **NEWOPERA** network performances imply a 12% gain in rail market share. For distances longer than 300km this gain will increase by 23%. Similar sensitivity tests can be conducted for intermodal traffic and simulating new services with new hubs and terminals.

Fig. 75: **NEWOPERA** Scenarios Work-Plan

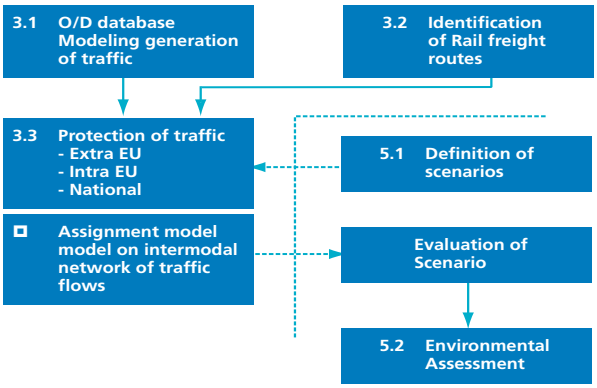
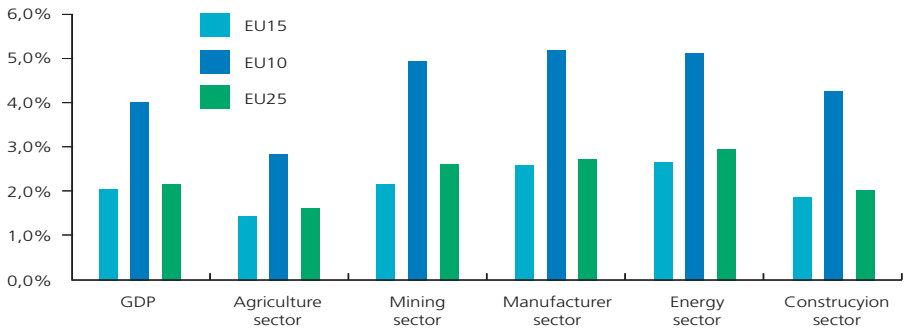


Fig. 76: Annual Growth Rate of GDP and GVA per sector



The model projections are presented at different horizons of **NEWOPERA** scenarios 2010 – 2015 – 2020 and 2025. However the annual growth rates do not differ significantly when different horizons are considered as far as generation of traffic is concerned. This might be different when contribution of modes or modal share are analyzed as it will be the case in the next chapter for **NEWOPERA** scenarios (step-wise scenarios) which differ significantly from transport supply side at different horizons.

Therefore only two horizons will be privileged for the generation of traffic projection:

- The short term horizon 2008/2010 is more an updating work of former 2000-2001 TEN STAC and ETIS database with more recent information up to 2004-2005
- The long term horizon of 2020 or 2030 with presentation of annual growth rate which gives already a good idea of the transport demand evolution in the long run.

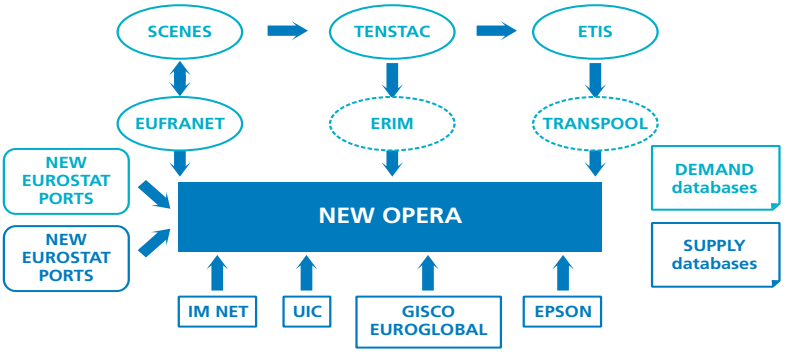
The initial **NEWOPERA** long term horizon was 2020 but major rail investments and implementation of new technologies will not come before this date. Therefore it is interesting to provide also an evolution profile beyond 2020 in order to consolidate the **NEWOPERA** vision of rail freight in the future.

Once these two horizons presentations have been defined the generation of traffic projections can be analyzed as regarding:

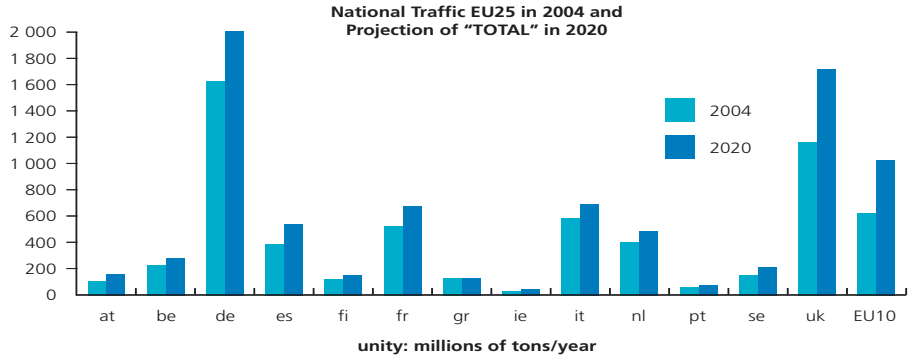
- The "type of product" which is fundamental for **NEWOPERA** market segmentation with 16 types of products regrouped in three main categories. Bulk transport (with identification of liquid bulk), general cargo (in particular inter industrial exchanges between major industries) and the so called category of unitized cargo. The latter regroups higher value cargos which can be fairly easily unitized in transport units. In particular intermodal transport units are involved in customers' supply chains on which **NEWOPERA** has a particular focus since they evidence better the customers' needs.
- The countries characterised by traffic three levels:
  - The interregional, national traffic (between NUTS II)
  - The interregional intra EU trade
  - The international extra EU trade generated by EU regions in the exchanges with extra EU countries.

The extra EU trade is particularly important for the maritime containers transport analysis, which is a **NEWOPERA** and European market dimension.

Fig. 77: **NEWOPERA** Approach for Updating Traffic Flows

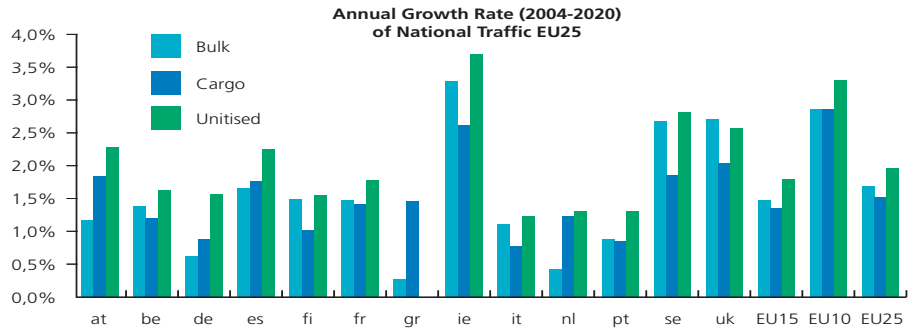


- Intra-EU traffic projection
- Fig. 78: Results per Country



The national transport growth can be detailed per categories of products bulk, general cargo and unitized. They show a higher unitized products growth in each of the countries. The general cargo transport growth is most of the time in an intermediate position between bulk transport growth and unitized products transport growth. The general cargo transportation depends very much upon specific industrial national structure.

- Fig. 79: Annual Growth Rate



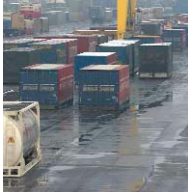


Fig. 80: Growth Rate per type of products

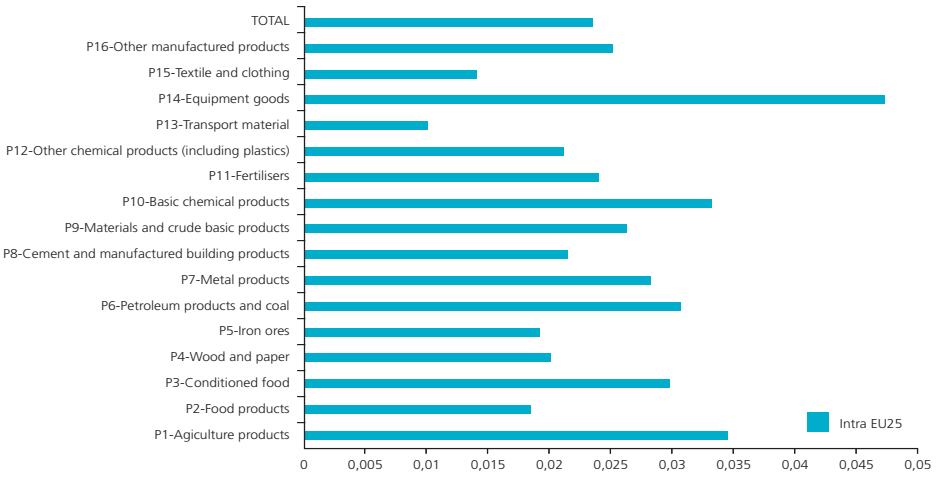


Fig. 81: Annual Traffic Growth Rate

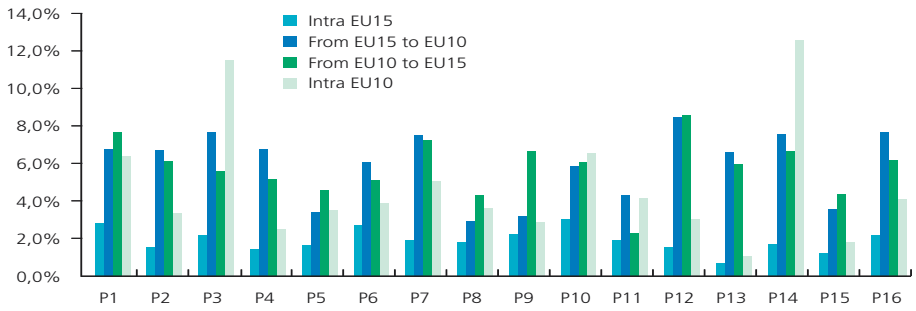


Fig. 82: Annual Growth Rate of Intra and Extra EU25 Traffic

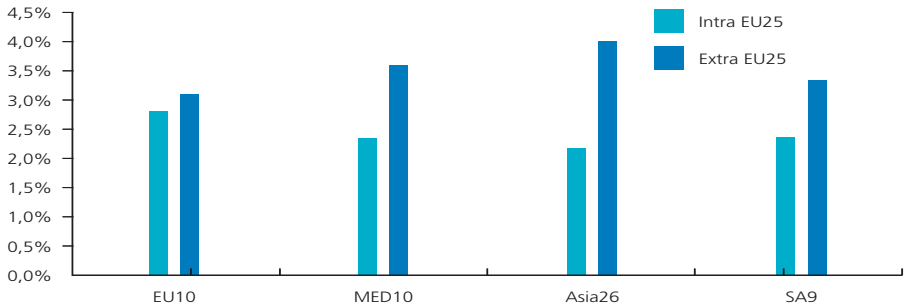


Fig. 83: Intra and Extra EU Traffic in mill. Tons/year 2004

2004 intra EU25 and extra EU27

Traffic	BULK	CARGO	UNITISED	Total
intra-EU25 international	557	520	289	1 366
intra-EU25 national	904	1 842	3 390	6 136
intra-EU25	1 461	2 362	3 679	**7 502**
EU27 - ASIA	46	73	54	173
EU27 - CIS	385	73	19	477
EU27 - MED	316	66	28	410
EU27 - NA	179	65	29	274
EU27 - SA	88	57	12	156
extra-EU27	1 014	334	142	**1 490**
Total	2 475	2 697	3 821	**8 993**

Fig. 84: Intra and Extra EU Traffic in mill. Tons/year 2020

2020 intra EU25 and extra EU27

Traffic	BULK	CARGO	UNITISED	Total
intra-EU25 international	1 091	1 075	548	2 714
intra-EU25 national	1 189	2 356	4 631	8 175
intra-EU25	2 280	3 431	5 179	**10 890**
EU27 - ASIA	114	151	115	380
EU27 - CIS	771	152	28	951
EU27 - MED	371	127	46	545
EU27 - NA	257	77	43	377
EU27 - SA	141	101	21	263
extra-EU27	1 654	608	254	**2 516**
Total	3 934	4 039	5 432	**13 406**

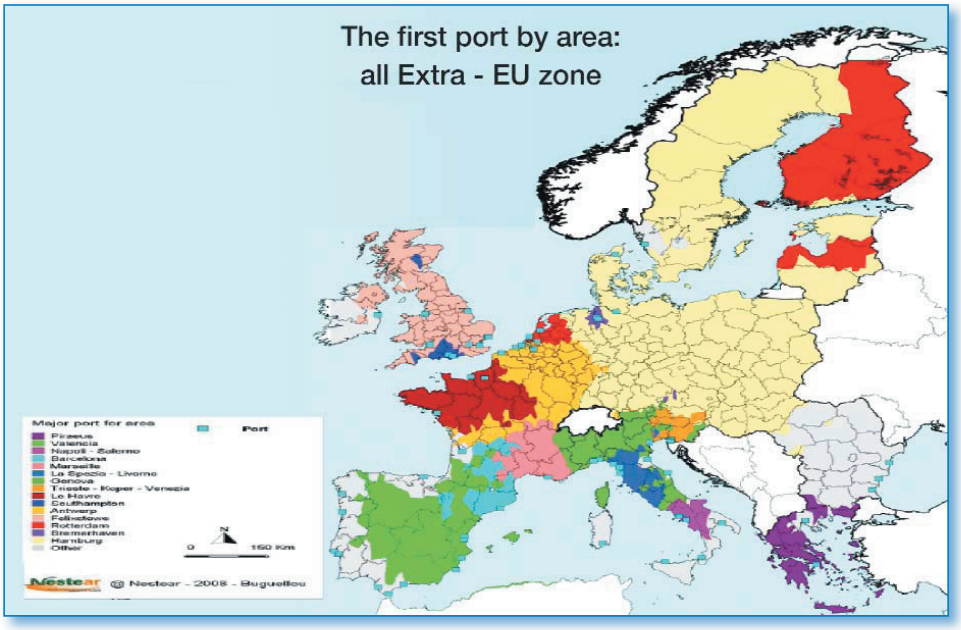
Fig. 85: Annual Growth Rate 2004-2020

Annual growth rate 2004-2020%

Traffic	BULK	CARGO	UNITISED	Total
intra-EU25 international	4,3%	4,6%	4,1%	4,4%
intra-EU25 national	1,7%	1,5%	2,0%	1,8%
intra-EU25	2,8%	2,4%	2,2%	2,4%
EU27 - ASIA	5,8%	4,6%	4,8%	5,0%
EU27 - CIS	4,4%	4,7%	2,4%	4,4%
EU27 - MED	1,0%	4,2%	3,3%	1,8%
EU27 - NA	2,3%	1,0%	2,5%	2,0%
EU27 - SA	3,0%	3,7%	3,8%	3,3%
extra-EU27	3,1%	3,8%	3,7%	3,3%
Total	2,9%	2,6%	2,2%	2,5%

In order to assign the maritime CTS traffic it has been necessary under this task to define a "port model". In fact rail freight appears to be particularly adapted for inland distribution from the ports. Apart from the traffic gravity areas, the transport industrialization is a deciding factor in order to have a distributing transportation system coherent with the volumes handled in the ports.

Fig. 86: The First Ports by Area



The map above shows the result of the gravity models aggregation estimated for each extra EU zone. For each EU region the first port of transit is identified. However the ports attraction differs very significantly from one extra EU zone to another as suggested by the port traffic maps for extra EU zones.

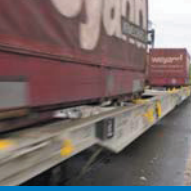
Traffic assignment and contribution of modes

It will be composed of three parts:

1) Reference database transport analysis per mode which is a prerequisite for understanding the modes contribution

Fig. 87: Traffic Table per Mode and Type of Products

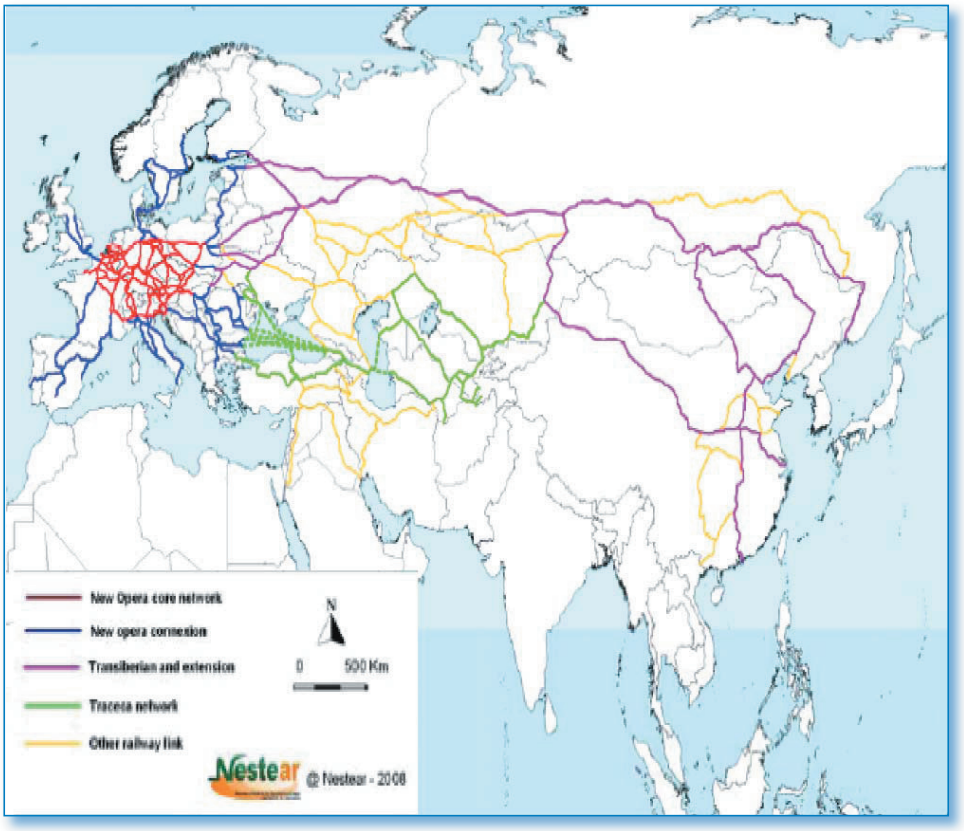
Intra EU international	Product\Mode	Sea	Rail	Road	Inland Waterway	Total
Millions of Tons/year	bulk	235	36	90	105	466
	cargo	135	49	185	33	402
	unitised	120	44	192	43	399
	Total	491	130	467	180	1 267
Billions of Tons*Kilometers/year	bulk	233	24	38	40	336
	cargo	131	25	109	13	278
	unitised	116	25	123	17	281
	Total	481	73	271	71	896
Mode Share of Tons per product	bulk	50,5%	7,7%	19,3%	22,5%	100%
	cargo	33,5%	12,3%	46,0%	8,2%	100%
	unitised	30,1%	11,1%	48,1%	10,7%	100%
	Total	38,7%	10,2%	36,8%	14,2%	100%
Mode Share of TK per product	bulk	69,4%	7,2%	11,4%	11,9%	100%
	cargo	47,1%	8,9%	39,2%	4,8%	100%
	unitised	41,3%	8,7%	43,9%	6,1%	100%
	Total	53,7%	8,2%	30,2%	7,9%	100%
Distance (KM) per ton	bulk	992	674	427	384	722
	cargo	973	500	591	407	693
	unitised	964	554	642	401	703
	Total	980	567	580	392	707



Intra EU national	Product\Mode	Sea	Rail	Road	Inland Waterway	Total
Millions of Tons/year	bulk	107	152	1 165	131	1 555
	cargo	38	118	853	22	1 032
	unitised	36	203	1 431	45	1 715
	Total	181	474	3 449	198	4 301
Billions of Tons*Kilometers/year	bulk	43	34	228	17	322
	cargo	18	33	177	3	231
	unitised	19	52	301	6	378
	Total	80	119	705	27	932
Mode Share of Tons per product	bulk	6,9%	9,8%	74,9%	8,4%	100%
	cargo	3,7%	11,5%	82,7%	2,2%	100%
	unitised	2,1%	11,9%	83,5%	2,6%	100%
	Total	4,2%	11,0%	80,2%	4,6%	100%
Mode Share of TK per product	bulk	13,3%	10,7%	70,6%	5,4%	100%
	cargo	7,0%	14,3%	76,3%	1,5%	100%
	unitised	5,1%	13,7%	79,7%	1,6%	100%
	Total	8,6%	12,8%	75,7%	2,9%	100%
Distance (KM) per ton	bulk	400	226	195	133	207
	cargo	474	280	207	156	224
	unitised	538	255	211	135	221
	Total	443	252	205	136	217

2) Assignment on intermodal network which is an important original modelling step evaluating the modes contribution.

Fig. 88: **NEWOPERA** with Eurasia Network Connection



3) Intermodal network definition at European level including all modes and in particular road network which was never done so far. This in order to assess competition between modes and the likely development of intermodal solutions.

Fig. 89: Intra EU Rail Flows

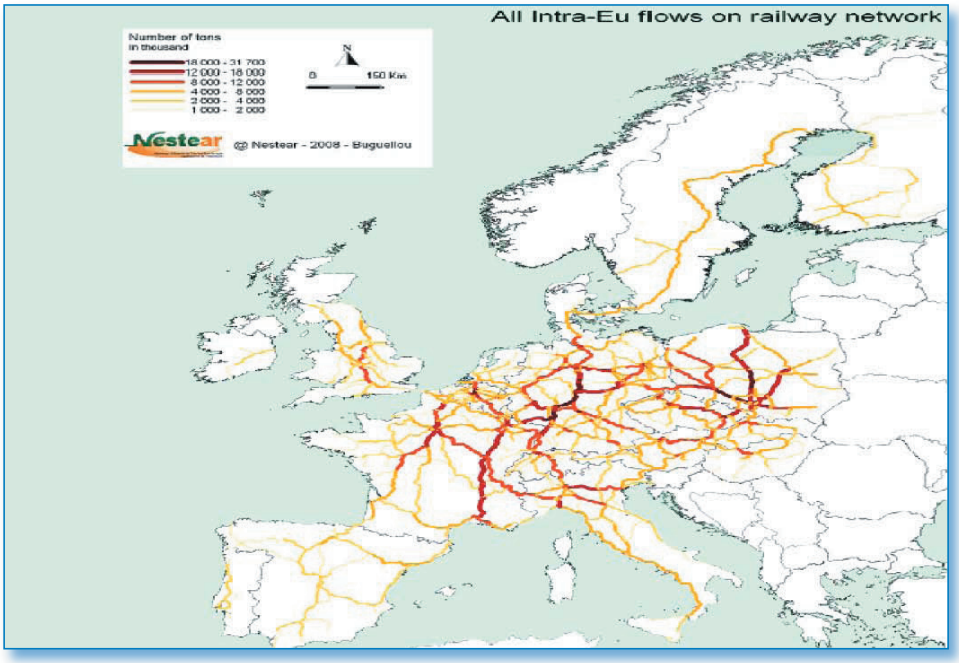
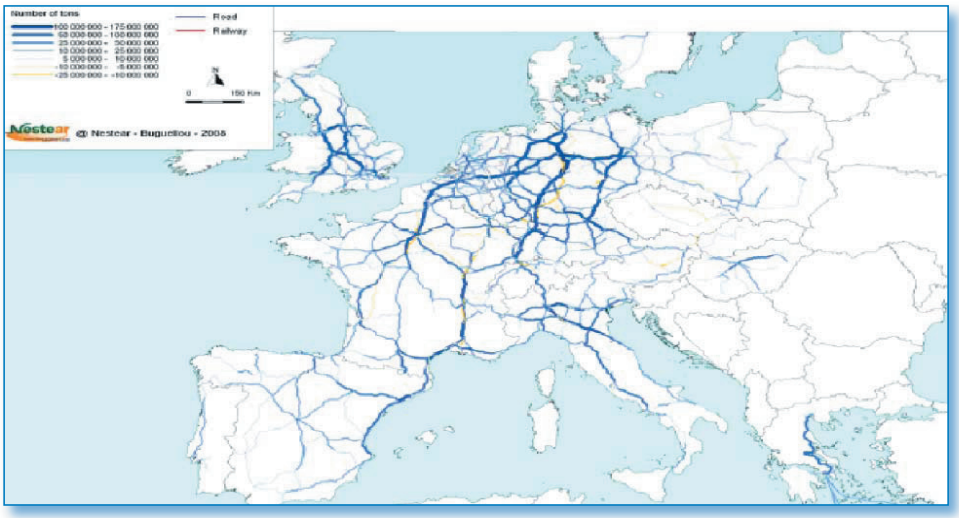


Fig. 90: Intra EU Flows on Intermodal Network



Conclusion on rail transport modelling

The conclusion of this task embraces three dimensions:

1) Trade pattern projections
2) **NEWOPERA** modelling tool
3) Results of model application to the EU Network

6.4 WP 4 NEW PRODUCTS SERVICES

The objective of this WP is the research and the definition of a PAN- European rail freight market approach based on OSS philosophy. In order to fulfil this task one had to put at the centre of the new rail freight economy, the customers and the services offered to them as drivers for the necessary changes. The traditional incumbents approach reduced the service offered in the market place to a "mono-product" positioned in the lowest economic quartile. The surveys and researches carried out in the European market confirmed the need by the customers of being offered a variety of product services capable of satisfying a range of differentiated market needs. Consequently it was established the existence of an enormous market potential to be exploited by the market segmentation approach. Rail lines productivity, service accessibility together with new logistics service requirements were properly evaluated in order to increase rail market share. The intermodal Interindustry dimension, the interconnection with ports dimensions were researched for evaluating their continuous development. New actors populating the rail freight market and their vision for new products coupled with the new interfaces emerging as a result, have been the object of a specific task.

6.4.1 Market Segmentation Report and Logistics Services

The segmentation analysis which is the research object, implies the strategic evaluation of the following market differentials:

- Variety of objectives
- Variety of needs
- Variety of preferences
- Variety of perceptions
- Variety of behaviours.

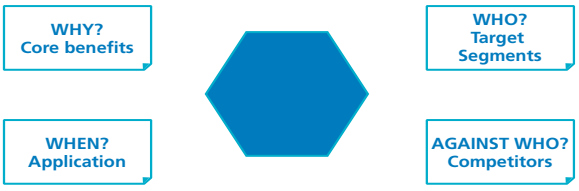
The academic methodology approach analyses the steps of building market segments through the variables causing choices, up to the preparation of a marketing plan where strategic goals, benefits, preferences and perceptions are described.

The scientific analysis continues with the targeting step. This operation is very important for choosing the targeted segments by evaluating:

- Attractiveness
- Accessibility
- Stability

The last and concluding step is represented by the Positioning Strategies which must be coherent with the economic goals to be achieved and with the position to be conquered in the market place.

- Fig. 91: Positioning Diamond



A further stage of this research is to apply the theoretical model recognised to be universally used by marketing specialists in the consumer field, to the rail freight industry. To verify the consistency of the model consideration has been given to the freight service industry in general, capturing its peculiarities. In applying the dummies to the model it has emerged that in the transport process the drivers for the decisions are lying in three separate time frames interrelated to each other into a proper time sequence:

In each sequence are contained specific drivers dictating the transport choice with key elements common to the clusters of this analysis.

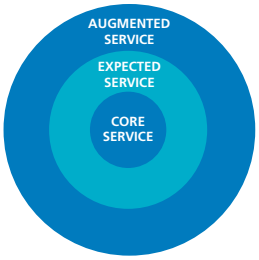
The end result produced by the chart demonstrates that without satisfying the drivers contained in the sequence, there is a return to the existing un-segmented scenario. This in itself supports the concept of the true scientific reason why traffic on rail continues to loose market share. The very basic requirements are not met.

A further sophistication of the chart is to identify similarities between the small – medium – large companies, populating the clusters. This will indicate the level of concentration characterising a certain market segment. This information is a vital piece for deciding the strategies to be adopted for the marketing approach and the distribution channels' choice.

The market segmentation chart, once completed, is conducive to the task of giving contents to the Value Proposition.

The classical scheme of the Segmentation Value Proposition can be basically represented as follows.

Fig. 92: Value Proposition Scheme



The following table is accessing the cluster peculiarities vs. the three critical phases of the transport process that are: Before- During and After. This exercise was to show the basic service differentiation necessary for the users' value creation. At the same time the table identified the population of companies active in that particular cluster of activity that is: large, medium, small companies represented by " L,M,S."

Fig. 93: Segment Identification

	Before	During	After
CHEMICAL	Transportation Means: Product Integrity **LM** Product Specialis. **LM** Handling Specialis. **LM** Cleaning + Certific. **LM** Civil Protection **LM** Customer Focus **LM** Door to Door **LM** Economies of Scale **LM** One Stop Shop **LM**	Costs & Stability **LM** Flexibility **LM** Consistency **LM** Velocity **LM** Punctuality **LM** Emerg. Response **LM** Quality **LM** Tracking & Tracing **LM** Travelling Stock **LM**	Handling Specializ. **LM** Cleaning **LM** Reverse Logistics **LM** Vehicle Rotation **LM** Reload Capabilities **LM** Customer IT Integ. **LM** Waste Management **LM**
STEEL	Transportation Means: 1) Weight Axle Load **LM** 2) Handling Specialis. **LM** 3) Special Saddles **LM** Customer Focus **LM** Door to Door **LM** Economies of Scale **LM** One Stop Shop **LM**	Costs & Stability **LM** Flexibility **LM** Consistency **LM** Velocity **LM** Punctuality **LM** Speed of Reaction **LM** Tracking & Tracing **LM** Quality **LM** Travelling Stock **LM**	Handling Specialis. **LM** Reverse Logistics **LM** Vehicle Rotation **LM** Reloading Capabilities **LM** Customer IT Integr. **LM** …
PAPER	Transportation Means: 1) Weight Axle Load **LM** 2) Volume **LM** 3) handling Specialis. **LM** Customer Focus **LM** Door to Door **LM** Economies of scale **LM** One Stop Shop **LM**	Costs & Stability **LM** Flexibility **LM** Consistency **LM** Velocity **LM** Punctuality **LM** Speed of Reaction **LM** Tracking & Tracing **LM** Quality **LM** Travelling Stock **LM**	Handling Specialis. **LM** Reverse Logistics **LM** Vehicle Rotation **LM** Reloading Capabilities **LM** Customer IT Integr. **LM**
GROCERY	Transportation Means: 1) Weight + Volumes **LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** Last Mile **LMS** Consumer Response **LMS** One Stop Shop **LMS**	Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Reverse Logistics **LMS** Vehicle Rotation **LMS** Vertical Storage **LMS** Automatic Wareh. **LMS** Optical Monitoring **LMS** Picking **LMS** Last Mile **LMS** Customer IT Integr. **LMS** Stock Replenishment **LMS**
AUTOMOTIVE	Transportation Means: 1) Volumes Components **L** 2) Cars **L** Demand Chain – JIT **L** One Stop Shop **L** Door to Door **L** Economies of Scale **L**	Costs & Stability **L** Flexibility **L** Consistency **L** Velocity **L** Punctuality **L** Speed of Reaction **L** Tracking & Tracing **L** Quality **L** Travelling Stock L	Car Park Capacity **L** Car Protection **L** Finishing & Cleaning **L** Reverse Logistics **L** Vehicle Rotation **L** Customer IT Integr. **L** Stock Replenishment **L**

BUILDING	Transportation Means: Weight **LMS** Product Integrity **LMS** Customer Focus **LMS** Door to Door **LMS** Building Sites **LMS** One Stop Shop **LMS**	Product Integrity **LMS** Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Handling Specialis. **LMS** Waste Management **LMS**
SCRAPS	Transportation Means: 1) Weight **L** Customer Focus **L** Door to Door **L** Economies of scale **L** One Stop Shop **L**	Product Integrity **L** Costs & Stability **L** Flexibility **L** Consistency **L** Velocity **L** Punctuality **L** Speed of Reaction **L** Tracking & Tracing **L** Quality **L** Travelling Stock **L**	Unloading capabilities **L** Handling Specialis. **L** Vehicle Rotation **L** Reloading Capabilities **L** Customer IT Integr. **L**
FRESH & DANGEROUS	Transportation Means: Temp. Control **LMS** Pre-packing **LMS** Product Integrity **LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** Last Mile **LMS** Consumer Response **LMS** One Stop Shop **LMS**	Transit Time **LMS** Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Last Mile **LMS** Reverse Logistics **LMS** Vehicle Rotation **LMS** Fresh Storage **LMS** Automatic Warehous. **LMS** Optical Monitoring **LMS** Picking **LMS** Customer IT Integr. **LMS**
WHITE GOODS	Transportation Means: 1.Volume **L** Customer Focus **L** Door to Door **L** Economies of Scale **L** Last Mile **L** Consumer Response **L** One Stop Shop **L**	Costs & Stability **L** Flexibility **L** Consistency **L** Velocity **L** Punctuality **L** Speed of Reaction **L** Tracking & Tracing **L** Quality **L** Travelling Stock **L**	Reverse Logistics **L** Vehicle Rotation **L** Vertical Storage **L** Automatic Warehousing **L** Optical Monitoring **L** Picking **L** Last Mile **L** Customer IT Integration **L** Stock Replenishment **L** Waste Management **L**
SAWN - LOGS	Transportation Means: Weight Axle Load **LMS** Volume **LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** One Stop Shop **LMS**	Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Vehicle rotation **LMS** Reloading Capability **LMS** Customer IT Integration **LMS** Vehicle Rotation **L** Reloading Capability **L** Customer IT Integration **L**

RAW MATERIALS & GRANULATES	Transportation Means: Weight Axle Load **L** Customer Focus **L** Door to Door **L** Economies of Scale **L** One Stop Shop **L**	Costs & Stability **L** Flexibility **L** Consistency **L** Velocity **L** Punctuality **L** Speed of Reaction **L** Tracking & Tracing **L** Quality **L** Travelling Stock **L**	Vehicle Rotation **L** Reloading Capability **L** Customer IT Integration **L**
COAL	Transportation Means: 1.Weight Axle Load **L** Customer Focus **L** Door to Door **L** Economies of Scale **L** One Stop Shop **L**	Costs & Stability **L** Flexibility **L** Consistency **L** Velocity **L** Punctuality **L** Speed of Reaction **L** Tracking & Tracing **L** Quality **L** Travelling Stock **L**	Vehicle Rotation **LMS** Reloading Capabilities **LMS** Customer IT Integr. **LMS**
FURNITURE	Transportation Means: 1.Volume **LMS** 2.Handling Specialis.**LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** Consumer Response **LMS** One Stop Shop **LMS**	Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Reverse Logistics **LMS** Vehicle Rotation **LMS** Reloading Capabilities **LMS** Customer IT Integr. **LMS** Stock Replenishment **LMS** Waste Management **LMS**
TOYS & ORNAMENTS	Transportation Means: 1. Volume **LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** Consumer Response **LMS** Last Mile **LMS** One Stop Shop **LMS**	Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Reverse Logistics **LMS** Vehicle Rotation **LMS** Vertical Storage **LMS** Automatic Warehous. **LMS** Optical Monitoring **LMS** Picking **LMS** Last Mile **LMS** Customer IT Integr. **LMS** Waste Management **LMS**
BEVERAGE	Transportation Means: 1. Weight Axle Load **LMS** Customer Focus **LMS** Door to Door **LMS** Economies of Scale **LMS** Consumer Response **LMS** Last Mile **LMS** One Stop Shop **LMS**	Costs & Stability **LMS** Flexibility **LMS** Consistency **LMS** Velocity **LMS** Punctuality **LMS** Speed of Reaction **LMS** Tracking & Tracing **LMS** Quality **LMS** Travelling Stock **LMS**	Reverse Logistics **LMS** Vehicle Rotation **LMS** Vertical Storage **LMS** Automatic Warehous. **LMS** Optical Monitoring **LMS** Picking **LMS** Last Mile **LMS** Customer IT Integr. **LMS**

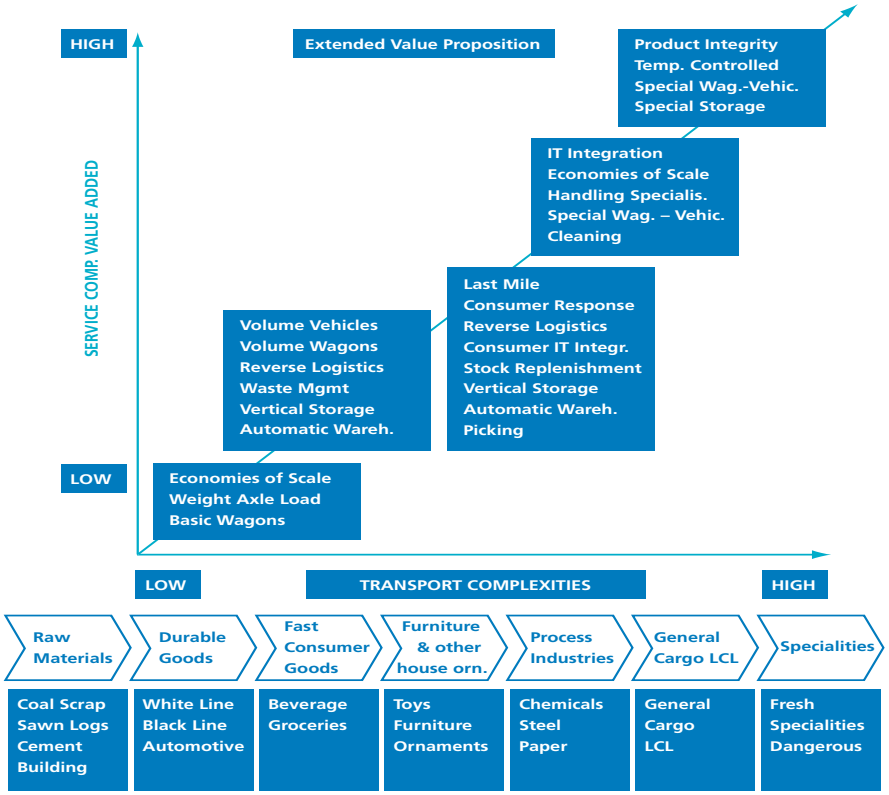
GENERAL CARGO LCL	Transportation Means: Variety of Vehicles **LMS** Consolidation **LMS** Warehousing **LMS** Optimisation **LMS** Differentiated Needs **LMS** Fragmentation **LMS** Door to Door **LMS** Last Mile **LMS** One Stop Shop **LMS**	Punctuality **LMS** Tracking and tracing **LMS** Quality **LMS** Velocity **LMS** Capability to consolidate from fragmented to industrial dimension **LMS** Costs **LMS**	Warehous. Capabilities . **LMS** Last mile **LMS** Capability to deconsolidate **LMS** Reloading capabilities **LMS**

COMMON DENOMINATORS - IDENTIFYING SIMILARITIES:

The next step is to identify common denominators and similarities both on the technical side and market variables of the 16 clusters taken as reference for exposing the value proposition extension.

L: Auto, Scraps, White Goods, Sawn Logs, Raw Materials & Granulates, Coal
LM: Chemicals, Steel, Paper, Beverage
LMS: Fresh & Dangerous, Building, Furniture, Toys & Ornaments, Groceries

Fig. 94: Extended Value Proposition and Transport Complexities



- KEY BENEFITS:

The above empirical exercise has the objective of identifying the "extended value proposition" for the Logistics Service Providers. Such extended value proposition is based on the value of the service perceived by the customers. The perceived value is given by the transport complexities on the three identified phases before, during and after, combined with the "service components value added". The graph is departing from a low position towards a higher position of the two axes describing the dummies.

This essentially is a detailed elaboration of the market segmentation matrix where key benefits must be identified both for the Logistics Service Providers and the users for the segmentation to stand up. The industry clusters are positioned either in the lower part or going toward a higher direction with the progressive increase of transport complexities associated with increased value added components. Theoretically this is proving the scientific exercise rationale whereby on the lower end are appearing clusters belonging to basic industries, such as raw materials, coal, cement, etc., characterised by economies of scale and low transport sophistication. In this area there is little space for either peculiar logistics engineering technology, or special collection and delivery arrangements. The only specialisation lies in the type of vehicle/wagons to be used for the product's transportation. Once this has been resolved the value both for the logistics service providers and for the users is concentrated on volumes, continuity, and vehicle/wagons usage. Progressively, the other clusters find themselves into the graph in a higher position according to the extended value proposition generated by growing transport complexities, specialisation, precautions, handling techniques, etc..

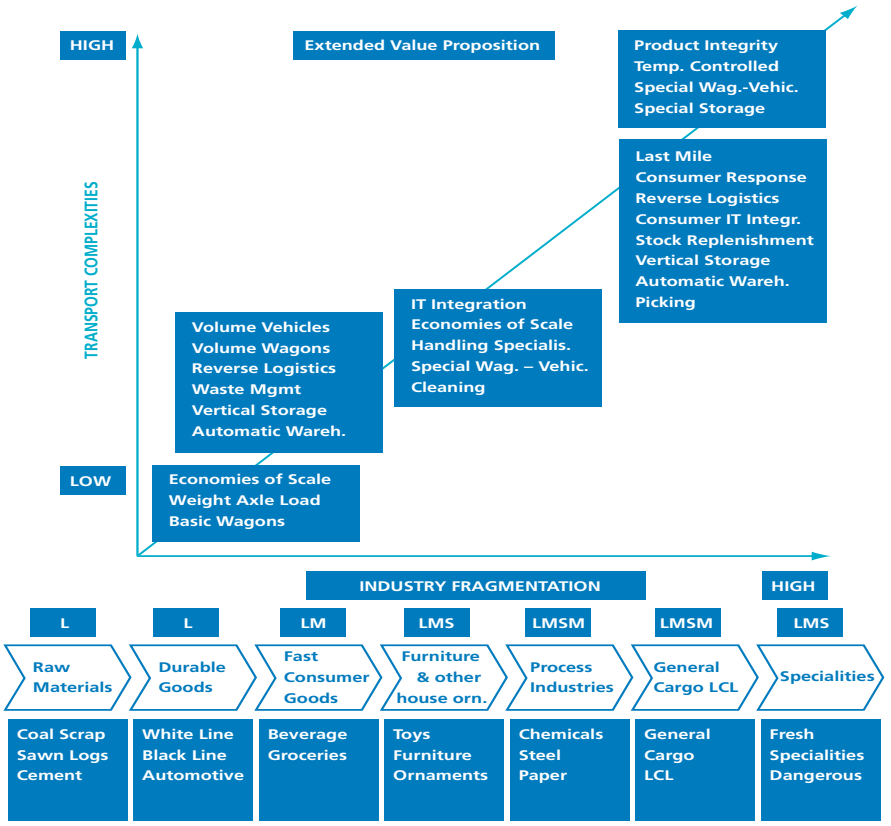
- Value proposition definition

  The graph confirms the theory. The concept of a core service, expected service and augmented service is hereby reinforced.

- Multiple Steps Segmentation.

  In the previous graph the two dummies of transport complexities and service components value added have been put as variables on the two represented axes. Another step of the exercise is to change the dummies and invert their order. On the base axe the industry fragmentation is represented whereas on the vertical axe the transport complexities are represented.

Fig. 95: Extended Value Proposition and Industry Fragmentation

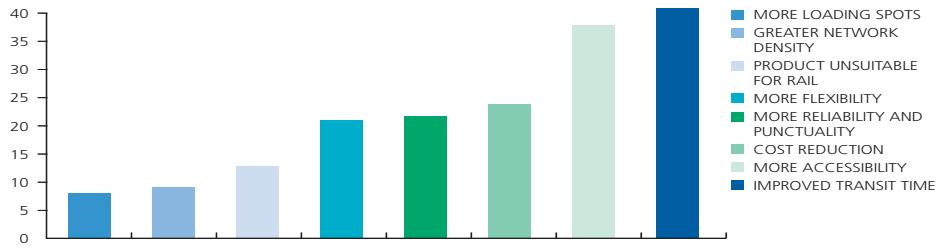


Also in this graph, the segmentation logic is confirmed. There is only an inversion of requirements in the central part which is not at all undermining the basic concept.

Whereas the objective of the first graph is to represent the extension of the value proposition, the second graph, in confirming such value proposition, implies for the service/products the adoption of a different channel distribution policy (4 Ps: product, price, placement, publicity).

Before passing to segmentation strategies for rail market it is important to take into consideration shippers requirements to shift from road to rail and ultimately to shift to rail from any competing modality. In other chapters of this research it is clearly demonstrated that to produce seamless cargo mobility in a borderless European Union, it is necessary for all modalities to integrate and complement each other. However transport modalities when considered separately compete against each other contributing to a totally free and liberalised Society. Clients decisions to prefer rail against road depend on a wide range of criteria that any service providers must identify, understand and perceive for succeeding in business. Out of various studies on rail freight shippers requirements the results of a survey by FORSA on behalf of Danzas Euronet GmbH in Germany are here reported. They highlight not only the shippers' frustrations against rail freight services but also their perception as to how rail companies should respond.

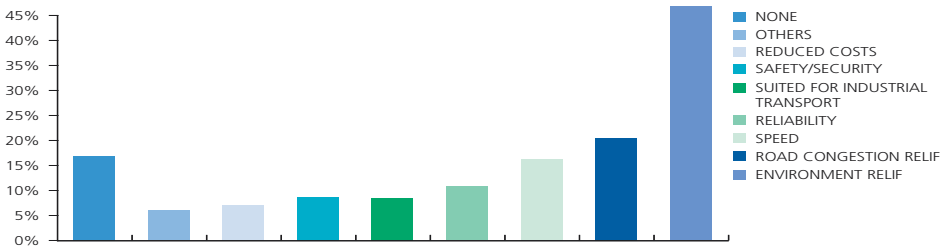
Fig. 96: Shippers Requirement to Shift from Road to Rail



Source: FORSA on behalf of DHL Danzas Euronet, IV/2000

When comparing the shippers' requirements against the perceived benefits of rail over road one can note that less than 15% of the customers perceive an advantage in speed, less than 10% in service reliability, and less than 5% in costs. Thus it could be reasoned that success – or the lack of it – of rail companies in fetching a greater market share, is the result of an apparent shortfall in satisfying customers' demands better fulfilled by other modes.

Fig. 97: Shippers Perception of Rail Advantages over Road



Source: FORSA on behalf of DHL Danzas Euronet, IV/2000

Some shippers' demands for transport and logistics services apply to all modes:

- **Accessibility** – enabling shippers to connect with the service
- **Availability** – minimising lead times
- **Punctuality** - meeting agreed transit times and time windows
- **Reliability** – meeting agreed service levels other than time
- **Flexibility** – orienting services at customers needs
- **Simplicity** – implementing SPOC to liaise with various subcontractors
- **Accountability** – attributing clear responsibilities and performances
- **Transparency** – keeping the customers informed either good or bad
- **Dependability** – reproducing planning and pricing
- **Affordability** –pricing the services competitively
- **Profitability** – producing sufficient margins to stay in business.

Failure too meet most if not all of these critical requirements will limit the ability of a mode to successfully capture a significant freight market share.

An important element emerged from task 1.2 deliverable is the projection of future cargo mobility needs in the years to come. The research completed under WP 1 provided relevant indications of

where the market is likely to go together with an ever increasing sophistication of the customers supply chain processes. An interesting result has emerged from the comparison of ten important best practices according to the different large shippers small & medium size industries and logistics service providers' view points.

From FIG. 44 at page 70 one can understand these best practices values. The best practices indicate how shippers and Logistics Service Providers manage and control their businesses to extract value. It is important that rail transportation and product segmentation contain the basic elements for satisfying this process.

A market research was conducted in 11 European countries during first quarter 2006. The research objective was to ask rail users to express their evaluation on the situation "as is" and according to the **NEWOPERA** scenario evolution on the future 5, 10, 15 years from now.
The result research is synthesised in the following matrixes.

Fig. 98: Macro segmentation matrix - modalities' comparison NEWOPERA Scenario 0 (As Is)

Market Segments		Capabilities to satisfy	Shipment size	Shipment profitab	Segment accessibil.	Total sum	
Raw materials	RAIL	4,0	4,4	3,1	3,4	**14,9**	RAIL
	SEA	3,4	4,7	3,4	3,1	**14,6**	SEA
	ROAD	2,1	2,0	2,0	3,6	**9,7**	ROAD
	INTERMODAL	3,2	2,7	2,7	3,1	**11,7**	INTERMODAL
Durable goods	RAIL	3,6	3,8	3,3	3,1	**13,8**	RAIL
	SEA	3,0	3,1	3,0	2,6	**11,7**	SEA
	ROAD	3,9	3,9	3,9	4,6	**16,3**	ROAD
	INTERMODAL	3,9	3,8	3,1	3,8	**14,6**	INTERMODAL
Fast Moving Consumer Goods	RAIL	2,6	3,9	3,5	2,9	**12,9**	RAIL
	SEA	1,8	2,2	2,8	2,2	**8,9**	SEA
	ROAD	4,6	4,0	4,2	4,7	**17,5**	ROAD
	INTERMODAL	3,3	4,1	3,7	3,8	**14,8**	INTERMODAL
Process industries	RAIL	3,5	3,9	3,2	3,4	**14,0**	RAIL
	SEA	2,7	3,8	3,2	2,9	**12,6**	SEA
	ROAD	3,6	3,2	3,2	4,2	**14,2**	ROAD
	INTERMODAL	3,4	3,3	3,0	3,5	**13,2**	INTERMODAL
Furniture and other house products	RAIL	2,5	3,8	3,5	2,5	**12,3**	RAIL
	SEA	2,0	4,0	2,8	1,0	**9,8**	SEA
	ROAD	4,0	3,8	3,8	5,0	**16,6**	ROAD
	INTERMODAL	4,0	4,0	3,7	4,5	**16,2**	INTERMODAL
Specialities	RAIL	1,7	3,2	3,5	1,7	**10,0**	RAIL
	SEA	1,0	1,0	3,5	1,0	**6,5**	SEA
	ROAD	5,0	4,0	4,8	5,0	**18,8**	ROAD
	INTERMODAL	3,8	3,8	4,2	3,8	**15,7**	INTERMODAL
General Cargo-LCL	RAIL	2,1	2,4	3,0	1,9	**9,4**	RAIL
	SEA	2,0	2,0	2,8	1,7	**8,5**	SEA
	ROAD	4,6	4,1	3,9	4,9	**17,5**	ROAD
	INTERMODAL	4,1	4,0	3,3	4,2	**15,6**	INTERMODAL
TOTAL SUM	RAIL	20,0	25,4	23,1	18,9	**87,3**	RAIL
	SEA	15,9	20,8	21,4	14,5	**72,6**	SEA
	ROAD	27,8	25,0	25,7	32,0	**110,5**	ROAD
	INTERMODAL	25,6	25,8	23,6	26,7	**101,7**	INTERMODAL

Scale from 1 to 5 (where 1 is minimum and 5 the maximum)

Fig. 99: Macro segmentation matrix - modalities' comparison NEWOPERA Scenario 1,2,3 - Future Situation

Market Segments		Capabilities to satisfy	Shipment size	Shipment profitab	Segment accessibil.	Total sum	
Raw materials	RAIL	4,4	4,4	3,6	3,7	**16,1**	RAIL
	SEA	3,8	4,5	3,6	3,3	**15,1**	SEA
	ROAD	2,1	2,1	1,9	3,4	**9,5**	ROAD
	INTERMODAL	3,4	3,4	3,0	3,7	**13,5**	INTERMODAL
Durable goods	RAIL	4,0	3,7	3,6	3,3	**14,6**	RAIL
	SEA	3,8	3,6	3,6	3,2	**14,2**	SEA
	ROAD	3,5	3,7	3,7	4,0	**14,8**	ROAD
	INTERMODAL	4,1	4,0	3,7	3,7	**15,5**	INTERMODAL
Fast Moving Consumer Goods	RAIL	3,6	4,1	3,6	3,7	**15,0**	RAIL
	SEA	2,4	2,4	2,3	2,6	**9,7**	SEA
	ROAD	4,2	4,0	4,0	4,5	**16,7**	ROAD
	INTERMODAL	4,2	4,3	3,9	4,1	**16,5**	INTERMODAL
Process industries	RAIL	3,9	4,1	3,8	3,9	**15,7**	RAIL
	SEA	2,9	3,9	3,7	3,0	**13,4**	SEA
	ROAD	3,3	3,1	3,0	4,1	**13,5**	ROAD
	INTERMODAL	3,9	3,7	3,5	4,1	**15,3**	INTERMODAL
Furniture and other house products	RAIL	3,0	3,7	3,3	2,7	**12,7**	RAIL
	SEA	1,7	2,7	2,7	1,3	**8,3**	SEA
	ROAD	4,5	4,0	4,0	4,8	**17,3**	ROAD
	INTERMODAL	4,1	4,0	3,7	4,3	**16,1**	INTERMODAL
Specialities	RAIL	2,0	2,6	3,6	2,0	**10,2**	RAIL
	SEA	1,0	1,0	3,7	1,0	**6,7**	SEA
	ROAD	5,0	4,0	4,5	5,0	**18,5**	ROAD
	INTERMODAL	4,0	3,8	4,2	4,2	**16,2**	INTERMODAL
General Cargo-LCL	RAIL	2,8	2,8	3,3	2,3	**11,1**	RAIL
	SEA	2,0	2,0	2,8	1,6	**8,4**	SEA
	ROAD	4,7	4,0	4,2	5,0	**17,9**	ROAD
	INTERMODAL	4,6	4,3	3,8	4,4	**17,1**	INTERMODAL
TOTAL SUM	RAIL	23,6	25,3	24,8	21,7	**95,4**	RAIL
	SEA	17,5	20,0	22,3	16,0	**75,8**	SEA
	ROAD	27,2	24,9	25,2	30,8	**108,2**	ROAD
	INTERMODAL	28,3	27,6	25,7	28,5	**110,1**	INTERMODAL

Scale from 1 to 5 (where 1 is minimum and 5 the maximum)

From this exercise it appears that indeed road modality has an advantage on all other transportation systems in Scenario 0. This situation seems to reflect the users' perceptions and preferences and is substantiated by the traffic volumes congesting every day the European road network. The second best is represented by intermodality and this again is a confirmation of the intermodal success. Considering the uncertain policies adopted by incumbents over the years on intermodality this score is very high if one admits that intermodality contains elements of complexity and absorbs rail weaknesses. Conventional rail and sea born traffic follow in the preferences' order, reflecting in the first case the lack of service and, in the second, longer transit time and unsuitability for several clusters.

If one starts to look at the individual clusters, one discovers that rail scores high in Raw Materials and Process Industries. Intermodality, although inferior to road, receives high marks in almost every

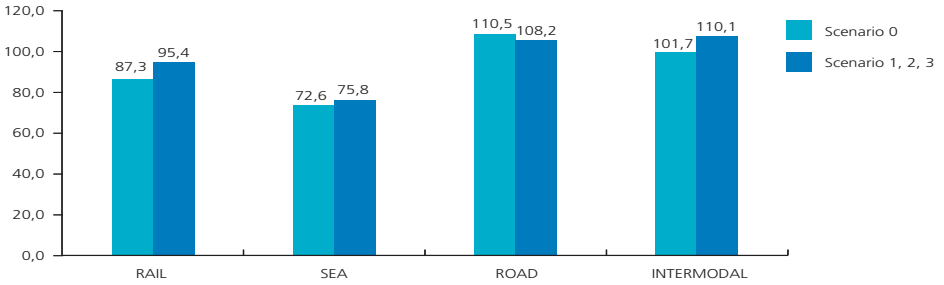
cluster and is perceived to be second best. The road apart from Raw Materials in scenario 0 is perceived by the customers as offering the best service combination. Although this is not a surprise it is interesting to note that intermodality is indeed valued as a viable alternative in cargo mobility.

The end results for **NEWOPERA** Scenario 1 2 and 3 seem to be coherent with expectations and service improvements. Intermodality is emerging as best in class with road modality deteriorating slightly in every sector. Rail improving significantly and sea improving marginally.

This situation tends to incorporate the congestion environment and safety awareness of the users as well as the need for a more sustainable mobility. This moreover appears to be consistent with the White Paper's objectives of doubling rail market share by 2020. Should these perceptions, behaviours and attitudes continue to prevail during the next few years, there will be more favourable conditions for rail modality to reaffirm itself as a credible mobility actor. In fact conventional rail modality will improve its overall performances with, intermodality being capable of responding to more sophisticated and flexible services' demands.

In this respect the results of this research is very encouraging.

Fig. 100: Modality Comparison



If one passes to analyse the individual clusters in order to evaluate the ones more attractive for rail, keeping into consideration the segmentation efforts, one discovers that conventional rail improves significantly its position on Raw Materials and Process Industries. In these two industrial sectors conventional rail is perceived as modality leader and there is a substantial advancement on other sectors indicating rail as a viable alternative. Intermodality conquers the leadership in Durable Goods and receives very high scores just below the road, in a number of other clusters. The road modality is seen as prevailing in Furniture Specialties and General Cargo and is just overtaking intermodality on Fast Moving Consumer Goods.

The conclusions to be drawn from this research is that the transport users have given credit to the modal shift describing the situation "as it should be". These results reinforce the **NEWOPERA** market approach.

UIRR corridors table with intermodal volumes identification.

In order to imagine the migration to future scenarios and the marketing polices to be adopted, this research concentrated on rail intermodality for two reasons:

1. Intermodality its connections and services have been growing continuously over the past few years unlike conventional traffic
2. Numbers and statistics are available on very well defined corridors. This is not the case for conventional widespread traffic.

To have the complete quantitative picture on international corridors one has to consider in addition the intermodal trains managed by non UIRR companies, the conventional trains, the rolling roads and the international maritime traffic, all of them not included in UIRR statistics. Also national traffic are not included despite playing themselves an important role on international corridors. However intermodal traffic which is commonly perceived as the best candidate for competing with road provides a good quantitative benchmark for making future simulation. The above matrix indicates a quantity of about 40.000 trains/year on UIRR alone. It is reasonable to assume that UIRR traffic can represent about 70/75 % of overland International intermodal traffic. To this volume one has to add the independent international traffic, the maritime traffic, the national traffic and the conventional traffic to reach the total rail circulation in Europe. The total figure is likely to be a number which indicates the inability of existing rail infrastructure to sustain future transports developments. The infrastructure issue must be put at the centre of rail freight mobility. The quantitative data extracted from this research indicate 5 things:

1. The international intermodal unaccompanied traffic is growing. It is industrially organised and satisfies a variety of business needs where market segmentation is necessary for improving quality and productivity
2. The greater percentage of international intermodal traffic is concentrated on well defined axes. Intermodal terminal infrastructures are available in the vicinity of recognised traffic basins allowing the adoption of industrial business model where shuttle services operate on a regular basis. Modern terminals working longer hours on seven days a week are essential for the adoption of any future rail rejuvenation strategy
3. The countries crossed by the international intermodal corridors like Switzerland and Austria have indicated with concrete actions that rail and intermodality constitute a viable and more sustainable alternative than road
4. In other big European countries where rail freight services are not reliable or where trains in transit do not represent high priority intermodality has not been equally successful
5. The prevailing corridors are in the North - South direction with Italy having a pivotal role. The West – East direction is yet to be industrially developed and exploited

Fig. 101: Unaccompanied international traffic, no Alpine traffic (2001)

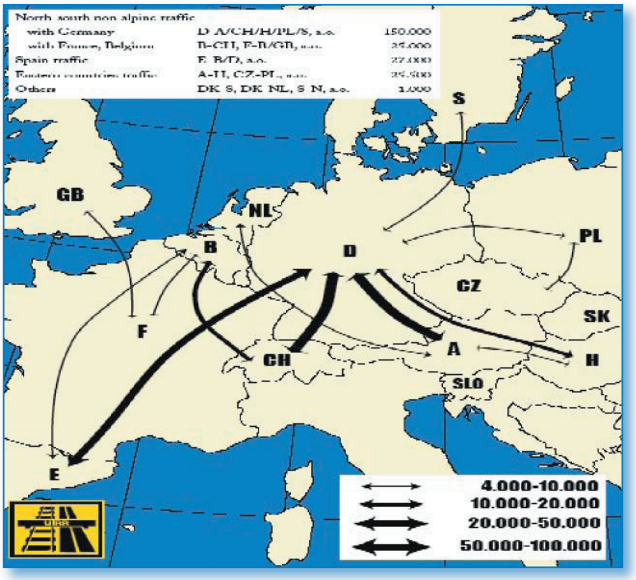
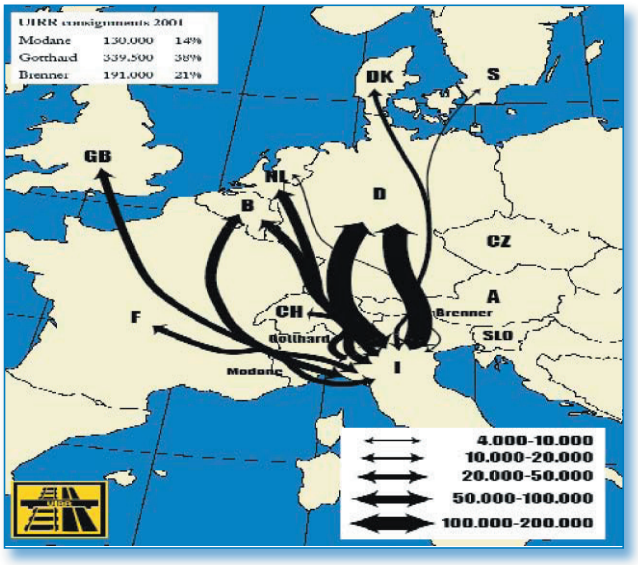


Fig. 102: Unaccompanied Intermodal with Alpine Traffic (2001)



On intermodal busiest corridors 264.811 intermodal trains/ year have been counted. For achieving White Paper objectives by 2020: 260.000 x 4 = 1.000.000 intermodal/trains.

Intermodal market share and reasons for success

Due to limited resources this research concentrated on few significant corridors where road statistics are available. The road statistics which are interesting for the traffic to be optimised by intermodality, are those available from Alps and Pyrenees crossing.

The supporting data for calculating market share on these selected corridors, are included in Annex II. The data include also service maps and some rail transit time versus road.

Table 1

CATALUNYA - BELGIUM					
	From Catalunya to Belgium	From Belgium to Catalunya	TOTAL TONS	TOTAL CONSIGNMENTS	%
ROAD	202.727	587.597	**790.324**	**26.344**	**78**
INTERMODAL	60.411	167.645	**228.056**	**7.602**	**22**
TOTAL	263.138	755.242	**1.018.380**	**33.946**	**100**

Table 2

CATALUNYA - RUHR					
	From Catalunya to Ruhr	From Ruhr to Catalunya	TOTAL TONS	TOTAL CONSIGNMENTS	%
ROAD	180.577	220.880	**401.457**	**13.382**	**53**
INTERMODAL	84.585	264.778	**349.363**	**11.645**	**47**
TOTAL	265.162	485.658	**750.820**	**25.027**	**100**

Table 3

LOMBARDY - BELGIUM					
	From Lombardy to Belgium	From Belgium to Lombardy	TOTAL TONS	TOTAL CONSIGNMENTS	%
ROAD	371.312	690.851	**1.062.163**	**35.405**	**47**
INTERMODAL	562.618	612.269	**1.174.887**	**39.163**	**53**
TOTAL	933.930	1.303.120	**2.237.050**	**74.568**	**100**

Table 4

LOMBARDY - UK					
	From Lombardy to UK	From UK to Lombardy	TOTAL TONS	TOTAL CONSIGNMENTS	%
ROAD	408.845	389.307	**798.152**	**26.605**	**52**
INTERMODAL	405.456	331.981	**737.437**	**24.581**	**48**
TOTAL	814.301	721.288	**1.535.589**	**51.186**	**100**

Table 5

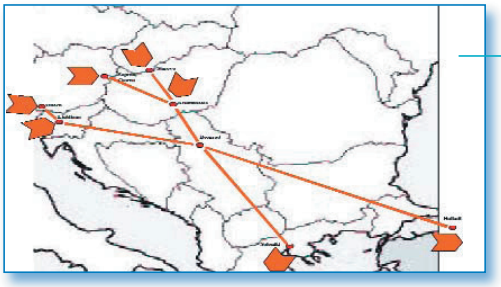
BUSTO ARSIZIO - KOLN					
	From Busto Arsizio to Koln	From Koln to Busto Arsizio	TOTAL TONS	TOTAL CONSIGNMENTS	%
ROAD	102.503	302.517	**405.020**	**13.501**	**30**
INTERMODAL	267.943	685.154	**953.097**	**31.770**	**70**
TOTAL	370.446	987.671	**1.358.117**	**45.271**	**100**

Source: Nestear

A single/group of wagons solution

The single wagon or group of wagons traffic still represent in excess of 50% of rail freight traffic. The increase of rail freight market share must presume the solution of service quality, operational efficiency and competitiveness of this traffic. A new operational and marketing approach is necessary based on directional corridors and innovative logistics solutions for cargo accessibility. An innovative business approach is here below reproduced based on cooperation and partnership between several actors. These actors together have been capable of creating the economy of scale for the service to be reliable, efficient and competitive.

Fig. 103: A Single/Group of Wagons Solution



From 300 to 1500 trains/year

The above business case indicates the market potential which is enormous. If in intermodal traffic for achieving 16% market share it is necessary to multiply by 4 the number of intermodal trains handled in 2006, conversely for conventional traffic one would have to multiply the number of conventional trains by the same factor reaching the colossal figure of 5/6 million trains.(1.500.000 conventional trains have been counted in 2006).

The new products will be instrumental for achieving the **NEWOPERA** quantitative objectives of tripling rail freight volume by 2020, and by so doing doubling rail market share to 16%. Increased transport capacity will be gradually achieved through a combination of technological innovations such as longer and heavier trains, increased axle load, gauge improvement, automatic coupling, improved interoperability/standardisation, intelligent applications, operational efficiencies, freight windows and last but not least, new investments in infrastructures.

One has to adopt a new business model driven by a new service culture where an innovative marketing approach based on product services' segmentation is a vital ingredient. In fact modal shift will not take place automatically but will have to be induced through commercial and marketing tools. Old and new rail freight operators will have to become key actors in the customers' supply chain and be capable with OSS approach of satisfying a variety of diversified services. In any service industry the market needs' satisfaction must be induced by the availability and quality of the provided services. In rail transportation this is even more so given the long lead time necessary for making changes in rail infrastructures.

The following technological improvements and new service management approaches were defined and described together with their level of applicability:

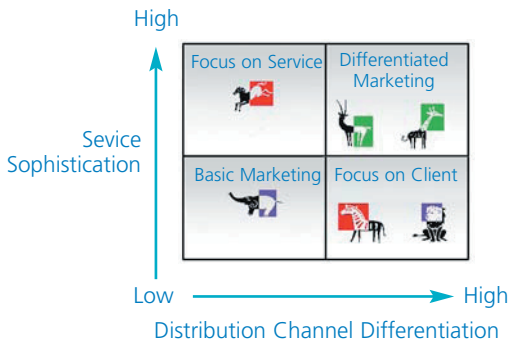
- Higher axle load
- Larger loading gauge
- Wagons axles and bogies design
- Automatic coupling
- Longer and heavier trains
- Horizontal trans-loader
- Hubs and terminals
- Private sidings
- Intelligent applications and signalling
- Wagons fleet management
- Green logistics (Simpler, safer, smarter)
- Service regularity (Liner Trains- Express overnight trains)

Finally for each researched cluster the attributable product service characterisation was studied and described in detail. The end result was the appropriate service products attribution to the clusters. At the same time a new table was created for identifying the "Extended value proposition" (Fig. 95 Page 91).

Fig. 104: Products Description

SEGMENTS	SYMBOL	Rail Market Share	Size of Market	Growing Potential	Customers Group
Raw Materials		High	Very Large	Linked to Growth	Heavy Industry
Durable Goods		Medium	Very Large	High	Large Shippers and LSP
Fast Consumer		Very Small	Very Large	Very High	LSP
Furniture, Toys, Household Ornam.		Very Small	Large	Very High	LSP
Process Industries		Medium	Very Large	High	Large Shippers and LSP
General Cargo		Negligible	Very Large	Very High	LSP, Optimisers, Consolidators
Specialities, Dangerous		Medium	Medium	Medium	Large Shippers and Specialised LSP

Fig. 105: Marketing Mix



The segments positioning in the matrix is not as clear cut as hereby described. Exception made for products associated to Basic Marketing, the others are likely to be positioned in the bordering areas of the various quartiles. The market positioning and the distribution channels are bound to be affected and influenced by the adjacent quartiles marketing approach.

ELEPHANT

With regards to distribution channel differentiation traditional rail companies as well as new entrants should distribute this product directly to their customers likely to be major industries requiring lower degree of service sophistication.

ZEBRA LION


These products are likely to be distributed in a combination of direct and indirect distribution. Whenever supply chain management services are required which is common to the majority of customers' logistics service providers, these will constitute the distribution channel. Whenever a pure transport performance is needed the direct sale to the user can be performed.

HORSE

This product is of high service sophistication and marketing differentiation. Rail is scarcely used due to the rail inability to meet high service specifications. In future this represents a considerable growth opportunity. Complex logistics services, systems integration and advanced information technology are key elements. The distribution channel is mainly indirect through logistics service providers with few direct sales to strategic key accounts.

GAZELLE GIRAFFE

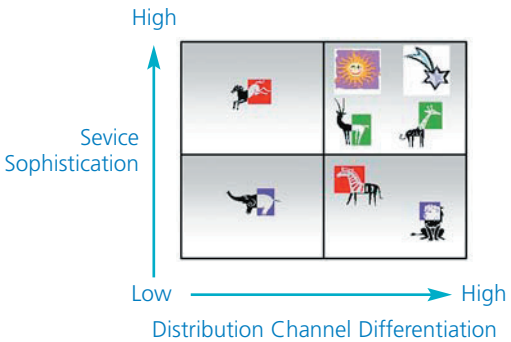

These products are characterised by very high service requirements and specialised approach where time factor and cargo peculiarities are key elements. The distribution channel is indirect through specialised LSP consolidators and optimisers.

THE SUPERNOVAS:


This expression is being used to signify the enormous potential and the new energy which could be liberated for rail freight by adopting the two concepts of Green Logistics and Web Star Logistics. They could constitute a distinct competitive advantage versus road modality because of the economy of scale and advanced technology necessary for their implementation.

SEGMENTS	SYMBOL	Rail Market Share	Size of Market	Growing Potential	Customers Group
Green Logistics		Large	Very Large	Very High	Heavy/Process industries, Large Shippers, Specialised LSP
Web Star		Large	Very large	Very High	Cross Section

Fig. 106: New Marketing Mix Including the Supernovas



A number of practical business cases describing success stories of services' differentiation and products' segmentation were described supporting the scientific approach toward the marketing oriented rail freight economy.

6.4.2 Intermodal Interindustry

This task objective was to evaluate the existing situation of the intermodal European unaccompanied market its existing offer and the potential development based on the best practices' approaches adopted by few independent operators. The intermodal service "strengths and weaknesses" have been properly evaluated together with causes and remedies emerging thereof. In addition specific industrial networks have been studied for understanding the Interindustry intermodal dimension and its "Rationale".

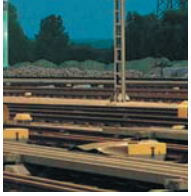
- Fig. 107: Origin Destination Matrix UIRR Consignments Year 2004

From\to	A	B	CH	CZ	D	DK	E	F	GB	H	HR	I	N	NL	PL	S	SLO	Others	TOT	%
A		637	521	1	20478,8					1142,46		12474,8		2310	19		230,95		37815	3,4%
B	11597		16705	29	6066	0	4761	12978		7		66243					267		118653	10,7%
CH	686	18037			35087,3	148						12341	233			632			67164,3	6,0%
CZ	55	51			272,1					2		379			289		31		1079,1	0,1%
D	26872,9	6073	37737,2	754,45		1368	17294	3661		10202	109	196718	1029	26794	6195	4403	1995		341206	30,6%
DK		1	98		1370							9729	4	92		336			11630	1,0%
E		3541			13328			1936	21			0							18826	1,7%
F		10611			2644		1211		2982		0	36021							53469	4,8%
GB							79	366				323							768	0,1%
H	1566,16	1		40	6036						256	90			21		2777,04		10787,2	1,0%
HR					0			3		1960		219					1166		3348	0,3%
I	9501,05	59105	12615	466	189021	9893	588	34178	1760	463	0			32341	55	4913	180		355068	31,9%
N			251		733	0													984	0,1%
NL	1450				27501	13						37036							66000	5,9%
PL	0			0	4746					0		0							4746	0,4%
S			484		2621	0						3056							6161	0,6%
SLO	5188,86	245		20	2398					2791,25	751	833							12227,1	1,1%
Others																			4433	0,4%
TOT V	56917	98302	68411,2	1299,45	312302	11422	23933	53122	4763	16567,7	1116	375463	1266	61537	6579	10284	6646,99	4433	1114364	
%	5,1%	8,8%	6,1%	0,1%	28,0%	1,0%	2,2%	4,8%	0,4%	1,5%	0,1%	33,7%	0,1%	5,5%	0,6%	0,9%	0,6%	0,4%	100,0%	

The above matrix represents the core of this research. Examining the matrix it is possible to understand where the traffic is moving in Europe on intermodal services, the corridors involved and the traffic dimension. The highest density is concentrated on very few corridors which unfortunately are also the most congested ones at European level or the ones having important bottlenecks.

In short the conclusions are the following:

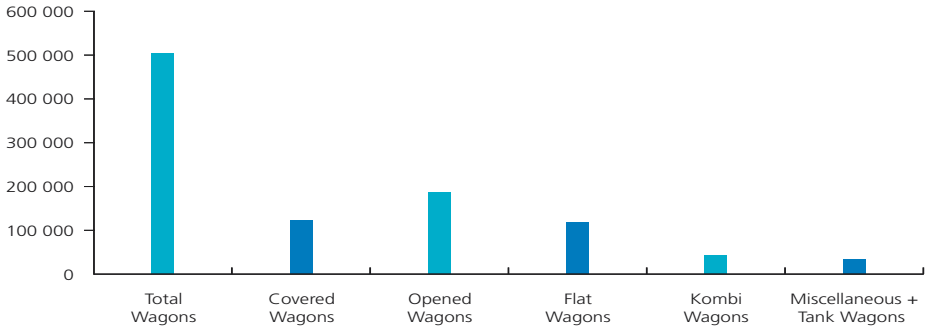
- About 62 % of the UIRR traffic is represented by Italy and Germany
- About 88 % of the UIRR traffic is represented by the following countries: Italy +Germany +Belgium +Switzerland +The Netherlands +France
- According to a fair market estimate it is reasonable to assume that UIRR companies may represent about 70-75% of total International intermodal European rail-road traffic
- These countries are separated by natural barriers



1. There is a prevalence of North/South/North directions versus East/West/East directions.
2. They have strong economies as to generate bi-directional flows
3. On these corridors environmental noise and pollution considerations have been made for a long term sustainable mobility.

Then the situation in each individual country has been properly evaluated and described for understanding the reasons of successes and failures.

Fig. 108: Alpine Transit: Number of Trains per Week/Relation Year 2004



The alpine transit is a further confirmation of the traffic development on the North- South corridors and is also expressing the potential development to be achieved in the near future particularly with Scandinavian Countries. In order to better define the combined traffic scenario and to understand how some companies are acting in the intermodal field this working group decided to focus its interest on some successful business cases.

The business cases analysed by this group are the following:

1. Case 1: Ambrogio
2. Case 2: Ewals group
3. Case 3: Hoyer group
4. Case 4: Transfesa
5. Case 6: LKW Walter International
6. Case 5: StoraEnso
7. Case 7: Volkswagen
8. Case 8: CEMAT - Polimeri Europa
9. Case 9: CEMAT – other Italian polymers producers

Of particular interest is the VW business case and the CEMAT for Polimeri Europa business case. These 2 examples synthesised the Intermodal Interindustry dimension. In particular VW has contributed to put in evidence the West- East interchange whereas the CEMAT for Polimeri the North-South direction.

Fig. 109: VW Inter-Industry Plants Connections

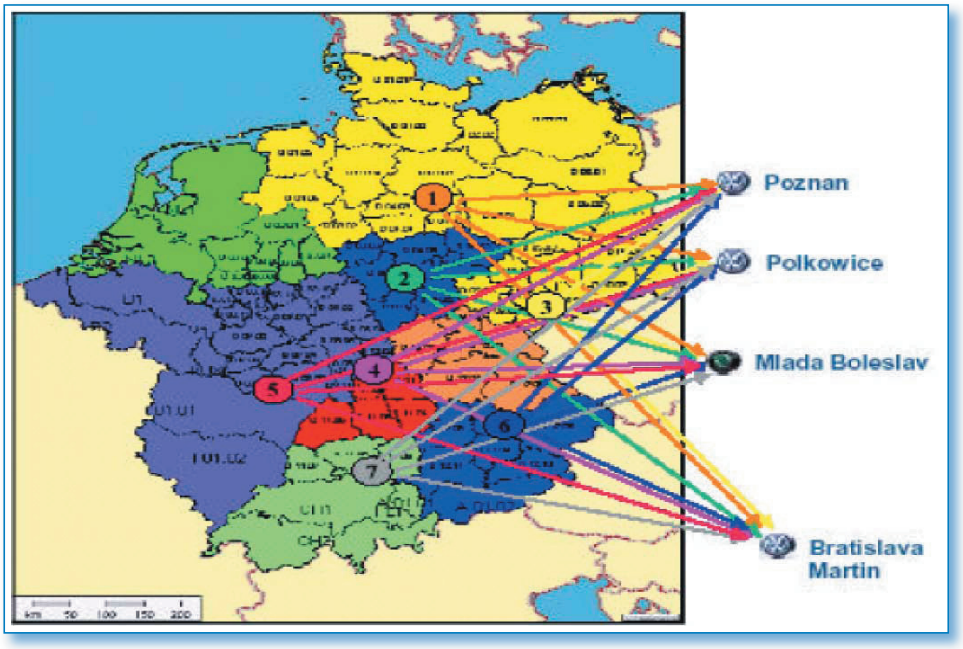
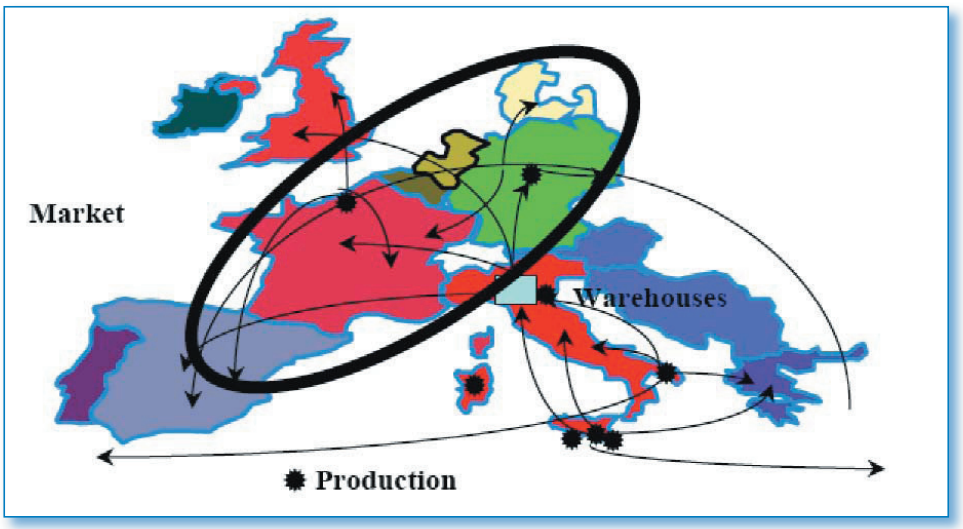


Fig. 110: Polimeri Europa – Production and Logistics Network



What conclusions can be derived from the above mentioned business cases?

Ambrogio has achieved an intermodal specialization in well defined corridors, using its own fleet of equipments and wagons. This business case confirms the principle described in the previous pages, that is: the intermodal transport in order to reach economy of scale has to concentrate on well defined corridors. Many of these corridors involve the Alps crossing constituting a natural

barriers also for road modality. Ambrogio moreover has achieved an industrial dimension through core business focalisation on intermodality and traffic concentration on few hubs and terminals.

Ewals had a different approach to intermodality. Ewals offers its customers a variety of services like logistics, warehousing, inventory management and is full actor of customers' supply chain management. It offers a wider range of transport services, systems and networks. The logistic activities encompass the physical distribution, road trucking reverse logistics for products and packaging. Ewals Cargo Care is active in all supply chain activities. The cargos handled by Ewals are represented in the automotive the process and the consumer goods industries.

The Hoyer group is a global logistic operator and has focused its activity in the logistic organization of certain types of products. These are: liquid and bulk products, dangerous products, gas, and other chemical industry products. The Hoyer group in addition offers customers planning services, transport planning and full logistic processes implementation. Also Hoyer is capable of offering road transportation to supplement and complement intermodality. The cargo category transported belongs mainly to the process industry.

Transfesa specialized its activity in durable goods, spare parts and components for the automotive industry. It has further developed a European transport concept by offering its customers some intermediate logistics operations as well as warehousing and distribution. Transfesa, for the cargos belonging to its specialisation is capable of offering custom made logistics solutions.

LKW Walter represents another peculiar example of an intermodal operator. The company core business is the offer its customer base the full truck loads door to door service. Despite being a pure road transport company, LKW Walter has seen the intermodality potential of complementing its road core business activity. For this reason decided to become a key intermodal actor in the future European mobility scenario.

StoraEnso is a different category compared to the above described transport and logistics operators. StoraEnso being an industrial company has well defined products to be transported and well defined service' needs. The means of transports have to satisfy total supply chain requirements and customers services. Unfortunately because of intermodal transport inability to satisfying StoraEnso requirements the company was forced to limit the use of intermodality. It is important to underline that because of StoraEnso support to environment protection there is a great chance of intermodal volume improvements, should intermodal services upgrade their performances.

Although in the past **Volkswagen** has been strong supporter of intermodality in the last few years, VW has been forced to reduce its dependence from intermodal services due to operating difficulties. VW however considers intermodality, likewise StoraEnso a viable future alternative should rail services be able to improve their performances.

The **Cemat** intermodal solution found for Polimeri Europa has been a great success and this has been followed by other chemical industries operating in Italy. All the advantages allowed by intermodality have been exploited to create value for both Cemat and its customers. This has been a "win-win" situation.

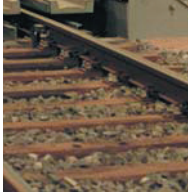
Cemat is convinced that this is the future of the inter-industry business and the so called business to business industrial traffic.

Fig. 111: Business Cases in Synthesis

	SOURCES OF INTEREST	MAIN IMPLICATION
AMBROGIO	Pioneer on intermodality long success over time. Industrial European dimension on few selected corridors.	Strategy of dedicating the whole activities to intermodality
EWALS GROUP	Successful European transport leader: experience on intermodality. Multimodal transport operator. Integrated logistics operator. Industrial European dimension.	Intermodality fully integrated in the customers industrial logistics chain. Specialised in process industry and consumer goods.
HOYER GROUP	Successful global player, strong intermodal presence. Founder of Kombiverkeher. Specialist approach. Industrial dimension.	Strategy of specialisation in well defined sectors mainly chemicals.
TRANSFESA	Successful specialised operator. Special wagons with axles change. Large volume mega-combi equipment. Industrial European dimesion.	Specialisation strategy for durable goods and automotive. Custom made logistics solution.
LKW WALTER	Leading European road operator. Industrial European dimension. Intermodality as a differentiated strategy for the future.	Winning road strategy. Road transport near to saturation. Intermodality as viable long term alternative. Wide range of goods transported.
STORA ENSO	Paper manufacturer, world market leader. Involved in Raw material and process industry. Volume producer. The customer view point.	Intermodality must produce better market offerings. More flexibility required, more accessibility required. Paper transportation.
VOLKSWAGEN	European leading car manufacturer. World market player. Supports intermodality. Service and costs should be improved.	Intermodality has more scope for development. Recommendations are given to improve intermodal penetration. Corridors towards the East must be developed.
CEMAT -POLIMERI EUROPA	Large scale industrial inter-industry successful business case. All theoretical intermodality advantages are fully implemented and exploited. Manual case.	Cemat as intermodal operators is part of the customer's supply chain delivering value added to both parties. "Win-Win" situation.
CEMAT – OTHER POLYMERS CUSTOMERS	Large scale industrial inter-industry successful business case. All theoretical intermodality advantages are fully implemented and exploited. Manual case.	Cemat as intermodal operators is part of the customer's supply chain delivering value added to both parties. "Win-Win" situation.

Amongst the strengths one could indicate the following advantages:

- Industrial dimension. Intermodal operators are perceived as supply chain key actors as per task 1.2 and 4.1 results
- Lower cost of investments compared to equivalent road fleet
- Travelling stock capability
- Inventories downstream near to the receiver
- Greater flexibility during peak and trough cycles
- Shuttle delivery capabilities
- Seven days a week operations. Effective national and international transportation can take place between terminals during Saturday and Sunday



- Adaptability to customer's planning
- Drop and swap capabilities
- Lower demurrage costs
- Better adaptability to new customers supply chain
- Adoption of best practices management, like vendor managed inventories, automatic replenishment
- Better adaptability to innovative transport technologies like automatic computerised transport calls, process automation, event management etc.
- Better capabilities to satisfy industrial dimensions and volumes
- Intermodality is more environment friendly. It is safer for the individuals and for the cargo itself, and more sustainable over time.

In particular it is interesting to underline that the weekly cycle constitutes a trucker's limit. Drivers can hardly afford to stay out over the weekends and tend to load and depart in the first half of the week. Intermodal operators can operate from Monday to Saturday on a perfectly equal basis and trains circulate on Sundays. Summer holidays and year-end cycles too are better tackled by intermodality. Demurrage cost of an intermodal unit is far less costly than for a truck or trailer due to the driver's absence. This allows the intermodal operator to easily follow a specific customer planning. Picks-ups or deliveries can be spread over several days at different hours at no or very little extra cost. Finally it may be mentioned that running and maintaining a fleet within a limited radius from the rail terminal, is far less expensive than maintaining a fleet running across Europe. Last but not least one has to consider the legitimate desire to improve the quality of life of all European citizens. It will be easier in the future to find drivers that can return home every evening after their daily work, rather than drivers forced to sleep in their cabs in a trailer park somewhere while in transit.

Furthermore if one wants to considers the swap bodies technical advantages, these could be summarised as follows:

- Higher volumes (85m^3), higher payloads (28t)
- Cheapest loading unit
- Loading or unloading like a truck
- Cheaper standby costs, standby-equipment, rolling stock
- Lower operational costs
- No special wagons needed
- No skeletal bogie with tyres to be carried around being dead weight.

A functioning drop-and swap system could reduce trucking costs considerably through much better use of costly trucking equipment. Instead of 2 movements a day by a drop and swap system one can do between 4-6 movements in 24 hours. It would be necessary to create the proper productivity environment to work longer hours at operating terminals both for reducing costs and maximising the whole transport chain.

Drop and swap systems offers also the shipper a lot of cost- saving potential through:

- Better use of loading facilities, equipment and personnel
- Off – peak loading or unloading
- Transport unit = rolling stock or buffer stock.

Compared to kombi-trailers however the swap body offers some disadvantages like double docking and some more handling operation at terminals.

If one passes to analyse the weaknesses of intermodal transport, one could lists the followings: Intermodality encompasses the rail system's weakness and the total transport chain is as weak as its weakest link. Consequently it absorbs several negative problems of the existing railways system. Intermodal transport is competitive on longer distances since the trucking cost at the rail head terminal are roughly standardised and they assume the characteristic of becoming a fix component of the total cost.

Intermodal transport does not have a dedicated driver to respond immediately to any emerging problem. However today it has been recognised that is more dangerous to go by road than by rail.

As one can see from this comparison, the advantages far outstrip the disadvantages and in the rail freight dedicated lines perspective which could eliminate many of the problems affecting rail transportation, intermodality is set to become the most natural choice for freight movement in Europe.

Also according to the vision of the Strategic Intermodal Research Agenda 2020 EIRAC, in 2020 intermodal transport will be the natural choice for cargo movements in Europe. By 2020, the European intermodal transport system will account for 40% of the movement of goods. Also bulk will get more unitised. Intermodal transport will be an industry with its own identity, its own strategy, and its own voice.

This consistent use of intermodal transport will enable Europe to:

- Cope with the demand's growth for transport and associated services
- Reduce the negative effects on the environment
- Enhance competitiveness

In order to meet this challenge the intermodal transport system needs to be: **Seamless** – barriers of modal exchanges at nodes are minimised.
Reliable – deliveries are punctual and commodities are undamaged.
Available – door to door services are provided all over Europe 24 hours on 7 days a week
Accessible – customers deal with O.S.S./ S.P.O.C.
Secure – commodities get into the hands of those entitled to receive them **Sustainable** – built to last and to strike the right balance between the cost for the customers and the overall objectives for society.
Accountable – customers have a contract with one party responsible for performance during transport.
Affordable – intermodal transport is in the position of offering competitive prices.
Transparent – all stakeholders understand the relationship between usage costs for infrastructures and market prices which incorporate all other variables including services, equipments, haulage/traction costs and operators profits.

CONCLUSIONS

One has to answer the following question: which is the real possibility for Europe achieving a modal shift from road? Two thoughts come to mind:

1. Will the combined transport be able of absorbing the future freight traffic increase?
2. Will the rail-road combined transport be able to compete in terms of price and service quality towards road modality?

Question 1

Starting from the first thought it is important to underline that the main intermodal constraints are:

a) Adequate infrastructures and their availability for freight capable of satisfying market needs. In addition the existence and availability of adequate intermodal terminals represent a major issue
b) The available resources for service production and service distribution in the market place.

In trying to deal with the constraints imposed by the **infrastructure limits**, one has to recognise the fact that the railway network, represent the major tool and resource necessary for achieving an efficient and effective traffic development.

This assumption does not mean that the availability of paths, in itself, can represent a sufficient condition for delivering intermodal traffic growth. The available track or train paths must be of the quality suitable for satisfying the customer's needs in terms of timetable and transit-time.

Furthermore the train paths availability must allow the best allocation of production resources such as personnel, locomotors, wagons, lifting gears and terminals.

The priority of the European Transport Policy is the creation of the Trans European Network for freight (TENs Freight Network). The TEN's will shape the European transport system for the next century. The planned development should contribute to create a European sustainable mobility. Although most of the investments in rail infrastructure are relating to passengers trains these should create the conditions for relieving the existing infrastructure congestion. This in turn should create the necessary redundant capacity for freight.

The new available freight capacity must also be accompanied by intermodal terminals availability. These intermodal terminals must be located in Europe keeping into consideration a borderless Union. In fact some of the existing terminals have been constructed and located according to the prevailing national interests. This principle must be overcome and new intermodal terminals must be strategically positioned inside the EU 25 territory, favouring the development of a dedicated rail freight European Network.

If one passes to consider the available resources for service production and service distribution, this area belongs to private enterprises and organisations. The European Authorities must fulfil their role for setting up infrastructures and dictating the rules of the game such as free market, competition, interoperability, standards, etc. The private enterprises operating on a free European market must themselves fulfil their role of serving the customers with modern products, by organising structures, resources, wagons, services, adequate for their objectives.

Question 2

The Second question can receive a variety of answers.

- Incumbents would like to increase their prices to intermodal operators.
- The intermodal operators find it difficult to increase prices to their customers since they are compressed by road modality offering better service at competitive prices
- Incumbents they made little efforts to reduce their operating costs and they have adopted the losing philosophy of increasing prices which have been the major cause for loss of market share
- Intermodal operators thanks to a more competitive market environment started to buy traction services from private traction companies improving service quality at lower cost
- At the same time one must recognise that intermodal operators have not implemented during the years a segmentation products policy for extracting better value from their services.

Their service is sold mainly to LSPs and forwarding agents and, in so doing, failed to have a proper cargo nomenclature of the freight carried by them.

Consequently a clear answer is not immediately possible. New market conditions must be generated. Some of these conditions could be briefly indicated as follow:

- Infrastructure managers are likely to implement a future train paths segmentation policy. This policy will tend to value more the quality/time congested paths and less the more flexible paths
- Incumbents under pressure from new rail entrants, will have no alternatives but to reduce their operating costs separating their businesses from passengers and becoming more competitive on freight
- Intermodal operators will have competing available offers from traditional and new rail companies together with different economical offers for train path availability
- Intermodal operators will have themselves to produce segmented offers to the market induced by different train paths' cost and different service quality
- The intermodal operators will have to start keeping automatic records of the cargo actually carried and, on this basis, structure their products for satisfying the different needs expressed by the goods and by their final customers
- From other **NEWOPERA** Tasks it appears that a new structural offer should be prepared to keep into consideration the "virtual distance" concept in line with competing modalities
- The market evolution with more stringent driving hours for road modality, and increased fuel costs, points towards more favourable market conditions for intermodality
- The intermodal operators they will have to take advantage of the intermodal points of strength. Seven days a week industrial concept, travelling stocks, shorter transit time and better overall safety and security.

It is obvious however, that this improvement process is possible over a period of time and in presence of substantial improvements of the service quality offered to the customers. Applying the **NEWOPERA** migration scenario, this improved service quality will be the result of the progressive stages generated by additional capacity, freight windows, hardware technology, TSI, Galileo and ERTMS stage 2 and 3.

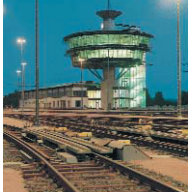


Fig. 112: Synthesis of Evolving Intermodal Market Conditions

Terminal level	Network level	Interoperability	Market conditions	Enabling framework
Increased terminals capacity	European dedicated intermodal network. Interconnection between overland network with maritime traffic	Abolition of cross border constraints	Free access to the rail infrastructure by private operators Free and open market competition	Modal shift enabling conditions
Urban terminals relocation	Introduction of one-stop-shop philosophy	Intermodal traffic standardization. Operational procedures standardization	Virtual distances principle 7 days/week industrial concept	Technical enabling engineering
Terminals relocation in borderless Union according to Ten-T network	Network connections improvement with major hubs and terminals	Loading units measurement harmonization	Transparent rules for regulating free access to rail infrastructure	EIB finance programme for wagons and intermodal equipment
Terminals restructuring	Bottlenecks and barrier crossing problems solution	TSI, ERTMS, Galileo management systems	New marketing tools via the web-site: web star products, green logistics	Automatic couplings
Improve terminals road-rail accessibility	Rail freight priority, freight windows	Safety and security standardization	New intermodal products to and from the East and Far East	Braking system
Terminals working hours harmonization	Network interoperability, standards and signalling	Technical standard harmonization	Product segmentation, marketing and market repositioning	Bogies design & double stacking where applicable
Terminals privatisation	Liberalization and opening of European rail market space	Intermodal traffic virtual platform exchange	Freight management through loading cargo track records	Horizontal transloader gears
Terminals operating standard and best practices adoption	Weight-gauge-length harmonization	Intelligent programming production systems	Creation of conditions for cost reduction through longer and heavier trains	Environment friendly measures
Customer service intermodal standardization and time-table	Network and infrastructure managers train path segmentation	Intelligent wagon and transport management systems	Mixed intermodal conventional trains	Application of equal access to the cargo principles

FUTURE DEVELOPMENTS: NEW PRODUCTS

From the research carried out in this deliverable/document, and from the evolving intermodal market conditions described in the above chart, it emerges that the future development of intermodality, lies in a more sophisticated market approach represented by service products segmentation.

In other New Opera Tasks, namely Task 4.1, the market evidence is indicating that segmentation is likely to be imposed to intermodal operators from the infrastructure managers. The latter in presence of a limited number of quality train paths and availability of economy paths will try to extract additional value, by attributing different prices to these products.

In such a situation intermodal operators will be confronted from the infrastructure managers with a different cost proposal and at this time they will have to behave likewise with their own customers.

In the previous pages the pressure exercised upon intermodal operators both by rail undertakings and their customers, was described. This situation is caused by shortcomings in service performance caused by incumbents such as low reliability, punctuality and consistency forcing intermodal operators to compete only on price.

The new challenge for intermodality will be the identification of ways and means to reverse this unfavourable market condition.

The market variables capable of playing a relevant role in the restructuring of European cargo mobility, are the new strategies and tools envisaged by **NEWOPERA** scenarios. Only the fulfilment of the **NEWOPERA** investment program can generate the additional rail freight capacity necessary for implementing a new business model, generating a fresh and sustainable rail economy.

If one accepts this to be the correct way of proceeding and one accepts more over that all the indicated measures will be accomplished between now and 2020, intermodality will become, by then, the preferred freight transport choice.

This choice is supported by the survey conducted under task 4.1, inserted in chapter 4.2 of this deliverable where rail users have indicated their future vision.

On the assumption that the new available transport capacity will allow intermodal operators to offer much better and reliable services, the future market development will have to be exploited through the adoption of more sophisticated marketing tools. These tools will have the task of distributing on the market place a greater variety of products.

The new products to be distributed to the target customers, will be developed according to the following basic determinants:

1. Geographical scope (space)
2. Service quality (time)
3. Intermodal / Inter-industry (integrated into production program)
4. Mixed conventional intermodal shuttle trains
5. Technical discoveries (technology)
6. Green logistics (environment)
7. Web Star (Internet and virtual distances)

6.4.3 Ports Interconnections and Flows

This task describes the existing integration between Sea and Rail and the one that will be necessary according to the **NEWOPERA** scenarios. The different economy of scale characterising the sea leg operated by giant containers vessels and the land distribution connecting into each other in the ports containers yards, is creating a challenge not easy to be solved. Only an industrial inland distribution system based on full containers trains together with inland navigation when available, represent a suitable answer.

The deliverable reported in details the situation in Europe country by country describing the ports integration with the overland infrastructures both road- rail and inland waterways. In order to

make the situation more easily understandable some comments regarding the main European Ports are here below summarized:

- **Rotterdam:** For 2010: an increase of throughput of over 40% or 12.5 million TEU- **realization of Maasvlakte 2**
- **Hamburg:** For 2015: container handling figures will increase from 7 million TEU today to 18 million TEU
- **Antwerp:** 1998: Antwerp Port Authority decided to build a new, tidal container dock, the Deurganck dock. Third port in Europe has grown 10% per year from 1997 to 7 million TEU in year 2006.

The ports of Rotterdam, Hamburg and Antwerp moved in year 2004 44% of all European traffic passed through European Ports.

- **Felixstowe:** Fast growing UK port. Far East imports notably from China, account for over 50% of all import containers volumes and this trend looks set to continue
- **Valencia:** Thanks to new investments will have the capacity in 2015 to handle traffic well in excess of 4 million TEU. Valencia is the fastest growing Mediterranean Port
- **Algeciras:** The Port Authority will invest €180 million in the global development project of Campamento facilities
- **Barcelona:** 2nd Strategic Plan 2003-2015: the Port of Barcelona has the ambition of becoming the **prime Euro Mediterranean logistics hub**
- **Le Havre:** The Port 2000 project is to develop a complex of port facilities designed to handle the largest containerships in the industry by improving transfers between ships and expanding upon inland connections by rail, road and river
- **Genoa:** Investments are in place for building facilities that would allow the terminal to reach a throughput of 2 million TEU per annum.

Many targets declared by the ports themselves have proven to be too much conservative and the volumes of traffic handled exceeded the best possible expectations to the point that some ports have suffered in the years 2006-2007 of unexpected congestion.

The following chart explains by itself the reasons of these development which is a further confirmation of the "breaks in trends" described in other parts of this document (Chapter 6.1.1 Page 29).

- Fig. 113: CTS Demand Growth with Ships Evolution

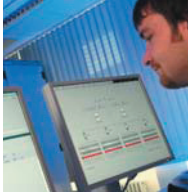
	Total TEU	Average TEU
2008	1.674.277	8.372
2005	1.308.581	6.543
2000	986.608	4.933
1995	733.155	3.666
1990	600.958	3.005

No change in overland transportation

Source	Destination	1997 M. TEU	2003 M. TEU	Change
Europe - USA	USA - Europe	1.5 1.5	2.2 1.6	+ 47% + 7%
Far East - Europe	Europe - Far East	2.9 2.4	5.2 3.2	**+ 79%** + 33%
Far East - USA	USA - Far East	4.8 3.5	9.4 4.3	**+ 96%** + 23%

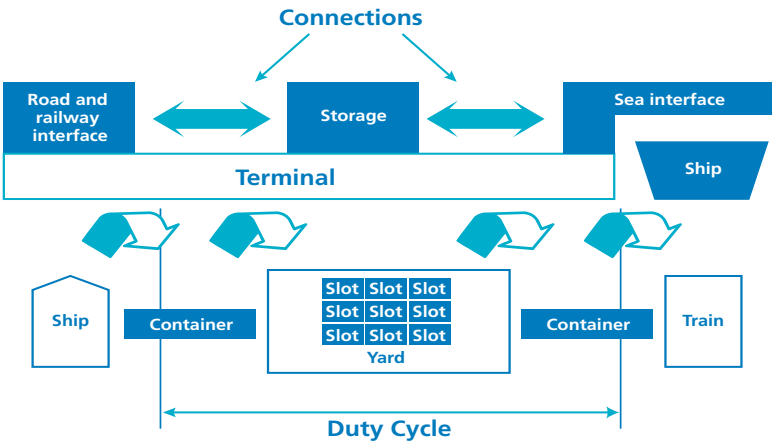
Fig. 114: Emma Maersk

Several ships orders have been placed to shipyards worldwide by leading shipping lines for vessels of 10.000 TEU plus. This means that the existing developing trend is set to continue. However the investments in ships as well as in port infrastructures allowing the ports to receive and handle these container vessels are not resolving the situation. The bottlenecks by virtue of these investments moved from sea into land where the connections for moving this traffic to final destination are proving to be inadequate.



Here below a simple scheme is reproduced for describing this new situation.

Fig. 115: Ports Bottlenecks Identification



The various European ports authorities or ports management have realised that the port effectiveness, efficiency and competitiveness, are measured not only on the port handling operations but above all on the combination between the ships-containers handling and the inland distribution network available for accessing the final customers. As a result of this new awareness the port is more and more perceived as a crossing point between different modalities. By virtue of this characteristics traffic should not be allowed to stop inside the dock area but it must start immediately after discharge its transit to final destinations or to an inland dry port where all ancillaries services can be provided to the cargo. In this way the traffic keeps moving delivering value to all actors in the chain.

To this effect the situation of the various European ports is different. As an example the modal split of two major North European ports is here below reported:

Fig. 116: Rotterdam and Antwerp ports modal split

Modal Split 2006	Port of Rotterdam	Port of Antwerp
Barge	48%	46%
Pipeline	21%	-%
Road	26%	45%
Rail	5%	9%

During year 2007 the Betuwe line started operating from the port of Rotterdam which will increase significantly the rail market share.

The port of Antwerp planned to double its intermodal volumes by year 2010 with the objective of increasing rail market share. At the same time the port of Antwerp planned to bring into operation the "Iron Rhine".

The port of Hamburg is by far the North European port having achieved high rail intermodal throughput. The port of Hamburg is handling every day between 190 to 205 trains/day. They plan to manage 450 trains/day by 2015.

Other ports such as Zeebrugge, Le Havre, Valencia, Barcelona, Genoa, Gioia Tauro, Taranto declared their objectives of increasing significantly the traffic moved by rail.

All the above efforts confirm and signify the need of achieving industrial economies of scales on maritime traffic. Intermodal services will improve productivity and efficiency of the ports handling operations and maximise the effectiveness of the rail freight inland distribution network.

6.4.4 Emerging actors and visions for new products

This task in the **NEWOPERA** evolving scenarios identifies the role of emerging actors and the different types of services to be made available in the market place. This new situation favours the appearance in the market place of new players. New drivers, new strategies, new priorities, new market segments are instrumental for new market opportunities and roles redefinition. Fresh capital investments associated to new entrants are favouring a higher level of competition and changing the interfaces in the whole logistics chain. Traditional rail operators are themselves facing a challenging dilemma: either they evolve into new marketing oriented actors or they die. The threat to the traditional incumbents activities is coming from several directions:

- From their own business environment (see FIG. 47)
- From new forces emerging from market opening.

Fig. 117: New Forces emerging from Market Opening

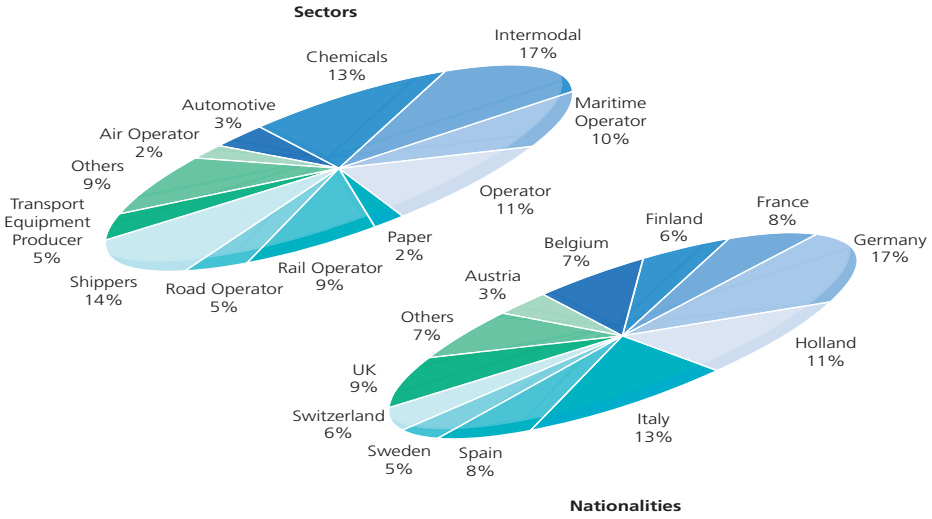
CAPITAL INTENSIVE	LESS CAPITAL INTENSIVE
New Infrastructure Companies New Traction Companies/private Rail Companies Intermodal Operators Port Operators Inland Terminals/ports Shipping Lines Private Wagons Owners Public/private Finance	LSP Optimisers and Orchestrators Outsourcers Integrators Consolidators Infomediaries/Virtual Platforms/Exchanges Forwarding agents 3/4th party logistics

- From marketing opportunities originating from the European transition into a service based economy.
  - The customer is king and objective at the same time
  - The customer is given a variety of choices
  - The customer is given a variety of prices to choose from
  - The customer is buying the product from a recognised channel
  - The customer is guaranteed in the proportion price/quality
  - The customer culture and preference are encompassed into the product
  - The customer knows where to go in case of problems.

- Moving towards a new rail freight economy

A market survey was conducted with the objective of receiving direct inputs from market leaders in their segments of activities.

- Fig. 118: Market Survey Results



This allowed the achievement of two major results: the very high percentage of redeemable 70%, and the effective quality of the replies given the role of key actors played by many companies in the European and Global Economy.

The questions asked were relating to the type of contracts and expectations the key market players would like to see implemented by future new rail freight actors. The results of this market survey were the following:

- Fig. 119: Market Survey: Answers from Respondents

ASKED QUESTIONS	- YES -	- NO -
LONG TERM CONTRACTS	MAJORITY	SOME
BONUS/MALUS-SERVICE	MAJORITY	SOME
OPEN BOOK RELATION.	MAJORITY	SOME
IND. RISK SHARING	SOME	MAJORITY
IND. PARTNERSHIP	FEW	MAJORITY
MULTIPRODUCTS	ALL	NONE
MULTI CHANNELS	MAJORITY	SONE
NEW ACTORS INTERFACES	ALL	NONE
OPEN COMPETITION	ALL	NONE
MONO-PRODUCT	NONE	ALL
SERVICE QUALITY	ALL	NONE
QUALITY AT PREMIUM	SOME	MAJORITY

The above answers must be put into the context of the Trans European Transport Network leading to rail freight dedicated perspective 2020. To this effect Rail Net Europe (RNE)constituted by the European infrastructure managers had the objective of providing the legal tools for accessing the European rail infrastructure and for providing a OSS service for obtaining train paths' allocation.

The conclusions to be drawn from the above research is substantiating the market readiness in undertaking innovative relationships with old and new market actors accepting also different forms of contractual obligations according to the various type of service products on offer. A number of successful business cases were surveyed and reported confirming these concepts. The business cases were the following:

- The HectorRail Business case in Sweden
- The BLS Cargo Business case in Switzerland
- Hannibal Business Case in Italy
- The BoxXpress Business Case for maritime Traffic in Germany
- The Rail Link (CMA- CGM) /Veolia Cargo Business case in France
- The CFL CARGO Business case in France and Luxembourg
- The Port of Rotterdam Business case
- The Port of Hamburg Business case
- The Port of Antwerp Business case
- DHL Mixed Rail Shuttle train Luebeck – Verona
- The DB Rail freight Business case
- The CEMAT Business case.

The market research indicated above together with the business cases have demonstrated a market evolution in which new interfaces and stakeholders relationships are shaping up. The new market entrants together with RAIL Net Europe and other actors interpreting new needs generated by EU rail packages 1, 2 and 3, are giving substance to these interfaces.

Fig. 120: Capital Intensive actors - drivers and interfaces

DESCRIPTION	CORE BUSINESS	DRIVERS	INTERFACES
NEW RAIL INFRASTRUCTURE COMPANIES	Infrastructure Ownership, Maintenance, Develop.	Network Productivity Efficiency for network funding Tech. innovation	Rail Freight Operators, Incumbents and New, Rail Traction Comp.
NEW PRIVATE RAIL FREIGHT OPERATORS and NEW TRACTION CO.	Rail Traction pure or integrated upstream or downstream with other transport services	Profitability and traction investments sustainability by efficient competitive traction service offers	New Infrastructure Co RNE, Intermodal Co, Industrial Clients, Integrators, Shipping Lines, Ports &Terminals, Leasing Co, Private wagons owners, other traction co. Trucking Co
INTERMODAL OPERATORS	Consolidating industrial unit loads either overland related or maritime related, to form full block trains in both directions, buy wholesale, sell retail, industrial risk assumption. May develop into private rail freight companies through cargo control	Profitability and wagons investments sustainability by efficient competitive products service offers including terminal services	Incumbents or New Traction Co. Ports & Terminals Shipping Lines Overland Cts Operators MTO Private wagons Owners LSP Integrators Consolidators Forwarding Agents Sectorial Specialist Outsourcers, Trucking Companies
PORT OPERATORS	Port Handling Infrastructures and Facilities for Shipping Lines, Upstream ship board Integration, Down stream overland Integration	Profitability Port Infrastructure Efficiency Productivity Investments sustainability and Technology Evol.	Shipping Lines, Intermodal Companies, Rail Traction Co Trucking Companies, Rail Freight Operators New & Incumbents, Inland Waterways Co
INLAND TERMINALS INLAND PORTS HUBS FREIGHT VILLAGES	Terminal Handling Infrastructures, Handling Operations Trains Handling,	Profitability by Infrastructure efficiency productivity, Real Estate for Developments in Transport logistics	Intermodal Companies, Incumbents, Rail Freight Operators, Traction Co. LSP MTO Shipping Lines Inland Waterways Consolidators, Integrators Forwarding agents, outsourcers
SHIPPING LINES	Ship-owning for Industrial Maritime CTS Transportation Deep	Profitability by maritime Door/ Door Cts Transportation,	Ports Operators, Intermodal Companies Inland Terminals Ports

	Sea & Short Sea	Integrating up/down stream with clients. Investments Sustainability in Ships Evolution	Hubs, Feeder operators Rail Companies Incumbents & New, Rail Traction Co, Trucking Co Inland Waterways Co
INLAND WATERWAYS OPERATORS	Ship-owning in Inland Waterways or Sea Going Ships or Barges for Industrial Inland Waterways Transport	Profitability by providing Inland Transportation Services Sustainability in Ships Barges Evolution	Deep Sea Short Sea Shipping Lines Port Operators Inland Terminals Inland Ports Hubs Trucking Companies Intermodal & Traction Companies Industrial Customers
PRIVATE WAGONS OWNERS	Wagons Owning for Renting to Rail Freight Operators and Industrial Customers	Profitability by renting medium long term rail wagons Investments sustainability in modern & specialised rail cars	Rail Freight Operators New & Incumbents, New Traction Companies Intermodal Operators Industrial Customers
LEASING COMPANIES	Leasing Traction Equipment to Rail Freight Operators	Profitability by renting medium long term locomotors Investments in tech. advanced equipment	New Rail Freight Operators Incumbents & Traction Companies

Fig. 121: Non Capital Intensive Actors - drivers and interfaces

DESCRIPTION	CORE BUSINESS	DRIVERS	INTERFACES
LOGISTICS SERVICE PROVIDERS	Providing Customised Logistics Service Offers to the Customers	Profitability by providing logistics solution suitable to customers supply chain needs	Customers Trucking Co Warehouses Terminals Hubs Freight Villages Shipping Lines Rail Freight Intermodal Co
OPTIMISERS OUTSOURCERS 4th PARTY LOGISTICS SPECIALISTS	Providing Specialised Sectorial Logistics Service Offers to the Customers. Specialised Products Handling & Delivering	Profitability by providing logistics solution suitable to customers supply chain needs in economy of scale Investments in dedicated equipment & structures	Customers Trucking Co Warehouses Terminals Hubs Freight Villages Shipping Lines Rail Freight Intermodal Co
INTEGRATORS CONSOLIDATORS	Providing Differentiated Logistics Service Products Based on Defined Service Standards, Global Networking and Global Information Systems Targeting Specific Market Segment	Profitability by providing logistics solutions suitable to customers supply chain needs in economy of scale on Worldwide basis Investments for tech evolution	Customers Trucking Co Warehouses Terminals Hubs Freight Villages Shipping Lines Rail Freight Intermodal Co

FORWARDING AGENTS MTO	Providing a Transport Service Offers to the Customers Based on Global Presence & Networking	Profitability by Providing Global Transport 0rganisation to Customers supply Chain Needs	Customers Trucking Co Warehouses Terminals Hubs Freight Villages Shipping Lines Rail Freight Intermodal Co
REVERSE LOGISTICS WASTE MANAGEMENT OPERATORS	Providing a Transport Service Offers to the Customers Based on Specialised Problems Solving & Handling	Profitability by providing tailor made logistics solution removing problems for the customers Investments in specialised Handling & Transportation	Customers Trucking Co Warehouses Terminals Hubs Freight Villages Shipping Lines Rail Freight Intermodal Co
GLOBAL PLATFORM & EXCHANGES E MARKET PLACES INFOMEDIARIES	Providing Global Virtual Networking for Sectorial Logistics Solutions Supporting Defined Supply Chain Needs	Profitability by Providing Software Information Solutions Supporting Sectorial Supply Chain needs	Industrial Customers Forwarding Agents Logistics Service Providers Optimisers 4th Party Logistics, Specialists

An additional research was made for the single wagons or group of wagons traffic cases where specific solutions must be found if one wants to reverse the existing decline. Too many recipes are adopted by important incumbents resulting in further market erosion. The Volkswagen group viewpoint has been reported. This viewpoint is a common denominator to many single wagon or group of wagons users.

Task 4.4 Conclusions

The Development of this document availed itself of results, analysis, data emerged from three major research area which were carried out:

1. Characteristics of major players in the European rail changing environment, their differences compared to the traditional ones their position, organisation and attitude, towards the challenges imposed by the new market drivers. At the same time new emerging forces, acquired a new awareness based on the category of invested capital and on the relevance of their activity in the whole transport and logistics process. The Capital Intensive, and Non Capital intensive differentiation was just a way of marking this relevance. Finally under this research, completely new actors and new opportunities have been examined. New entities like RNE and ERA were not existing until recently and the opportunities brought about by the EU enlargement represent a recent market variable. All of these factors have been related to the mono product service culture prevailing in the old rail freight operators' market approach.
2. The market fundamental factors for generating new opportunities, and creating for the newcomers the basic conditions for investing and prospering over time. These have been largely developed in WP1 and WP4 task 4.1, 4.2,4.3.In this document it was underlined the customers' needs for a variety of services originating from the cargos nature and different preferences, perceptions and behaviours. All these variables have been put in connection with the constraints of European freight mobility. This in addition to the emerging European need of achieving a better modalities integration towards a transport system capable of extracting the best values and efficiencies from each of them.

3. Finally the above principles and considerations have been verified at the market level for understanding whether in practice these ideas would find practical implementation. To this effect a comprehensive market research was undertaken approaching a selected target of key European actors in two separate events, and a variety of business cases were examined. **As it always happens the reality has overtaken both forward thinking and imagination.** The market in its supreme automatic adjustment found ways and means to create within itself the seed of innovation, generating the conditions for the remedies and the possible solutions. Of course the speed by which such remedies and solutions are encouraged and implemented, will represent a competitive advantage or disadvantage of the European Economical System. New interfaces and market drivers are generated as a consequence of this market evolution. The legal and operational framework has to be adapted accordingly.

If one has to draw specific conclusions from examining in more details the development of this research, and the message that the market place and the business cases are delivering, one could try to synthesize as follows:

- The new rail freight economy must be based on a new rail freight business model where the customer and its needs are placed at the centre of any Logistics service providers activity. More so is the case for the rail freight operators not so fast in responding to market changes
- The mono product rail service culture must evolve in a multi products marketing oriented culture, capable of intercepting the variety of sophisticated and differentiated customers supply chain requirements
- To start the transition into this market demanding service culture, new skills and techniques, competences, marketing knowledge, new tools and technologies, management and training, and easier accessibility are necessary. The global competitive game requires quick reaction market response and greater flexibility which the traditional rail incumbents do not seem organized to provide
- The different market approach adopted by the incumbents compared to the newcomers have been already described in WP1 Task 1.3 as well as in this document where different actors have been examined. These new categories of actors identified as capital intensive and Non capital intensive have already identified substantial market opportunities for themselves and have already made significant inroads into the rail freight business. This is generating a fresh and impelling demand of effective competition on rail tracks
- Such competition on rail tracks will be possible if all these new actors are allowed to access the network on equal terms as the incumbents and to this effect the EU Commission will have to monitor that the rules of an equal level playing field are universally applied
- The rail freight users replies to the questionnaires have proved that they understand the relevance of accessing an efficient and competitive European freight mobility system and for achieving this task, they are prepared to undertake several commitments with their Logistics Service Providers. These commitments stretch from long term contracts, premium/penalties linked to service quality, open book relationship, partners profitability, adoption of some industrial risks. Higher prices would be acceptable for higher service levels. This was not the case only few years back and the research has contributed to defeat old common places
- The customers questionnaire moreover has put in evidence the desire by the users of seeing the emergence of new actors in the rail freight business, capable of resolving the cargo mobility problems. These problems are associated both with the intermodality service quality and particularly with the non acceptable performance of single wagons or group of wagons
- The transition into this new service culture will only be possible by resolving the two everlasting problems represented by A) the conflict with Passengers, B)the lines capacity

situation. This condition can be satisfied only by the new rail freight dedicated network approach represented by the **NEWOPERA** project

- The market place is in the process of overtaking the incumbents which are unsuccessfully managing the old fashioned rail freight traffic plagued by bad services and conflict with passengers
- Together with the progressive migration into the **NEWOPERA** scenario, the market will generate the insurgence of a variety of new service oriented actors capable of responding to customers needs
- The emerging result is the appearance of new drivers, new interfaces, new collaborations, new partnerships, motivated by the need to change the rail market approach
- One key element of the above considerations is the marketing need of distributing the various rail freight products, required both by the customers and the cargos, through a differentiated distribution channel approach. Such differentiated multi channel distribution approach can be achieved by a process of investments, development and continuous growth based on the two available strategies" make" or "buy". The DB business case demonstrates that DB has conquered this new situation through the buying process and now it is capable of providing a variety of service products distributed by its various operating companies. This has been successful. In this day and age it is no longer realistic to imagine that similar result is achievable through the "make" process. The time factor, the investment in competences and human resources, in marketing, in publicity, for an uncertain return makes this possibility impracticable. Consequently the other situation likely to emerge whenever the DB strategy cannot be replicated, is the incumbents "implosion". This means that newcomers emerging actors, new capital intensive or non capital intensive companies engaged in the transportation business, will be selling directly their own products in the market place. They will be identifying their products positioning and the price the customers will be prepared to pay. This process according to the different market circumstances and variables will either be accomplished in cooperation with the incumbents prepared to evolve themselves towards market needs, or in competition with them.

In essence this new rail freight economy populated by these new market actors will be giving effective answers to the customers supply chain needs. In addition the new service culture based on knowledge, skill, know-how, competence, communications and technology, needs a powerful tool which today is not on offer. This tool is the availability of the necessary capacity on rail freight lines capable of creating the basic conditions for this market to develop. Only the progressive implementation of the rail freight dedicated network promoted by the **NEWOPERA** project will be instrumental for these changes taking place. The service reliability, timing, consistency of performance, flexibility, sustainability over time are ingredients that only the elimination of the conflict with passengers can deliver. In any case the market given a starting point will ultimately be the motor for the necessary changes. This document the researches carried out and the business cases prove all the points which have been the subject of this research elaboration and development.

6.5 WP 5 NETWORK APPROACH-SOCIO ECONOMIC EVALUATIONS

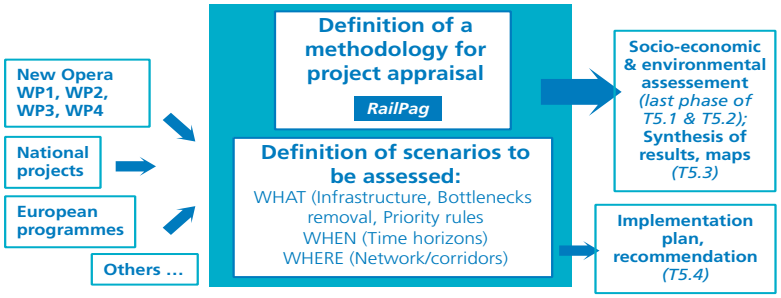
In this WP a global evaluation for implementing a rail freight dedicated network is made taking as an assumption a succession of scenarios paving the way towards a radical change of the rail freight economy in Europe. One has to say that after such a complex research project a major dilemma had to be resolved. Either consider a theoretical approach of a totally new rail freight

dedicated network, neither realistic nor economically sustainable, or consider a progressive improvements of the existing infrastructure and of its utilization. The latter was the choice.

6.5.1 Assessment of scenarios

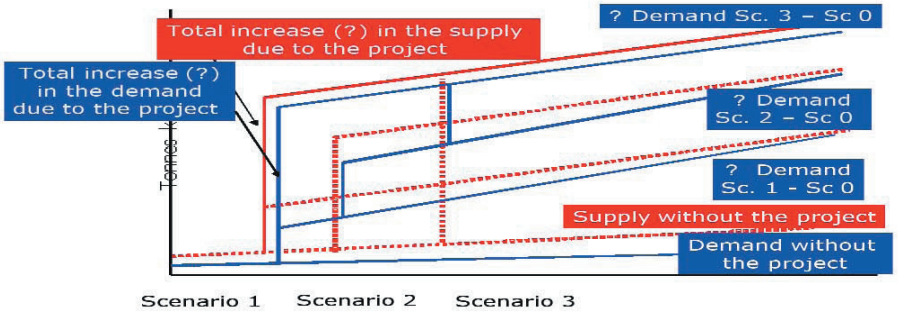
The aim of this task is to provide the methodological basis for the projects assessment as defined by the previous **NEWOPERA** workgroups.

- Fig. 122: Overview and links



As indicated in the figure reproduced below, the migration path defined by the **NEWOPERA** workgroups is an incremental project made of three stages. Each stage has been called a scenario as per figure 4 page 7.

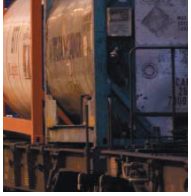
- Fig. 123: The Three Stages of the Migration Path



At this point it is relevant to examine which of these technical perspectives are realistic or one has to reconsider the time horizon. These perspectives depend on different aspects such as gauges, rolling stock age, technology, parking yards, bottlenecks etc. Therefore, a precise scenario definition necessarily represent the corridors choice results rather than the opposite.

The proposed **NEWOPERA** network is composed by a core part, centred on Central Europe with connections towards peripheral countries and regions. One should remind the following:

- This network is not a juxtaposition of corridors but a set of interoperable links and nodes, which are the major organisational centres for intermodal transport, loading of wagons and freight consolidation.
- WP2 showed that implementation of ERTMS on conventional lines brings only a limited capacity increase whereas it remains costly. Therefore the **NEWOPERA** network is not supposed to use systematically ERTMS routes, at least in the initial stages.
- The definition of the **NEWOPERA** network was made notwithstanding the existing



infrastructure. New infrastructure projects aimed at alleviating bottlenecks in suburban areas and new schemes of operations have to be specified in the migration scenario.

- The proposed network has been defined according to the major freight routes across Europe which are interesting for rail transport. It can be modified in the future whenever a new freight route appears and be completed with new important intermodal nodes.

The proposed **NEWOPERA** network absorb a significant share of the total rail freight in Europe, with 25% of tons transported by rail between regions utilizing at least 300 km of the network and 64% for international traffic. Expressed in tons. Km, the utilisation of **NEWOPERA** network represents 59 % of the total rail traffic and 66 % for transport distances above 800 km as per Fig. 74 page 75.

The three assessment methodologies "descriptive framework", "cost benefit analysis" and "multi- criteria analysis" aim at evaluating transport investments vs. direct and indirect benefits.

- Fig. 124: Cost and Benefits Assessment of Transport Projects

	Type of Cost/Benefit	Assessed?
Direct	Investment Cost, including: ▫ Preparation and administration ▫ Labour ▫ Land and property ▫ Construction material	**Usually included in CBA**
	Maintenance and System Operating Cost	**Usually included in CBA**
	Vehicle Operating Cost (VOC) savings	**Usually included in CBA**
	Journey time savings	**Usually included in CBA**
	Impact on operators' revenue and costs	**Usually included in CBA**
	Accident reduction / improved safety	**Often included in CBA**
	Environmental Impacts, such as: ▫ Noise pollution ▫ Impact caused by clearing the Right of Way ▫ Impact of construction spoilage ▫ Increased vehicle gas emission	Depends – "Noise" is often included in CBA. Separate Environmental Impact Assessment (EIA) complements the economic analysis
	Increased reliability of service	Qualitative Assessment
	Increased comfort and convenience	Qualitative Assessment
	Increased accessibility, including: ▫ Access to primary social facilities and centre of economic activities	Qualitative Assessment
Indirect	Stimulation of economic development, including: ▫ Increased economic activities ▫ Increased employment opportunities ▫ Increased income of local population	Often included in qualitative or separate assessment (such as EIA, Social Analysis, etc.)
	Environmental Impacts, such as: ▫ Changes in local air quality and greenhouse effect	
	Impacts on land use Impacts on landscape, townscape, heritage of historic resources, biodiversity, water environment	
	Increased risks of contagious disease spread	

This is the list of potential costs and benefits for a transport projects and does not necessarily indicate that all of them listed here are generated by the transport project itself. In addition not all can be measured in monetary terms.

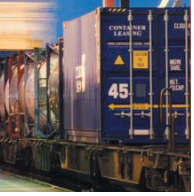
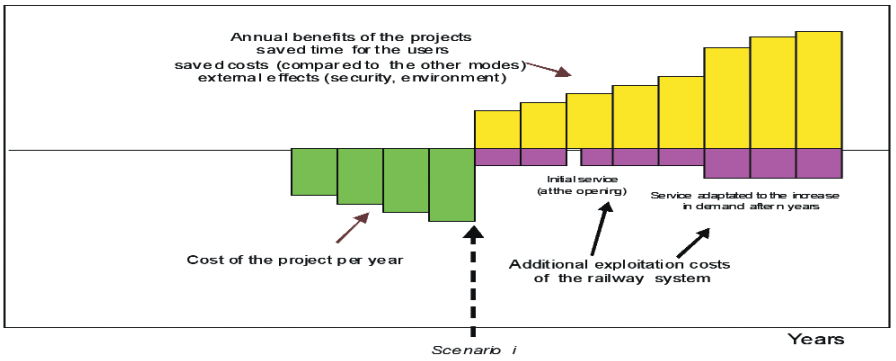


Fig. 125: Cost and Benefits Analysis



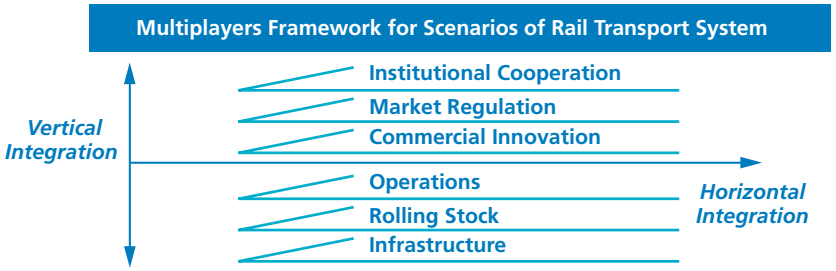
The net present value of those effects are calculated and presented via a stakeholders/effects matrix (SE Matrix). The SE Matrix is actually the main novelty of RAILPAG. It aims at providing for large and complex projects a thorough and clear analysis of its distributional effects. The distributional issues are particularly interesting for grant providers or other stakeholders who might be asked to contribute to the investment costs.

Fig. 126: The RAILPAG approach

	Rail users	Road to rail users	Generated traffic	Rail oper.	Rail manager	Local non user	National gvt	ECONOMIC VALUE
USER SERVICE								
Travel time	190,8	6,4						**197,2**
Safety		45,7						**45,7**
Cons. surplus (new traffic)			79,6					**79,6**
OPERATION								
Track charges				13,7	-13,7			**0,0**
Road operating costs		82,2						**82,2**
Rail operating costs				-115,5				**-115,5**
Fares		-57,4	-55,6	113,0				**0,0**
Taxes (fuel); VAT		23,3	-8,9				-14,4	**0,0**
ASSETS								
Infrastructure					-200,0			**-200,0**
Residual value					35,3			**35,3**
Taxes					-32,0		32,0	**0,0**
Infrastructure maintenance					3,2			**3,2**
Air pollution								
Climatic change								
ECONOMIC PROFITABILITY	**190,8**	**100,1**	**15,1**	**11,2**	**-207,2**		**17,6**	**127,6**

Transport Scenario inputs for modelling

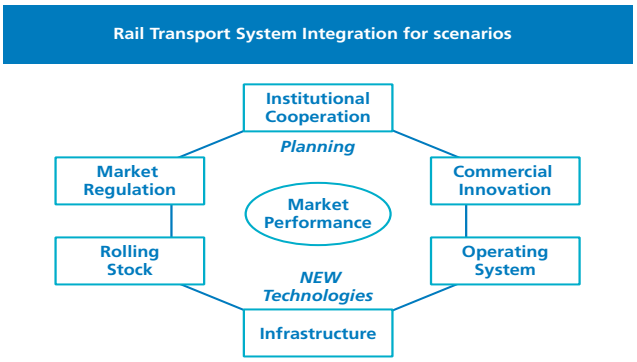
Fig. 127: The "LAYER Model"



Few comments about interrelations of layers within scenarios:

- New infrastructures do not bring decisive change in rail performance in itself (increase of speed eventually shorter distances). They are "decisive" only in the sense that they bring required capacity and improved services reliability
- The most critical bottleneck and infrastructure adaptations (gauge, interconnection) must be identified and eliminated in 2015
- Increase of rail services quality and rail performances is expected for short, medium and long term. In the long run intermodal network will be as reliable as modal network
- Increase in rail productivity should allow a higher contribution towards infrastructure costs (maintenance and eventually contribution to new investments)
- Improved rail investment planning is essential along freight routes so that new steps could be reached in rail performances (longer trains, new terminals)
- Clarification of infrastructure charging for rail and road passenger and freight in a perspective of sustainable mobility is required
- For the time being the commercial and market environment seem to be ready for major changes but institutional cooperation and planning is not yet in place. Institutional cooperation is easier in a corridor context which justifies the choice of corridor illustration for **NEWOPERA** scenarios.

- Fig. 128: The System Integration for Scenarios



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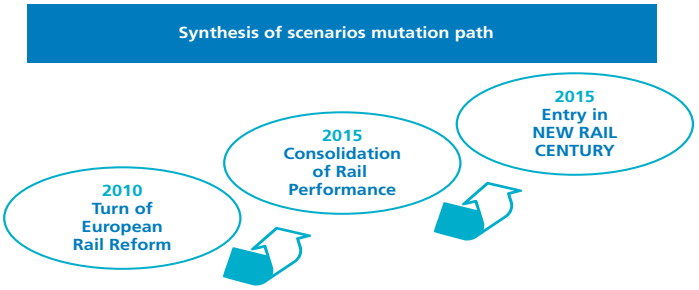
The Madrid- Berlin corridor has been selected for scenario evolution because of fairly low volumes of international rail traffic despite on this corridor there is an important road transport traffic which is affecting not only Spain and Germany but also Italy, Benelux and France. The easier choice of Rotterdam - Genoa was not considered for the scope of this research for the opposite reasons. On this corridor intermodality has a high market share across Switzerland and very high rail traffic volumes. Moreover rail operators are well developed and the traffic is industrialised.

One of **NEWOPERA** originality was to define the mutation path of the scenarios with different horizons 2010, 2015, 2020. Therefore the input data must be prepared for these different horizons. While 2010 equates already to present days, the next 2 horizons 2015-2020 appear very important for this mutation path.

Fig. 129: Mutation Path Scenarios



2010
- Rail modal share is not declining any more.
- Rail system is open.
- Significant successes are observed for transalpine traffic, port services, and services provided by new entrants.

2015
- Increase of rail productivity.
- Modernisation and anticipation of rolling stock renewal.
- Long trains operations along New Opera corridors.

2020
- Implementation of ERTMS for quality, security, capacity..
- Dedicated rules for freight slots allocation.
- Corridor planning is developed.

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6.5.2 Socio Economic and Environmental assessment

The structure of 5.2. deliverable is then composed of **4 parts:**

A first part which is more a general overview about methodologies used at national and EU level with reference to "unit" emissions per ton or vehicle x km. The starting point of this research is to consider the basic elements constituting the external costs of transport which are:
- Congestion
- Accidents
- Air pollution
- Noise
- Climate change.

Elaborating on this part several paragraphs were developed such as: concept of external costs of transport and methodologies for their assessment, impact of the EU transport policy, the EU research projects and National studies, the standardization impact, the information on the Genoa-Rotterdam Corridor in relation to the Trans-Alpine traffic and the most sensitive areas.

This part was concluded by recommending the unit costs to be considered

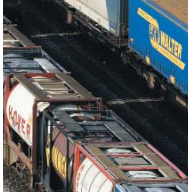


Fig. 130: Air Pollution Unit Costs (€ct/veh*km or €/ton of pollutant)

Cost component	Heavy duty vehicle (HDV)				
	Values in €ct/vkm (€2000)				
Air pollution	Interurban, diesel	Average European value			**15**
	Cost per ton of pollutant in €				
outside built-up areas	Pollutant emitted	NOX	NMVOC	SO2	PM2.5
	Belgium	2,700	1,100	5,400	95,000
	Switzerland	4,500	600	3,900	86,000
	Germany	3,100	1,100	4,500	80,000
	France	4,600	800	4,300	83,000
	Italy	3,200	1,600	3,500	70,000
	Netherlands	2,600	1,000	5,000	88,000
	Average corridor	**3,560**	**1,026**	**4,367**	**82,200**

Sensitive areas: in these areas the above figures must be multiplied for a factor of 2.1

Fig. 131: Noise Pollution Unit Cost (€Ct/Veh/Km Or € X Person X Db(A)

Cost component	Heavy duty vehicle (HDV)			
	Values in €ct/vkm (€2000)			
	Average European value			**1.10**
Noise			Suburban	Rural
	HGV	day	1.10	0.13
		night	2.00	0.23
	Values in €ct/vkm (€2000)			

The recommend values expressed in € per exposed person per dB(A) per year can a be found in Annex E to HEATCO Deliverable 5 and are also reproduced in Table 20 of the mentioned IMPACT D1 "Handbook on estimation of external cost in the transport sector" Sensitive (alpine) areas: the above figures must be multiplied for a factor of 5.0

Fig. 132: Congestion Unit Cost (Marginal Social Cost) In €Ct/Veh/Km

Cost component	Heavy duty vehicle (HDV)		
	Values in €ct/vkm (€2000)		
Congestion	Interurban peak	Average European value	**35**

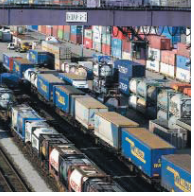


Fig. 133: Climate Change Unit Cost

Cost component		Heavy duty vehicle (HDV)	
		Values in €ct/vkm (€2000)	
Average European value	Interurban, diesel	Average	**2.2**
		Values in € per ton of CO_2	

Recent recommended values for Germany and Switzerland (e.g. DLR, 2006) are a central value of € 70 per ton of CO2, with a range of € 20 (short term EU average, based on Kyoto targets) to € 280 (long term strategy and risks).

	Values in €/litre or €/m³ for different fuels used in road transport					
		Petrol	Diesel	LPG EU mix	CNG	CNG
2010	Lower	0,019	0,022	0,012	0,014	0,016
	Central	0,069	0,078	0,044	0,052	0,056
	Upper	0,124	0,140	0,078	0,093	0,101
2020	Lower	0,047	0,053	0,030	0,035	0,038
	Central	0,111	0,125	0,070	0,083	0,090
	Upper	0,194	0,218	0,122	0,145	0,157
2030	Lower	0,061	0,069	0,038	0,045	0,049
	Central	0,152	0,171	0,096	0,114	0,124
	Upper	0,277	0,311	0,174	0,207	0,225

Fig. 134: Accident Risks Unit Cost In €Ct/Vehicle-Km

Cost component		Heavy duty vehicle (HDV)	
		Values in €ct/vkm (€2000)	
Accidents	Average European value	(Interurban)	2.7
		Belgium	4.23
		Switzerland	2.8
		Germany	2.65
		France	4.3
		Italy	3.07
		Netherlands	2.06
		Average value in the corridor	**3.19**

Fig. 135: All Components Unit Cost In €Ct/V*Km (€2000)

Total external unit costs **€ct/vkm (€2000)**	
Accidents	3.2
Air pollution	15
Congestion	35
Noise	1.1
Climate change	2.2
Total	56.5

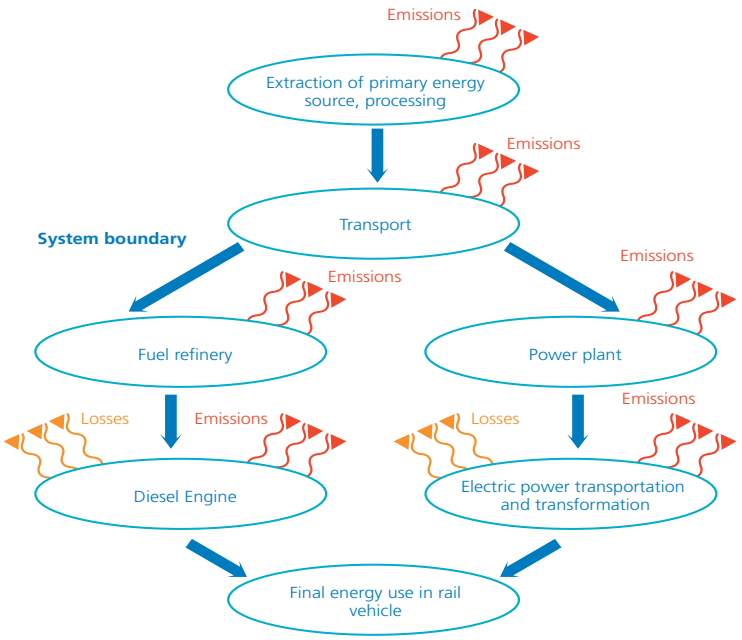
The above data increase with increasing income and to this effect increasing monetary values have been based on GDP growth. The monetary values should be adjusted with Purchasing Power Parity (PPP) as per following table.

Fig. 136: GDP/Cap. PPP Adjust

GDP/cap. PPP adjust											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
EU25	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EU15	109.6	109.5	109.5	110.2	110.0	109.6	109.3	109.3	108.6	108.3	108.1 (f)
Belgium	118.0	116.9	115.9	115.5	116.7	117.2	117.5	117.9	118.1	117.5	117.6 (f)
Germany	118.1	115.8	114.2	113.7	111.9	110.0	108.5	108.1	108.0	109.3	109.0 (f)
Switzerland	136.7	138.6	137.9	134.1	133.0	128.3	130.0	130.3 (f)	131.6 (f)	127.2 (f)	126.7 (f)
France	112.8	113.5	113.9	113.6	113.6	113.9	112.0	111.6	109.5	108.8	108.1 (f)
Italy	115.6	114.0	114.6	114.0	113.3	112.0	110.0	107.6	105.5	102.6	101.7 (f)
Netherlands	119.2	121.3	121.5	122.9	124.3	127.0	125.3	124.7	124.4	124.2	124.8 (f)

A second part concerning rail unit emissions for different types of operating context related to topography, geographical zones (urban, rural, protected areas), type of rolling stock and trains composition has been elaborated. Such elaboration is a complex one having examined all operating conditions both for electric and diesel traction. Here below only a partial and synthetic analysis is reproduced to give an idea of the research conducted. Further information are contained in deliverable 5.2.

Fig. 137: Energy Flow Chains & System Boundary for Electric & Diesel Rail Transport



After the above scheme the rail energy consumption was established through:

- Energy consumption for electric and diesel rail traction according to the terrain topography
- Energy consumption for electric rail freight traction
- Energy and fuel consumption for diesel rail freight traction.

Then the emissions were established through:

- Emission factors of the European average electricity mix

- Emissions for electric rail freight traction
- Emissions from diesel rail freight traction.

Similarly the noise level calculation was established through:

- Factors that influence the noise levels from rail transport
- Noise levels according to train type and number of pass-bys in 24 hours.

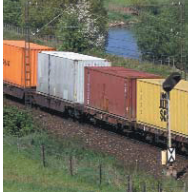
All the above research relating to energy consumptions and emissions reproduced in details in various charts and figures has been projected into 2020 assuming 2020 scenarios taking also into consideration alternative source of energy such as bio-diesel.

A third part relative to unit road emissions in order to assess environmental impact reduction due to traffic transfer to rail in the transport chain. This analysis considers:

- Different types of unit emissions
- The evolution of road unit emission as a result of implementation of more stringent rules. Figures relative to the past evolution will also be introduced in order to provide a profile over a long period
- Application of road unit emission to different spatial context with differences between urban, road and motorways infrastructure. The different spatial contexts are associated to differences in operating regimes with more frequent breaking and acceleration sequences in urban area than on motorways.

Fig. 138: Emissions of Heavy truck > 32 T in gr/km

gr/km	1985	1995	2005	2015	2025
FUEL U	501.59	501.59	501.59	501.59	501.59
FUEL R	336.18	336.18	336.18	336.18	336.18
FUEL A	297.38	297.38	297.38	297.38	297.38
FUEL	**347.41**	**347.41**	**347.41**	**347.41**	**347.41**
CO2U	1553.50	1555.92	1566.20	1569.92	1570.35
CO2R	1044.70	1045.70	1050.45	1052.51	1052.75
CO2A	896.76	901.01	918.01	926.41	928.13
CO2	**1069.24**	**1071.59**	**1081.46**	**1085.99**	**1086.78**
PM	**0.75**	**0.38**	**0.08**	**0.00**	**AbV**
PMU	1.37	1.24	0.37	0.04	0.00
PMR	2.41	2.19	0.65	0.08	0.00
PMA	0.37	0.33	0.10	0.01	0.00
COU	4.65	4.09	1.91	1.15	1.07
COR	2.46	2.20	1.11	0.67	0.63
COA	1.78	1.61	1.00	0.63	0.59
CO	2.55	2.28	1.19	0.73	0.68
NOxU	24.97	21.95	9.34	3.93	2.81
NOxR	14.97	13.36	6.20	2.65	1.89
NOxA	11.52	10.13	4.72	2.04	1.46
Nox	**15.26**	**13.52**	**6.15**	**2.63**	**1.88**
CH4U	0.18	0.15	0.07	0.04	0.04
CH4R	0.08	0.07	0.04	0.03	0.02
CH4A	0.07	0.07	0.04	0.02	0.02
CH4	0.09	0.08	0.05	0.03	0.03



Subsequently fuel consumptions and CO2 emissions have been adapted to different conditions, gradients, urban, rural vs. motorways, speed etc.

A forth and final part which is an applicative illustration of the environmental methodology proposed using GIS tool at different local regional corridors or national level providing quantitative results in terms of tons of pollutants and monetary values for environmental impacts.

The 2020 **NEWOPERA** scenario is characterized by the implementation of a RAIL freight dedicated network (priority freight network) in Europe.

Environmental assessment GIS is composed of different information "layers" describing territorial context and transport network. Information are geo-coded.

Transport impacts are analyzed at different spatial "level". The method developed is a multilayer, multilevel assessment applied to the different modes.

The GIS networks are now complemented with geo-coded territorial and population information which means that the transport analysis' impact can be analyzed at different spatial level using information of CORINNE LAND COVER which differentiates 50 types of zones. A serial of maps have taken into consideration main nodes in Germany, France, Italy and Spain

A map has been provided illustrating the population living less than 1km from the rail infrastructure. The estimation has been done for the entire EU 27 by NESTEAR and will be applied to the **NEWOPERA** selected corridor Madrid - Berlin.

A global European coverage was necessary since the corridor is a long distance corridor with possible alternative routes when new transport policies are implemented along such corridor.

However in this case, some bias have to be eliminated in particular part of population of large cities such as Paris or London since only few freight trains will penetrate within these large cities having several end central stations not interconnected. Such sections will never be transit sections but only terminal sections for few trains which nevertheless are introduced in the main network. The terrain topography has been taken into consideration since the gradient is important for emissions and energy consumption.

A section has been dedicated to the intermodal policies across the Alps and the Pyrenees on which sufficient data are available for estimating 2020 traffic. Road traffic in 2020 coming from trans-Alpine and trans-Pyrenean flows is estimated in 208 billions T/Km: 37% is on French territory, 18% in Spain, 16% in Italy, 12,5% in Germany, 6% in Switzerland and 3.6% in Austria. From the above figures an alternative "intermodal scenario" has been built making different assumptions based on road transport costs evolution vs. rail and service improvements on existing freight corridors. In this first exercise quite an important number of billions T/Km is shifting from road to rail.

A second exercise has been made assuming new services being opened between Spain, France, Germany and other European countries. In this exercise a 7,5% shift from road to intermodality is achieved.

The third simulation has been conducted combining the 2 former ones. The result achieved is quite astonishing reaching 38% modal shift from road to rail intermodality for the total transalpine and trans-Pyrenean traffic. Rail traffic would increase by 88 billions T/Km.

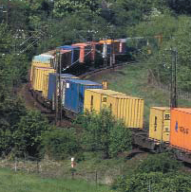


Fig. 139: Scenario Improved services (road cost+20% rail cost -15%)

Countries	Road	TRT	Rail	TOTAL	Rail share
France	47 677 347	365 170	34 929 091	82 971 609	42.1
Spain	26 847 563	2 339 062	8 635 816	37 822 442	22.8
Italy	24 249 934	1 958 958	9 362 985	35 571 877	26.3
Germany	11 525 159	1 197 641	17 470 212	30 193 012	57.9
Switzerland	5 717 085	1 274	6 278 732	11 997 091	52.3
Austria	5 411 420	174 490	2 610 697	8 196 606	31.9
Slovenia	1 682 723	7 086	198 655	1 888 465	10.5
United Kingdom	1 136 440	210 974	384 000	1 731 414	22.2
Greece	708 187	136 271	0	844 458	0.0
Belgium	635 729	516 437	5 952 485	7 104 652	83.8
Netherlands	355 301	447 333	779 406	1 582 040	49.3
Portugal	267 385	1 476	0	268 862	0.0
Sweden	138 099	2 468	176 401	316 967	55.7
Luxembourg	81 011	19 664	654 941	755 616	86.7
Serbia	70 790	1 092	0	71 882	0.0
Ireland	65 509	9 097	0	74 606	0.0
Czech Republic	55 001	2 575	122 781	180 357	68.1
Hungary	46 573	364	1 218	48 154	2.5
Denmark	38 277	66 671	613 456	718 404	85.4
Bulgaria	33 074	753	0	33 827	0.0
Finland	18 956	56 502	0	75 458	0.0
Poland	209	87	0	295	0.0
Slovakia	45	0	360	405	88.9
TOTAL	**126 761 817**	**7 515 446**	**88 171 237**	**222 448 499**	**39.6**

This reference volume is 37 billions TK which means a multiplication by more than 3 of the total of transalpine and trans-Pyrenean combined transport at the horizon 2020, or a 10 % increase per year of this market in terms of T/Km.

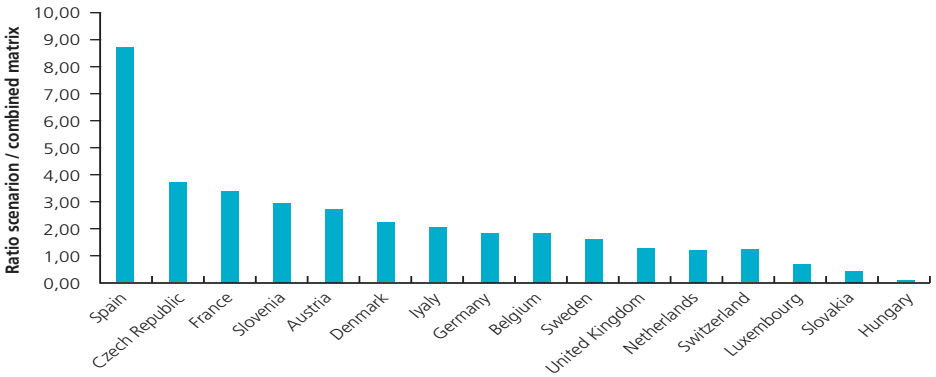
But what is even more interesting is the analysis of such increase per country showing indeed how this combined transport market enlarges across Europe.

The beneficiary countries are not only Germany, Italy, France, Switzerland, Belgium which have already an important share of transalpine and trans-Pyrenean combined transport market. It enlarges in particular to Spain so that France becomes the first beneficiary country with more than quadrupling the intermodal traffic volume of this market.

Fig. 140: Countries Benefiting from Modal Shift

	Tons.KM [Combined matrix]	Scenario intermodal	Ratio
Spain	988 567	8 635 816	8,74
Czech Republic	33 146	122 781	3,70
France	10 213 568	34 929 091	3,42
Slovenia	66 734	198 655	2,98
Austria	944 852	2 610 697	2,76
Denmark	270 903	613 456	2,26
Italy	4 609 382	9 362 985	2,03
Germany	9 310 029	17 470 212	1,88
Belgium	3 228 492	5 952 485	1,84
Sweden	109 605	176 401	1,61
United Kingdom	290 161	384 000	1,32
Netherlands	610 171	779 406	1,28
Switzerland	5 065 365	6 278 732	1,24
Luxembourg	902 088	654 941	0,73
Slovakia	785	360	0,46
Hungary	13 261	1 218	0,09
TOTAL	**36 657 108**	**88 171 237**	**2,41**

Fig. 141: Visual Chart of Modal Shift



The environmental assessment results of "intermodal scenario"

The final results per country for CO2 in 2020 are presented in the next tables:

- Reduction of road emissions obtained from road modal shift which amounts to 4.2 millions tons of CO2
- Increase of rail emissions which is only 1.3 millions tons of CO2
- Increase of road terminal transfer emissions which is 0.4 million tons of CO2.

The total result is a significant reduction of 2.5 millions tons of CO2 emissions.

For Nox the result is 3.300 tons of reduction which could be improved considerably (multiplied by 3) with lower percentage of diesel traction (or use of new diesel engines).

For PM the result is negative but negligible because of road performances (Euro V) and 20% diesel traction. It could be neutral from this point of view with lower percentage of diesel traction (or new engines).

For sake of this research completeness the diesel vs. electric traction case has been considered despite this topic being often controversial.

The test has been made supposing an additional 10% of diesel in rail tractions for different origins and destinations. The global results are synthesized in the next tables with increase of CO2, Nox and PM emissions which are the most critical in this case.

The differential does not appear very high for CO2 because of energy production from fossil fuels being the primary source of electricity in certain countries(IFEU data of 2003). New EU norms applied in 2009-2012 should considerably decrease emissions of new diesel engines.

Fig. 142: Electric vs. Diesel Differential

	Electric 100%	Electric 90% and	Differential	Ratio
		Number of tons by year		
CO2	667 969	707 908	39 939	1,06
NOX	1 241	2 907	1 666	2,34
PM	182	230	48	1,27

This task has evidenced very interesting results regarding substantial environmental benefits in favour of rail intermodality at a time when climate changes and consumption of fossil energy becomes a concern.

Considerable improvements are still possible on energy consumption and noise by the rail sector.

For traction the debate about the choice diesel vs. electric engines and their differences in emissions considering primary source of energy in different countries, appeared to be particularly important.

It is expected that after a transition period electric engine will prevail and impact on environment might justify an incentive for such a choice in **NEWOPERA**. The result is that environmental negative impact of diesel traction can justify incentive for accelerated renewal of such engine with lower emissions or for shift to electric traction with better energy performances.

This tested scenario which can be considered as a realistic scenario for 2020, generates 80 billions TK shift from road to rail which means a multiplication by 2.5 of the combined transport market share across Alps and Pyrenees in year 2020, and a steady increase of around 10 % of this market till 2020.

Indeed the benefits of such policies in monetary terms, reach a very significant level. The reduction of CO2 emission is 2.5 Millions tons. The reduction of Nox is 3.3 thousands tons but could reach 10 thousands tons with only electric traction.

This proves that internalization of external cost would affect the competitive profile between modes and transport chains.

This means an estimated 300 millions of Euros of social benefit per year with unit value of 100 € for 1 ton of CO2 emissions at horizon 2020 knowing that one could expect a higher reference unit value for CO2 by then, at a time when climate change become a major political concern.

In addition to these figures one has to consider the NOX and safety issue together with a general improvement in the quality of life of EU citizens. At European level the figures are going to be much higher if one considers also the increased productivity of the EU cargo mobility in general. In fact by removing traffic from the roads less congestion costs will be generated delivering additional consequential benefits.

6.5.3 Mapping and monitoring the rail freight network

The mapping of the **NEWOPERA** rail freight network has been largely elaborated in deliverable D.3.3 Network Perspective(page 108).This task had the objective of concentrating on scenario traffic volumes and modal shift capable of feeding the envisaged **NEWOPERA** mapped network. Moreover this task developed economical calculation proving the necessary long term sustainability for investments on the mapped network monitoring the migration from now up to year 2020 and beyond. For obvious reasons this exercise could not be accomplished for the entire **NEWOPERA** network but it concentrated on the Madrid-Berlin corridor which for its peculiarities could provide enough information for extending the findings to all other freight corridors of the network. The research carried out in this task completed Task 5.1 and Task 5.2 described in the previous chapters. The definition of a development scenario, presented hereunder, will have to:

- Select representative strategic corridors in the **NEWOPERA** network
- Identify the investments already planned along these corridors by rail infrastructure managers, the ports and other terminals involved
- Propose a minimum mix of technical measures aimed at improving the corridors capacity in connection with the planned investments
- Identify the remaining capacity bottlenecks which may appear in the middle-term along these corridors assuming the traffic simulations
- Prepare a definition of additional investments which should be envisaged
- Indicate the institutional measures which should accompany the investment plans and their implementation.

In order to do this the "layer model" structure is used starting from infrastructure analysis up to institutional cooperation. In this version six layers have been considered which are more or less interdependent with each other. These layers are:

1. Infrastructure
2. Rolling stock
3. Operating system
4. Commercial environment
5. Market regulation
6. Institutional cooperation.

Each layer' effects have been analysed in detail in relation to **NEWOPERA** scenarios.

The importance of the investments necessary for project implementation has a strong influence on the right mix of actions to be selected. The following findings which are outputs from previous tasks have to be kept in mind. They are:

- The construction of additional sidings or the lengthening of existing ones are necessary for accommodating longer trains. Such improvements should be immediately designed for a substantial increase of the train length up to 1500 meters. A progressive improvement with a first step to 1000 meters would be less effective and more costly in the long run

- The infrastructure improvement for accommodating double-stack wagons can hardly be envisaged on long lines. Even less on the whole network. The investments would be enormous. The utilization of double-stack wagons may be envisaged only for short distance traffics such as the exchanges between containers ports and dry ports. However double stack gauge should be planned for any new tunnel in order not to forego this possibility to the benefits of future generations

- The actual effects of introducing ERTMS on a complete freight dedicated line cannot be precisely envisaged at the moment. Conversely it is recognized that these effects would be quite different depending on the ERTMS chosen level 1, 2 or 3. A direct move to ERTMS 3 is in principle advisable to get a sizable capacity increase. It is assumed that the relevant technology will soon be operational and may be introduced before 2020.If not it would be necessary to adopt ERTMS 2 for the middle term

- The same standards should be applied to all facilities and operations on the proposed **NEWOPERA** network for achieving long term interoperability.

The proposed basic actions are the following:

- Locate, design and construct all necessary sidings allowing utilization of trains up to 1500 meters long
- Identify, design and execute all infrastructure works necessary to eliminate the existing or potential bottlenecks on the corridors
- Generalize B+ as minimum gauge along the corridors
- Generalize 22.5 tons as standard minimum axle-load
- Plan the introduction of ERTMS level 3
- Speed up the renewal of existing locomotives replacing them with multi-current ones. For diesel traction the replacement of old locomotives is paramount
- Speed up the renewal of existing wagons with new generation ones.

All these basic changes on facilities and equipments must be accompanied by appropriate institutional actions and by an improved operating organisation. As it has been stressed before a coherent/continuous development planning and monitoring is compulsory for achieving at European level the desired results.

No one at the **NEWOPERA** project launch ever thought or imagined that a new rail freight dedicated network could be developed in one go. A rail freight network is a combination of corridors integrating into each other by means of freight hubs and platforms where freight bundling and trains integration are accomplished in appropriate exchanging structures. The corridors' dimension is therefore essential for studying peculiarities, technical standards, gauges, operating differences dictated by the rules and practices of the various countries involved. The corridors' approach is a more short term manageable entity for harmonising the different features which eventually will be the common denominators when the **NEWOPERA** Network is being implemented.

However at European level the final **NEWOPERA** rail freight dedicated network must be the ultimate long term objective and must constitute the guiding line for any future plans, investments or actions. Rail Freight industrialisation is the objective not to be missed. Failing this by concentrating only on short term improvement measures on individual corridors dictated by local

requirements, the risk will be to reproduce the mistakes of the past which the **NEWOPERA** project is trying to correct.

For illustrating the application of **NEWOPERA** scenarios two corridors have been selected in two different contexts.

- Barcelona-Berlin through Perpignan-Lyon-Metz-Mannheim-Frankfurt am Main-Hannover. This corridor has a natural extension to the West from Barcelona to Madrid through Zaragoza and up to Lisbon and to the East to Warsaw. It presents also an alternative branch from Frankfurt am Main to Berlin, serving Leipzig, with an extension to Wroclaw and Katowice.

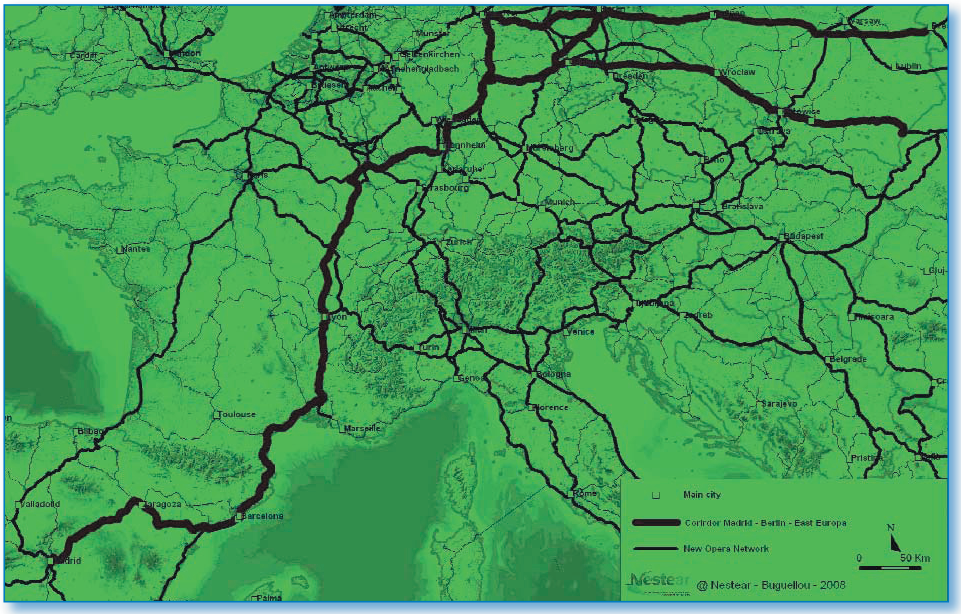
- Antwerp-Genoa, with an Eastern branch Antwerp-Köln-Karlsruhe-Basel-Milano and a Western branch Antwerp-Dijon-Lyon-Torino and a connection between the two branches from Metz to Basel.

For this study the Madrid-Berlin corridor was selected for the following reasons:

- The Iberian Peninsula had for decades a long standing need for better rail connections to North and Central Europe. The different rail track gauge was in the past always and hindrance. This corridor has several interesting peculiarities. It can be linked to Lisbon in Portugal and Via Lyon it connects with EU corridor 5 via Italy up to Kiev. It serves the North of Europe and U.K and via Germany again up to Poland to the East. This is one of the longest corridors linking the dynamic economy of the Iberian Peninsula with the core of Europe. It coincides also with a section of the FERRMED corridor
- This is not an easy corridor because of the different rail track gauge, the crossing of the Pyrenees and the relative lack of existing traffic due to service capacity/problems. Consequently is more difficult to make future traffic projections
- This corridor makes the modal shift particularly challenging having to compete with road service and short sea shipping. By achieving modal shift the Iberian Peninsula will have finally an industrial alternative to road and sea modalities
- This is a South/North as well as a West/East corridor integrating several other EU TEN T corridors. It is an integrator for achieving the **NEWOPERA** network perspective
- The choice of this corridor was also done by exclusion since the Genoa/Rotterdam has been object of previous studies and a lot of investments are actually in the course of execution.

The Madrid-Berlin corridor will be considered as representative of the whole proposed **NEWOPERA** network to conduct a more detailed analysis of the possible capacity bottlenecks. Such an exercise seems compulsory for defining with more accuracy an adequate mix of investments and operational improvements for the medium term and for conducting the socio-economical evaluation of such a mix. In other words this exercise is actually supposed to help defining with more accuracy the whole **NEWOPERA** network development and in particular to test the setting-up of new entities in order to better coordinate the major stakeholders.

Fig. 143: The Madrid Berlin Corridor



The methodology and models for extracting the traffic projections have been explained. The traffic projections results have been extracted for building up the reference scenario 2020. This has been done by:

1. Considering for basic year 2004 the global rail volume of traffic (called traffic "Acquis") which includes:
   - Direct trains (conventional rail traffic)
   - Wagon load (conventional rail traffic)
   - Part of intermodal traffic: this is the "intra" EU combined transport traffic, which is included in the global rail statistics (region to region)[1] but not isolated[2]

2. Projecting at **NEWOPERA** horizon 2020 the rail "Acquis" traffic. This will be done using projection of traffic generation without changing the modal share of Origin/Delivery and type of products. For this first market segment the growth of the market will only depend upon the growth of traffic generation produced in task 3.3. However for traffic assignment the rail "acquis" segment will benefit from **NEWOPERA** service improvements, and from changes of rail routes because of the increased attractiveness of **NEWOPERA** services. Modal share as compared to road is not affected

3. Estimating the combined transport market share increase versus road when rail transport improves using the ACHEMINE model applied to the intermodal European network.

In addition to these two market dimensions the rail "Acquis" and the combined transport transferred from road, the extra EU containers traffic market will be considered using the port

[1] As it is the case in ETIS, COMEXT, SITRAM.
[2] In exception of CAFT for Transalpine and Transpyrenean traffics as mentioned before.

model "PORT-PRINT". This will constitute a third market dimension detailed in the results presentation. PORT-PRINT provides the containers traffic volumes and the modal split between a region and a port. The transport of maritime containers by rail will be added to the two former market dimensions.

In this analysis the extra EU rail bulk traffic is not considered[3] either in the "Acquis" rail traffic or in the PORT-PRINT modelling which implies that some underestimations of the total rail traffic is to be considered.

Once the projections are presented the **NEWOPERA** scenario evaluation is compared with the reference 2020 scenario. The **NEWOPERA** scenario refers to a policy mix of measures applied to **NEWOPERA** network defined in task 5.1.In concrete terms such scenario means :

- A complete fluidity of rail transport along the **NEWOPERA** network with "quality" slots dedicated to rail freight
- An improved rail productivity in the **NEWOPERA** network. With more reliable trains' path better use of trains drivers and rolling stock the productivity of rail freight can increase by 30% by 2020.
- An increase of infrastructure charges. Half of rail productivity gains within the **NEWOPERA** network will be assigned to increase of rail infrastructure charge. One must consider that on average the road cost will increase from 1€ per truck/km to at least €1,20 including increase of energy price. Imagining intermodal train cost of €17 per train/km, €2.5 per train/km will be devoted for increasing rail infrastructure charges in countries where infrastructure charges are well below maintenance costs. In countries such as France, Spain, Italy this increase of rail infrastructure charges will hardly pay for use of infrastructure since they are only around €1.5 per train /km. Furthermore one must also take into account that in Italy and Spain the length of train is shorter. In these two countries the rail cost is supposed to be higher by 30% per unit transported to reflect this situation
- The opening of new intermodal services.

Here below the traffic results presentation is made for the different flows as a consequence of the previous considerations. Tables summarising the various traffic situations are reproduced. The next table Fig. 144 the Flows "Flux Acquis" indicates that the rail traffic projections for the "flux Acquis" (projections of the 2004 rail market) for the total rail freight network is 416 billions of TK in 2020 in the reference scenario and 418 in the **NEWOPERA** scenario. It is supposed that, for this market the increase in rail performance will not affect the rail market share compared to road. The second column of the first table indicates how much traffic **NEWOPERA** rail freight dedicated network is attracting. It concentrates 63% in the reference case and 70% in the scenario case.
The second table gives the importance of international traffic in the global rail European traffic: 45% in the total rail network and 55% in **NEWOPERA** rail freight network without taking into consideration the extra EU flows. This shows how important it is the **NEWOPERA** network in the future TEN-T policy regarding exchanges between member states.

[3] The traffic along the Rhine Valley would require more in depth analysis taking into consideration extra-EU bulk traffic and competition between inland waterways as well as rail for container. PORT-PRINT next version will introduce IWW mode, but this was not possible in NEWOPERA project and will affect only partially the global NEWOPERA scenario assessment; at the corridor level, the NEWOPERA corridor selected (Madrid-Berlin) is not much affected by IWW competition.

Fig. 144: Flow" Flux Acquis"

RAIL TRAFFIC PROJECTION 2020 INTRA EU : « flux acquis »

TOTAL in millions

	Tk global rail	Tk New opera
Reference 2020	415 703	262 334
Scenario 2020	418 318	292 237
Differential	2 615	29 903

INTERNATIONAL

	Tk global rail	Tk New opera
Reference 2020	187 720	144 563
Scenario 2020	189 309	162 505
Differential	1 589	17 942

NATIONAL

	Tk global rail	Tk New opera
Reference 2020	227 983	117 771
Scenario 2020	229 009	129 732
Differential	1 026	11 961

Source NESTEAR

The next table describes the results of the modal shift from road to rail for Intra EU traffic. For this segment the "reference" situation for rail should be equal to zero, since the evolution of the existing intermodal market of 2004 is already included in the "flux Acquis", as mentioned before. In the next table the reference is not exactly equal to zero because of model calibration. This residual volume different from zero is very low and the calibration can be considered as satisfactory. A very important remark of the modal shift analysis from road to intermodality is relative to the international volume (intra EU) transferred. It represents 115 billions TK for **NEWOPERA** out of 126 billions total equal to 90% of modal shift. By contrast the national volume transferred is only 10.6 billions TK equal to about 10% of the International traffic.

Fig. 145: Traffic Transfer from Road 2020

TOTAL in millions

	Tk global rail	Tk New opera	Tk road
Reference 2020 (calibration)	7 183	5 721	1 489 690
Scenario 2020	144 537	131 722	1 369 230
Differential	**137 354**	**126 001**	**-120 460**
Scenario 2020 + direct relation	161 911	147 357	1 354 190
Scenario 2020 + Complete Interconnection	307 015	268 763	1 230 680

INTERNATIONAL

	Tk global rail	Tk New opera	Tk road
Reference 2020 (calibration)	6 457	5 231	1 489 690
Scenario 2020	130 991	120 596	1 369 230
Differential	**124 534**	**115 365**	**-120 460**
Scenario 2020 + direct relation	144 243	132 888	1 354 190
Scenario 2020 + Complete Interconnection	264 225	233 270	1 230 680

NATIONAL

	Tk global rail	Tk New opera	Tk road
Reference 2020 (calibration)	726	489	1 489 690
Scenario 2020	13 546	11 126	1 369 230
Differential	**12 820**	**10 637**	**-120 460**
Scenario 2020 + direct relation	17 668	14 469	1 354 190
Scenario 2020 + Complete Interconnection	42 790	35 493	1 230 680

According to UIRR data the national intermodal traffic in 2004 was 8.3 billions TK compared to 26.2 billions TK for international intermodal traffic. This makes a total of 34.5 billions TK in 2004 becoming 53 billions TK in the "flux Acquis" in 2020. This means that with the modal shift from road, the Intermodal traffic triples by then.

In the limit case of complete interconnections the International and National intermodal traffic growth is more than doubling the traffic volumes. Although the limit case might not be realistic nevertheless this proves the target potential for intermodality.

In the next table the PORTPRINT model provides an estimate by 2020 of inland rail traffic to ports in TK for the reference scenario "flux Acquis". This projection is 82 billions TK as compared to 92 billions TK for road and 249 billions TK for feeder traffic. The fairly high feeder volume is explained by the fact that most Mediterranean and Northern Range hubs generate an important volume of feeder traffic sometimes over long distances.

In the **NEWOPERA** scenario one can expect that the intra EU rail volume will more than double to reach 169 billions TK. These new volumes of 86 billions TK are taken from road and from feeders.

The tables show:

- The importance of rail traffic increase in the **NEWOPERA** scenario
- The attraction of the **NEWOPERA** network which concentrates most of modal shifts from road and from feeders. Modal shift 80 to 90%
- The importance of **NEWOPERA** rail freight dedicated network for modal shift in EU member countries. This demonstrates the relevance of such rail freight dedicated approach in the TEN-T network implementation. In 2020 with **NEWOPERA** scenario, 42% of trade between EU member countries as compared to 26% in the reference scenario would be transported by rail as compared to 57% by road[4]
- Rail freight assumes a dominant position in continental containers transportation compared to road but also to feeders.

- Fig. 146: Extra EU Traffic Flows In 2020

In millions

	Tk global rail	Tk New opera	Tk route	Tk feeder
Reference 2020 (acquis)	82 096	59 069	92 636	249 654
Scenario 2020	168 680	139 190	53 797	162 001
Differential	86 584	80 122	-38 839	-87 653

TOTAL FLOWS 2020 international - In millions

	Tk global rail	Tk New opera	Tk route	Tk feeder
Reference 2020 (acquis without caligrating)	269 816	203 632	1 461 866	249 654
Scenario 2020	488 980	422 291	2 777 217	162 001
Gain / loss	**219 164**	**218 660**	**1 315 351**	**-87 653**

[4] Excluding here IWW contribution.

TOTAL FLOWS 2020 - In millions

	Tk global rail	Tk New opera	Tk route	Tk feeder
Reference 2020 (acquis without caligrating)	497 799	321 403	1 582 326	249 654
Scenario 2020	731 535	563 149	1 423 027	162 001
Gain / loss	**233 736**	**241 747**	**-159 299**	**-87 653**

Returning to the Madrid-Berlin corridor the same approach has been adopted.

Fig. 147: Flow" Flux Acquis" Madrid-Berlin

RAIL TRAFFIC PROJECTION 2020 INTRA EU : « flux acquis »

TOTAL in millions

Countries	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)
Reference 2020	63 389	25 058	36 844	32 515	56 713
Scenario 2020	71 588	29 087	43 117	38 958	66 922
Differential	8 198	4 030	6 273	6 443	10 209

INTERNATIONAL

Countries	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)
Reference 2020	30 428	24 373	19 780	25 490	37 424
Scenario 2020	34 378	23 008	27 815	30 774	42 740
Differential	3 949	-1 365	8 035	5 284	5 316

NATIONAL

Countries	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)
Reference 2020	32 961	685	17 063	7 025	19 289
Scenario 2020	37 210	6 080	15 301	8 184	24 182
Differential	4 249	5 395	-1 762	1 159	4 893

Fig. 148: Traffic Transfer from Road 2020 Madrid-Berlin Corridor

TOTAL in millions

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	922	417	703	498	1 311	313	1 123
Scenario 2020	36 133	28 926	30 844	43 292	49 003	40 661	45 085
Differential	**35 211**	**28 510**	**30 141**	**42 794**	**47 692**	**40 347**	**43 962**
Scenario 2020 + direct relation	47 321	38 312	41 179	54 408	62 645	52 374	58 314
Scenario 2020 + complete Interconnection	84 048	53 636	60 433	105 428	71 820	81 996	94 454

INTERNATIONAL

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	887	417	703	498	1 311	313	1 123
Scenario 2020	34 363	28 916	30 804	43 276	48 943	40 661	45 085
Differential	**33 477**	**28 499**	**30 102**	**42 778**	**47 632**	**40 347**	**43 962**
Scenario 2020 + direct relation	43 055	36 991	39 254	52 870	59 943	52 374	58 314
Scenario 2020 + complete Interconnection	80 224	50 923	56 324	98 440	63 352	81 996	94 454

NATIONAL

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	35	0	0	0	0	313	1 123
Scenario 2020	1 769	11	39	16	60	40 661	45 085
Differential	**1 734**	**11**	**39**	**16**	**60**	**40 347**	**43 962**
Scenario 2020 + direct relation	4 266	1 322	1 925	1 537	2 702	52 374	58 314
Scenario 2020 + complete Interconnection	3 825	2 713	4 109	6 988	8 468	81 996	94 454

Fig. 149: Extra EU Traffic Flows in 2020 Madrid-Berlin Corridor

TOTAL in millions

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	922	417	703	498	1 311	313	1 123
Scenario 2020	36 133	28 926	30 844	43 292	49 003	40 661	45 085
Differential	**35 211**	**28 510**	**30 141**	**42 794**	**47 692**	**40 347**	**43 962**
Scenario 2020 + direct relation	47 321	38 312	41 179	54 408	62 645	52 374	58 314
Scenario 2020 + complete Interconnection	84 048	53 636	60 433	105 428	71 820	81 996	94 454

INTERNATIONAL

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	887	417	703	498	1 311	313	1 123
Scenario 2020	34 363	28 916	30 804	43 276	48 943	40 661	45 085
Differential	**33 477**	**28 499**	**30 102**	**42 778**	**47 632**	**40 347**	**43 962**

Scenario 2020 + direct relation	43 055	36 991	39 254	52 870	59 943	52 374	58 314
Scenario 2020 + complete Interconnection	80 224	50 923	56 324	98 440	63 352	81 996	94 454

NATIONAL

	Tk rail on corridor (at least 1Km)	Tk 500 rail on corridor	Tk 300 rail on corridor	Tk 500 km (OD)	Tk 300 km (OD)	Tk 500 km (OD) route	Tk 300 km (OD) route
Reference 2020 (calibration)	35	0	0	0	0	313	1 123
Scenario 2020	1 769	11	39	16	60	40 661	45 085
Differential	**1 734**	**11**	**39**	**16**	**60**	**40 347**	**43 962**
Scenario 2020 + direct relation	4 266	1 322	1 925	1 537	2 702	52 374	58 314
Scenario 2020 + complete Interconnection	3 825	2 713	4 109	6 988	8 468	81 996	94 454

These scenarios have been detailed at country level and by sections along the corridor. In the reference scenario the traffic volume in Spain is much lower than in France 4.3 billions TK compared to 15.5 billions TK or to Germany 45.5 billions TK. For the "flux Acquis" with **NEWOPERA** scenario these orders of magnitude do not change very much except that there is more concentration of traffic in each country along the corridor. This is happening more in France than in Germany where alternative corridors exist in the **NEWOPERA** freight network.

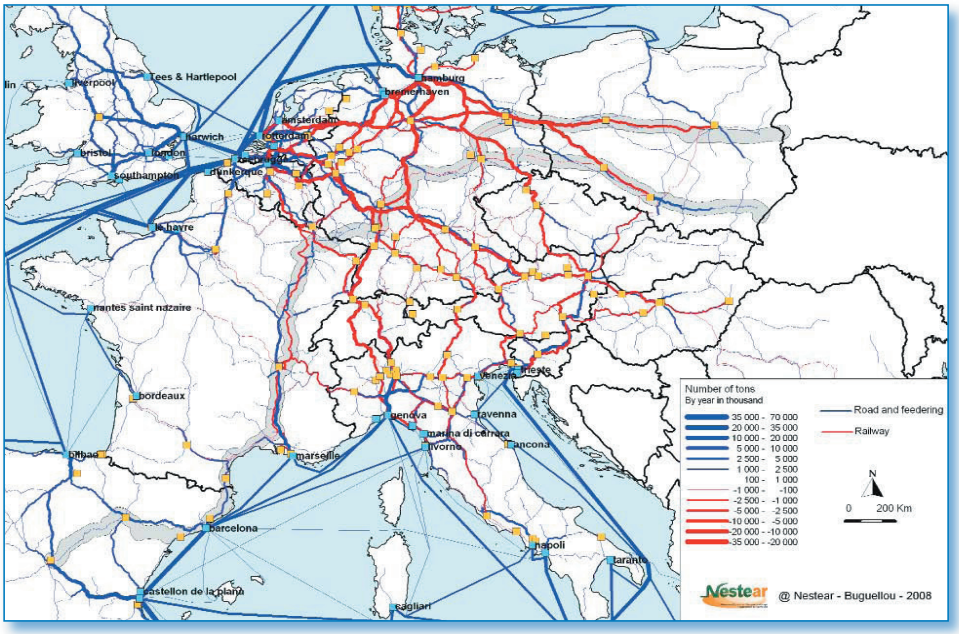
Analysing the traffic transfer from road to rail in the **NEWOPERA** scenario this transfer appears also to be relatively much more important in France than in Spain or Germany.

- Between 31% and 59% in Germany according to the distance along the corridor
- Between 80% and 153% in France according to the distance along the corridor
- Between 58% and 120% in Spain according to the distance along the corridor.

The extra EU traffic also impacts the corridor in Spain for the **NEWOPERA** scenario as well as in France. There is much lower impact in Germany where this corridor is not really oriented towards Northern Range ports.

The next map illustrate the Madrid-Berlin corridor.

Fig. 150: Map- Extra EU Traffic Flows in 2020 "Reference Scenario"



An economic evaluation of the **NEWOPERA** project has been made. Work Package 3 developed a traffic demand assignment model and recommended a **NEWOPERA** rail freight dedicated Network. This traffic assignment model has been utilized to assess the total traffic volumes to be accommodated by the **NEWOPERA** Network in 2020. For the purpose of the economic evaluation of the **NEWOPERA** Project, the following figures have been extracted:

- Total intra EU rail traffic in 2020 — 415 billions ton/km
- Intra EU rail traffic on the NewOpera Network — 262 billions ton/km
- Extra EU rail traffic on the NewOpera Network — 59 billions ton/km
- Total road traffic in Europe — 1,489 billions ton/km
- Intra EU traffic "modal shift Road to Rail" — 137 billions ton/km
- Extra EU traffic "modal shift Road to Rail" — 40 billions ton/km

The traffic diverted from road to rail would basically refer to intermodal traffic. Full train transport being considered.

Advantages related to the proposed scenario execution would include:

- Productivity gains for traffic carried by the **NEWOPERA** Network estimated roughly at 15% of the average marginal operating costs
- Economic advantage of keeping on rail the traffic which would otherwise be shifted to road.

In year 2020, these two advantages would be:

- For productivity gains 262+59 billions x 0.15x2.24 cent= € 1.08 billions(€ 2,24 per TK rail freight marginal costs calculated by RFF)
- For modal shift from road to rail 137+40billions x 3.81+1.44+6.25–3.93 –0.34 cent = € 12.80 billions (Road Costs by C. Nat. Routier+ Road Ext. Costs by TREMOVE+ Road Cap. Adaptation costs – Rail Cap. Adaptation – Rail Ext costs)

In order to get reference figures before and after 2020 these advantages have been geometrically interpolated before 2020 and increased every year by 3.5 % thereafter.

The following table provides the yearly advantages expected from the **NEWOPERA** Project every five years over a 25 years period and their discounted value using an opportunity cost of capital of 5%.

- Fig. 151: Expected **NEWOPERA** Advantages

Year	2005	2010	2015	2020	2025	2030
Total advantages in € billions	0	2.40	5.76	13.88	16.48	19.60
Discount factor with an OCC of 5%	1.0000	0.78353	0.61392	0.48102	0.37690	0.29531
Discounted advantages in € billions	0	1.88	3.54	6.68	6.21	5.79

Total discounted value in 2005 of the economic advantages over a 25 years period is thus roughly € 106 billions. In other words, the **NEWOPERA** project justifies by itself that € 106 billions are spent immediately on its proposed network. If this investment cost is spread over a ten years period it would be equivalent when discounted to €121 billions in constant 2008 money to be spent on the whole **NEWOPERA** network.

It should be reminded that the above assessment of the socio-economic **NEWOPERA** project return has been done only to get an order of magnitude of the infrastructure investments which would be justified for the project implementation.

When reviewing in detail all the investments and actions to be carried out at first on specific corridors and later on the whole **NEWOPERA** network one should keep in mind that many investments so far envisaged actually concern not only freight transport but also passengers transport. The above figure given as order of magnitude should be understood only as the amount to be legitimately charged to rail freight transportation.

The net present value are calculated and presented via a stakeholders/effects matrix (SE Matrix). The SE Matrix is actually the main novelty of RAILPAG. It aims at providing, for large and complex projects a thorough and clear analysis of its distributional effects. The distributional issues are particularly interesting for grant providers or other stakeholders who might be asked to contribute to the investment costs.

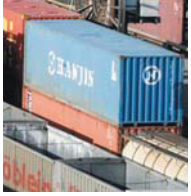


Fig. 152: Stakeholders Matrix for the **NEWOPERA** Network (Result IRR 5,3%)

	Road to rail shipper	Road operators	Rail oper.	Rail manager	New Opera investments contibutors	Non users	ECONOMIC VALUE (millions €)
Users							
Change in transport costs	37 488,4						37 488,4
Additional revenues			100 202,7				100 202,7
OPERATION							
Track charges			-35 315,2	35 315,2			0,0
Additional operating costs			-55 778,2				-55 778,2
Change in benefit		-6 612,8					-6 612,8
ASSETS							
Infrastructure					-43 000,0		-43 000,0
Infrastructure maintenance				-35 315,2			-35 315,2
Safety						2 822,6	2 822,6
Green house effect gaz emissions						1 282,6	1 282,6
Air pollution							
Climatic change							
ECONOMIC PROFITABILITY	**37 488,4**	**-6 612,8**	**9 109,3**	**0,0**	**-43 000,0**	**4 105,2**	**1 090,2**

Therefore the result about the net present value of the investment which is presented above is a consequence of a number of assumptions and should simply be taken as such. It cannot be taken at this stage of the analysis as a recommendation. It is important also to notice that the global amount of the economically justifiable investment calculated with the Railpag method can differ from the one which has been calculated with the discounted approach. Railpag is based on an analysis in terms of estimated benefits and costs. The assessment of transport marginal costs is rather an analysis in terms of opportunity cost.

Fig. 153: Stakeholders Matrix for Madrid-Berlin Corridor (Result IRR 5,5%)

	Road to rail shipper	Road operators	Rail oper.	Rail manager	New Opera investments contibutors	Non users	ECONOMIC VALUE (millions €)
Users							
Change in transport costs	12 251,8						12 251,8
Additional revenues			23 790,9				23 790,9
OPERATION							
Track charges			-7 655,4	7 655,4			0,0
Additional operating costs			-13 972,7				-13 972,7
Change in benefit		-2 161,2					-2 161,2
ASSETS							
Infrastructure					-13 000,0		-13 000,0
Infrastructure maintenance				-7 655,4			-7 655,4
Safety						922,5	922,5
Green house effect gaz emissions						514,8	514,8
Air pollution							0,0
Climatic change							0,0
ECONOMIC PROFITABILITY	**12 251,8**	**-2 161,2**	**2 162,8**	**0,0**	**-13 000,0**	**1 437,2**	**690,7**

The above tables show that for the **NEWOPERA** network considering an investment amount of € 43 billions the project is economically justifiable. The benefits/ loss sharing among the stakeholders are shown. For the Madrid-Berlin corridor considering an investment amount of € 13 billions the project is economically justifiable. The benefits/ loss sharing among the stakeholders are also shown.

For the Madrid-Berlin corridor it should also be noticed that the traffic gain sharing by country in tons-km is the following.

Fig. 154: Madrid-Berlin Corridor Traffic Gain Sharing

Cuntry	Total million tk	Part of the tk
DE	1 286,4	4%
FR	15 068,0	47%
GM	7 871,8	25%
PL	5 547,4	17%
SP	2 264,9	7%
TOTAL	**32 038,5**	**100%**

Source: NESTEAR

NEWOPERA D5.3 assesses a mix of chosen actions theoretically aiming at increasing the rail market share. Some of them may appear unrealistic and may have to be adapted taking into consideration existing programmes such as ERTMS implementation. It shall be recalled here that **NEWOPERA** does not aim at assessing a "what is already planned" scenario compared to a "do nothing" scenario but testing other possibilities compared to a reference scenario. A right compromise must be chosen between ambition and realism for practical implementation.

- Fig. 155: Modal Shift to Rail

TOTAL FLOWS 2020

In millions

	Million tk global rail	Million tk New Opera network	Million tk route	Million tk feeder
Reference 2020 (acquis without calibrating)	497 799	321 403	1 582 326	249 654
New Opera Scenario 2020	731 535	563 149	1 423 027	162 001
Gain / loss	**233 736**	**241 747**	**-159 299**	**-87 653**

The overall context remains favourable towards a significant modal shift to rail.

6.5.4 Implementation plan

At **NEWOPERA** project preparation this title appeared to be very ambitious indeed and it represented at that time a "wishful thinking" After nearly four years of research approaching the project conclusion, it has become more realistic to foresee the **NEWOPERA** Implementation Plan being realised by 2020.

One would like to think that the **NEWOPERA** project has been instrumental for a new rail freight service culture appearing in Europe, but in any case thanks to the European Commission's drive for changes, the rail freight situation appears now to be making substantial progress compared to the recent past.

Market conditions and general public opinion have never been so favourable towards rail freight and the opportunities must be seized for making the necessary investments and bringing about the changes that are needed.

In order to tackle the task of imagining a **NEWOPERA** Implementation plan at Pan European level one could choose from two options:

- Indicate a number of theoretical actions to be undertaken. These actions and investments however could not be substantiated by events. The individual Governments have different priorities and despite the progress made they are guided by national interests. The Institutional European guiding activities from the EU Commission are not yet sufficient by their own to channel decisions without the Countries involved. The EU funds that can be made available for Infrastructure Pan European projects represent an important incentive but they are insufficient to cope with the pace intensity that would be necessary. The corridors constituting the **NEWOPERA** rail freight dedicated network are still an empirical entity where local budget constraints constitute an hindrance for removing bottlenecks and achieving seamless rail

freight transport mobility. Then the Political dimension comes into play with different visions which are imagined in each country according to the political party in power. Rail freight free traffic movement is something to be conquered with a continuous activity during every single day.

- Indicate a number of concrete decisions and actions that have already been taken or are about to be taken. These decisions and actions by member States go indeed towards the **NEWOPERA** direction for the rail freight dedicated network' implementation. They might appear to be incomplete for achieving within the desired time horizon 2020 the **NEWOPERA** rail freight dedicated network but at least they reinforce the awareness and need of progressively building it up. Moreover they can increase their momentum if public opinion, the electorate, the leaders, the Academia , the individual Governments perceive the urgency of doing rather than talking. The common place that the "passengers vote" and the "freight does not" is being overtaken by events in some countries where recent elections have taken place. Citizens have suddenly changed the "ideological political camp" to elect representatives that were more capable of transmitting the culture of taking decisions for making Society going forward rather than backwards.

The second option has been chosen for pragmatic and practical reasons. This option is also reinforced by the high speed service' success for passengers which is eroding the medium distance airlines market. This service, so effective and popular, is becoming the passengers' natural choice both in alternative to air and road modalities. The recent increase in fuel costs has de facto forced airlines to close medium distance links because of their impossibility to compete. Would this scenario have been imaginable 30 years ago when the first TGV trains started to operate? There is no contrary indication for rail freight to reproduce this situation.

The socio economic sustainability calculation has demonstrated that a figure of € 120 billions in **NEWOPERA** infrastructure investments could be sustainable. What is described in the following pages for **NEWOPERA** rail freight dedicated network implementation represents a much inferior order of magnitude. This means that there is ample space of manoeuvre for European Institutions, Governments and decision makers. The RAILPAG approach produced a figure of € 43 billions delivering positive economical returns.

At Institutional levels a lot of facilitating measures have been adopted. The Rail packages 1,2 and 3 have effectively opened the market to competition. ERA for achieving the EU Commission interoperability objectives and RNE for offering the OSS rail trains paths to an open market, are important structures pointing in the right direction. The EU Commission ERTMS implementation project is a considerable motor for Rail technological innovation providing in the not to distant future increased rail freight capacity. On rail freight infrastructures a lot of actions are in progress:

GENOA – ROTTERDAM corridor horizon 2020

- DB NETZ. Basel-Mannheim freight dedicated line will be completed in various stages in 2013-2015-2017-2020. In particular the 4 rail tracking' line Offenburg- Basel is well in progress and the first segment is set to be ready by 2013.
- Switzerland. There are two alternatives: 1)Loetchberg/Simplon/Luino/Busto Arsizio/Novara. The Loetchberg has effectively entered operations in 2007 providing considerable additional capacity to this corridor. Works are in progress also between Domodossola and Milano

scheduled for completion in 2010. However this line will be hampered by gradients and curves in the segment Iselle di Tasquera –Domodossola. 2)Gothard base tunnel scheduled for completion in 2017 running one year late for geological reasons, will secure access to Chiasso.

- Switzerland. Monte Ceneri Tunnel will complete works in 2019 providing direct access via Switzerland to Milano.
- Switzerland. The doubling of the railway bridge on the Rhine in Basel, scheduled to open in December 2010, will remove a major bottleneck on this very congested route by reserving two tracks to freight.
- Italy. Genoa/Milan third rail tunnel necessary to complete the corridor is still under debate. Genoa port and Liguria Region are pushing very hard for this decision to be taken. Local private entrepreneurs have challenged RFI to build it on 50 years concession and to complete it by 2016.
- Italy. By 2017 the whole Milano – Novara -Torino region via Luino will be cleared for gauge "C" and ETCS. The same situation will be reproduced in 2019 when the Monte Ceneri Tunnel will be opened to traffic delivering the same characteristics via Chiasso with maximum gradient 14%°.
- Italy. The Milano – Como expansion program to 4 tracks for making it aligned with Como – Chiasso existing 4 tracks, is still in abeyance due to Italy budget problems. This project is part of an Italy/ Germany/Switzerland agreement for enhancing capacity in line with the new Gothard Tunnel traffic's objectives.

When all the above investments are completed huge rail freight capacity is achieved along the whole corridor, reducing distance, and transit times with ETCS system in place. Other administrative bureaucratic and technical barriers will have to be eliminated increasing the investments' productivity. These barriers have been described at length in this document.

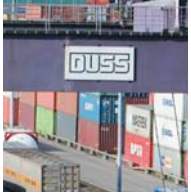
BETUWE LINE

- The Betuwe Line is indeed the only rail freight dedicated line in Europe.It was opened to traffic in 2007 between Rotterdam and Zevenaar at the Dutch - German border. The rail traffic is increasing at a steady pace relieving the Port of Rotterdam congestion, penetrating inland.
- Germany. The 3rd rail track between Emmerich and Oberhausen is scheduled to be completed by DB NETZ in 2015 allowing the Betuwe line to access directly the RUHR area. At the same time conversion to AC current is being programmed.

ERTMS level 3 is planned on this line.

THE PALERMO BERLIN CORRIDOR

- Italy. The Rail BRENNER TUNNEL. The budget for drilling the exploratory tunnel has been provided and the drilling site has been officially opened in the last few months. There is a lot of support by local communities in favour of it. Local communities are worried that road traffic congestion might be inducing authorities to tempt the motorway expansion which is an impossible task being the valley too narrow. Rail is being preferred to road modality in an already very congested road traffic situation. However final decision will not be taken for some time yet despite general feelings are positive
- Italy. This new Rail Brenner tunnel will serve the expected increased traffic along the South – North direction and VV. The new high speed passengers lines will be opened from Naples-



Rome- Florence- Bologna up to Milano in 2008. This is bound to relive traffic on the existing rail tracks. However the crossing of nodal points such as Naples – Rome and Florence will continue to represent bottlenecks. The alternative is the use of the Adriatic Line up to Bologna which is far less congested thus capturing by rail both the Gioia Tauro and the Taranto ports' traffics. The doubling of the Bologna – Verona rail track will be opened to traffic also in 2008 removing a very big bottleneck. This de bottlenecking via Bologna – Verona is serving the North corridor via Austria and Germany as well as the East corridor 5 towards Kiev.

The " LISBON – BARCELONA - LYON – TURIN – KIEV

- Italy. The work for the Mont Cenis Tunnel are restarting following the new Government formation. Public opinion shifted from negative to positive following the extremists' disappearance from the Italian Parliament which were very active in torpedoing this project. The original tunnel's exit on the Italian side has been changed lengthening the tunnel but this modification contributed to shift local moods. This is an Italian Government priority.
- France. The French are more advanced on the above Tunnel having drilled 3 exploratory bores. This project has been declared of public utility in France. However budget constraints are hanging over. One has to understand that this tunnel will be linked to 3 additional projects on the French territory. One is the Lyon rail freight line bypassing the city's congested area. The second one is the Lyon – Chambery line and the third is the Chartreuse Tunnel. These additional investments are necessary to saturate the huge capacity the new Tunnel will be generating. The above planned work are also inserted in the segment of the Madrid – Berlin-Warsaw corridor allowing the Lyon bypass.

The " LISBON –MADRID - BARCELONA - LYON – BERLIN –WARSAW corridor

This is an integrating corridor for Europe. Moreover it provides the Iberian Peninsula its much needed rail access to central Europe. Investments on this corridor for an order of magnitude of € 13 billions is proven to be immediately sustainable. Task 5.4 proved that with such an investment this corridor could be debottlenecked for freight trains.

THE ANTWERP – BASEL

- France. Only minimal physical investments are planned in France apart from ERTMS as part of corridor C. However a double secondary line has been identified suitable for upgrading which would also relieves the Metz-Strasbourg passenger line. This secondary line upgrading would consist of covering a 70 Km electrification gap. However this upgrading is not judged at the moment to be a priority despite this solution would be welcomed by InfraBel whose lines are constrained because of difficulties in France.

THE PORTS AND INLAND TERMINALS

A lot of activity is being undertaken in many European ports both North and Mediterranean. Internal ports railway networks are being upgraded in order to cope with the enormous increase in maritime intermodal traffic. This particular dimension has been addressed in great detail in WP 4. In addition one has to mention that a new drive has been adopted in several European Countries for moving rail containers inland in an industrial way by rail. To this effect new Inland DRY PORTS or MEGA HUBS have been planned. This is one of the major **NEWOPERA** pillars, since

the DRY PORTS or MEGA HUBS are indeed the integrating rail freight dedicated network tools. Likewise the Inland terminals and Freight Villages are fundamental for the EU continental intermodal traffic. Their geographical location in a borderless union must be also coherent with the traffic zone generation model. Their open access is a fundamental prerequisite.

LONGER AND HEAVIER TRAINS – ROLLING STOCK AND TECHNOLOGY

It has now been recognised that longer and heavier trains up to 1500 meters is a viable operating proposal for increasing rail corridors' capacity. Specific studies have reinforced this **NEWOPERA** project approach. This is the only way of increasing carrying capacity waiting for the necessary infrastructure investments. Although this option needs itself investments in longer sidings, technology and rolling stock it is easier to be realized in the short - medium term.

ERTMS

This is a Common European project which is being led by the EU Commission itself. So nothing more will be added other than it reinforces the need for achieving Interoperability on the **NEWOPERA** rail freight dedicated network. This despite the **NEWOPERA** assigned network includes additional lines over the ERTMS declared corridors.

THE LANDBRIDGE CONNECTIONS WITH THE EAST AND CHINA

There are two Land bridges which are already in operation. One across Russia using the Transiberian line via the Chinese transit points of either Suifenhe or Erenhot. The other across Kasachstan via the Druzba Chinese transit point. VR Finland have been regularly operating intermodal trains for years via the Transiberian facilitated by the same rail gauge. Now DB of Germany in 2008 has successfully managed operating a train service called the " Beijing- Hamburg containers express" with a 15 days transit time. This proves another key **NEWOPERA** pillar demonstrating that these two land bridges have a viable commercial future. When the first **NEWOPERA** network " concept" was published back in 2005 with these two Eastwards land bridges some argued with skepticism. Now market needs and "better use of available infrastructure" have transformed a "vision" into reality.

When **NEWOPERA** is being described as a "Visionary" Project this attribution is taken by the **NEWOPERA** partners as a very positive compliment. Visions are instrumental for generating Implementation Plans. Without visions no innovative implementation plans are possible. This is confirmed by a banner welcoming passengers at the Brussels airport. Man must be allowed to have visions. Without them there will be no progress……..! **NEWOPERA** project financed by the European Commission under the FP6 program, is finished.

Long live **NEWOPERA**. The **Rail Freight Dedicated Network** for Europe.

6.6 WP 6 DISSEMINATION, COOPERATION, EVALUATION

6.6.1 Tools for Dissemination

The dissemination activities have been very intense in the **NEWOPERA** project development and conclusion. In addition to the 5 **NEWOPERA** European wide events organised at month 6, 12, 24, 36 and 45 four newsletters were issued both on paper and were disseminated also through the web. These newsletters updated everyone on the project progress, innovations and discoveries. Press releases after each event were issued with articles appearing on the international specialised press as a result. The www.newopera.org website proved to be a very effective tool for dissemination as well as an internal mean of communication between the partners who had the privilege to access the private area. The cooperation with other European funded projects proved to be a good vehicle of dissemination through the mutual supporting activities. In addition every **NEWOPERA** partner contributed significantly by multiplying the disseminating efforts through its own business environment.

However all the above would not have been sufficient to explain the success the **NEWOPERA** project enjoyed in all European corners. Both the acronym name and a very innovative colourful logo proved to be excellent marketing and image building instruments. They caught the imagination of many freight people who perceived **NEWOPERA** as a motor for changing the European rail freight economy.

NEWOPERA representatives were invited as keynote speakers practically in every rail freight conference taking place in Europe in the last 4 years. These were indeed very many with the following countries involved, some of them, several times: Italy, Spain, Portugal, France, Belgium, UK, Germany, The Netherlands, Switzerland, Austria, Hungary, Poland, Russia, Bulgaria, Ireland, Luxemburg, Finland etc. Another good dissemination practice was identified in joining efforts with other rail freight and logistics associations. Many associations such as F&L, EIA, UIRR, EIM, ERFA, UIP, FLC, CER, UIC, ERFCP, House of Rail, RFG, ERC, ECR, ECTA, EUROPLATFORMS cooperated in the events' organisation together with UNIFE in charge of **NEWOPERA** disseminating activities.

6.6.2 Cooperation

Under the framework of Task 6.2 cooperation an agreement was signed with TREND regarding the sharing of information in order to avoid work duplications. At the same time during the development of such cooperation agreement it was discovered that cooperation could in fact embrace a lot of other subjects directly or indirectly connected with both **NEWOPERA** and TREND projects. REORIENT project was also approached but due to their own reasons they elected not to participate. The fields of common interest were discovered to be:

- Improved services in terminals
- Efficient interfaces between transport modes
- Continental shipping
- New generation of European Freight trains
- Co-modal IT transport solutions
- Green corridors
- Innovation process in surface transport
- Policy packages and best practices for transport

- Sustainability effects of new logistics
- Transport forecasting and globalization

This cooperation agreement was found to be of value for existing EU project managers. it allowed them to focus on European problem solving and to share experiences on work practices along different corridors. Moreover the cooperation created a network of data and transport experts facilitating the research process as well as the sharing of any innovation.

Besides this cooperation with TREND, **NEWOPERA** managed to achieve a high degree of acceptability in terms of its project innovations, discoveries and strategic approach from the European rail establishment. CER and UIC cooperated actively with **NEWOPERA** having perceived that its market driven approach was instrumental to rail freight rejuvenation and to the creation of a new rail freight economy. Such economy must be open to competition and must rely on a new marketing approach from the incumbents. Particular appreciation has been received by **NEWOPERA** from EIM, ERFA, UIRR, UIP, Rail Freight Group, FERRMED and many others.

In particular with UIC a cooperation agreement for accessing each other documents and discoveries has been signed in the common interests and for improving data consistency of both ERIM and DIOMIS. Another agreement although not written is existing between **NEWOPERA** and INTEGRAIL.

NEWOPERA having appreciated the advantages of such a cooperation not only with TREND but also with other projects, pursued this policy of seeking to cooperate with whoever is interested in improving rail freight mobility.

7. EVALUATIONS AND RECOMMENDATIONS

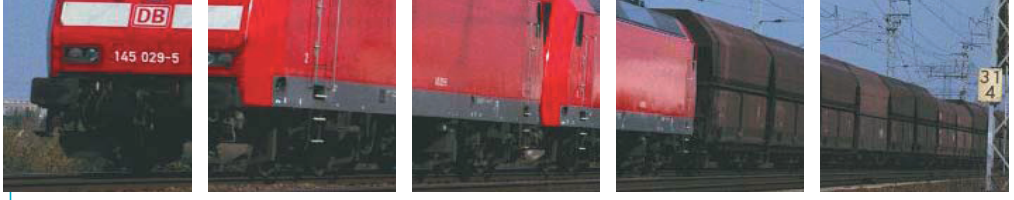
This Report wanted to highlight the market variables , the topics, the facts the figures, the technologies, the networks, the products, the marketing, the actors, the socio economic and environmental aspects, researched under the various **NEWOPERA** work packages and tasks. These were very many and despite some aspects might have been developed more than others new possibilities have been studied for the first time introducing in the European freight mobility debate additional elements of evaluation. The market players key actors in the **NEWOPERA** project, managed through their work to send their messages to the EU Institutions, Governments and decision makers. These simple facts are themselves quite an achievement.

Drawing towards the project end, **NEWOPERA** had to make one of two choices having an impact on future European economic scenario:

1. Consider a purist very long term approach of building a new "Rail freight dedicated network " which in this case would be exclusive
2. Consider a more pragmatic realistic approach based on market and economic evaluations applied to European Rail freight traffic corridors.

The choice made by **NEWOPERA** was the second one for the following reasons:

- The first choice which appeared to be the most appealing for achieving the separation of traffic between passengers and freight, implies huge investments whose order of magnitude would not be standing up on "pure freight economical basis". Other studies had already been completed quantifying the investments order of magnitude. Another one was not necessary. This approach appeared not coherent with the existing European Economic climate. However if one could take into consideration other dimensions like, environment, emissions, climate change, safety, security, quality of life, loss of productivity due to road congestion, and structural inadequate capacity of surface network, such option should not be either discarded or discouraged. In fact from the socio-economic evaluation a figure of € 120 billions emerged as being economically viable.
- However the above evaluations being outside the market variables did not belong to the market actors, but rather belong to Politicians, EU Institutions, and Governments. Projects such as **NEWOPERA** must however supply all the elements for helping decision makers taking the correct decisions. The **IF NOT** option must also be incorporated into this evaluation process. The figure indicated in the previous paragraph is certainly above the expected result at the **NEWOPERA** Project start. This stands to indicate a very high level of **NEWOPERA** sustainability.
- The market actors could only apply the economic concept and the **NEWOPERA** scenario evolution to specific corridors, making the necessary investments in infrastructure, bottlenecks, bypasses, technology, rolling stock, longer heavier trains etc in order to increase productivity, generate additional capacity to be dedicated to freight.
- This satisfied one basic premise of the **NEWOPERA** project proposal which indicated the upgrading of old or unused rail lines as available resources to be exploited.
- Another principle which needed immediate response was "to make the best use of the available infrastructures" to be associated with the market requirement of extracting additional capacity as from **NOW** for satisfying the growing European freight mobility demand.
- The progressive introduction into service of the new High Speed Lines in several European member States will liberate capacity on existing rail tracks. The undertaking of initiatives and



investments for maximising such capacity with freight windows appeared to be a concrete market friendly and competitive option.

After having made such evaluations a set of recommendations emerged from this long **NEWOPERA** project research.

Market Trends and Customers Requirements.

- Breaks in World Commercial Trends since year 2000, industries relocation and the EU enlarging towards the East generated huge traffic increases in Europe which were not planned. Surface transportation has severe difficulties in coping with this new traffic wave.
- Practical experience is indicating that weight/volumes exchanges increase more than value due to the multi phases transportation facets. Such phases originate from manufacturing products components in different countries/continents. The next operation is assembling them for obtaining the final products nearer to final market distribution. Packaging to be effected in the final stages. Such process involves both technology and industrial products as well as textiles, consumer domestics, and durables.
- According to these applied practices it has been calculated that transportation needs are growing between 2 and 3 times the annual GDP. This gives the measure of the freight mobility demand Europe will be facing in future. This trend is going in the opposite way it was forecasted only few year back according to the "decoupling" philosophy.
- Longer, complex and more sophisticated customers supply chains together with the adoption of new logistics concepts are the service requirements' driving forces. The triangle Cost – Service – Quality becomes a pre requisite in the decision making. Rail freight does not appear to figure in this competitive game.
- Future supply chains trends and evolutions are researched and studied evidencing an old Rail service structure totally inadequate for responding to these new market challenges. Best practices, benchmarking, continuous improvements, total chain control, inventory management, transport management, event management, planning processes, customers satisfaction, OSS, track and trace for cargo on transit, ICT connectivity, real time response, quality etc are only some of the service answers not being made available by the rail freight industry. Other actors are filling these service gaps.
- Supply chains become global. New technological logistics platforms, infomediaries, virtual networking, information data exchanges, outsourcers, 3RD/4TH party logistics, forwarding agents with world coverage, integrators, consolidators etc, become key actors in the shippers supply chain. Rail freight must be capable of interfacing them with modern and advanced service performances.
- Following the Introduction in the EU of the Rail Packages 1, 2 and 3 with the progressive EU Rail space opening to competition, New Rail Traction companies and Rail Freight operators appeared on the market. Their business plans are targeted to satisfying specific market needs. Their operating structures are agile, flexible and efficient. The comparison with incumbents is made and the difference in strategy is evidenced. These new rail freight actors and traction companies conquered 7% of EU 25 market share with a maximum peak in Sweden of 21%. Effective competition and true market alternatives are materialising in Europe.
- The **NEWOPERA** project objective was conceived for increasing rail market share creating the conditions for modal shift. By migrating these mobility needs in 2020 it has become clear that

investments in rail infrastructures are necessary. Trains have been counted. The result is a number of 250.000 for intermodal trains. The conventional trains number reached an order of magnitude of 1.5 million. Should the EU White Paper objective of 16% rail market share to be reached by 2020, this means that capacity must be made available for operating 1.000.000 intermodal trains and 6.000.000 conventional trains in the existing profile. Should trains become longer and heavier this number to be reduced accordingly.

New Operating and Technical Systems/Aspects

- The impossibility of providing by 2020 the above rail freight capacity forced the recommendation of considering the other only option of longer and heavier trains. Longer trains do not impact negatively on rail tracks productivity which means that theoretically doubling the train length the rail line productivity increases by the same quantity. The axle weight increase must be achieved at the same time to take full advantage of the expected benefits. However this increase capacity is achievable only through investments in longer parking yards, longer overtaking sidings, new breaking/communication signalling technologies, rolling stock, automatic coupling and more powerful electric substations just to mention the most important chapters.
- The double stack option should be considered for any new rail lines being planned or built together with new tunnels. Such option appeared to be most relevant wherever shuttle trains operations are implemented for port decongestion transferring CTS traffic from ports to inland dry ports.
- The old dilemma of choosing between electric vs. diesel traction moved in favour of electricity. This is due to technology evolution allowing multi current locomotives, environmental considerations and power made available by renewable sources. Diesel traction is still very important for covering electrification gaps and manoeuvring flexibilities. Diesel traction allows greater flexibility to New Entrants. In order to reduce the impact of using fossils fuels, bio-diesel percentages could be increased together with improving the balance in favour of renewable energies.
- Standardised maintenance emerged as a major area for reducing operating costs improving rail line efficiency.
- The adoption of software technologies was recommended particularly for the cross border abatement barriers. Important gaps must be covered to resolve: insufficient cross-border co-ordination, train numbering, tracking/tracing, traffic management and trains priorities. Other gaps exist in empty wagons optimisation still done manually in national management systems not communicating to each other and in the inability to deal with shippers / cargo peculiarities.
- The effective movements of trains on the corridors and their punctuality is moreover hampered by the incumbents inability to calculate expected train's time of arrival. Trains delayed +10 minutes loose their slot. National Infrastructure Managers(IM) find solutions up to their borders. The bordering IMs are unprepared to find short term slots. A train pre-announcing system for international freight does not exist in Europe. In emergency, most control centres have no intelligent tools for deciding trains priorities.
- The adoption of a Decision Support System for dispatchers is recommended for detecting future conflicts and resolving them. This system could be based on two methodologies: optimization and rule based methods. A capacity assessment was made on the showcase corridor Béning – Ludwigshafen. This exercise showed that the capacity of a railway line is indeed heavily influenced by the train control system and delays.

- Many operating differences are still existing in each national network. These differences are in fields such as: attribution of train paths, operational, information and corridors management. Contracts between infrastructure managers and railways undertakings and between the latter and their customers should be introduced.
- In order to harmonise these differences, recommendations on operating rules were made. IMs to adopt the regular time-headway scheduling system for increasing corridors capacity. Domestic and international Freight trains should not be discriminated against passenger trains. Priority rules must be the same throughout the Pan-European freight corridors. And above all an independent European body must be set-up on RNE experience. Its role is managing train-paths ensuring consistency/transparency on OSS conditions implementing the principle of "corridor ownership".
- A specific study had been conducted by RWTH University in Aachen relating to the loss of productivity and service quality on a showcase corridor by giving always priority to passengers trains. The result of this simulation was that only by giving slightly higher priority to freight trains accepting marginal delays on passengers trains total system punctuality would be improved significantly. Increasing punctuality means increasing capacity.
- On the Contractual stand point the recommendation is for performance management contracts to be established between IMs and Rail Undertakings. These contracts to be based on KPIs so that penalties must be applied in case of non-performance. Penalties to be borne by the non-performing parties. Hence the necessity to have a corridors management neutral body. This new operating regime to be experienced on one show-case corridor before wider EU implementation.
- New interfaces, roles and responsibilities are appearing both on the demand and supply side. New training module facilities must be created for the personnel involved. The Training Schools must ensure the original and the refreshing of the personnel knowledge.
- The interoperability aspect was covered by ERTMS system. This can be supplied in 3 levels, ETCS 1, 2 and 3 according to the applied level of technology. Level 3 is called also "moving block" since the signalling blocks are no longer fixed by signals. The effect on lines capacity using these technologies are: ETCS 1- Capacity increase 1%, ETCS 2- Capacity increase 16%, ETCS 3- Capacity increase 50%. Although ETCS- 3 is not yet fully operational it is clear that the recommendation make sense using this advanced GSM based system. The cost effectiveness and productivity analysis on ETCS level 3 was made.

Network Perspective

- A demand and supply assessment has been carried out for single wagon traffic, traffic between ports and inland terminals, intermodal traffic. Moreover the space and time variables have been incorporated. The traffic on the European busiest freight corridors was also surveyed. The Intra-EU traffic and the Extra- EU traffic for applying the demand generating model were also considered. The introduction of an extra-EU model is a **NEWOPERA** Innovation. The assignment of traffic on the network is done according to the best routes or "minimal path" including also door to door "Road routes " concepts. This new approach supplements the application of an abstract modal split used so far.
- It was considered that the **NEWOPERA** rail freight network had to satisfy five major requirements judged to be of fundamental importance: a Demand Driven Network; a Service Driven Network; an Operative Network; a Multi-Level Network; an Evolutional Network.

The recommendation here is to consider not only the origin delivery matrix but also the traffic between nodal points and hubs along the corridors and between them.

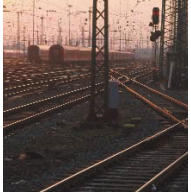
- On the projection and modal split the definition of a generation model with detailed desegregation of traffic flows in 16 types of products and unitized traffic was accomplished. In addition the definition of an assignment model using GIS techniques with its direct application to the European intermodal network was also completed. The short and long term horizons evolutions have been considered. The various type of traffic have been assigned to the network. The percentage traffic increases foreseen from now to 2020 on the various corridors have been established. This traffic increase is enormous.
- The origin Delivery matrix has been produced with the volumes assigned to the various European zones.
- A traffic table per mode and types of products has been produced as supporting evidence.
- According to traffic needs, a European **NEWOPERA** rail freight dedicated network has been assigned composed of several rail corridors, incorporating all ERTMS corridors, as well as strategic hubs/gateways/connections for trains' formation and exchanges.
- The same **NEWOPERA** rail freight dedicated network has been completed with the existing intermodal terminals. This map shows many of these Intermodal terminals being located outside the assigned **NEWOPERA** network. This is the result of local policies where freight mobility had been conceived at national level and not European Level. A borderless Union implies an harmonised and larger vision coherent with European wide interests.
- This **NEWOPERA** rail freight dedicated network has then been inserted into a context of global trade lanes. The traffic to/from the Union has been assigned to the sea ports or traffic points of entry. The ultimate result is a network connected either by rail or by sea to the rest of the World. This map helps to evaluate the network assignment relevance and to make a calculated estimate where problems on the network are likely to materialise in the near future.

New Products Services

- The marketing dimension is an important element for adapting service products to customers needs. These originates from variety of objectives, needs, preferences, perceptions, and behaviours. The value proposition for the service buyers must be researched according to the principle "core service-expected service-augmented service".
- A market survey was conducted on 16 industrial clusters starting from identifying the cargo needs before, during and after transportation. These are likely to dictate most of the customers requirements and behaviours. These clusters are: chemicals, steel, paper, groceries, automotive, building materials, scraps, white/brown goods, sawn logs, coal, furniture, toys/ornaments, beverages, raw materials, general cargo, specialties.
- This research demonstrated that each cluster before, during and after transportation required different approaches. For simplicity reasons the 16 clusters were subsequently grouped in 7 macro families incorporating similar transport and handling techniques. Accepting a level of approximation these macro-families identified a specific market segment which needed service peculiarities. The research proved that the basic mono service/product offered by incumbents is no longer adequate for the market place.
- A graph had been prepared to reproduce " the extended value proposition" where higher transport values are warranted according to the identified segment transport complexity. An additional exercise was carried out on the type of industry populating each market segment

to know whether such industries were small, medium or large. This was also necessary since the size is relevant for the corporate organisation influencing the decision process. A Boston Matrix marketing mix showed the positing of innovative service/product in higher quartiles compared to the basic mono-product.

- The graph demonstrated moreover the inadequacy of the mono-distribution channel. A variety of service/products requires a multi-channel distribution approach.
- Another research was at the same time completed in order to establish the shippers requirements to shift from road to rail. Environment, road congestion, speed and costs were the first element in order of priority in a scale of 9.
- The customers attitude towards rail is open and unbiased. This was the result of a specific market survey. Should rail service and intermodality be cost competitive and of quality comparable to road, rail freight is seen market leader in several market segments such as raw materials, durable goods, steel and chemicals and close second in fast moving consumer goods and furniture. Road would maintain its undisputed leadership in specialities and general cargo. Modal shift is therefore a realistic option and not a theoretical one.
- Specifically on intermodality the research revealed that when service level and cost competitiveness are acceptable, Intermodality commands a very high market share. Specific corridors were mentioned. Lombardy- Belgium, Lombardy- UK, Lombardy- Koln, Catalunya- Ruhr.
- European industries having relocated towards the East created the conditions for new traffic being generated between these countries and continental Europe. The traffic flows are in both directions. The future rail traffic development on the East West corridors is going to be fed by these industries together with the new consumers requirements. A number of successful business cases have been reported as supporting evidence.
- A chart reproducing in synthesis the intermodal evolving scenario has been produced for visual reference. This charts indicates clearly the most important intermodal freight traffic corridors.
- Specifically on conventional traffic the research revealed that a different management and operating approach can revitalise this very important sector of activity which still covers about 60% of rail freight revenues. The traffic concentration on directional corridors, industrialising the intermediate part represent the correct answer.
- Sea born CTS traffic has assumed a great relevance. Many European ports have made investments for accommodating the last generation of giant CTS vessels. However these investments will not be sufficient if boxes are not moved away from the ports to inland destinations. This has become a major bottleneck since surface transportation had not changed significantly in the last 20 years whereas the average CTS vessels moved from 3.000 TEUS to 10.000 TEUS. At the same time trades between the World zones increased dramatically. For example Far East to Europe has grown 79% between 1998 and 2003. The percentage increases between other world trading zones have also been reported.
- Transport industrialisation by means of full intermodal trains to and from the ports is the only rational reply to the port congestion's challenge. Investments in rail infrastructure both inside the ports and in inland hubs or gateways are necessary. The increase in ports rail market share is essential since road modality and barges have difficulties in coping with this new situation.
- **NEWOPERA** asked itself whether all the changes necessary for bringing back to life the rail freight sector, could be achieved by old actors. The answer was negative. New emerging actors are beginning to populate the market having different visions from the past and having



new ideas about service/products and their distribution in the market place. These new actors have been classified in Capital intensive and less Capital intensive.

- A market survey conducted between leading rail freight users indicated a considerable readiness for undertaking innovative contracts solutions with their counterparts. Open book, multi- products, bonus/malus service agreements, long term contracts are some of the suggested formulas.
- New actors, new products, new drivers, new interfaces are reshaping the reference market. The capital intensive actors such as shipping lines, ports, inland terminals, infrastructure managers are driven by industrial scales and their response to the market pressures is perceived to be in their hands rather than in the hands of incumbents.

Network Approach – Socio Economic Evaluation

- For the Network Approach and the Socio Economic Evaluation it was necessary to build up a reference scenario and a **NEWOPERA** scenario. For this to be accomplished several market variables have been considered for making projections on future traffic volumes including modal shift from other competing modalities. Alternatives based on "IF NOT " strategy have been made. At the same time for the Socio Economic Evaluation a costs benefits analysis and assessment has been produced using the RAILPAG approach.
- Methodologies and assumptions have been chosen. For the modelling inputs the Layer model has been adopted. The mutation path was projected in 2010 – 2015 – 2020 and beyond. For Socio Economic and Environmental Assessment several dimensions have been considered such as Congestion, Accidents, Air Pollution, Noise, Climate change, incorporating energy evaluations and emissions. Evaluating charts have been produced.
- A Table summarising the countries benefiting from modal shift has been produced together with the rail market share improvements. In various simulation the modal shift adopting the **NEWOPERA** approach is substantial and in some case astonishing. Percentages as well as quantities expressed in billions T/Km have been attributed in details. The tripling of Intermodal traffic by 2020 appears to become a reasonable projection.
- The research pointed more in favour of the Electric power versus diesel mainly for environmental consideration recognising however the Diesel traction validity.
- Recommendations for ERTMS level 3 have been made. Level 1 and 2 would in fact generate costs without delivering additional capacity. It is envisaged that level 3 technology will be available in the near future.
- Recommendations for using the same standards for interoperability have been made. Bottlenecks elimination have been valued and economically assessed.
- Recommendations for strategic choices to be made have been issued. Siding for longer trains should be designed immediately for 1500 meters long. Shorter solutions would be less effective and more expensive in the long run. At the same time a minim gauge B+ is recommended for recognised corridors standard. Similarly a minimum 22.5 tons per axle standard, should be implemented in all **NEWOPERA** corridors.
- The environmental benefits have been properly established and evaluated according to the prevailing EU methodologies.
- The corridor approach was adopted for evaluating purposes both from a traffic stand point as well as from specific geographical peculiarities stand point. The corridors' North – South and East – West consolidation constitute the **NEWOPERA** network. The intra EU traffic and the extra EU traffic have been surveyed and projected into the adopted scenarios.

- The mapping of the **NEWOPERA** rail freight dedicated network was accomplished. A complete exercise was carried out on one showcase corridors the MADRID – BERLIN and the emerging results to be applied to the other corridors incorporating their peculiarities and traffic differences. The full traffic impact, the modal shift from other modalities, the scenario projections have been evaluated. Investments costs and their sustainability properly assessed both at corridor level and Network level. The reference scenarios and the **NEWOPERA** scenarios have been compared and benefits have been made visible.
- In all exercises an infrastructure cost increase of € 2.5 per Train/km has been incorporated in countries where the infrastructure charge is valued to be too low to be realistic.
- The **NEWOPERA** network both at corridors level as well as at EU network level appear to exercise huge modal shift attraction from other modalities reaching percentages of 80/90% of total envisaged modal shift.
- The economical benefits of the modal shift has been evidenced together with the specific items of environmental benefits. These have been compared rail versus road in detail.
- The modal shift in TK has been established both at national, EU international and extra EU levels. The modal shift from road to rail has been calculated for the corridor Madrid – Berlin and attributed to the zones crossed by the corridor. At the same time similar calculation was accomplished for the whole **NEWOPERA** network.
- The economic sustainability exercise based on the very realistic assumptions made indicates an amount of € 120 billions of constant 2008 money that can be invested in the **NEWOPERA** network. Using the RAILPAG method a figure of € 43 billions has emerged producing positive returns(IRR 5,3%). The same exercise on the Madrid-Berlin corridor for € 13 billions investments would produce a higher return (IRR 5,5%). In particular on the Madrid-Berlin corrridor the research has evidenced that with such an investment this corridor could be debottlenecked for intense rail freight traffic.
- The implementation plan described some of the actions which are in progress for implementing the **NEWOPERA** rail freight dedicated network. The actions are concentrated on some corridors and only in certain countries. A lot remains to be decided.
- The technical dimensions, rolling stock and longer heavier trains up to 1500 meters have been recommended as key factors for rail freight modernisation in the short medium term. Automatic coupling will have to be introduced in central Europe on selected corridors/projects for a progressive wider implementation. The rail wagons renewal fleet is an objective to be achieved in the next few years given that the average wagons fleet age is about 35 years old.

- AAE, Statistics for European railcar fleet by country and type, 2005
- ACEA, Landscape and perspective for intermodal transport, Brussels
- Centro Studi CONFETRA, Nota congiunturale sul trasporto merci, Milano N. 1, 2005
- Centro Studi CONFETRA, Nota congiunturale sul trasporto merci, Milano N. 2, 2005
- ERRAC, Rail research in the EU, A comparison of member state public research programmes with the ERRAC SRRA 2020, Brussels, 2005
- ERRAC, Rail research in the EU, A comparison of member state public research programmes with the ERRAC SRRA 2020, Brussels, 2004
- FORSA on behalf of DHL Danzas, Shippers requirement to shift from road to road to rail, 2000
- GTC (Combined Transport Group of UIC), Study on Infrastructure capacity reserves for combined transport by 2015, Freiburg/Frankfurt am Main/ Paris, 2004
- KTH Railway Group at The Royal Institute of Technology, Efficient Train Systems for Freight Transport, Report 0503, Stockholm, 2005
- NESTEAR, Intermodal traffic flows, Research from CAFT
- RAIL NET EUROPE (RNE), Information system
- TRANSFESA, Research on Spanish export 2005 vegetables and fruits, 2005
- UIC - ERIM, European rail infrastructure master plan, WP1 High level corridor analysis, Final draft, Paris, 2005
- UIC - ERIM, European rail infrastructure master plan, WP2 Detailed business-focused analysis, Final draft, Paris, 2005
- UIC, Key elements to ensure modal shift towards rail, Paris, 2004
- UIRR, UIRR Report 2004, Brussels, 2004
- UIRR, UIRR Statistics 2004, Brussels, 2004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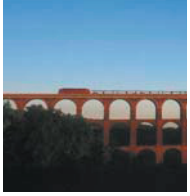
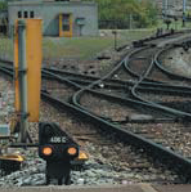
Exogenous Reason	Explanation
B	Backward leg
CERTET	L. Bocconi University – Transport Research Institute
CIS	Commonwealth of Independent States
CRM	Customer Relationship Management
CTS	Containers
EIB	European Investments Bank
ERP	Enterprise Resource Planning
ERRAC	European Rail Research advisory Council
ETA	Expected Time of Arrival
ETCS	European Trains Control System
EU	European Union
EUROFER	European Confederation of Iron and Steel Industries
F	Forward leg
F&L	The European Freight & Logistics Leaders Forum
FCL	Full Container Load
FERRMED	Rhine-Phone- Occidental-Mediterranean Corridor
GHG	Greenhouse Gas
GIS	Geographic Information System
HSD	High Street Distribution
ICT	Information Communication Technology
IMF	International Monetary Fund
IT	Information Technology
KPI	Key Performance Indicators
L	Large Companies
LCL	Less than Cargo Load
LSP	Logistics Service Providers

M	Medium Companies
MEDA	Financial Instrument of the EU for the implementation of the euro-mediterranean cooperation
NMS	Non Member States
OSS	One Stop Shop
PERFN	Primary European Rail Freight Network
REORIENT	Research Project Funded by the 6th Framework Program of the European Commission
RFF	Reseaux Ferrés de France (French infrastructure Managers)
RFI	Rete Ferroviaria Italiana (Italian Infrastructure Managers)
RNE	Rail Net Europe
SB	Swap Bodies
SPOC	Single Point of Contact
TEU	Twenty Foot Equivalent Unit(s)
TREND	Towards new Rail freight quality and concepts in the European Network in respect to market Demand
UIP	Association of Private Wagon Owners
UIRR	Union internationale des sociétés de transport combiné Rail-Route
UNIFE	The European Association for the Railway Supply Industry
VMI	Vendor management inventories
SRRA	Strategic Rail Research Agenda









This **NEWOPERA** FINAL REPORT BOOK is aiming at providing data, facts, figures, suggestions and recommendations for supporting European Institutions, Governments, Decision makers, Infrastructure managers in making the correct choices towards the European freight mobility solution. It is hoped that this objective has been fulfilled.

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Former member of the EU Freight Freeways Kinnock's advisory Team and Task Force Intermodality.

Former member of The EU – USA Intermodality team. Former BAC member of the North Western University Transportation Centre in Evanston-Chicago. Alumno of the Columbia University New York.

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CEMAT

Ermewa

Stora Enso

Deutsche Post/DHL

Rail Traction Company

Volkswagen Transport

Bombardier Transportation

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