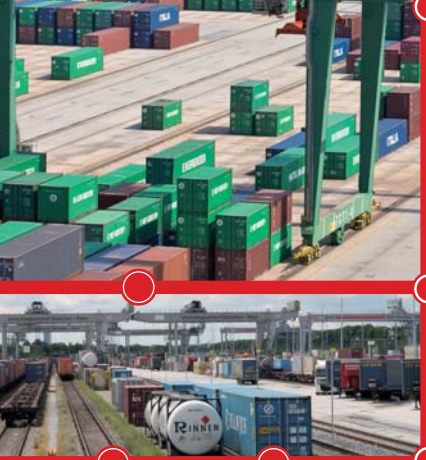
TIGER DEMO

TIGER DEMO

THE RAIL BASED SOLUTIONS FOR INDUSTRIALIZING THE MARITIME TRAFFIC VIA DRY PORTS



FINAL DEMONSTRATORS REPORT

© Courtesy of HHM

Front Cover courtesy of: © HHM/S.Breitenbach; © Gioia Tauro; © Interporto Bologna; © DUSS; © RTE

TIGER DEMO

THE RAIL BASED SOLUTIONS FOR INDUSTRIALIZING THE MARITIME TRAFFIC VIA DRY PORTS

FINAL DEMONSTRATORS REPORT

© HHM/S.Breitenbach

TABLE OF CONTENTS

1. FOREWORD 7

2. THE TIGER-TIGER DEMO PROJECTS "RED THREAD" 9

3. INTRODUCTION & AKNOWLEDGEMENTS 13

4. FRAMEWORK AND METHODOLOGIES 17

- 4.1 THE TIGER DEMO PROJECT OBJECTIVES 18
- 4.2 THE WPS AND TASKS DEVELOPMENT TO SUIT THE OBJECTIVES 21
- 4.3 THE PROJECT MANAGEMENT STRUCTURE 23

5. THE STATE OF THE ART 25

- 5.1 STATE OF THE ART 25
- 5.2 THE PROJECT IMPACTS 26

6. THE THREE TIGER DEMO PROJECT DEMONSTRATORS 29

- 6.1 THE GENOA FAST CORRIDOR OR GFC 30
- 6.2 THE INNOVATIVE PORT & HINTERLAND OPERATIONS - iPORT 31
- 6.3 THE INTERMODAL NETWORK 2015 - MEGA-HUB 32

7. THE TIGER DEMO TRANSITION FROM TIGER PILOTS INTO TIGER DEMO AUGMENTED PILOTS 35

- 7.1 GENOA FAST CORRIDOR OR GFC BASED ON GENOA PORT THROUGHPUT 35
- 7.2 THE INNOVATIVE PORT & HINTERLAND OPERATIONS OR iPORT BASED ON HAMBURG - BREMERHAVEN - WILHELMSHAVEN PORTS THROUGHPUT 37
- 7.3 THE INTERMODAL NETWORK 2015+ MEGA HUB BASED ON THE MUNICH RIEM NEW PRODUCTION CONCEPT AND NEW TRIMODAL SERVICE FRANKFURT TO TRIESTE 43

8. THE TIGER DEMO FULL SCALE DEMONSTRATORS 45

- 8.1 GENOA FAST CORRIDOR OR GFC 45
- 8.2 INNOVATIVE PORT AND HINTERLAND OPERATIONS OR " iPORT" 56
- 8.3 INTERMODAL NETWORK 2015 - "MEGA-HUB" 64

9. THE TIGER DEMO IMPACTS' EVALUATION 75

- 9.1 GENOA FAST CORRIDOR - GFC 75
- 9.2 INNOVATIVE PORT & HINTERLAND OPERATION - iPORT 78
- 9.3 INTERMODAL NETWORK 2015 + "MEGA-HUB" 81

10. THE INTERNATIONALISATION OF THE DEMONSTRATED SOLUTIONS 85

11. THE TIGER DEMO PROJECT CONCLUSIONS, RESULTS & RECOMMENDATIONS 89

TIGER DEMO IS A TRANSPORT RESEARCH PROJECT FINANCED BY THE EUROPEAN COMMISSION UNDER THE FP7 FRAMEWORK PROGRAM. THE PROJECT HAS BEEN DEVELOPED BY A MARKET DRIVEN CONSORTIUM LED BY NEWOPERA AISBL DURING A PERIOD OF 33 MONTHS UNDER THE SCIENTIFIC SUPERVISION OF DG MOVE. **TIGER DEMO** IS THE ACRONYM OF **T**RANS-RAIL **I**NTEGRATED **G**OODS **E**UROPEAN – EXPRESS **R**OUTES **DEMO**NSTRATORS

- **Publisher:**
  NEWOPERA Aisbl
  Rue d'Idalie 9-13 – 1050 Brussels – Belgium
  www.newopera.org
  Tel: +32 2 739 30 20
  Fax: +32 2 743 15 50

- **Report Title:**
  TIGER DEMO - THE RAIL BASED SOLUTIONS FOR INDUSTRIALIZING THE MARITIME TRAFFIC VIA DRY PORTS

- **Editor:**
  Franco Castagnetti

- **Design:**
  UNIFE The European Rail Industry
  221 Avenue Louise – 1050 Brussels – Belgium
  www.unife.org
  Tel: +32 2 626 12 60
  Fax: +32 2 626 12 61

- Printed by Drifosett, Brussels
  Layout by Orangemetalic.be

- **Orders: NEWOPERA Aisbl**

- **Depot:** December 2013 in Belgium

- **ISBN:** 978-2-9601435-0-8

THIS **TIGER DEMO** REPORT BOOK IS NOT ISSUED FOR COMMERCIAL USE OR COMMERCIAL DISTRIBUTION. IT IS INTENDED AS A TOOL FOR THE **TIGER DEMO** PROJECT DISSEMINATION. THIS REPORT BOOK IS PRINTED IN ONE ONLY EDITION. EACH BOOK WILL BE DISTRIBUTED FREE OF CHARGE TO ANY INTERESTED STAKEHOLDERS UP TO WHEN AVAILABLE.

1. FOREWORD

The elaboration of **TIGER** and **TIGER DEMO** Projects concepts, very innovative for Europe, coincided with an increased congestion of the European ports. It became apparent that the economies of scale generated at sea by the new gigantic vessels could not find any similar development on land. The sea ports were indeed capable of handling these new giant CT vessels of 15000 TEU capacity through investments in lifting gears and equipment, only to discover that the crisis point had moved one step further along the line in the sea terminals/hinterland distribution area. The world maritime traffic handling movements doubled in six years between the year 2000 to 2006 with the overland infrastructures basically unchanged, be them road, rail or inland waterways. This is the weak link to be reinforced in the maritime transport supply chain if one wants to maintain on land an efficient and effective transport distribution system. In fact despite the recession experienced in recent years, the CT traffic movements have started to increase again. The **TIGER DEMO** partners consortium realized that the sea ports have within themselves the economies of scale necessary for feeding continuously intermodal trains capable of dislocating CT in an industrial way to Dry Ports, Freight Villages, Mega Hubs, located in the Hinterland Traffic Attraction Zones. The rail lines linking the Sea Ports with these Dry Ports, Freight Villages, Mega Hubs, would be the Corridors of the European rail Network for Competitive Freight. The **TIGER DEMO** Project totally market driven and born on these concepts demonstrates that additional productivity can be extracted from the existing infrastructures by applying the Dry Ports distribution strategy combined with intelligent management systems. **TIGER DEMO** is totally supportive of the European Commission White Paper objectives towards a more sustainable Freight mobility. The White Paper objectives of reducing 60% the GHG emissions by 2050 minimizing the dependency from fossil fuels can be achieved through a better use of the existing infrastructures, reduction of energy consumption and the adoption of environment friendly transport means.

NEWOPERA Aisbl

© HHM/S.Breitenbach

2. THE **TIGER-TIGER DEMO PROJECTS** "RED THREAD"

The **TIGER-TIGER DEMO** "Read Thread" objective is to provide a synthetic explanation of the **TIGER-TIGER DEMO** Rationale which is instrumental for a better understanding of this Final Report.

The Final Report represents the conclusive document of the **TIGER DEMO** Project summing up the results from its initial conception, the transition from **TIGER Project** into **TIGER DEMO**, the planning, the equipment utilization, the management systems, the tools, the applied technologies, the internationalization of the demonstrated solutions, the impacts evaluation up to Final demonstration on an industrial basis. The challenges to be overcome were very many having to resolve complexities relating to infrastructures bottlenecks, traffic recessionary trends and various other obstacles. So much so that one of the Pilots called **MARIPLAT** could not be transformed into a full commercial operation due to insurmountable bottlenecks developed in Taranto after its Pilot phase for major works undertaken inside the Port and traffic volumes shortage from Gioia Tauro to hinterland destinations. Therefore as a result of these difficulties totally beyond the Project management control, the **TIGER DEMO** demonstrators efforts were concentrated on three operating theatres adding further sophistication to the **TIGER** pilots. One demonstrator took place in Germany, involving the major Ports of Hamburg, Bremerhaven and Wilhelmshaven, with the Bremen Dry Port, in addition to the Nienburg "Close to the Port" optimization platform and Munich Riem implementing the "Close to the Market" approach. One demonstrator was carried out in Italy reinforcing the Genoa-Rivalta Dry Port link with an increased number of trains and an upgraded organization inside the Genoa Port terminals. The third demonstrator involved a new link connecting Frankfurt to the Port of Trieste in addition to the "Mega Hub" innovative production process introduced in Munich Riem. Therefore in order to perceive the correct value of the **TIGER DEMO** Project and its future influence on the European freight mobility evolution, it is necessary to explain the whole Project development from its conception up to the Project conclusion.

TIGER DEMO Project origin is the continuation of the **TIGER Project TIGER**, where the following dimensions have been researched and developed.

1. The Market Assessment and potential traffic flows targeted at 2020
2. The Tiger Logistics concepts
3. The Tiger Tools and Means
4. The Training for implementation
5. The Tiger Pilots implementation
6. The Evaluation of Impacts of the adopted solutions
7. The Internationalization of Best Practices and Dissemination.

The **TIGER DEMO** Partners having participated themselves to the **TIGER Project** development which attracted private investments in excess of Euro 300 Mln, identified market uptake opportunities in three geographical areas of Europe. Each one of these areas, having a traffic attraction zone based on one or more Sea Ports, constituted the operating theatre of a selected demonstrator to which a specific name was attributed as follows:

- GFC - Genoa Fast Corridor centered around Genoa Port and the Dry Port of Rivalta Terminal Europe from where full rail access to the rest of Europe is secured through the European corridor Genoa/Rotterdam.

- iPORT - Innovative Port & Inland operations centered around the Ports of Hamburg, Bremerhaven and Wilhelmshaven and three Dry Ports in Germany of Bremen, Nienburg, Munich Riem introducing the "Close to the Port" and "Close to the Market" distribution approach.

- MEGA HUB - Intermodal Network 2015 centered around the Mega Hubs of Lehrte and Munich Riem where economies of scale are achieved combining maritime and continental traffic and introducing new "train to train" production concepts. Additionally a new regular train service was established between Frankfurt and Trieste providing a Germany - Mediterranean rail link.

MARIPLAT - Maritime Platform which originally centered around the transshipment Ports of Gioia Tauro and Taranto, the Ionian rail line to Bari and the Adriatic rail line from there to the Bologna Dry Port, could not be demonstrated in an industrial basis despite the pilot was successfully completed during the **TIGER Project**. In fact major infrastructure works were undertaken in Taranto Port for upgrading its technical intake facilities capable of receiving the new giant generation vessels. This upgrading activity on the Sea front has de facto closed the CT terminal drying up the traffic flows to Bari necessary for generating the economy of scale together with the volumes originating from Gioia Tauro. **MARIPLAT**, which was conceived on the "Y" concept, bundling together the flows from the two transhipment Ports could not be continued in its original concepts relying only on the Gioia Tauro traffic.

TIGER DEMO Project entered into operations with a seamless transition from the **Tiger Project** Pilots. This transition was necessary to consolidate the results achieved during the Pilot phase securing the feasibility operations into an industrial level capable of extracting commercial results from the market place. Such results had to be measured both in terms of service attraction for the users and in terms of financial viability considering that the Tiger Demo partners expected to receive from such innovative services the return for their relevant investments. As a matter of fact this transition period proved to be a strategic decision since it was during this time that the Mariplat demonstrator showed its vulnerability towards outside fluctuating circumstances allowing its partners to realize that further efforts could not reap the desired results. The available resources were therefore directed elsewhere for improving the performances of the three remaining demonstrators as already indicated in the previous pages.

TIGER DEMO Augmented Pilot. The Pilot phase by definition has a limited demonstrating scope both in operations and in time. The Step Change necessary for bringing a pilot into a full scale commercial operating demonstration is quite huge having to set up and organize a number of administrative, procedural, process management, organizational and procurement activities capable of providing the tools and means necessary for transport industrialization. This activity involves a preparation phase affecting every component of the planned maritime transport chain such as the information flow, track and trace, ICT technologies, intelligent management systems, industrial equipment, computerized tools, partners coordination, best practices transferability, train path procurement, time tabling organization, infrastructure availability, technologies integration, connectivity with the users outside the consortium, connected services integration such as Customs, Port Authorities and Infrastructure managers.

TIGER DEMO Full scale demonstration. The full scale demonstrations of the adopted solutions entail the service execution into full commercial basis for a consolidated period of time long enough to prove both the economic sustainability, the transit time consistency and the customers' acceptance into the market place. The "Extended Port" concept into the Italian hinterland through the utilization of Rivalta Terminal Europe Dry Port is proved with a considerable number of trains. The Genoa port for the first time in its history exceeded the threshold of 2m TEU and GFC has certainly supported the increased port throughput with added efficiency, lower costs, better transit times and effective debottlenecking of the quays. The other **TIGER DEMO** approaches such as "Close to the Port" and "Close to the Market" are affirmed successfully in Germany assigning a pivotal role to the Nienburg wagons sorting hub as well as Bremen CT terminal. A central strategic role for the German maritime traffic is assigned to the Mega hubs of Munich Riem, Lehrte and Bremen directly involved into the project. Other German terminals such as Duisburg, Frankfurt, Nurnberg, Mannheim, Stuttgart have also been integrated into the distribution network. The competitive reach of the German North European ports is increased by the industrial Intermodal System network of Kombiverkeher having introduced a new capacity management tool capable of securing the containers space on connecting trains at terminal interchanges up to final destination. Track and trace and timetabling on individual routes provide the necessary service consistency. Additionally a Southern link to Trieste has been provided connecting the heart of Europe with the Adriatic Port opening up a strategic routing to the South Mediterranean sea.

TIGER DEMO Evaluation of Impacts. This Work Package dealt with the results achieved on the various implemented solutions adopted in the demonstrators. The evaluation of impacts is achieved by identifying criteria and indicators needed to perform a comprehensive survey covering costs, environment, energy, economic service quality and societal assessment. The KPI developed during the **TIGER project** are utilized in a quantitative criteria and adjusted for the market conditions. Performance measurements are applied to each demonstrator for obtaining the proper individual results analysis.

TIGER DEMO Internationalization of the demonstrated solutions. The Potential application of the **TIGER DEMO** logistics concepts, technical findings and best practices have been planned in other part of Europe exception made for the local territorial peculiarities. The new maritime distribution business model based on the Dry Ports /Mega hub utilization and development is an innovative concept introduced by **TIGER** in Europe providing the container transfer to/from the ports in an industrial scale. The system is contributing to keeping the Sea Ports free from congestion and is instrumental for the rail network productivity increase generating the much needed capacity despite the lacking of new investments in infrastructure because of budget constraints. This system is a driver for change and a key element for modal shift to rail on a wide scale. The E/customs, E/freight, E/seals, the RFID technologies, the capacity management, the business model, the ICT advanced tools tested and applied during the **TIGER DEMO** execution delivered better services at lower costs. These results together with their sustainability over time because of the positive environmental impacts, have been disseminated in dedicated workshops for replica application in other European countries.

Conclusions. Infrastructures investments, be them in ports developments railways or road infrastructures, are becoming scarcer for budgeting reasons but also due to uncertain return on the substantial financial resources required which are in very short supply. This however is not the only reason. Space in Europe is no longer an unlimited resource and local Governments have started to

plan a different social development model based on a better reutilization of already industrialized/ urbanized areas. In recent decades Europe has eaten up a colossal number of acres subtracting them from agricultural use with three negative effects on the European economies. The first is a very high urbanization costs, the second is the subtraction of agricultural productions from the newly urbanized areas and last but not least the permanent loss of locally grown products at zero mileage substituted by similar goods with inferior nutritional qualities not being fresh, originating from other continents at huge transport costs converting fossil fuels. Such obsolete approaches which do not take into consideration the overall costs for Society are no longer acceptable. The extraction of the best possible performances from the existing infrastructures represents a challenge for the next decades being the European Society confronted with mobility changes dictated by lesser dependence from fossil fuels. The solution of the congestion paradigm and the GHG and CO2 emissions, is the conservation of the environment, the noise and accident abatement, the zero mileage for the overall objective of delivering a better life quality to the European citizens.

The **TIGER DEMO** project demonstrators proved that it is possible to transport more with the existing resources by industrializing the transfer chain from the Sea Ports into the hinterland Dry Ports delivering an overall better performance at much lower costs. In addition the Dry Ports, Mega Hubs and Freight Villages are business initiatives promoted by either private entrepreneurs or at maximum they are "PPP" Private Public Partnerships. They constitute the Freight multipliers for traffic bundling necessary for creating the economies of scale for transport industrialization. This is the only way for fulfilling the much desired modal shift to rail in sizeable volumes taking off the roads a considerable number of medium long distance trucks. By so doing a significant contribution is achieved for reducing road congestion and producing environmental friendly transport solutions sustainable over time. The competition between single modes in "anti-historic" since every mode has in itself the potentiality to deliver its best performance in certain conditions and on certain distances. The single modes integrate themselves in a co-modal approach for providing the best overall performance at reduced costs, multiplying effectively the points of strength and minimizing the weaknesses. The **TIGER DEMO** project has proven this to be the case.

Franco Castagnetti
The Editor

The **TIGER DEMO** Project drivers originated from the European Commission efforts for achieving sustainable mobility through environment friendly transport means with particular attention to energy saving solutions and GHG reductions. Such efforts culminated in the adoption of a new legislation passed though the EU Parliament called "The European Rail Network for Competitive Freight" and a new European Commission White Paper on Transport, setting up very ambitious objective on a 2050 mobility scenario. Around these two basic pillars a number of other initiatives pointing in the same direction have been adopted or are in course of execution, such as the Core Network, the TEN-T Network, the ERTMS Corridors and the new importance attributed to Sea Ports, Dry Ports, Mega Hubs, Freight Villages, Stations, Terminals, Nodes capable of realizing in practice the co-modal approach. Budget constraints constitute colossal obstacles for dreaming about new infrastructures which due to their long time to market do not constitute a realistic recipe for overcoming the competitive gap with other leading world market players. The other driver spearheaded from the FP6 NEWOPERA Project which provided unchallenged evidence that the European Rail Network has to produce a far better performance in rail freight. To this effect a number of preferential corridors must be identified for rail freight and Intermodality in order to produce better services at lower costs. It is necessary therefore to industrialize the rail freight intermodal transport chain and this operation is possible where economies of scale are already existing and/or can be generated by traffic attraction zones. Such zones exist already, represented by the Sea Ports and by the Dry Ports/Freight Villages/Mega Hubs which are feeding industrial and urban agglomerates. Many local and central European Governments have tended to forget that their cities are Urban Hubs for passengers and for people' mobility but at the same time are also Hubs for freight because of the consumables to be transported in the proximity shops and high street markets as well as for the disposal of the Urban waste produced as a result. New urbanization has not taken into consideration logistics requirements and no planning activities have dealt with the emerging challenges of people' mobility, cargo mobility and City Logistics. Each transport mode has found its own solutions lacking totally interconnections between themselves necessary for fulfilling co-modality. A new planning awareness is therefore necessary for implementing and complementing the interfaces between transport modes in a combination of interchanges where cargo mobility can be carried out in an industrial way. The Sea Ports, the Mega Hubs, the Dry Ports and the Freight Villages constitute integral parts of these nodes where long distance freight trains are capable of operating regular services becoming the feed stock lines for people and industries. The economies of scale so generated allow the implementation of longer, heavier and faster trains running between these platforms reducing considerably the operating costs. These interfaces are linked to the Urban Hubs through lighter trains and fuel efficient or hybrid vehicles for City Logistics distribution, producing lower noise and GHG emissions. A proper integration of the time factor with the space factor is necessary for transport avoidance and for favoring zero mile solutions.

TIGER DEMO demonstrators are dealing with all these dimensions having identified in the various demonstrators the Sea Ports, the Dry Ports, the Mega Hubs and the Freight Villages where transport industrialization can be achieved providing a guidance for other parts of Europe. Through the Internationalization of the **TIGER DEMO** solutions other Sea Ports and Dry Ports in Europe and elsewhere can themselves extract the same benefits producing the domino effect which is necessary for changing people habits, perceptions and behaviors.

The European Commission, through the contribution of the FP7 Program has provided the necessary incentive and the European wide imaging for **TIGER DEMO** demonstrators. However **TIGER DEMO** could not have seen the light without a number of leading European operators being convinced of the potential expressed by this project. Very substantial private investments driven exclusively by the new market opportunities have been realized during the Project lifetime in a period of recession in order to be ready when the European Economy will enter into a new expansion cycle. Courage and determination have been ingredients necessary for bringing **TIGER DEMO** to its POSITIVE conclusion demonstrating with business cases, commercial initiatives and service innovation that transporting more with the existing resources at lower costs, is possible.

Partner No.	Company short name	Involved experts
1	TRAIN	Valerio Recagno, Elisabetta Noce, Sara Fozza, Maria Lelli, Gabriella Messina
2	HACON	Marian Gaidzik, Lars Deiterding, Miriam Mascolo, Renee Keppler, Jan Hildebrandt, Echard Riebe
3	NEWOPERA	Franco Castagnetti, Armand Toubol, Horst Kubek
4	RIVALTA TERMINAL EUROPA	Romano Giacchero
5	DUSS	Wolfgang Müller, Barbara Müller
6	EUROGATE / boxXpress	Benjamin Brügelmann, Manfred Burk, Michael Petersen
7	GENOA PORT AUTHORITY	Francesca Moglia, Emanuele Profice, Gian Battista Maccagno, Francesca Pino
8	HAFEN HAMBURG MARKETING	Sebastian Doderer, Stefan Breitenbach, Britta Schreiber, Bastian Fischer
9	BOLOGNA INTERPORTO	Zeno D'Agostino, Angelo Aulicino, Chiara Lepori
10	FS LOGISTICA (ITALCONTAINER)	Maurizio De Fazio
11	KOMBIVERKEHR	Rainer Mertel, Uwe Sondermann, Christophe Büchner
12	LIGURIA REGION	Riccardo Mollo, Jacopo Riccardi
13	RETE FERROVIARIA ITALIANA	Stefano Castro, Diego Sciulli, Laura Bunicci, Giusi Spitale
14	SOGEMAR	Sebastiano Grasso, Stefano Lontano
15	TERMINAL SAN GIORGIO	Maurizio Anselmo
16	TRENITALIA CARGO	Francesco del Vecchio
17	UNIFE	Giorgio Travaini
18	ACOS	Helmut Frank, Thorben Kuhn

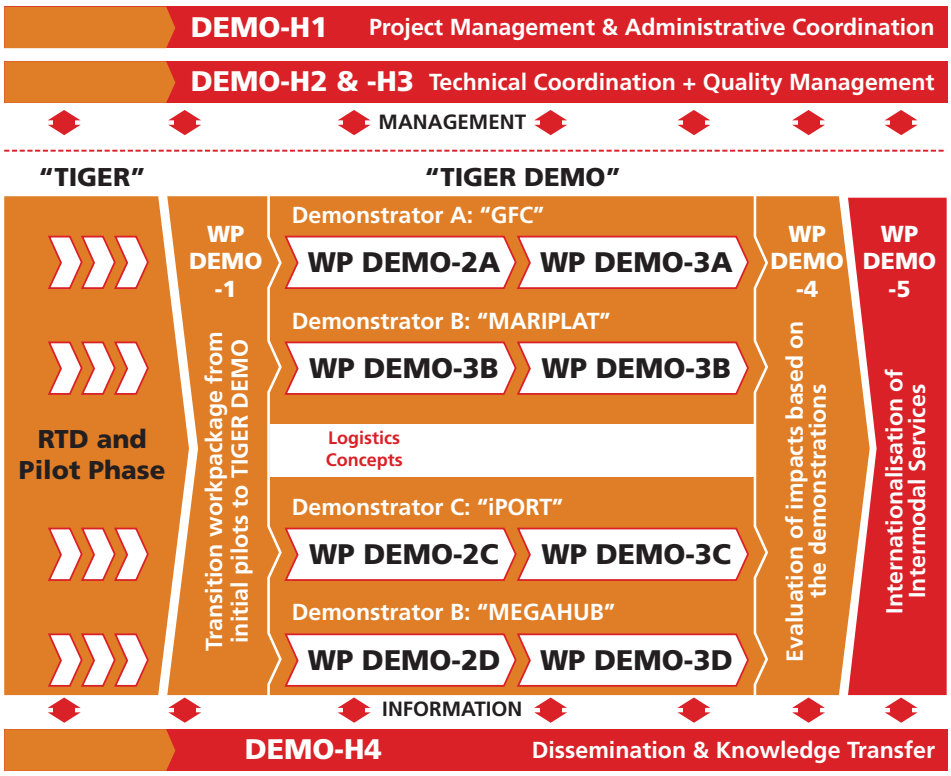
© Courtesy of EUROGATE

It has been established in previous research works that the generation of transport demand is growing between 2 to 3 times the European GNP. In particular the World CT traffic handled in Sea Ports doubled between Year 2000 to 2006 from 240 to 450m TEU. This colossal growth has generated a formidable development in ships evolution at sea while the overland infrastructures remained practically unchanged. This awareness is pointing decisively into the direction of a major reengineering of the transport processes on land and particularly the rail ones.

The **TIGER DEMO** project demonstrators are driven by the European need of achieving a greater degree of effectiveness, efficiency and competitiveness on the Rail Freight Network. This is now perceived as being key for a more sustainable freight mobility. The reduction of road congestion, accidents, emission on the atmosphere and the negative effects on climate changes are leading to a safer and better environment for improving the quality of life of European citizens. In particular the recent breaks in trends in global trades brought about by EU enlargement and by the enormous traffic flows with the Far-East and South East Asia, have highlighted the road modality impossibility for sustaining by its own the future European freight mobility needs. Port congestion has become a common feature both in the North and South of Europe to the extent that only a new distribution system to/from ports to inland destinations based on industrial intermodal shuttle trains, represents the solution of this problem. The objectives of keeping the traffic moving through the European ports and increasing the market share of rail freight traffic improving the rail network productivity, are indeed the biggest challenges of our times.

The **TIGER DEMO** project framework has been built around the four demonstrators originating from the **TIGER** project, as indicated in the next figure of which only three have entered into the full demonstration phase having Mariplat executed only the Pilot for reasons already explained in the previous pages.

→ Figure 1: **TIGER DEMO Project** with Work Packages & Management Structure.
Source: **TIGER DEMO Project**



The **TIGER DEMO** Management, Administrative and Technical Coordination, together with Quality Assurance and Dissemination guided the Project to the complete fulfillment of its objectives.

4.1 THE **TIGER DEMO** PROJECT OBJECTIVES

The **TIGER DEMO** project challenge is to demonstrate in a real business environment the solutions identified by the **TIGER** project already tested on the field with Pilot solutions. The operating theatre are the Sea Ports of Hamburg, Bremerhaven, Wilhelmshaven in Germany and Genoa, Trieste in Italy with their traffic attraction zones in the hinterland where Dry Ports or Mega Hubs have the facilities and capacity for handling sizeable traffic volumes arriving and departing by rail intermodality in an industrial way. The next table (Figure 2) represents the followed methodology indicating the area of **TIGER DEMO** interventions producing the desired results.

→ Figure 2: **TIGER** interventions areas and actions.
Source: **TIGER DEMO Project**

AREAS OF INTERVENTION	**TIGER DEMO** ACTIONS
The Three Project Demonstrators via Dry Ports/Mega Hubs. → GFC - Genoa Fast Corridor → iPort - Innovative Port & Hinterland operations → MEGA HUB - Intermodal Network 2015	Infrastructure Improvements/ investments Software and Hardware Technologies & ICT Management Systems. Logistics process re-engineering. Cooperative Approach between the key actors of the transport chain. Innovative Marketing Strategy for Transport Industrialization.
Innovative Routings	Introduction of Innovative Intermodal Routings with new shuttle train services Via Rivalta for GFC. Via Bremen, Nienburg, Munich Riem, for iPORT. Via Munich Riem, Frankfurt to Trieste for Mega Hub.
New Dry Ports and Mega Hubs for transport industrialization and multiplication. New business models, new transport chain processes, space optimization, traffic bundling, E/customs, E/freight, E/seals, E/security,	Investments in Dry Ports – Mega Hubs in Rivalta Terminal Europe, Bremen, Munich Riem, Duisburg. Lehrte mega hub is under construction. Upgrading existing facilities in Nienburg to maritime trains formation for industrial scale. Replica of Hamburg distribution network in Lehrte when construction is completed. Industrial scale transportation between the two mega hubs of Lehrte(when completed) - Munich Riem and between Hamburg to Nienburg or Bremen. Introduction of new automated computerized facilities for E/customs, E/seals, E/security, E/freight in Genoa and Rivalta together with new automated system for gate management.
Management systems, intelligent systems, production control systems, hardware technologies, new interfaces, system compatibilities, equipment update, theoretical and on the field training.	Rollout of new management system for managing and optimizing space on Intermodal trains such as Capacity & Transport planning management. Centralized maintenance and repair concept. Combination of continental and maritime volumes. Introduction of innovative two approaches: "Close to the Port and Close to the Market".
Bottlenecks correction - use of existing infrastructure	Dry Ports applying Hub and Spokes strategies are freight multipliers increasing the rail lines productivity and capacity. Identified bottlenecks corrections in execution.
Shuttle service regularity, service quality	Increased train utilization by bundling maritime volumes of several seaports. Lean shunting concept by electric line locos. Reduction of operating effort for train formation. Higher punctuality rate. Combination of continental and maritime volumes. High frequent shuttle trains from/to the German North European Ports. Train to train transfers. Introduction of regular weekly shuttle trains from Frankfurt to Trieste.
Longer, heavier and faster trains	Traffic bundling of different trains categories for better services and costs reductions.

AREAS OF INTERVENTION	**TIGER DEMO** ACTIONS
ICT technologies, track and trace, electronic readings/bar codes	Real time data availability. Track & Trace. Automatic reading devices. Train monitoring interfaces with customers.
Identified best practices	Integration of operating partners into the communication loop. Integration of shipping lines into intermodal distribution strategies. No shunting in sea ports. Sharing economic benefits between transport partners. Close co-operation between railway undertaking, terminal operators and intermodal operators.
Operational costs reduction, transit time reduction, rail freight market share increase, rail lines capacity increase, increase of commercial speed in rail corridors, energy saving, transport sustainability, GHG emission reduction, congestion reduction	External depot integration for maritime containers in Munich. Increased efficiency utilization of existing rail infrastructure in Nienburg and Bremen. Constant maximum train capacity achieved. Transit time reduction on all three demonstrators due to lower numbers of handling, reduced shunting and increased service efficiency.
Better use of the available resources through use of preferential corridors for freight	Optimized cooperation between long haul carrier and last mile rail operator in Hamburg seaport. Process optimization along the hinterland transport chain. Joint specification of market requirements for layout and service parameters in maritime oriented inland terminals. Interfaces IT solutions integration in existing data processing of all actors.
Traffic bundling through combination of different types of cargo	Bundling traffic volumes in Mega Hubs for terminals not having enough traffic for direct trains services to/from the seaports.
Quality of life value, noise reduction, carbon footprint reduction, human resources opportunities, environment as a limited resource	Better use of trains available space and capacity improvements through transport industrialization and optimization of rail operation processes reducing automatically the carbon footprint by saving energy. Dry Ports contribute to making a better use of existing rail infrastructures.
2020 Freight Mobility Vision	The Project forecasting the future transport capacity needs, opens a window on 2020 Freight Mobility Vision. Maximization of existing resources is paramount. Transporting more with less becomes a Societal need.

4.2 THE WPS AND TASKS DEVELOPMENT TO SUIT THE OBJECTIVES

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

WP DEMO-H1 PROJECT MANAGEMENT AND ADMINISTRATIVE COORDINATION

This WP had the objective of controlling both the financial and administrative project procedures according to the contractual obligations undertaken with the European Commission.

WP DEMO-H2 TECHNICAL COORDINATION

This Work Package had the objective of evaluating and monitoring the Project progresses according to the GANTT chart. The coordination efforts between the demonstrators, the communication channels and the problem solving were part of this Work Package. The Technical Coordinator, supervised each demonstrator leaders, responsible for its own area of activity, making sure that the progress were consistent with the overall Project objectives.

WP DEMO-H3 - The Quality Management part of the Technical Coordination ensured proper Project quality achievement and that performances were improved during the project development. In parallel, it provided continuous assessment of the key criteria or requirements of the Project development.

WP DEMO-H4 DISSEMINATION

This Work Package had the objective of disseminating the **TIGER DEMO** Project concepts and innovation through a variety of tools and channels. The networking activities with other major transport and logistics actors as well as cross fertilization with other European co-funded Projects, were part of this Work Package. The presence of **TIGER DEMO** in major European Transport and Logistics events was assured.

WP DEMO-1 –TRANSITION FROM INITIAL PILOT TO TIGER DEMO

This Work Package had the objective of ensuring a seamless transition from **TIGER** initial pilots to **TIGER DEMO** full scale demonstrators. The results of the Pilots trials were compared to the original plan in order to verify that all the operating conditions necessary for the success of the full scale demonstrators were in place. This Work Package lasted several months since corrections were necessary because of infrastructure works not completed, bottlenecks not removed and other delays that could have jeopardized the final result. During this period it was possible to realize that the Mariplat demonstrator could not have gone beyond the pilot phase. In fact the Port of Taranto undertook major works for upgrading its facilities which in practice brought the handling activity in the terminal to a halt drying up any traffic flows lasting at least one year. In such circumstances it has proven impossible to sustain the traffic volumes necessary for feeding the trains relying on Gioia Tauro alone. In fact the Mariplat logistic concept was based on the "y" design involving the two South of Italy transshipment ports bundling the traffic in Bari for the hinterland Italian and North European destinations. As a result of this process the available resources were diverted to the other three remaining demonstrators which were able to scale up their operations enlarging the extent and penetration of the services involved for a full and complete market uptake implementation.

WP DEMO-2A Genoa Fast Corridor, augmented pilots

WP DEMO-2C Innovative Port and Hinterland Operations, augmented pilots

WP DEMO-2D Intermodal Network 2015+, augmented pilots

These three Work Packages were denominated "Augmented Pilots" to signify that for each demonstrator the objective was to scale up the Pilot up to a proven train production system. The plan involved for each operating theatre the adequacy of the supporting software and systems, the computerized traffic and capacity management, the provision of the train paths, the terminal capacity, the equipment performing transfers and handling, the distribution organization up to all the facilities connected with CT maritime traffic such as storage and repairs.

WP DEMO-3A Genoa Fast Corridor full scale demonstration

WP DEMO-3C Innovative Port and Hinterland Operations full scale demonstration

WP DEMO-3D Intermodal Network 2015+ full scale demonstration

These three Work Packages were denominated "Full Scale Demonstration". Each Demonstrator had the objective of proving the full commercial viability of its planned activity evolving effective concepts. Genoa Fast Corridor had to prove the "Extended Port Concept" in Rivalta Terminal Europe Dry Port where all traditional ports activities such as Customs Clearance, safety and security as well as the connected ancillary operations could be carried out reducing the traffic congestion due to trucks in the urban area around the port. The connection between Genoa Port and Rivalta is relying on regular shuttle trains from Genoa Voltri, Terminal San Giorgio(inside ATI Ignazio Messina-Terminal San Giorgio) consolidating their respective traffic for achieving the necessary economies of scale. The entrance inside the Genoa port was equipped with a system of gate automation integrated with rail management for achieving the reduction of the trucks traffic flow. By so doing the Genoa Port traffic fluidity is enhanced reducing overall transit time, costs and pollution. One has to appreciate that Rivalta Terminal Europe is a private investment planned from the outset of **TIGER project** for providing an hinterland Dry Port facility in support of TERMINAL SAN GIORGIO which is part of the same Group of Companies.

The Innovative Port and Hinterland Operations had the objective of proving the full scale commercial viability of the two concepts "Close to the Port" and "Close to the Market". The **TIGER** findings have shown the importance of rail hubs and dry ports for the European Sea Ports and the global maritime supply chain' traffic fluidity. These concepts act as enablers for the high-efficient intermodal hinterland transport chains throughout Europe. Indeed these two concepts were based on regular shuttle trains operated both by boxXpress through Nienburg and ACOS via Bremen for the "Close to the Port" approach and through Munich Riem for the "Close to the Market" approach. The trains for the "Close to the Port" approach originating from various German terminals, are sorted in Nienburg so that it is possible to send the full train to the Bremerhaven and Hamburg quays for a specific vessel or service avoiding any shunting or transfer operation inside the ports.

Similar operation is carried out in Bremen in the Roland Umschlag terminal with the only difference that the traffic sorting is done by containers and not by wagons. Roland Umschlag is a traditional terminal where the container transfer is handled from train to train using vertical trans loaders. Here the train operator is ACOS. In the "Close to the Market" approach Munich Riem is an existing but recently upgraded facility entered into operation coinciding with the TIGER DEMO demonstrator fulfilling the project's objectives. Transit time and costs are reduced substantially as a result. Other terminals such as Duisburg, Frankfurt, Nurnberg, Mannheim, Stuttgart have been integrated into the maritime distribution network.

The Intermodal Network 2015+ demonstrator had the objective of proving the full commercial viability of its planned activity evolving around the Lehrte and Munich Riem Mega hubs where new production and capacity management systems are introduced by Kombiverkehr and DUSS. Because the Lehrte Mega Hub is still under construction all innovative production systems such as traffic transfer from one train to another and "train entry" with "momentum" are tested in Munich Riem. One has to appreciate that Lehrte Mega Hub was specifically planned for TIGER and TIGER DEMO projects in order to combine the maritime traffic with the continental traffic for generating economies of scale and transport industrialization. The Kombiverkehr distribution network via the Mega Hub is greatly enhanced increasing the frequencies for the services destined to the smaller terminals of origin/destination.

WP DEMO-4 EVALUATION OF IMPACTS ON THE DEMONSTRATORS

This Work Package had to evaluate the impacts resulting from the application of the different solutions implemented in the three demonstrators. This work was carried out using an integrated approach which could also be of support to the following Work Packages. The evaluation of impacts was fulfilled by identifying criteria and indicators capable of performing a comprehensive survey including environmental, energy, economic, service quality and Societal assessment.

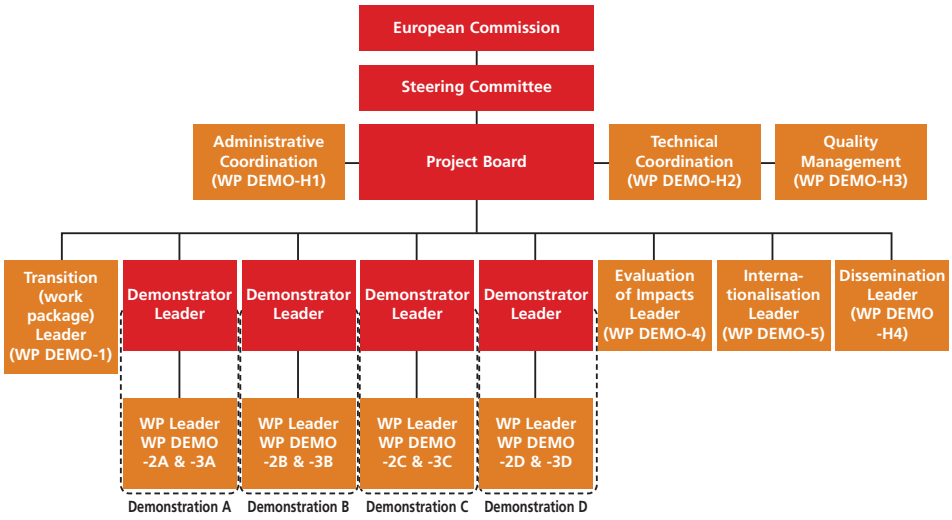
WP DEMO-5 INTERNATIONALISATION OF THE DEMONSTRATED SOLUTIONS

This Work Package had the objective of facilitating the potential application of the **TIGER DEMO** logistics concepts and technical solutions in other corridors of the European Network connected to Sea Ports, Hubs and Terminals. This internationalization was based on effective performances of the **TIGER DEMO** operations in the market place. The new business model of the maritime traffic transit via Dry Ports entails the introduction of industrial scale and transport industrialization representing a considerable innovation in current European Intermodal practices. Moreover the E/customs, E/freight, E/seals innovations wanted to prove the advantages of managing the available transport information in a paperless environment.

4.3 THE PROJECT MANAGEMENT STRUCTURE

In order to secure the complete fulfillment of the **TIGER DEMO** Project objectives a proper management structure had to be put in place capable of coordinating the demonstrators efforts and steering the necessary process for decision-making and any emerging corrective actions. The **TIGER** management Project structure operated according to the chart indicated in the figure (Figure 3) reproduced on the next page.

→ Figure 3: The Project Management Structure.
Source: **TIGER DEMO Project**



5.1 STATE OF THE ART

The whole description of the maritime traffic State of the Art and the way to achieve an efficient business environment going beyond that through a step change in the performances and work processes, are described at length in the **TIGER PROJECT** which fostered **TIGER DEMO**. All this research work is summarized in the **TIGER FINAL REPORT BOOK** having the title: "The Co-modal Role in industrializing the Maritime Traffic Hinterland Distribution". www.tigerproject.eu

Here one can summarize in extreme synthesis the market situation as being the following:

- Substantial increase of freight mobility demand versus an insufficient or constrained infrastructure. In particular the rail one appears to be inadequate for the future cargo mobility needs.

- The Ports of entry into the Union, both North and South have been highly congested due to difficulties of moving their forecasted volumes in an efficient way to inland destinations. The existing economic downturn has alleviated temporarily this situation. It is hard to figure out that the contingent traffic reductions because of recession, may represent the problems solution. It is widely recognized that this recession must be taken by the market forces as an opportunity for restructuring the operational processes and introduce the much needed innovations. Investments must be made in Ports and distribution infrastructures if one wants to avoid further congestion and unbearable costs when the economy is back to normal. The first signs of the economic recovery are appearing in the market place and above all in the geographical areas ports which are the **TIGER DEMO** object.

- The environmental situation and climate changes are imposing transport solutions towards a more sustainable mobility. Modal shift is being encouraged and becomes every day a necessity.

- The costs of construction and the time needed dictate that any infrastructure expansion will take at least a decade to produce its beneficial effects. It is therefore imperative that the best possible productivity is extracted from the available European infrastructures.

TIGER DEMO contributes to innovations in three dimensions: Strategic, Market, Technological impacting also on Environment and Socio-Economic.

Strategic dimension: the adoption of co-modal logistics chains - the drive for capacity increase - the choice of alternative routings - the introduction of heavier longer and faster trains - the ports decongestion - are all initiatives generating extra capacity on the existing network. The insertion of inland terminals/dry ports/gateways/mega hubs in the rail network facilitating the integration between sea and land deliver added flexibility to the inland distribution system. The introduction of an integrated industrial work process in the ports for inland distribution based on co-modality, generates the much needed industrial scale necessary for keeping moving to their final destination the traffic volumes discharged by giant container vessels.

Market dimension: the customers have the need to be given a viable and long term sustainable transport choice. The service improvement is achieved through punctuality, performance consistency and reliability with the introduction of regular shuttle trains. The continuous improvements through a phased in work process together with the availability of overland service products plugged into the maritime ones, constitute all innovations expected by the market. The industrial bypass of

congested and expensive port zones, the delivery of a better service product at an inferior cost and the adoption of logistic solutions safer and more environment friendly, are providing concrete answers not only to the customers but also to the Society at large.

Technological dimension: **TIGER DEMO** adopted technologies for bridging gaps and cutting idle time. The introduction of last generation wagons for longer heavier faster trains and the use of soft/hardware ICT technologies for logistic chain integration and control, capacity management, allow to overcome technical barriers and constraints. The use of advanced equipment in the Ports and terminals together with investments in modernizing dry ports infrastructure and constructing new ones, generate additional capacity on the rail lines through traffic bundling and transport industrialization. These innovations facilitate the transport process integration. The implementation of E/customs E/freight E/seals solutions and when possible the transfer of such operations to the inland dry ports, combined with the cross border control by electronic RFID means, are a considerable technological step change reversing old practices in use for decades. The CT loading on the trains in the sea ports destined to inland dry ports is indeed a considerable tool for accelerating the production process improving transit time and the service performance.

The EU Commission through its action plan and Rail Packages legislation is creating a level playing field for generating a new rail freight economy in Europe. In the NEWOPERA research project the market actors stated clearly that modal shift does not take place automatically but must be induced. The **TIGER DEMO** demonstrators are providing the ground for this to take place in practical terms driving the market towards the achievement of this vital objective.

5.2 THE PROJECT IMPACTS

The objectives and tools beyond the state of the art indicated in the previous paragraphs developed in **TIGER** and demonstrated in **TIGER DEMO**, impact on five dimensions which characterize the transport co-modal value chain: **STRATEGIC**, **MARKET**, **TECHNICAL**, **ENVIRONMENTAL** and **SOCIO ECONOMIC**.

STRATEGIC dimension. In **TIGER DEMO** the value of innovations have a very positive impact, modifying the traditional way of penetrating inland from major European Ports. The productivity gains generated by the industrial dimension is the driver for the Ports decongestion philosophy. This task is achieved by optimizing space and resources and has to keep the traffic moving from sea ports to inland dry ports/gateways through the use of longer heavier and faster trains. At the same time the additional volumes handled by the inland dry ports and Mega Hubs allow integration between modes extracting redundant productivities from new or existing services. The increased effectiveness resulting thereof equates to a service costs reduction whereas the industrial dimension delivers higher frequencies and punctualities. In conclusion better services at an overall inferior costs. It was always said by **NEWOPERA project** that modal shift does not take place automatically but must be induced. Cost reduction is a key element for achieving modal shift towards a competitive and sustainable cargo mobility over time. This concept is also reinforced in the next paragraph.

MARKET dimension. In transport and logistics like in any other field the customers must be given the possibility of making a choice. Today road modality is prevailing and other alternatives to road are more theoretical than practical. **TIGER DEMO** wants to bring the ships either to the factories or in the middle of the consumer markets by producing a direct service plugging the ships into inland Dry ports located in the middle of industrial traffic basins. By so doing the inland hubs or gateways

integrate both the overland and maritime traffic generating the much needed economy of scale. The integration of complex logistic chains and their management generate added value to the services. Value added services is what the customers want. These requisites together with the awareness that rail is capable of providing safer and environmental friendly solutions at inferior costs are formidable catalysts for attracting to rail the new market share which has been lacking up to now.

TECHNICAL and TECHNOLOGICAL dimension. In **TIGER DEMO** innovative routings are tested in the demonstrators. New techniques and technologies are used both in managing the trains and in handling traffic into hubs where the economy of scale is achieved. New hardware and software technologies support the operations and the traffic chain management integrates both the maritime and overland traffic into new connectivities and E/freight solutions. Greater flexibility is offered to the customers by moving the critical barrier from the ports into inland destinations. Last generation rail rolling stocks are used to improve the trains performance and capacity.

ENVIRONMENTAL dimension. **TIGER DEMO** generates substantial values on environmental sustainability. These values are both at transport/operating level and at Societal level. The reduction of the CO2- GHG footprints caused by traffic congestion is of paramount importance. It is achieved by modal shift towards rail providing a more sustainable cargo mobility over time. At operating level the benefits become visible by reducing in the ports the trucks waiting time eliminating drivers frustration, noise and congestion. In this way the sea ports regain their original mission of integrating sea with land by forwarding immediately the containers by rail nearer to their final destinations. Road traffic around Sea Ports Cities is reduced dramatically. Shorter road deliveries from inland terminals to final destinations equate to less CO2 emissions and particles in the atmosphere. An inferior level of road congestion on highways and motorways means less accidents and health hazards. The energy saving component is also relevant because of inferior fossils fuel consumption. The higher system productivity the better control of security and safety together with the increased traffic fluidity, all these contribute in the long term to the overall costs reduction. This is even more so for the Port and the City of Genoa where the Apennines mountains descend at sea level. Here the road traffic generated by the Port is creating permanent congestion to the City access roads and motorways links penalizing heavily the citizens mobility. At Societal level there is a marked improvement in the citizens life quality combined with a substantial reduction of external costs. The best way to reduce the negative effects of the Climate Change is to provide an operating rail freight alternative to the dominant road modality.

SOCIO - ECONOMIC dimension. **TIGER DEMO** delivers positive impacts in two categories of socio-economic fields: workers and the Society at large. The first category is represented by the higher degree of professionalism required by the introduction and use of new Soft - Hardware technologies. The new work process redesign together with an innovative operating approach both entail the adoption of substantial training activities at all levels. The traditional training activities for the operating demonstrators' leaders is supplemented by the training activities on the job before during and after the demonstrators' implementation phases. The second category is represented by the step change in the working cycle productivity introduced with the demonstrators' innovations. Increased working opportunities are generated all along the Supply chain from ship to shore and up to final destination. The old system with the driver claiming the container at the port is surviving only for the short distance portion. All other components of the chain involve new operations with a higher degree of job value and professionalism. Once the TIGER DEMO demonstrators are extended into a total industrial system the technological components are predominant compared to the manual ones. This job evolution is responding to the natural ambition of every human being for improving his personal knowledge and skills.

© Courtesy of GPA

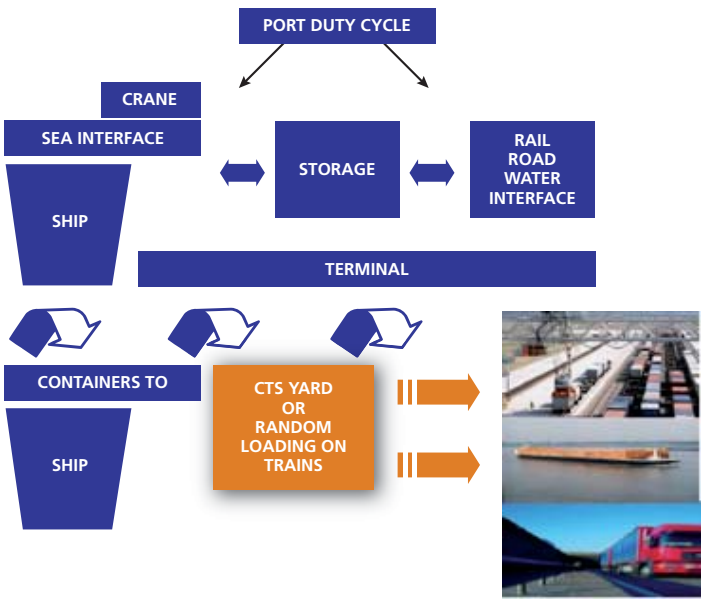
6. THE THREE TIGER DEMO PROJECT DEMONSTRATORS

As indicated in the previous chapters, the MARIPLAT Pilot having been terminated both for market and Taranto infrastructure upgrading reasons, the TIGER DEMO Project concentrated the traffic development on the three remaining demonstrators called:

GENOA FAST CORRIDOR - GFC
INNOVATIVE PORT & HINTERLAND OPERATION - iPort
INTERMODAL NETWORK 2015+ - MEGA HUB

All three demonstrators wanted to correct a "weak link" in the Sea Ports Duty Cycle (Figure 4) transforming it into a "strong point" of the maritime transport chain.

→ Figure 4: Port Duty Cycle graphic representation
Source: **NEWOPERA Project**



The maritime traffic which is generating economies of scale, is the field where rail service intermodality can extract the maximum advantage from the practical implementation of co-modality and where the best performance from each transport mode is enhanced through the exploitation of its potential capability. The intermodal Rail service industrialization when implemented efficiently can deliver the advantage of moving the traffic to several inland destinations in substantial volumes. Also the inland waterways transport mode has in itself such ability. However this is limited to the existence of a navigable river. The European rail network is far more extended overcoming already the natural barriers which, since the origin of mankind, have been an obstacle to the circulation of people and goods. Therefore analyzing the existing capability of all surface transport modes, rail intermodality is the one offering the greatest opportunities for improvement. Some infrastructure investments in inland Dry Ports are necessary for the rail network to extract and deliver its maximum productivity. The Dry Ports are the necessary links between the sea Ports and the inland destinations generating the step change needed to pass from occasional transportation to a standardized industrial transportation system. It has been

recognized that by exploiting rail intermodality in an industrialized way from the Sea Ports to the Dry Ports, the weak link which today is coinciding with the congestion of the CT yards, can be removed by re-distributing the traffic into the traffic attraction zones of the cargo origins and destinations. The feeder services constituting and supplementing the shipping lines maritime network according to the hub and spoke approach have been and will continue to be successful in distributing containers in an industrial way from a hub port to regional ports. However this system is shifting the meeting point with the land further down the transport chain.

In the next pages the graphic representation of the three TIGER DEMO demonstrators is reproduced and described in order to make clear the dedicated transport chains organized in each TIGER DEMO geographical areas.

6.1 THE GENOA FAST CORRIDOR OR GFC

The Genoa Fast Corridor or GFC has the objective of transferring the containers arriving both at Terminal San Giorgio Terminal Messina(in ATI) and Genoa Voltri to Rivalta Terminal Europa, a new Dry Port immediately behind the Apennines mountains at a distance of about 75 Km from Genoa Port quays. Shuttle trains are operated joining together the San Giorgio, Messina and the Voltri traffic, adopting fast transfers from quays to trains speeding up operations in a total industrial way. The trains operations are designing a "loop" formed by using a secondary uphill Rail link returning to the Genoa Port via the main rail line. A correlated objective is the reduction of logistic environmental impact inside the urban area, optimizing gate operations for trucks traffic flow in addition to the modal shift from road to rail.

New technologies and management systems innovations as well as investments in ports infrastructures and signaling are introduced in order to make this innovative concept a viable operating commercial proposition. Innovative RFID and E/seals OCR reading devices are in place for allowing automatic reading of the containers while the train is entering or exiting the gates. Industrialized tracking and tracing system are operational in direct connection with the Italian Customs Agency for implementation of E/customs at Rivalta Terminal Europe. During the project lifetime more than 500 shuttle trains have been operated proving the system effectiveness on large scale. An interoperable collaboration platform ready to be implemented on regular interchanges has been introduced between SE Asia and Europe for the efficient management of the Intermodal Transport chain (Figure 5).

→ Figure 5: The Genoa SE Asia/Europe Transport chain.
Source: **TIGER DEMO Project**

Rivalta Terminal Europa is linked to the major Italian and European Rail network being directly located on the Genoa-Rotterdam European corridor(Figure 6). From Rivalta the connectivity to the rest of Italy and the rest of Europe is available thanks to the elimination of barriers and bottlenecks represented by the Apennines mountains. Rivalta Terminal Europa is already today recognized as Genoa Sea Port Customs meaning that both security and Customs operations can be effected there without interference in Genoa Port while the containers are in transit by rail.

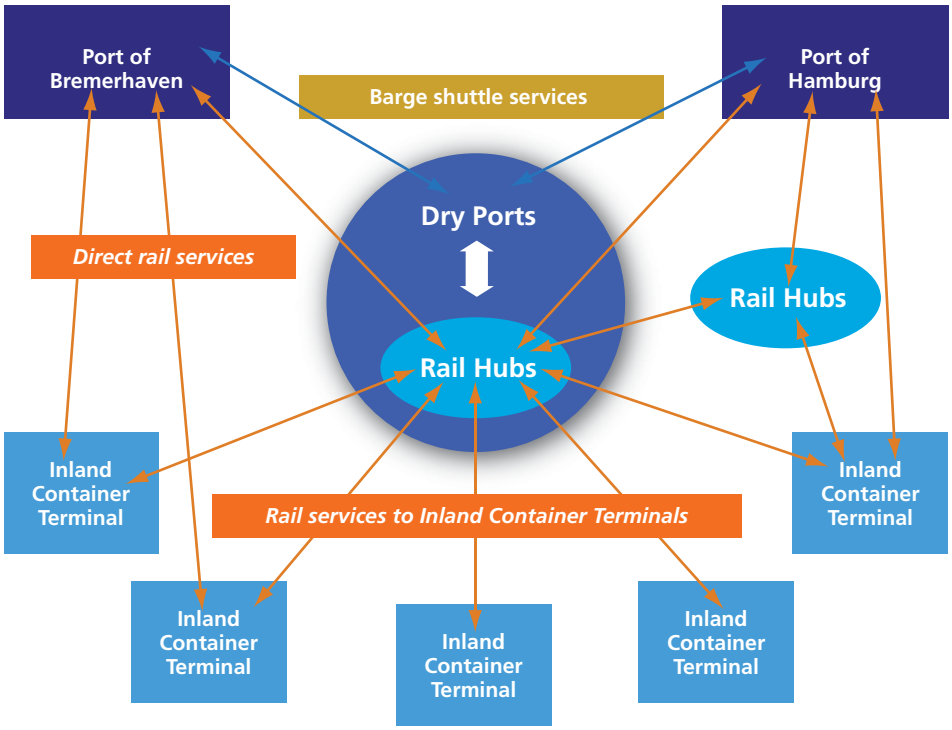
→ Figure 6: The Genoa Fast Corridor "GFC" concept.
Source: **TIGER Project**

6.2 THE INNOVATIVE PORT & HINTERLAND OPERATIONS - iPORT

The Innovative Port & Hinterland Operations iPort has the objective of optimizing the CT flows between the Ports of Hamburg Wilhelmshaven and Bremerhaven and the hinterland. Since the development of new greenfield hub projects is a very complex process, the importance of using existing infrastructures has been growing steadily. For this reason the feasibility of implementing innovative and intelligent transport concepts on existing facilities was evaluated. In this demonstrator different approaches are considered. The "Close to the Port" and "Close to the Market" approaches are the two prevailing characteristics chosen for serving the customers. The "Close to the Port" approach entails the choice of a Dry Port/rail hub where to route immediately the containers to/from the Sea Ports for subsequent re-launching to other Terminals of destination. The "Close to the Market" approach entails the routing of the CT trains directly from the Ports to the terminals of final destination. Massive investments for expansions are being made in the ports of Hamburg, Bremerhaven and Wilhelmshaven in order to secure their continuous development having achieved above average expansion rates in the years immediately before the recent recession. The iPort concept is planned to avoid future bottlenecks between the German CTS ports and the hinterland which are likely to occur failing corrective actions. The iPort concept through the Dry Port strategy is set to achieve improved productivity along the maritime hinterland transport chain. The inland terminals and Dry Ports are important interfaces in this process. Their integration in the total logistic chain as well as their production efficiency are important factors for the success of the maritime

intermodal hinterland traffic industrialization. The adoption of co-modal solutions allows production cycles in line with the expected volume increases in the three Ports of Hamburg, Bremerhaven and Wilhelmshaven. The application of new management technologies are set to improve the coordination and reorganization of the work processes and interfaces between the different actors(Figure 7).

→ Figure 7: Innovative Port & Hinterland Operations "iPort " concept.
Source: **TIGER Project**

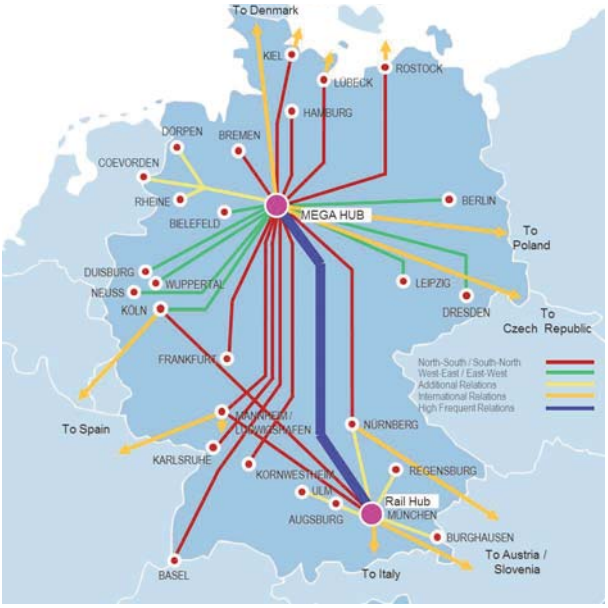


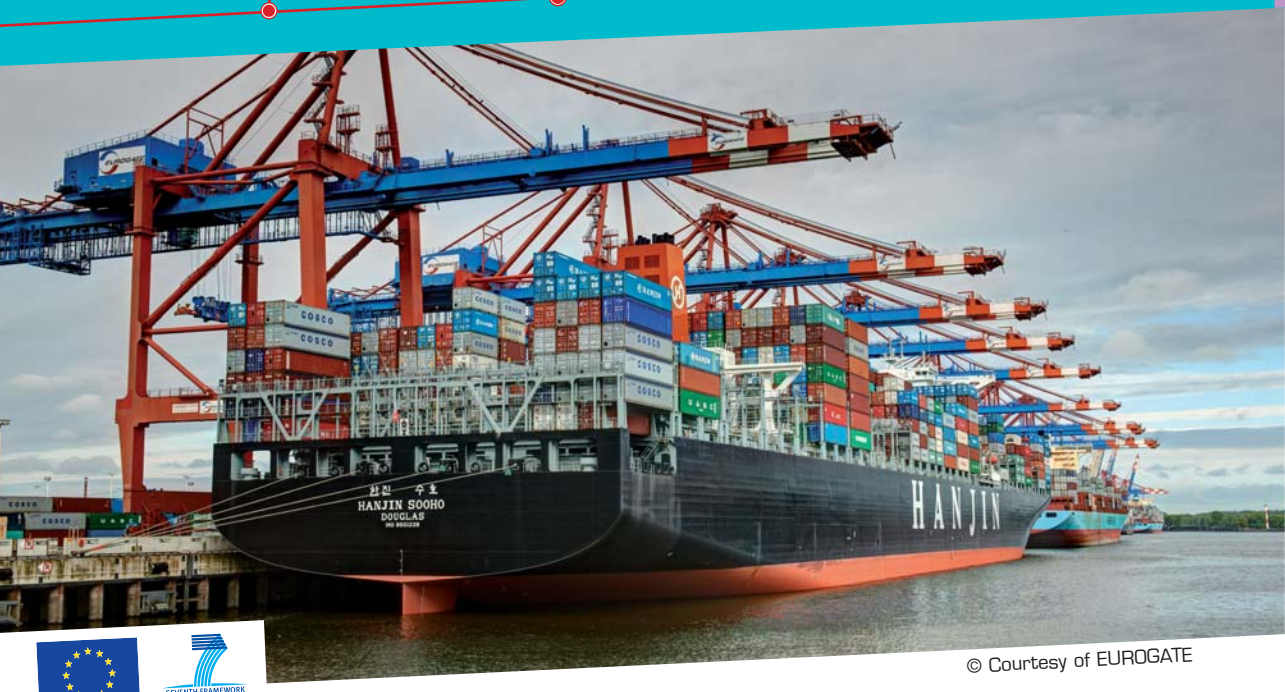
6.3 THE INTERMODAL NETWORK 2015 - MEGA-HUB

The Intermodal Network 2015 – MEGA HUB aims at making a further step change in the inland distribution by intermodal trains via the Kombiverkehr extensive shuttle service network. This step change is achieved through a major new investment in a Mega Hub which is being executed in Lehrte near Hanover and Munich Riem. While Munich Riem is ready to start operations, the Lehrte Mega Hub, although under construction, will not be ready for operations during the Project lifetime. However the Lehrte investment was driven by the **TIGER Project** objectives. The new Lehrte Mega Hub is set to increase terminal productivity and efficiency both to and from the Sea Ports/inland waterway Ports and the national/ international inland destinations. The Lehrte and Munich Riem Mega Hubs are set to combine maritime as well as overland traffic achieving larger economies of scale. New production concepts based on train to train transfer are planned and implemented. Both Mega Hub facilities are designed and constructed with identical train operation concepts. Two

production levels are planned: the first production level of larger scale is implemented with the direct shuttle services between major Sea Ports and inland Terminals/ Dry Ports, whereas the second production level is implemented for destinations having smaller volumes where direct daily services from Sea Ports cannot be secured. The Economy of scale obtained by concentrating the traffic in Munich Riem/Lehrte Mega Hub where both the maritime and overland domestic/international traffic is converging, allows the expansion of intermodal services by improving the frequencies. A the same time additional smaller terminals, where either the continental traffic or the maritime traffic individually do not have enough volumes for direct train links, can be connected with regular services. The new technologies and management concepts support all these innovative processes(Figure 8).

→ Figure 8: Intermodal Network 2015+ "MEGA-HUB" concept.
Source: **TIGER Project**





© Courtesy of EUROGATE

This transition was necessary to consolidate the results achieved during the Pilot phase securing the feasibility operations into an industrial level capable of extracting commercial results from the market place. Such results had to be measured both in terms of service attraction for the users and in terms of financial viability considering that the **TIGER DEMO** partners expected to receive from such innovative services the return for their relevant investments.

This work package was designed to ensure seamless transition from the **TIGER** pilots to **TIGER DEMO** full scale demonstration. The results of the **TIGER** pilots were compared and evaluated against the original plan. Then the **TIGER DEMO** integrating itself into the **TIGER** pilot phase was able to bring these trials pilot results to a consolidated industrial level. During this transition several tasks had to be accomplished such as:

1. The re-adjustment in the light of the prevailing market situation,
2. The gaps or shortcomings identification,
3. The operational design and plan for **TIGER DEMO** full scale demonstrators,
4. The preparation of the training program and the best practices identification,
5. The training activities' implementation necessary for preparing the full scale demonstration into an operational profile.

During the fulfillment of these tasks and with the documentary support of the research activities accomplished during the **TIGER** project in relation to the 2020 "Traffic Volumes Market Assessment", it emerged that for 3 Pilots namely GFC, iPort and MEGA HUB it was possible to plan the extension into a full scale demonstration whereas for MARIPLAT the changed market conditions advised to the contrary. The common denominator characterizing the 3 **TIGER DEMO** full scale demonstrators for subsequent introduction into permanent market uptake services, was the enlargement of their traffic attraction zones. This increased competitiveness of the overland maritime services was achieved through the dry port strategy capable of bringing nearer to the final customers the ships by applying the extended quay concepts, such as the "Close to the Port" and the "Close to the Market". By so doing the Sea Ports involved of Genoa, Bremerhaven and Hamburg showed a strong resilience to the economic downturn but above all were able to put forward thereafter a stronger than expected performance in the traffic recovery. Such fast traffic volumes recovery to the pre-crisis levels were substantiated with facts and figures by Market statistics. www.Tigerproject.eu.

7.1 GENOA FAST CORRIDOR OR GFC BASED ON GENOA PORT THROUGHPUT

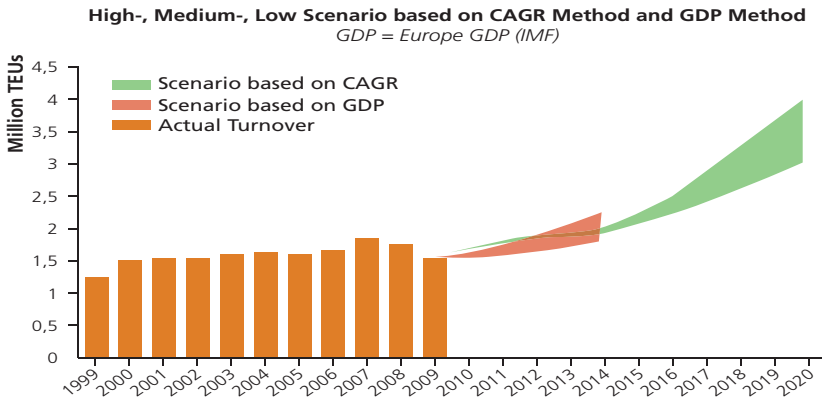
The Port of Genoa traffic projections(* in mil TEU) for 2015 and 2020 are reproduced in Figure 9.

→ Figure 9: CAGR-methodology traffic projections for the Genoa Port.
Source: **TIGER Project**

Scenario	2015	2020
High	2,24	4,00
Medium	2,14	3,50
Low	2,04	3,00

Considering that in 2012 Genoa Port throughput exceeded the 2m TEU from 1,5m TEU of **TIGER** project base year 2009, the pace of the forecasted traffic development reproduced in the next Figure 10 has been largely exceeded. So much so that Genoa Port forecasted its own traffic scenario of 2,1m TEU by 2015 which has nearly been reached in 2012. This stands to indicate that assuming overland distribution services capable of handling growing volumes through the Dry Port of Rivalta Terminal Europe combined to the improved handling/transfer performances on the quays, integrated connectivity between the key actors, the implementation of E/customs, E/freight, E/seals, the high scenario objective is not only possible but realistically achievable.

→ Figure 10: High/Medium/Low scenario based on CAGR and GDP for Genoa Port.
Source: **TIGER Project**



The following graphs (Figures 11-12) reproduce the Genoa Port situation for its modal split according to its individual scenario.

GENOA PORT
Genoa Port modal split in mil TEU

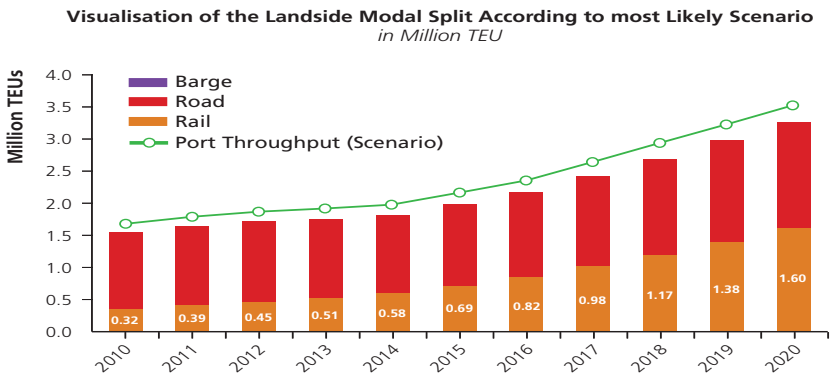
→ Figure 11: Genoa Port Landside Modal Split according to individual scenario.
Source: **GPA**

	2010	2015	2020
Barge	-	-	-
Road	1,20	1,30	1,70
Rail	0,30	0,70	1,60

The traffic volumes handled by rail increased to 0,35m TEU on a total throughput of 2m TEU or 17%. Although in absolute term the volumes handled by rail are on the increase in percentage terms the performance is less satisfactory. This is due to the Infrastructure upgrading inside the port which although planned is far from being completed. The areas of intervention are very many and their completion is forecasted in the medium term as per TIGER FINAL REPORT BOOK www.tigerproject.eu.

The gradual rail infrastructure upgrade both inside the various terminals and outside for connecting the Port rail network with the RFI National and International network should allow a gradual increase of rail capacity handling up to the planned figures. The increased Port throughput of 2012 exceeding 2m TEU three years ahead of plan, provides the economy of scale volumes for feeding the trains frequencies. The TIGER DEMO increased performances of GFC demonstrator having upgraded substantially during 2013 the number of trains into Rivalta Terminal Europe is a proof of the correct approach for keeping the traffic moving through the port of Genoa in a sustainable and competitive way.

→ Figure 12: Genoa Port Landside Modal Split Visualization according to individual scenario. Source: **GPA**



7.2 THE INNOVATIVE PORT & HINTERLAND OPERATIONS OR iPORT BASED ON HAMBURG - BREMERHAVEN - WILHELMSHAVEN PORTS THROUGHPUT

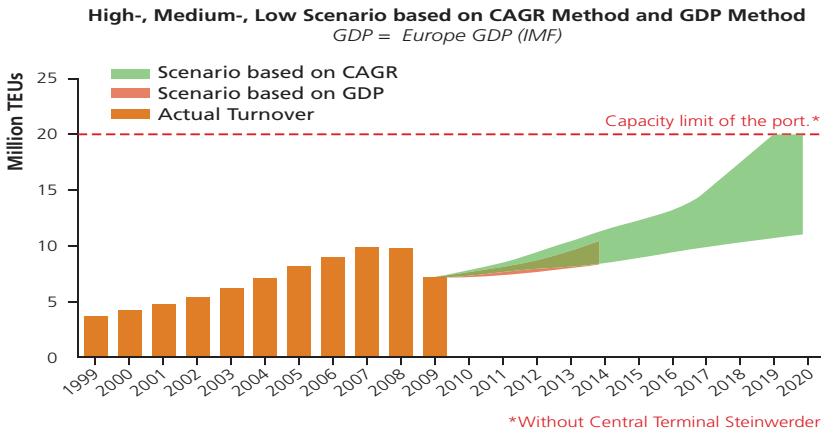
The Port of Hamburg traffic projections (* in mil TEU) for 2015 and 2020 are reproduced in Figure 13.

→ Figure 13: CAGR-methodology traffic projections for the Port of Hamburg. Source: **TIGER Project**

Scenario	2015	2020
High	13,09	19,20
Medium	10,29	14,91
Low	8,65	10,77

Considering that in 2012 The Port of Hamburg throughput reached near 9m TEU from 7m TEU of **TIGER project** base year 2009, the pace of the forecasted traffic development reproduced in the next Figure 14 has been exceeded. So much that the Hamburg Port forecasted its own individual traffic scenario of 10.3m TEU by 2015 which is likely to be exceeded by reality.

→ Figure 14: High/Medium/Low scenario based on CAGR and GDP for Port of Hamburg. Source: **TIGER Project**



The following graphs (Figures 15-16) reproduce the Hamburg Port situation for its modal split according to its individual scenario.

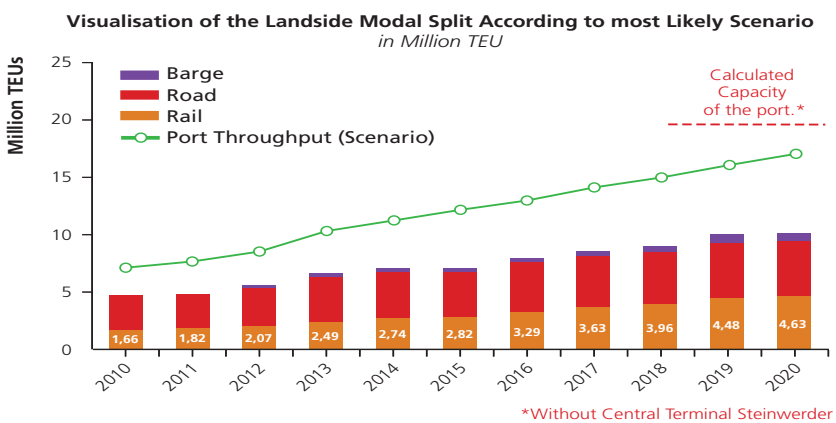
HAMBURG PORT

Port of Hamburg modal split in ml TEU

→ Figure 15: Port of Hamburg landside modal split according to individual scenario. Source: **HHM**

	2010	2015	2020
Barge	0,11	0,28	0,71
Road	3,00	3,90	4,80
Rail	1,66	2,82	4,63

→ Figure 16: Port of Hamburg landside modal split visualization according to individual scenario. Source: **HHM**



→ Figure 17: The Port of Hamburg in full operation.
Source: **HHM**

→ Figure 18: The Port of Hamburg in full operation.
Source: **HHM**

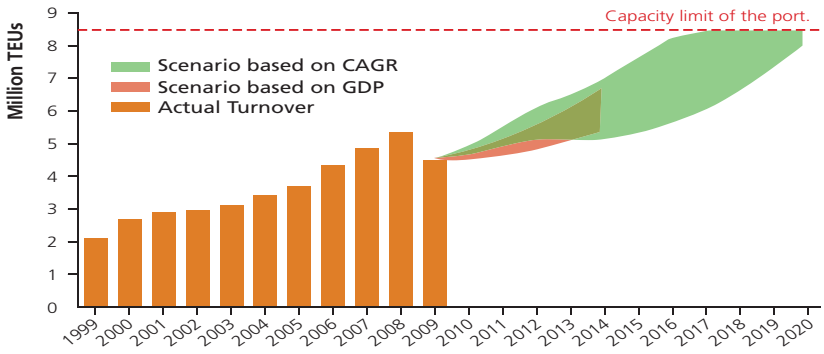
At the time of writing this report the actual modal split achieved in 2012 is very much in line with the forecasted volumes planned in the medium scenario with the Rail performance at about 2m TEU or 37%. Road achieved 61% with barges at 2%.The Port of Bremerhaven traffic projections(* in mil TEU) for 2015 and 2020 are reproduced in Figure 19.

→ Figure 19: CAGR-methodology traffic projections for Bremerhaven Port.
Source: **TIGER Project**

Scenario	2015	2020
High	7,59	8,48
Medium	6,31	8,48
Low	5,23	7,98

Considering that in 2012 the Port of Bremerhaven throughput exceeded 6m TEU from 4,56m TEU of **TIGER project** base year 2009, the pace of the forecasted traffic development reproduced in the next Figure 20 has been exceeded. So much that Bremerhaven Port forecasted its own individual traffic scenario of 6m TEU by 2015 which has been reached and exceeded already in 2012.

→ Figure 20: High/Medium/Low scenario based on CAGR and GDP for Port of Bremerhaven. Source: **TIGER Project**



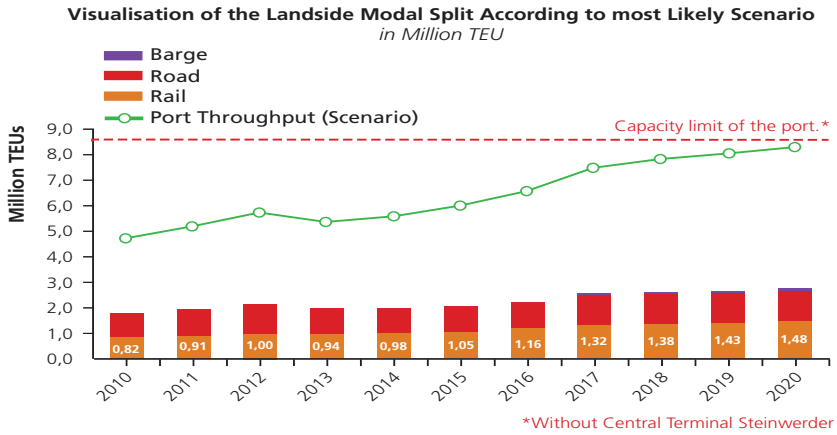
The following graphs (Figures 21-22) reproduce the Bremerhaven Port situation for its modal split according to its individual scenario.

BREMERHAVEN PORT
Port of Bremerhaven modal split in ml TEU

→ Figure 21: Bremerhaven Port Landside Modal according to individual scenario.
Source: **HHM**

	2010	2015	2020
Barge	0,06	0,08	0,10
Road	0,90	1,00	1,20
Rail	0,82	1,05	1,48

→ Figure 22: Bremerhaven Port Landside Modal Split Visualization according to individual scenario. Source: **HHM**



The modal split is evenly shared between Road and Rail for the overland traffic.

The traffic projections of an expert group coordinated by HHM for the port of Wilhelmshaven are visualized in Figure 23. Starting from the first year throughput of 1.0m TEU in 2013 the following traffic are forecasted (* in mil TEU) in the years 2015 up to 2020.

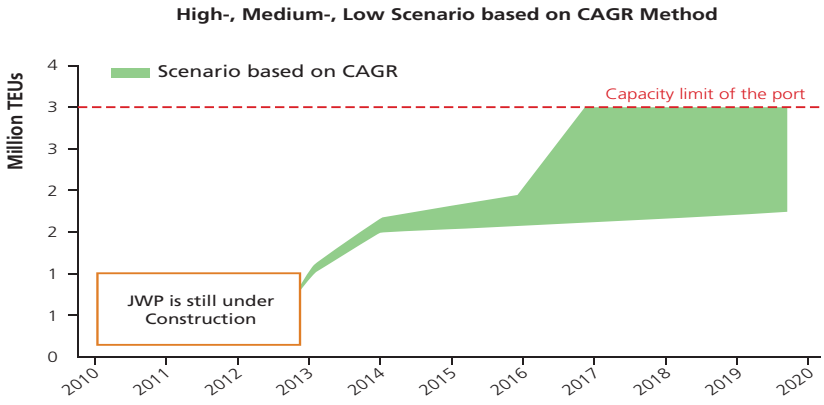
→ Figure 23: CAGR-methodology traffic projections for Wilhelmshaven individual scenario. Source: **TIGER Project**

Scenario	2015	2020
High	1,82	3,00
Medium	1,62	3,00
Low	1,54	1,74

Wilhelmshaven started operations during 2012.

The following Figure 24 indicates the cone of the CAGR projections. According to the medium scenario capacity limit is reached in 2019 whereas on high scenario the capacity limit is reached in 2017. The strong growth rates in the high scenario for 2016/2017 are due to the Bremerhaven Port reaching its capacity limit. The very strong performance of Bremerhaven Port in 2012 substantiates this high scenario becoming reality. Wilhelmshaven forecasted its own individual traffic scenario of 1,6m TEU by 2015 which is likely to be exceeded given the exceptional performance of Bremerhaven.

→ Figure 24: High/Medium/Low scenario based on CAGR methodology for Wilhelmshaven. Source: **TIGER Project**



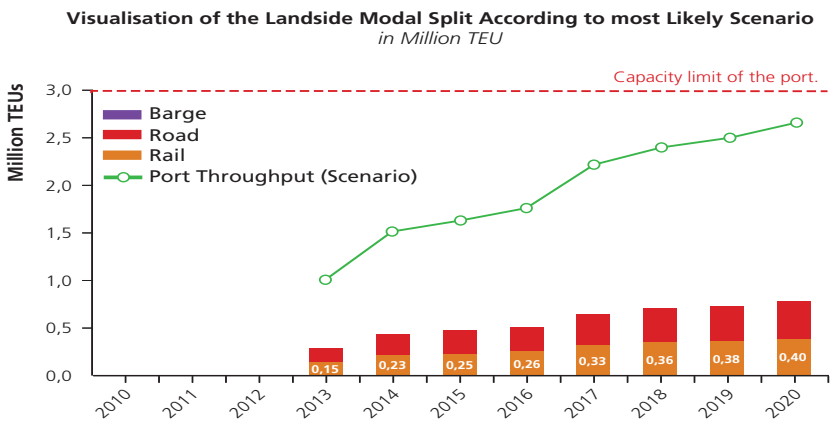
The following graphs (Figures 25-26) reproduce Wilhelmshaven situation for its modal split according to its individual scenario.

Wilhelmshaven modal split in ml TEUs

→ Figure 25: Wilhelmshaven Landside Modal Split according to individual scenario. Source: **HHM**

	2010	2015	2020
Barge	0,06	0	0
Road	0,90	0,25	0,40
Rail	0,82	0,25	0,40

→ Figure 26: Wilhelmshaven Landside Modal Split visualization according to individual scenario. Source: **HHM**



7.3 THE INTERMODAL NETWORK 2015+ MEGA HUB BASED ON THE MUNICH RIEM NEW PRODUCTION CONCEPT AND NEW TRIMODAL SERVICE FRANKFURT TO TRIESTE

Munich Riem. The first implementation step of a new Rail-Hub terminal is the development of a viable timetabling for all planed train runs. In the planning process the intermodal operator Kombiverkehr involved DB Intermodal as sales representative of DB Schenker Rail Group operational railways, DB Netz as infrastructure manager and finally DUSS as terminal manager of Munich-Riem.

The markets to be targeted by Munich-Riem are those along the North-South rail axes involving both continental and maritime traffics.The Munich Riem rail hub terminal role is to bundle and sort cargoes on various origin/destination relations. The rail connections in the **TIGER DEMO** project scope in the Northern sector of Munich Riem are the following:

- Hamburg - Munich
- Duisburg - Munich
- Köln - Munich
- Ludwigshafen - Munich
- Buna/Leipzig - Munich
- Bremerhaven - Munich
- Dörpen - Munich
- Dortmund - Munich
- Warstein - Munich
- Rotterdam - Munich

Whereas from the Munich Riem rail hub towards the Southern destinations/origins are the following:

- Munich - Ljubljana
- Munich - Verona
- Munich - Segrate (Milano)
- Munich - Trieste
- Munich - Budapest

The network timetable and the slot allocation in the terminal allow the handling of both the local and hub volumes to the customer satisfaction, so that the general rail hub concept can be demonstrated in the full scale demonstration. The hub's performances are satisfactory according to the volumes and the timing achieved during the Pilot phase and planned in an industrial scale for the rest of 2013 according to the 2013 annual timetable. The full scale demonstration site is based on Munich Riem. The extension of the 3rd module of the Munich-Riem terminal, with an investment of approximately EUR 25 million, is in operation since January 2012. The 3rd module of the terminal comprises of:

- 4 train-long transshipment tracks,
- 2 high performance gantry cranes (RMGs),
- 3 intermediate storage lanes,
- advanced crane control and terminal management system,
- driving and loading lanes for trucks.

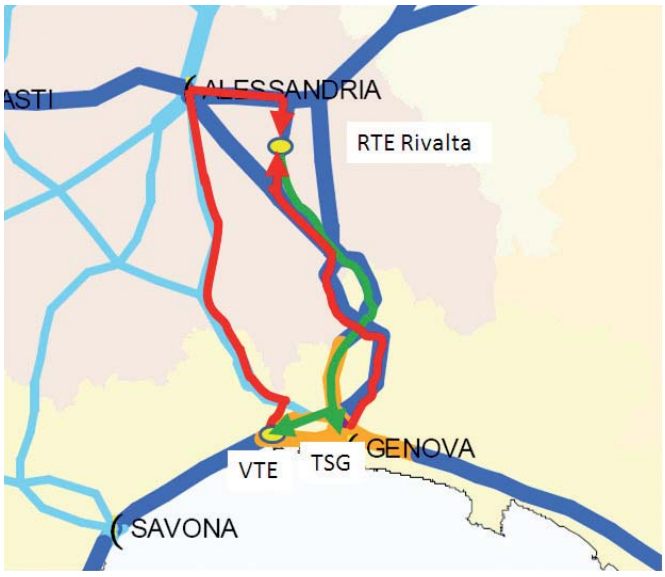
The rail terminal infrastructure has been adapted to fulfill the customers' needs and requirements. The major advantage of this rail terminal is the possibility of providing double–sided and electrified rail access for the North & South entry gates. In addition, the Munich-Riem terminal provides the direct entrance with momentum and the direct train paths exit. Such operational concept provides faster trains delivery into the handling tracks for subsequent direct departure, saving both the usage cost and the waiting time for the shunting locos.

Frankfurt to Trieste Rail Link. The ferry maritime traffic originating from the seaport of Trieste is instrumental for feeding a new intermodal service from the seaport of Trieste in Italy to the dry port of Frankfurt am Main in Germany. Such international service connection is of particular strategic importance since the plan is to combine intra-European continental traffic with maritime traffic providing an innovative logistics solution in train operations with the necessary economy of scale supported by adequate capacity management technology. In order to achieve a viable service objective for the full fruition in the market place a new tri-modal service was planned by Kombiverkehr for a start-up date on the second part of 2013 aiming to link Frankfurt am Main and Ludwigshafen in Germany with Pendik in the Asian-side of Turkey as well as the port of Patras in Greece. The tri-modal service is a combination between railway, short sea shipping and road. This tri-modal service is a completely new service to be tested on the field during **TIGER DEMO** Project.

This new service concept is an open-access train for multiple-clients and ensures not only the freight transport for containers but also swap bodies and semi-trailers. Moreover, the advantage of this new service is that it provides a continuous "P400" profile, which means that mega-trailers with a loading height of 3 meters can be transported without any problems. The intermodal train originating at the terminal of Frankfurt am Main passes only through the terminal of Ludwigshafen (BASF) and ends at the Europe Multipurpose Terminal (EMT) in Trieste in Italy. The trains frequency departing from terminal Frankfurt to Trieste Port is 3 times per week each direction. The departing days from Frankfurt are Monday, Friday and Saturday. The transit time of this service is Frankfurt am Main/Ludwigshafen (Germany) to Patras in Greece → 4 days and Frankfurt am Main/Ludwigshafen (Germany) to Pendik in Turkey → 6 days.

8.1 GENOA FAST CORRIDOR or GFC

→ Figure 27: The Genoa Fast Corridor "GFC" concept.
Source: **TIGER Project**



The Genoa Fast Corridor re-engineering process involved the following components of the Genoa maritime CT transport chain largely explained in the **TIGER Project**:

- Terminal San Giorgio.
- ATI Ignazio Messina-Terminal San Giorgio.
- Voltri Terminal Europa (VTE).
- The Genoa Port internal and external railway network master plan.
- The wagons/trains maneuvering inside the Genoa Port rail sidings and the shuttle trains from the Genoa Terminals involving TSG, Messina, VTE and Rivalta Terminal Europa (RTE).
- The shuttle trains path agreed with RFI from Voltri Terminal and/or TSG and Messina Terminals to Rivalta Terminal Europa.
- The Rivalta Terminal Europa (RTE) Dry Port.
- The National and International CT freight trains from Rivalta to other Italian and International inland destinations together with the connecting activity of train path request with RFI.
- The introduction of a complete new system allowing seamless mobility combining together customs, security, documents through E/customs, E/seals, E/freight.
- The hard/soft technologies equipment systems, controls, processes, management, training of personnel, governing the whole maritime CT transport chain.
- The rail monitoring and signaling system.
- The rail/truck gate management system.
- The whole process is managed through intelligent Track & Trace systems overlooking and monitoring the position of the containers before, during and after transportation. The full production cycle is under control.

During the research work carried out in the TIGER Project it has emerged that the most important gravity attraction areas for the traffic in origin/destination for the port of Genoa are:

In Italy the Regions of Lombardy, Emilia Romagna, Veneto, Piedmont, Tuscany and South Regions of Germany, France, Switzerland, Austria as well as the Eastern Countries of the European Union. The future demand traffic forecast elaborated in 2009 by Ocean Shipping Consultant for the port of Genoa have attributed in terms of O/D traffic 71.16% of the volumes to national sources whereas the remaining 28.84% was attributed to international sources.

For national Italian market the port of Genoa developed the following O/D traffic volumes in percentages terms:

- 35% with Lombardy Region using the Arluno-Rho, Milano–Certosa, Milano–Rogoredo, Melzo terminals and Busto Arsizio dry ports;
- 32% with Emilia Romagna Region using the Modena, Rubiera and Piacenza terminals;
- 21% with Veneto Region using Verona and Padova dry ports;
- 5% with Tuscany Region using Arezzo dry port;
- 4% with Piedmont region using Rivalta Scrivia, Casale Monferrato, Orbassano and Novara dry port;
- 3% with other Italian Regions using several other terminals.

For the international market the port of Genoa developed the following O/D traffic volumes in percentages terms:

- 38.8% with Germany;
- 24.75% with France;
- 18.07% with Switzerland;
- 18.38% with Austria and East EU Countries.

If one analyzes the modal split, in 2009 the final statistical results indicated a 18% of cargo routed by rail and 82% of containerized cargo by road. On the basis of 2009 throughput, the port of Genoa out of 1,43m TEU has managed 1,01m TEU for the national market of which 0,84m TEU by truck and 0,19m by rail. The remaining 0,41m TEU were for international O/D of which 0,16m TEU with Germany, 0,10m TEU with France, 0,07m TEU with Switzerland and 0,07m TEU with Austria and East EU Countries. The modal split has remained roughly the same.

In 2010 during the TIGER Project development it was forecasted that a total traffic of 1,90m TEU not including feeder and transshipment, would be performed by port of Genoa in 2015 with about 40% of the traffic to be handled by rail and 60% by road. Out of this total amount 1,41m TEU were planned to be destined to the Italian market and 0,50m to international markets.

As a matter of fact the Genoa port achieved a CT traffic throughput in 2012 in excess of 2m TEU three years ahead of target confirming that the Sea Ports business model is "offer driven". When competitive services and infrastructure are available the customers and the shipping lines are prepared to use them at their best.

The Genoa Port throughput per Italian Regions in mil TEU planned 2015 & 2020 (Figure 28).

→ Figure 28: Genoa Port throughput per Italian Region projected 2015 - 2020.
Source: **TIGER DEMO Project**

O/D Region	Planned 2015	Planned 2020
Lombardy	0,49	0,81
Emilia Romagna	0,45	0,74
Veneto	0,30	0,48
Tuscany	0,07	0,12
Piedmont	0,05	0,09
Others	0,04	0,07

The Genoa Port throughput per International areas in TEU, planned 2015 & 2020(Figure 29).

→ Figure 29: Genoa Port throughput per International areas projected 2015 - 2020. Source: **TIGER DEMO Project**

O/D Region	Planned 2015	Planned 2020
Germany	0,22	0,37
France	0,14	0,23
Switzerland	0,10	0,17
Austria & East Countries	0,07	0,17

The Genoa Port scenario 2020 throughput in TEU forecasted during TIGER project development in 2010 was for a total traffic of 3,2m TEU not including feeder and transshipment with about 40% of the traffic handled by rail and 60% by road. Out of this total volume 2,32m TEU were planned to be destined to the Italian market and 0,94m TEU to international markets as per the following Figure(Figure 30).

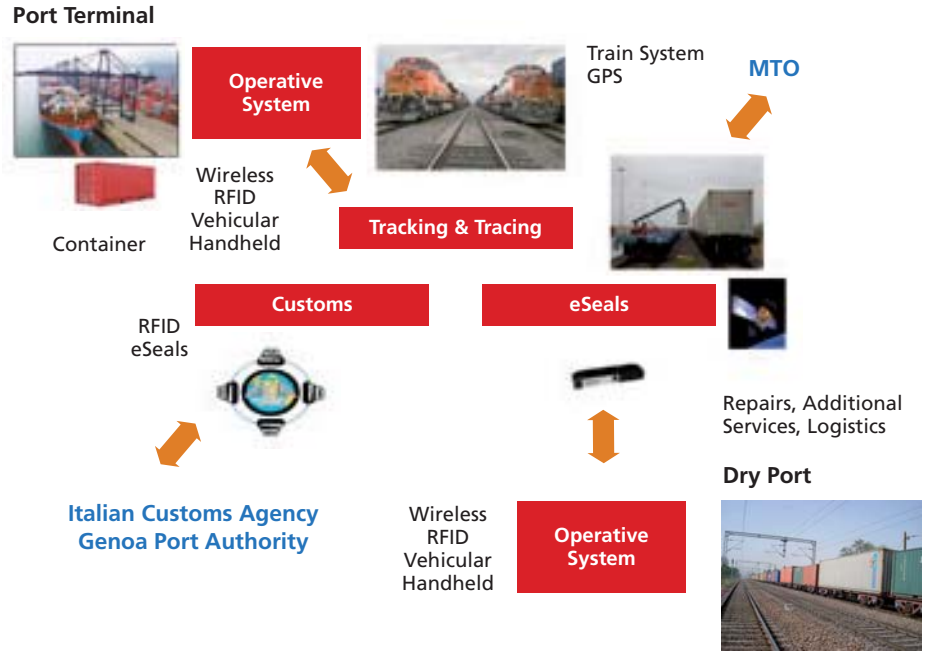
→ Figure 30: Genoa Port throughput planned 2015 - 2020 with modal split.
Source: **TIGER DEMO Project**

Trasport modality "Port of Genoa - Final market"				
	2015		2020	
	Rail (TEUs)	Truck (TEUs)	Rail (TEUs)	Truck (TEUs)
Italy	423,963	989,248	694,917	1,621,500
EU inland market	400,926	171,825	657,164	281,642
Total per modality	**824,889**	**1,161,073**	**1,352,081**	**1,903,142**
Total throughput	**1,985,962**		**3,255,223**	

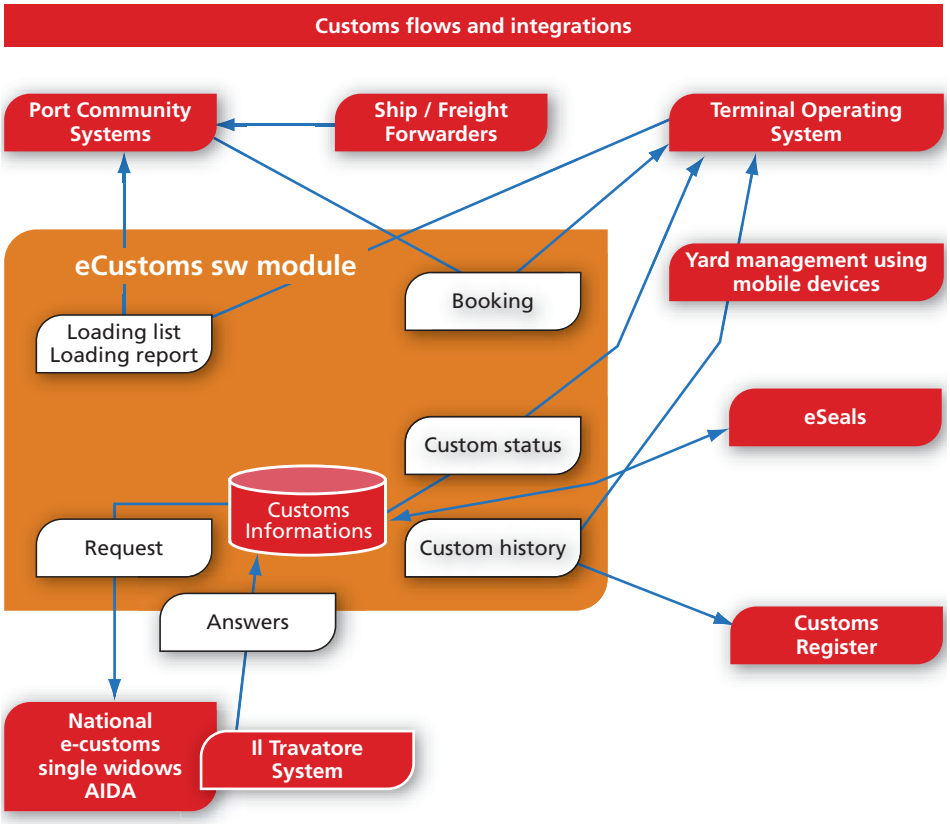
The fact that the Genoa port was able to reach 2,06m TEU overtaking in 2012 the 2m barrier three years ahead of target stands to indicate that productivity increases are possible and that the fast dispatch of containers from the port to the hinterland destinations represents the way forward for decongesting the ports and at the same time increase their throughput with the existing resources.

In the next pictures(Figures 31-32) the overall Genoa fast Corridor system architecture is reproduced signifying the objective of putting all the maritime chain actors in one single communication loop capable of managing and coordinating the arrival, port handling, transit and re-forwarding activities at the same time fulfilling the extended quay dry port concept in Rivalta Terminal. In this system architecture the Italian Customs Authorities through their information tools "Aida" and "il Trovatore" are a fundamental link since the Rivalta Terminal Europe is a section of the Genoa Customs Agency when the containers are loaded on the trains hence not requiring any additional transit formalities for the transportation by train to Rivalta. The automated E/seals procedure which is reading the seal coupled to the container number both at departure and arrival gates is securing the cargo safety during transit to the Dry Port. The full automation and the electronic management control are extended to every chain component including the handling operation on the quay, the train transfer, the RFID tag, the E/seals the Customs Authority, the gate operation, the train operator, the track and trace up to train arrival inside the Rivalta Dry Port. The whole working cycle is reducing idle time in the port, is cutting transit time to Rivalta signifying lower operating costs, better service to the final customers, increased port productivity with better environmental impact. The whole Genoa maritime transport chain is benefiting from this Tiger Demo innovation which is accelerating considerably all the production phases of the traffic flows.

→ Figure 31: Overall Tiger Demo Project GFC system architecture.
Source: **TIGER DEMO Project**



→ Figure 32: Genoa Customs operations architecture.
Source: **TIGER DEMO Project**



During the Pilot phase about 8000 TEU have been moved testing the system architecture organization, the Customs flows as well as the shuttle train services to Rivalta. This traffic resulted in being fairly balanced with about 55% of the total being Import and 45% export. The Pilot Phase during the TIGER DEMO project demonstration was considerably upgraded adding to the Voltri traffic also the Messina and Terminal San Giorgio traffic allowing the achievement of increased volumes up to an industrial scale which indeed constituted the project objective in the first place. In particular the following actions were undertaken for the full project implementation:

- A more innovative industrialized tracking and tracing system was introduced supported by new Customs processes conducing towards E/customs, such as real time interaction with Customs single window or optimization of dry port simplified procedures etc.
- A new RFID E/seals system was designed for large scale use and readable with trains and transfer equipment in motion allowing real time information. The integrated information system including all functionalities such as track and trace, E/seals, E/customs, E/freight, entails the installation of automatic reading devices based on transponder technologies at the various gates, be them exiting the Port or entering the Dry Port. In the next pictures(Figures 33- 34) there is a visual representation of such devices.

- A new OCR system was introduced supported by new information flow management integrated with the Port Community System, the shipping companies in order to streamline the gate operation hence reducing the rail/truck processing time for port area decongestion.
- A more powerful management system was put into operation performing the traffic optimization of larger volumes and greater number of trains which was a pre-requisite for dealing with different functionalities at the same time.
- A stronger integration was achieved with the intermodal partners linked to trains flows operation.
- A fully computerized rail traffic management signaling and monitoring system was introduced in Rivalta Dry Port having the capabilities of tracking and managing the movements both inside the Dry Port and outside it, for connection with RFI rail network.

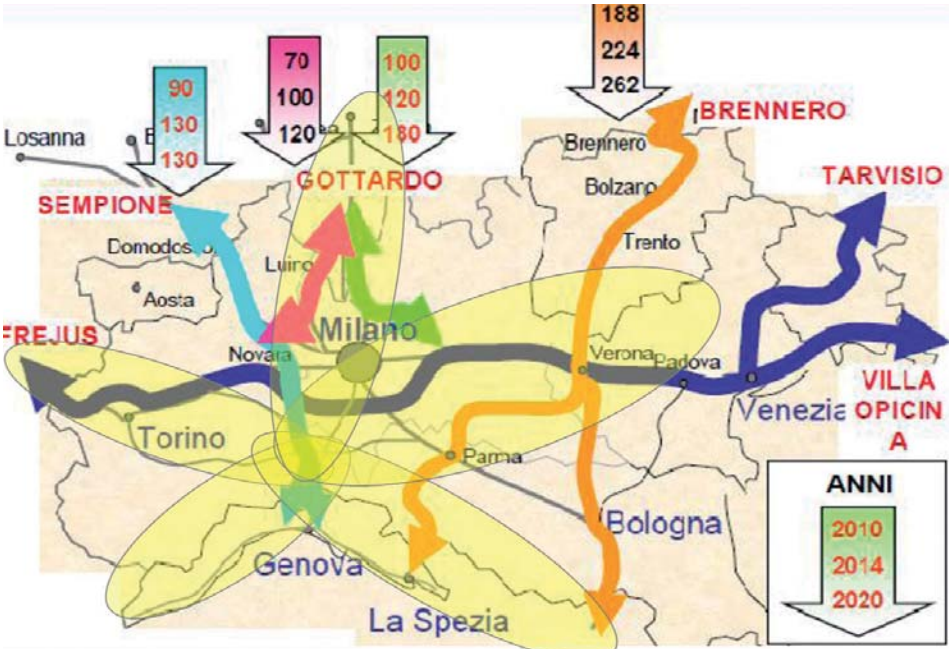
Figure 33: E-seals applied technology. Source: **GFC**

Figure 34: Automatic reading devices allowing full electronic and CTS management. Source: **GFC for TIGER DEMO Project**

At the time of writing this report the actual number of TEU moved under GFC **TIGER DEMO** demonstrator reached 9050. The split between Import and export was respectfully 55% of the total being Import and 45% export. It is expected that by the project end which is 31.12.2013 the total number of TEU moved under this project scheme will reach 11400. This result represent the very beginning of a new way of managing traffic flows to the hinterland via Rivalta Terminal Europe of the Genoa port in an industrial and systemic way.

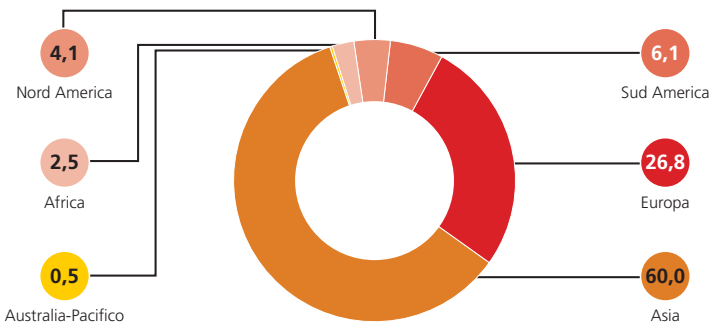
As a result of these measures costs and transit time have been reduced by about 30% achieving at the same time actual costs reduction in presence of an improved service which was the original paradigm to be resolved. Through **TIGER DEMO** system demonstrator the competitiveness of the Genoa Ports operators increased substantially delivering to Genoa a more centric role via Rivalta augmenting its accessibility position towards North, East, West as well as improving the reach towards other Italian destinations. This in fact constitutes the Genoa Port future challenge for playing a greater role in the South Central/Europe Maritime traffic scenario. For this reason while in the short medium term **TIGER DEMO** innovative system of moving traffic to the hinterland via Rivalta dry port constitutes a solution, in the long run a third rail tunnel across the Apennines represents the final answer. This is a plan in the "infrastructures to do" things when budget resources are available which means not in the immediate future. However works started on the base tunnel of this major new rail link. The next picture (Figure 35) represents the new centric role assumed by Rivalta Terminal Europe in the maritime traffic flows management of the Genoa Port together with the other two Liguria Region Ports of Vado Ligure and La Spezia.

→ Figure 35: Genoa centric role together with other Liguria Region Ports of Vado Ligure & La Spezia improving accessibility network to Hinterland destinations via Rivalta dry Port. Source: **TIGER DEMO Project**



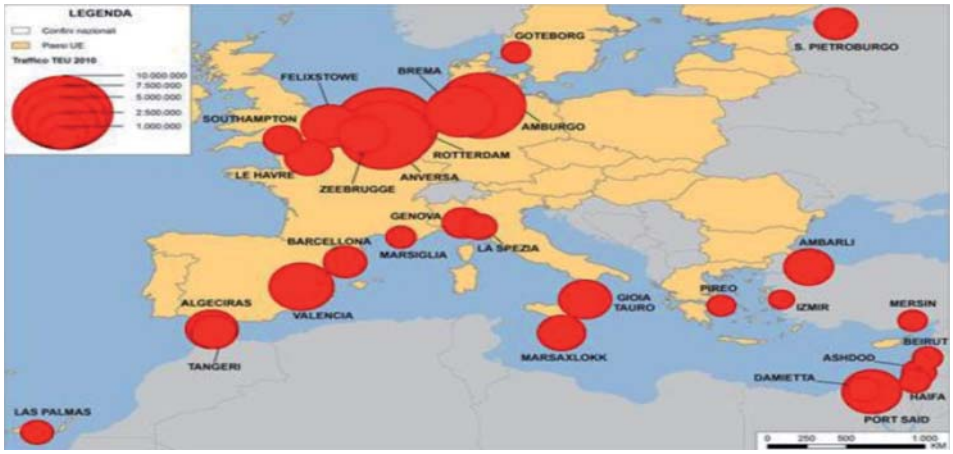
In order to establish Genoa port role in the light of the **TIGER DEMO** innovations together with the other two Liguria region ports of Vado Ligure and La Spezia one has to consider these ports in the International context in connection with the competitive position of the other Mediterranean and North European ports. The next picture(Figure 36) is reproducing the trading areas making up the Italian traffic 2010 in percentage terms. Asia is taking the lions share as one would have expected with 60% of traffic moved. The giant container vessels call at an inferior number of ports , where an increased number of movements are performed. These ports entail little deviations from the ideal navigation line for maximizing the slot costs competitiveness. Such maritime traffic organization should signal a preference towards the routing via the North European ports for the traffic loaded on these vessels. This choice is to be traded off against the much longer transit time expressed by this longer routing as well as against a disoptimization of the overland distance to be covered either by road or rail.

→ Figure 36: Italian Traffic composition 2010 . Continents in %.
Source: **CDP on UCTAD data**



The absolute importance status of the European Ports dictated by the achieved traffic volumes, reinforce the comments made regarding the choice in favor of the North European range or the Mediterranean one(Figure 37).

→ Figure 37: The first 30 European Ports for container traffic 2010.
Source: **ESPO 2012 & other sources**

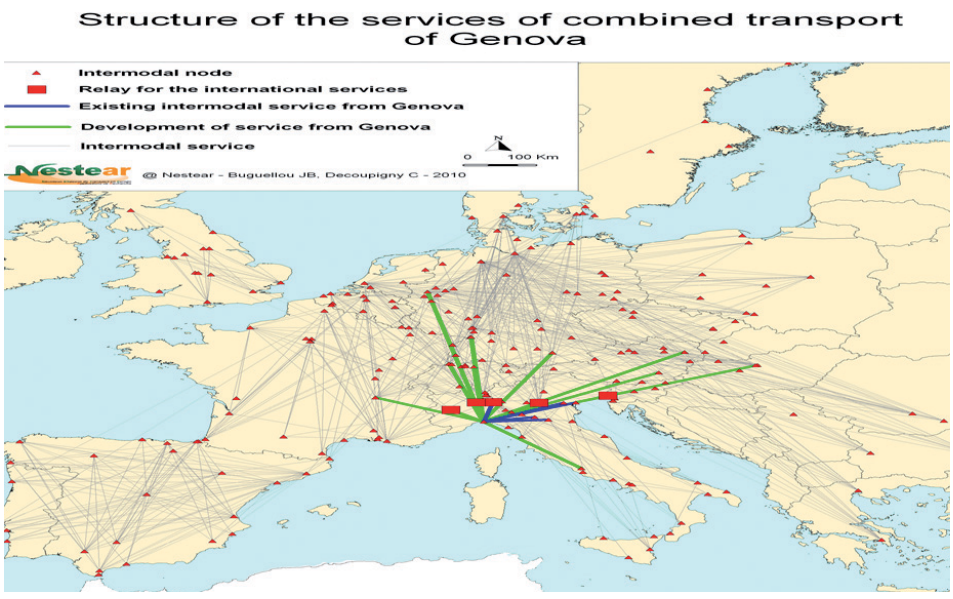


The Genoa Port together with the other Liguria Region Ports of Vado Ligure and La Spezia are obliged to reinforce their hinterland competitive reach if they want to achieve larger volumes throughputs for traffics destined to or originating from the "competing areas" which can be either accessed via the North European Ports or with a shorter transit time and lower distribution costs from the Liguria Region Ports(Figure 38). The visual graphic which appears to be in favour of the Mediterranean solution should not be taken as granted. The competition game is played on a much more sophisticated ground where for instance the "Virtual Distances" come into the game together with the rail corridors efficiency and capacity multiplied by the Mega hubs and Dry Ports presence into a given industrial district. The new Gothard Tunnel coming into service within the next 5 years could constitute a variable for one or the other Ports system.

→ Figure 38: Competing area identification between North European and Mediterranean Ports. Source: **NEA Transport Research 2011**

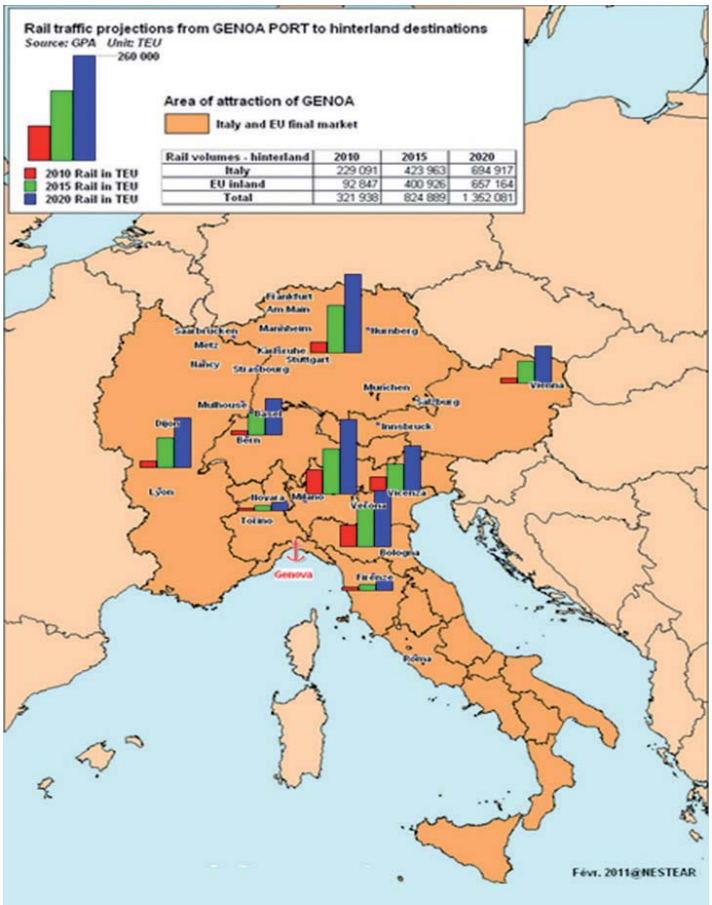
Assuming that Genoa is capable of fulfilling completely the paradigm of producing lower operating costs in presence of a much better distribution service into the hinterland, its accessible position will improve substantially and together with it its penetration into the competing areas of the previous Figure. In such positive scenario considered by the **TIGER DEMO** project the future accessible aria for the Genoa Port is reproduced in the following picture (Figure 39).

→ Figure 39: Genoa Port Attraction zone and extended competitive reach via RTE.
Source: **Nestear for TIGER DEMO Project**



As a result of the increased competitive profile of rail Intermodal services operated via Rivalta Terminal Europe the Genoa Port accessible and competitive area is emerging as being considerably expanded. The geographical limits imposed by the Apennines natural barrier is overcome and by so doing the Port attractiveness in terms of costs and services is enhanced(Figure 40).

→ Figure 40: Rail traffic projections from Genoa to hinterland destinations enlarged Area of competitive reach after **TIGER DEMO Project**. Source: **GPA**



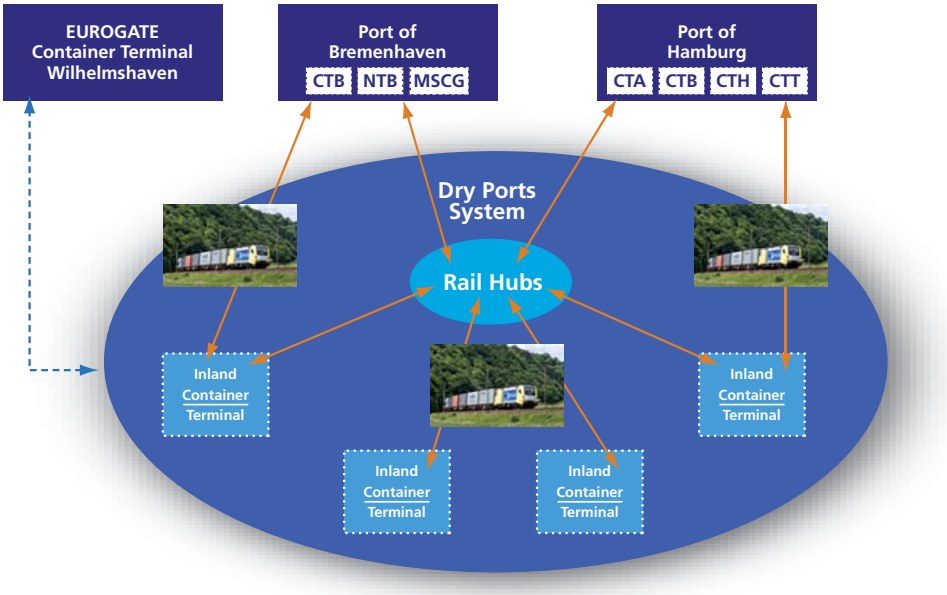
8.2 INNOVATIVE PORT AND HINTERLAND OPERATIONS or "iPort"

The Ports of HAMBURG, BREMERHAVEN and WILHELMSHAVEN

The Port of Bremerhaven achieved in 2012 excellent performance producing traffic volumes of 6.1m TEU which is a figure higher than the best possible envisaged scenario. The Port of Hamburg achieved in 2012 8.9m TEU which is a fraction less than 2011. The port of Wilhelmshaven started operation in the second part of 2012. These three German ports when considered together exceeded the 2011 aggregated throughput volumes. All three ports, exception made for the internal and local sea port rail infrastructure, are accessing the same rail network for their hinterland containers and general cargo distribution. In fact being located geographically in the same range, the traffic developed by the three ports is funneled through the same rail corridors. The most interesting markets for rail freight cargo in terms of volumes are represented by Southern Germany, the Czech Republic, Poland, Hungary, Switzerland and Austria without neglecting farther destinations which are bound to become more and more serviceable following the deployment of the giant containers vessels calling at fewer number of ports.

Most of the cargo distributed by rail is transported over distances exceeding 200 km. In intermodal terms this is a relatively short distance for rail to be competitive since the common understanding is indicating in 500 km the distance above which rail freight becomes competitive. However for the North Germany ports range the relatively short distance of 200 km becomes interesting for rail freight since the economy of scale provides the required incentives for industrializing the rail transport chain moving containers in quantities(Figure 41).

→ Figure 41: Innovative Port & hinterland operations "iPort" concept.
Source: **TIGER Project**



Ports are vital to Europe's economy, to Europe's trade and to the wellbeing of European citizens. Cargo volumes through Europe's major container ports will continue to increase. Therefore congestion within and outside the ports threatens to strangle the smooth traffic flow. For this reason the future challenge is to keep the maritime traffic moving through the European Ports and the demonstrator iPort as part of **TIGER DEMO** is demonstrating that this challenge can be won. The Innovative Port and hinterland operations involved several components of the Hamburg, Bremerhaven and Wilhelmshaven maritime CT transport chain where the "Close to the Port" and "Close to the Market" approaches have been planned, introduced and implemented. The "Close to the Port" approach stands to indicate the identification of rail hubs to be utilized as immediate relief close to the Port for optimizing train loads originating to/from several German Intermodal terminals. The "Close to the Market" approach stands to indicate the identification of a terminal distant from the above Ports capable of handling industrialized traffic in economy of scale close to the ultimate customers.

In fact it became apparent during the container peak period just before the recent recession that there was a need of optimizing the intermodal chain due to highly congested infrastructures. Another important aspect was the emergence of ultra large container vessels with capacities of 13000 TEU or more. Therefore it was necessary to introduce management innovations and systems capable of adapting these new traffic flows by identifying additional infrastructural nodes such as dry ports and rail hubs. To this effect four new facilities had been identified in order to execute this plan. These facilities are: Nienburg rail yard acting as a train bundling platform, Bremen Roland rail hub, Munich Riem Terminal/Dry Port for traffic bundling and further distribution either to German inland or International destinations, Poznan new Terminal/Dry Port facilities (within **TIGER project**) for Polish traffic and International destinations towards the East of Europe.

The iPort maritime innovative logistics engineering process involved the following components and actors of the maritime CT Transport chain:

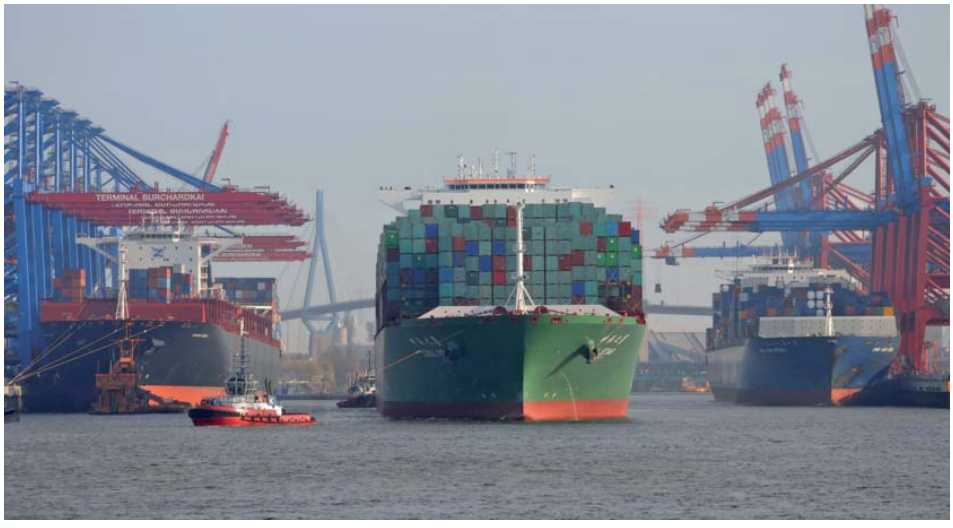
- The ports of Bremerhaven and Hamburg together with their container Terminals;
- Wilhelmshaven new Terminal facility, the first German deep sea port entered into service in 2012. This new Port facility is road connected to the German motorway system and rail connected to the German intermodal network. The strong point of this facility is the draft of 18 m capable of accommodating latest and future CT vessel generations(Figure 42);

Figure 42: The Wilhelmshaven new Sea Port facilities.
Source: **TIGER DEMO Project**

- The Bremerhaven and Hamburg internal and external Railway network where bottlenecks have been removed and bridges of higher capacity have been built(Figures 43-44);

- Figure 43: Port of Bremerhaven 4,680 m long quay.
  Source: **Eurogate**

- Figure 44: The Port of Hamburg in full operation.
  Source: **HHM**



- The boxXpress rail undertaking, integrated into the iPort maritime transport chain for train management and train operations to/from the above Sea Ports;

- The Nienburg rail hub operated by boxXpress for "Close to the Port" approach implementation strategy;

- The Munich Riem new intermodal facility module, completed and operated by DUSS, for the "Close to the Market" approach. It has been established during the Pilot trial operations that indeed Munich Riem is suiting perfectly the **TIGER** purposes since Munich Riem is a fully industrialized Terminal operating in economy of scale with a multitude of intermodal services

to/from other German and International destinations such as Italy, Slovenia, Hungary and the Netherlands. In Munich Riem, a third party facility for last-mile distribution, container buffering and CT repair has been integrated into the transport chain for full production cycle traffic optimization;

- The shuttle trains path were managed by boxXpress and ACOS for the respective destinations and for their insertion into the DB NETZ timetable;

- The Eurogate maritime transport management processes involving planning, tools, systems, track & trace, training of personnel for managing the whole downstream chain including the interfaces with the train and Terminal operators such as boxXpress, DUSS and other supporting actors involved in last mile road distribution as well as wagons and CT repairs (Figure 45);

- Figure 45: Eurogate terminal in operation.
  Source: **Eurogate for TIGER DEMO Project**

- The Bremen Roland Umschlag Hub activated under the **TIGER DEMO project** lifetime by ACOS is in an ideal geographical position accessing all three German North Sea ports. The existing intermodal terminal was integrated into the iPort concept. This terminal has the full characteristics of a Dry Port having dedicated space for containers storage which means that the Dry Port can act as a buffer for the seaport terminals. The terminal is equipped with traditional vertical lifting facilities for handling the containers transfer both for the arriving and departing trains. The train operator and logistics architect is ACOS;

- ACOS is a leading intermodal operator in the hinterland of the German ports, introducing efficient terminal dedicated trains. An additional focus is on a further shift of road traffic between the Port of Hamburg and the Bremen freight village.

The iPort objectives are:

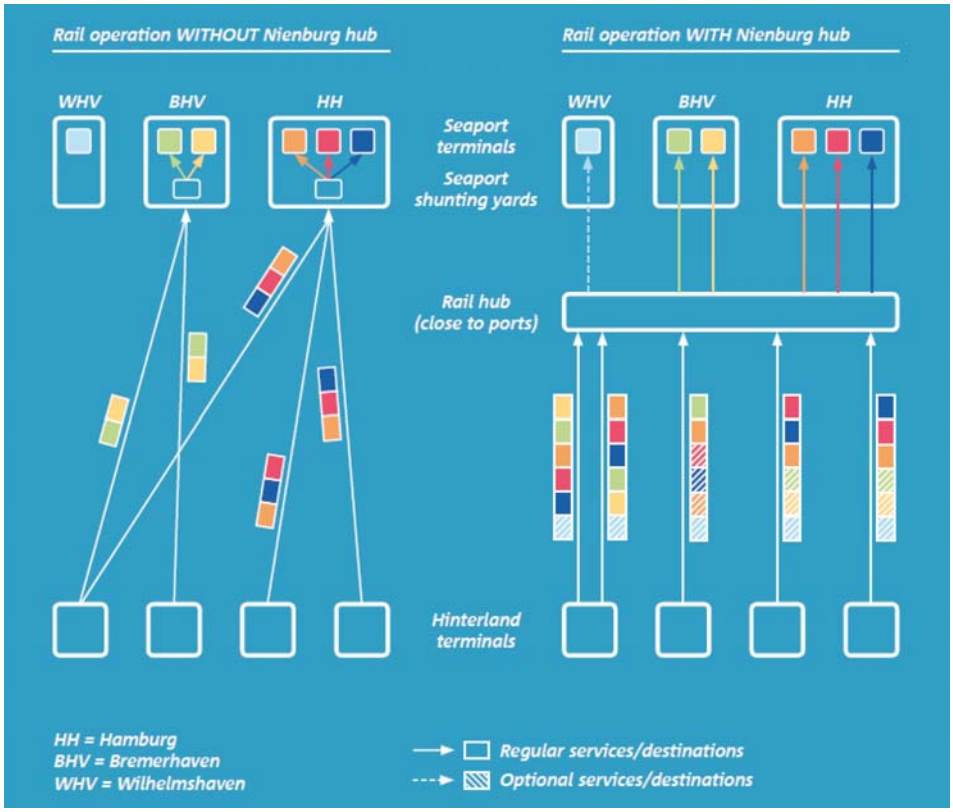
- The Hamburg, Bremerhaven and Wilhelmshaven increased port efficiency
- The maximum utilization of the rail slot capacity produced by the trains between the seaports and the inland terminals
- The productivity increase along the entire transport chain
- The increase in rail efficiency, capability and competitiveness
- The modal shift from road transport to rail.

These objectives are achievable through the fulfillment of specific actions and tasks such as:

- developing and implementing rail hub concepts or dry ports for optimizing the hinterland transport chain of the German Sea Ports
- connecting the seaports with re-organized rail services
- optimizing operational procedures and interfaces between the various stakeholders and operators along the transport chain
- evaluate the benefits of consolidating continental and maritime traffic flows via rail hubs for transport industrialization, more frequent services at lower costs.

During the iPort **TIGER DEMO Project** implementation, it was found that rail hub strategy depends on the smart combination of the hinterland supply chain with the sea ports. The vital component of this strategy is represented by the geographical location of the hub/dry port allowing the traffic bundling for volumes originating to/from the seaports and the traffic attraction zones serviced with frequent shuttle trains. The iPort demonstrator through the "Close to the Port" concept implemented trains formations in the Nienburg hub for wagons groups assembling. The same concept is applied in Bremen Dry Port with the variation that instead of sorting and assembling groups of wagons the trains' optimization is achieved by exchanging containers between shuttle trains for specializing the convoys to/from the sea Ports, Dry Ports or hinterland terminals(Figure 46).

- Figure 46: Optimization of hinterland processes via a "Close to the Port" train bundling platform in Nienburg. Source: **iPort for TIGER DEMO Project**



The basic principle of the Nienburg concept is the shift of the train assembly process from the sea port area to the rail hub. If one considers export containers as an example the operational steps are the following:

- The full trains from all South of Germany' origin destined for export made up of several wagons arrive at Nienburg rail hub. The trains are managed by boxXpress;
- The trains are sorted and reformed using electric line locomotives;
- The trains are ready for departure for Hamburg seaport each consisting of wagons destined only for one nominated seaport terminal.

An important element of this concept is the centralized maintenance/repair facility in Nienburg rail hub reducing downtime hence increasing the wagons rotation and availability.

The Nienburg rail hub is a formidable success story. The management of the trains formation in Nienburg by assembling traffic destined to the Altenwerder, Burchardkai and Eurokombi terminals in Hamburg port, saved both costs and time. The original 12 trains per week have been increased during the **TIGER DEMO** demonstration phase up to 18 trains per week becoming a full scale commercial operation totally driven by market considerations. The emerging results are the following:

- The dwelling time in the Hamburg sea port area was reduced up to 92% for weekend export services;
- The slot utilization in Hamburg seaport terminals increased from 60% to 100% freeing up capacity at the terminals;
- The trains punctuality improved while the rail production costs decreased by avoiding shunting movements in the sea port area which were the major cause of delay prior to **TIGER** and **TIGER DEMO Projects**;
- The environment benefits were also delivered by the use of electric traction in Nienburg opposed to diesel shunting units inside the port;
- A better utilization of the existing resources was also achieved by the centralized maintenance and repairs facilities in Nienburg securing a better equipment utilization.

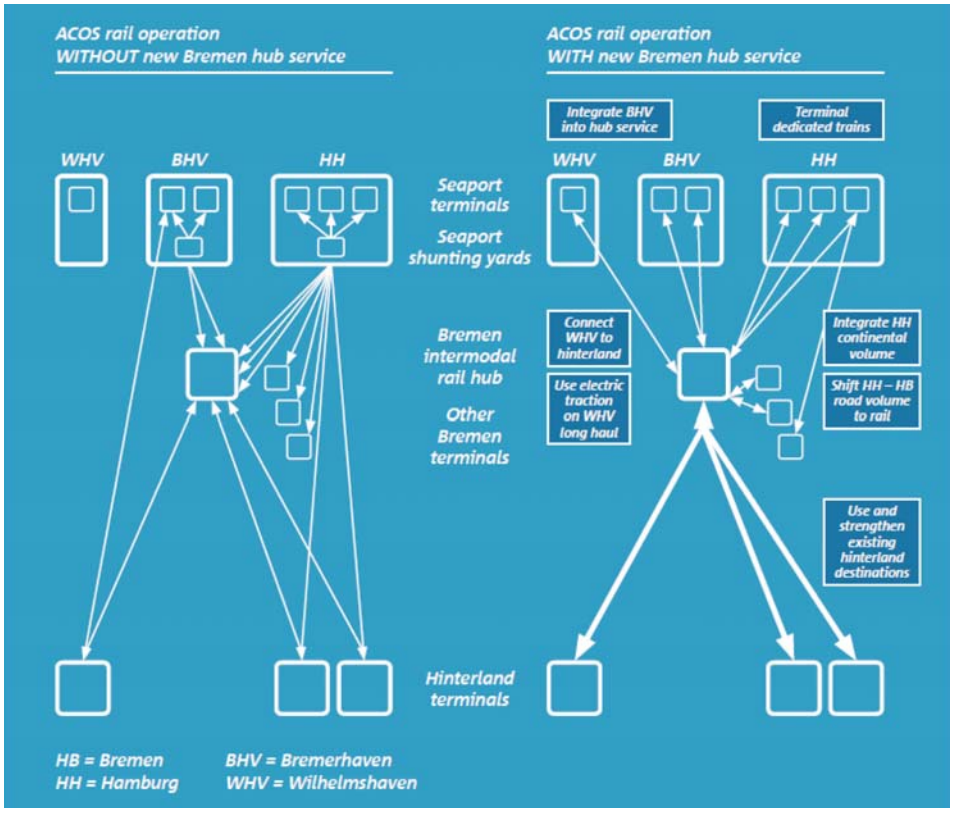
It is planned to handle about 400 trains in Nienburg during the project lifetime transporting about 32000 TEU. This success story represents the best guarantee for continued operation after the **TIGER DEMO Project** closure.

The second hub activated under the **TIGER DEMO** project lifetime is Bremen (started demonstration in 2013)due to its ideal geographical position accessing all three German North Sea ports. The existing intermodal terminal of Roland Umschlag was integrated into the iPort concept. This terminal has the full characteristics of a Dry Port having dedicated space for containers storage which means that the Dry Port can act as a buffer for the seaport terminals. The terminal is equipped with traditional vertical lifting facilities for handling the containers transfer both for the arriving and departing trains. The train operator is ACOS who is capable of supplying a full

comprehensive intermodal service portfolio. The vertical lifting facilities in Roland Umschlag can be benchmarked with the horizontal facilities of Nienburg for the best performing solution. A focus of attention which makes this demonstrator particularly interesting is the accessibility of the short distance traffic between the dry port and the seaports carried by road, to be shifted to rail. If one consider an import flow having taken already as example the export flow in Nienburg the operational steps are the following:

- The dedicated shuttle trains operated by ACOS fully loaded with import traffic from only one terminal either from Bremerhaven or Hamburg arrive in Bremen Roland Umschlag;
- These arriving trains carry up to 90 TEU per train bound for different German destinations;
- The containers are either stored in Bremen or shifted immediately to another train bound to the final destination. The containers stored temporarily in the Dry Port will be dispatched later on when the final instructions are received by the consignee either by train or by road;
- The shuttle train service will be extended to Wilhelmshaven as soon as the traffic volumes permit this to happen. Since Wilhelmshaven has no full load train destination, in the start-up

Figure 47: Optimization of hinterland processes via Bremen Dry Port.
Source: **iPort for TIGER DEMO Project**



phase, this concept will facilitate the integration of the port into the intermodal network of the German Ports.

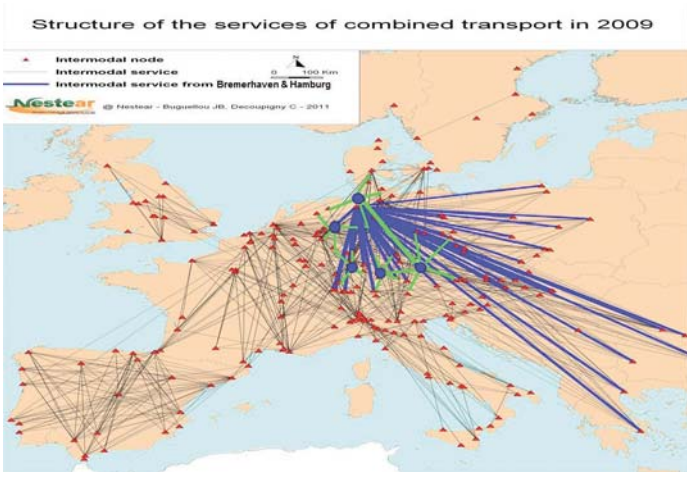
During the **TIGER DEMO** project lifetime it is planned to manage about 150 trains through the Bremen Dry Port moving more than 10000 TEU. This innovative routing via Bremen Dry Port acting as Hub and Spokes towards the three North European German Sea Ports and towards the South of Germany Inland terminals through regular and terminal dedicated shuttle trains, represents a further demonstration of maritime transport innovations via Dry Port driven by full commercial market reasons(Figures 47-48-49).

→ Figure 48: The Bremen Dry Port of Roland Umschlag in operation.
Source: **iPort for TIGER DEMO Project**

→ Figure 49: The BREMEN Dry Port of Roland Umschlag in operation.
Source: **iPort for TIGER DEMO Project**

As a result of the TIGER DEMO innovative routing via the Dry Ports as described in the previous paragraphs, the new distribution pattern for the hinterland German destinations adopting the "Close to the Port" or "Close to the Market" concepts is as reproduced in the following figure(Picture 50).

→ Figure 50: iPort "Close to the Port & Close to the Market" approaches hubs & spokes. Source: **Nestear for TIGER DEMO Project**



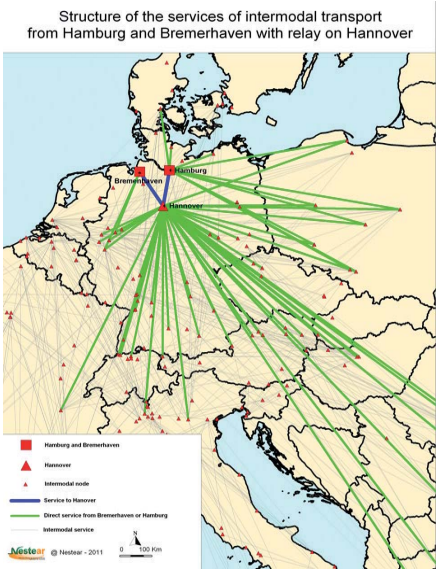
8.3 INTERMODAL NETWORK 2015 – "MEGA-HUB"

→ Figure 51: INTERMODAL NETWORK 2015 - "MEGA-HUB" concept. Source: **TIGER Project**

The **TIGER Project** original idea was based on a Mega Hub green field new investment in Lehrte near Hanover, where full integration could be achieved by combining both the continental/domestic and the maritime traffic. This traffic combination together with the introduction of innovative production system involving train to train operations, would allow the generation of larger economies of scale and the possibility of servicing with regular train links more remote areas where otherwise direct train services would not be possible. However it became apparent during the Project lifetime that the Lehrte facilities could not be ready on time before the Project closure to perform the Pilot tests. Therefore the Pilot tests were performed in Munich Riem where a complete new production module entered into service at the end of 2011 having similar technical characteristics planned for Lehrte. At the time of writing this report the Lehrte green field construction of a new mega hub is in the course of execution. One has to appreciate that DUSS constructed and managed Munich Riem and is responsible for the construction and management of the Lehrte Mega Hub. The contract for Lehrte Mega Hub construction entails a total investment exceeding € 100 Million. With the Lehrte Mega Hub construction several new operation are possible on the German hinterland distribution for the maritime traffic such as:

- The replica of the Hamburg distribution organization in Lehrte involving also the traffic from Bremerhaven(Figure 52);

- Figure 52: Connection Hamburg - Bremerhaven - Lehrte - Munich Riem with satellite Terminals & connections. Source: **TIGER Project**



- The operational introduction of high productive corridor between Lehrte and Munich Riem (Figure 51)
- The industrialized distribution scale characteristics
- The double sided electrified access for momentum operations
- The high performance gantry crane servicing several rail tracks
- The Information and Communication technology
- The technical management tool

- The capacity management tool
- The train monitoring.

They are instrumental for developing the intermodal industrial production concept, the management of the operations connecting the trains in the Rail Hub, the information and communication system for handling and managing the traffic via the Rail Hub, the integration of the Rail Hub and the regional satellite terminals into the existing intermodal network, the assessment of the Sea Port inland transport traffic complementing the overland one into the Rail Hub with the emerging synergies. All these activities are monitored in real time with the availability of the booking/capacity management, the information and communication systems providing pre-existing information as well as real time progressive production evolutions. The customers are supplied with the communication of their interest covering the entire transport chain. Then the train monitoring system, the capacity management and the terminal operation system are integrated into each other for providing a total network visibility(Figures 53-54-55-56).

Figure 53: Advantage of Entrance with Momentum.
Source: **Hacon & Kombiverkehr**

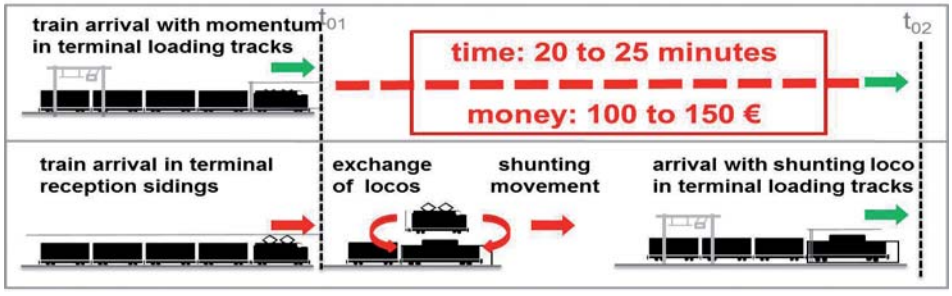
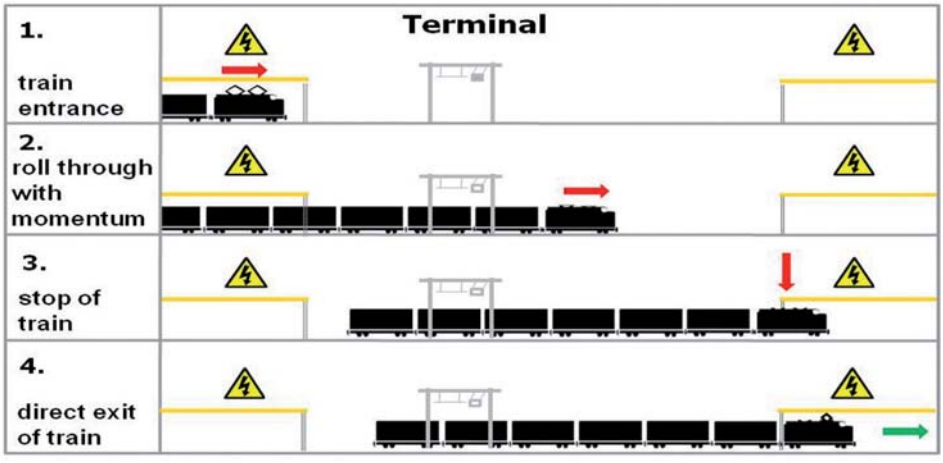
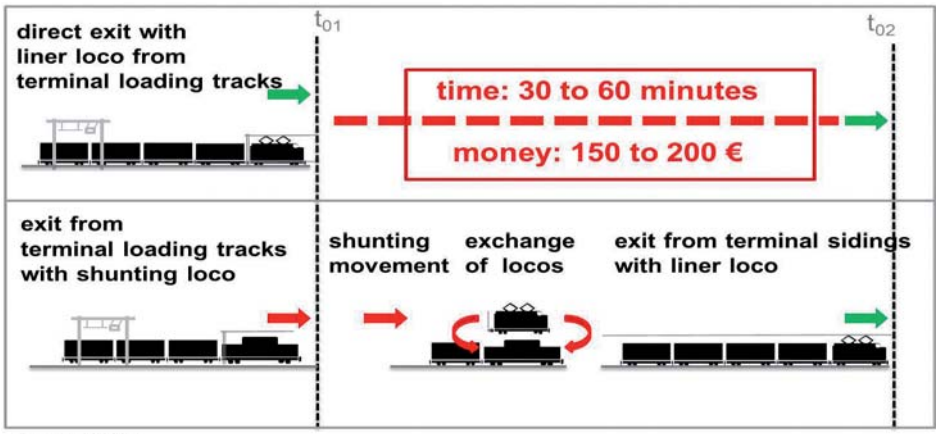


Figure 54: Entrance with Momentum and Direct Exit.
Source: **Kombiverkehr**



→ Figure 55: Advantage of Direct Exit.
Source: **Kombiverkehr**

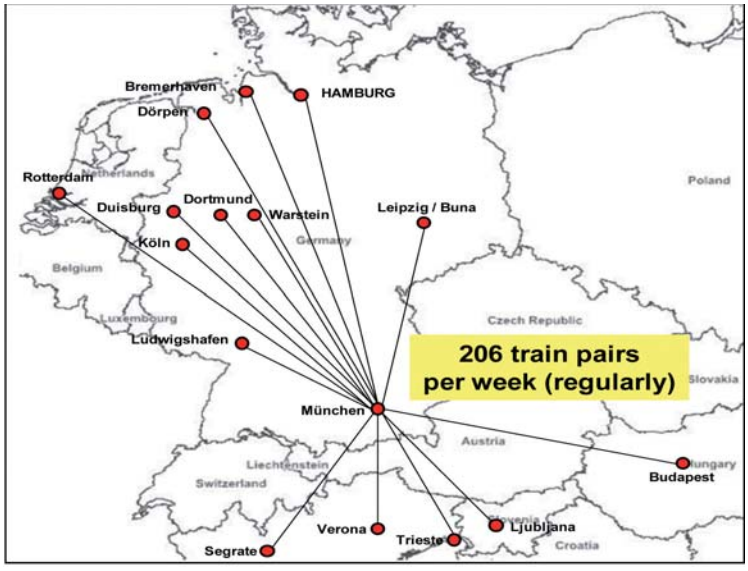


The ICT Technology is providing the timetabling, Track & Trace on the individual routes while the continuous through-booking provides alternative appropriate routings for the transportation request should the direct link not be immediately available. Once a routing has been agreed with the customer, the system automatically reserves capacity on the relevant routes for transporting the boxes to final destination. This capacity management is capable of giving immediately visualization of both the reserved and the free capacity on the various routings.

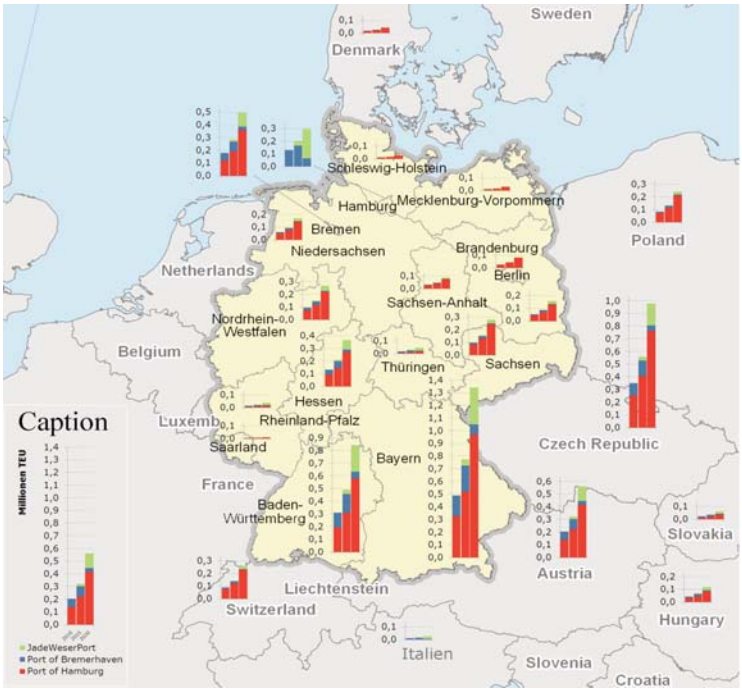
The role of the rail hub terminal Munich is to bundle and sort cargoes for various destinations. The relations treated in the scope of the **TIGER DEMO** project are reproduced in Figure 57. Compared to the time at the beginning of the demonstration the transport volumes handled in Munich-Riem increased steadily. In 2012 Munich-Riem was the second largest terminal of DUSS in Germany, right after Hamburg-Billwerder realizing about 270000 loading units. For 2013 a further increase is expected on the basis of the first nine months figures: the continental traffic increased by 8%, the maritime traffic by 19% and the gateway traffic by 18%. The increase of the gateway demonstrated the hub production concept market acceptance and effectiveness for linking new areas and attracting additional market segments to combined transport.

→ Figure 56: New Terminal module in Munich Riem in operation.
Source: **DUSS**

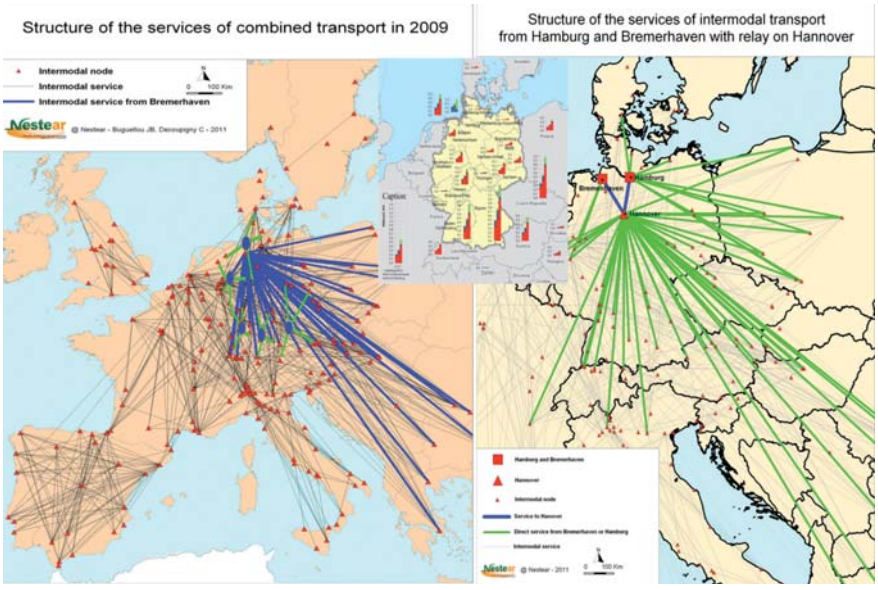
→ Figure 57: Rail-Hub Munich –Integration into Service Network.
Source: **KombiConsult**



→ Figure 58: Forecast of cumulated rail freight traffic in million TEU from northern **TIGER** ports to their respective hinterland in 2010, 2015 & 2020.
Source: **HHM**



→ Figure 59: Full Structure of TIGER DEMO new distribution model for Hamburg, Bremerhaven ports. Source: **HHM**



The above figures (Figures 58-59) shows also the potential growth up to 2015 which can be expected to be routed by rail.

The next Figure 60 shows in detail the table of cumulated forecasted volumes assigned from the sea ports to the Federal States and to other international countries for the years 2010, 2015 and 2020.

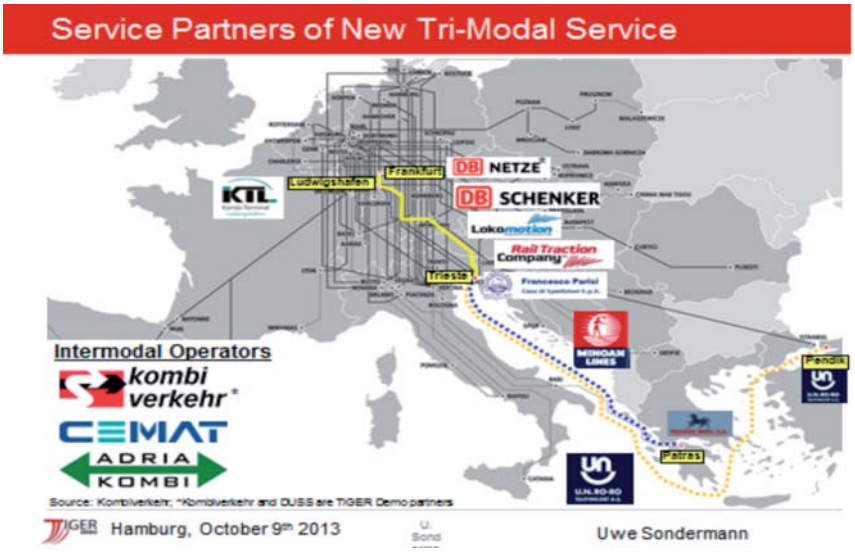
→ Figure 60: Table of cumulated forecasted volumes assigned from the sea ports of Hamburg Bremerhaven and Wilhelmshaven to the Federal States and to other international countries for the years 2010, 2015 and 2020
Source: **HHM**

Comulated rail volumes by hinterland region	2010 Rail in TEU	2015 Rail in TEU	2020 Rail in TEU
Germany, thereof:	1,66	2,76	4,33
Baden Württemberg	0,31	0,51	0,81
Bayern	0,49	0,81	0,28
Berlin	0,03	0,05	0,08
Brandenburg	0,06	0,09	0,15
Bremen	0,18	0,30	0,48
Hamburg	0,13	0,20	0,29
Hessen	0,13	0,22	0,35
Mecklenburg Vorpommern	0,01	0,02	0,03
Niedersachsen	0,06	0,10	0,16
Nordrhein Westfalen	0,10	0,16	0,25
Rheinland Pfalz	0,01	0,02	0,04

Comulated rail volumes by hinterland region	2010 Rail in TEU	2015 Rail in TEU	2020 Rail in TEU
Saarland	0,00	0,00	0,01
Sachsen	0,10	0,16	0,26
Sachsen Anhalt	0,03	0,05	0,08
Schleswig Holstein	0,01	0,02	0,03
Thüringen	0,02	0,03	0,05
Austria	0,20	0,34	0,53
Belgium/Luxemburg	0,00	0,00	0,00
Czech Republic	0,35	0,59	0,93
Denmark	0,01	0,02	0,04
France	0,00	0,00	0,00
Hungary	0,04	0,07	0,11
Italy	0,01	0,02	0,03
Netherlands	0,00	0,00	0,00
Other HL countries	0,00	0,00	0,00
Poland	0,08	0,14	0,22
Slovakia	0,02	0,04	0,05
Switzerland	0,09	0,15	0,24
All hinterland regions	**2,48**	**4,12**	**6,51**

In **TIGER DEMO** a completely new service link has been activated between Frankfurt and Trieste allowing a new rail connection between Central Germany and the Adriatic Sea opening up the trade lane to Greece via Patras and Turkey via Pendik. This new three weekly service opened up its regular rail connection in October 2013 implementing co-modality to a high level of planning sophistication. The operational scheme is reproduced in the slide below (Figure 61).

→ Figure 61: The Frankfurt to Trieste rail service intermodal link.
Source: **Kombiconsult for TIGER DEMO Project**

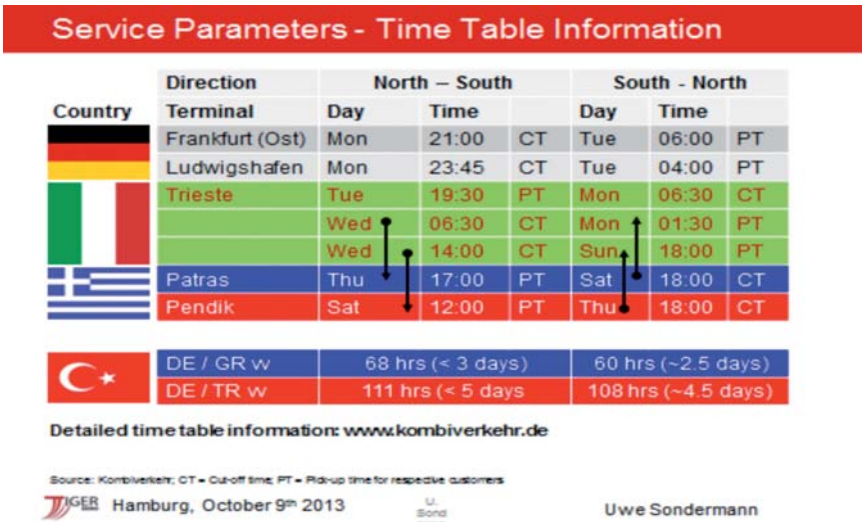


This new rail service link allows the integrated connection between Rail Road and Sea. The service is capable of transporting semitrailers of 4m high dimension which means in rail terms Gauge P400. The planning and service organization is based on 3 departures per week in each direction capable of connecting with the maritime services departing to/from Trieste. In this way a perfect „Synchro Mobility" is achieved. The service characteristics here contain all the ingredients described in TIGER DEMO objectives such as service industrialization, cooperation between different operators along the route and above all a multi-channel distribution approach since all various actors, operators , shipping lines, ships and forwarding agents, terminal operators all participate to the objective of filling up both the vessels and the trains in direct connection with them.

The technology component which allowed the original study, the planning, the realization of this new rail service profile is constituted by:

- New wagons technology for tri-axle semitrailers 4m high
- Longer and heavier trains
- The ICT technology dimension with trains management and capacity tools
- The Intelligent system for managing operations in real time(Figure 62).

Figure 62: The Frankfurt to Trieste rail service intermodal link timetable.
Source: **Kombiconsult for TIGER DEMO Project**



The state-of the-art intermodal wagons ensure the transport of semi-trailers. These wagons are called double pocket wagons "T3000" and can carry(Figure 63):

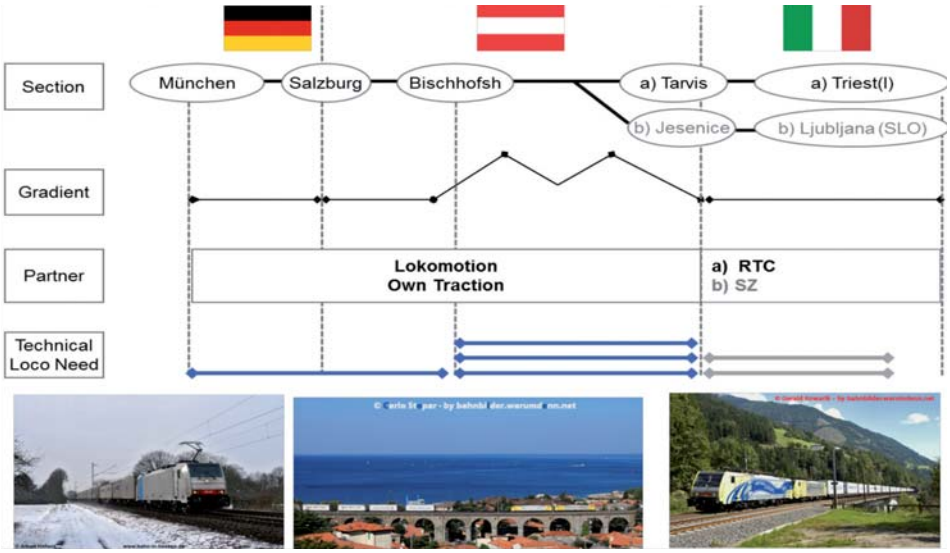
- 2 semi-trailers (of length 13.6 m) or
- 4 swap-bodies up to 7.82 meter.

→ Figure 63: Double Pocket Intermodal Wagon Loading a Semi-trailer.
Source: **Kombiconsult for TIGER DEMO Project**

The Longer and heavier trains introduce a technological innovation in **TIGER DEMO Project**. The rail traction operators along the new tri-modal service network are Lokomotion and Rail Traction Company (RTC). The Lokomotion operates between Germany and Tarvis at the cross-border of Austria/Italy. From Tarvis to Trieste, RTC provides its traction services. The following innovations have been introduced(Figure 64):

- between Germany and the city of Bischofshofen in Austria, only 1x locomotive is in operation due to the geographical standard and gradient of the rail section

→ Figure 64: Longer and heavier trains. Traction concept.
Source: **KombiConsult based on Lokomotion for TIGER DEMO Project**



- between Bischofshofen and Tarvis, 3x locomotives are in operation due to the gradient increase of the rail sections
- between Travis and Trieste only 1 locomotive is performing the traction.

The traction concept ensures a productive train system and a continuous operation along the transalpine route. The tri-modal service is able to provide:

- longer trains exceeding the length of 550 meter at the **TIGER Project** start
- heavier trains > 1.500 tons.

Figure 65: Supplied capacity during demonstration period.
Source: **KombiConsult based on Kombiverkehr for TIGER DEMO Project**

	October ´13	November `13	December `13
Departures per week	6	6	6
Weeks per month	4	4	2
Total departures per month	24 / 13*	24	12
Capacity per departure	30	30	30
Total capacity per month	720 / 123*	720	360
Total capacity TIGER Demo**	1.800 loading units ≈ 4.140 TEU		

* Achieved volume based in the first two weeks of operation
** 2.3 TEU/per semi-trailer

The planned period of three month for the additional demonstration activities targets at supplying a total of 60 train departures(Figure 65). Already in the first two weeks the monthly target for October 2013 was achieved. The first departure carried 14 loading units which is an utilization of almost 50 per cent. Kombiverkehr, DUSS and the related partners are confident that the newly initiated intermodal service will become viable after the demonstration period to be turned into a sustainable commercial product to continue after the **TIGER DEMO Project** closure at December 31st 2013.

© HHM/Breitenbach

The previous chapters described the market evolution and traffic market projections up to 2020, the planning of the three **TIGER DEMO** Demonstrators together with the desired results after the Project completion. These Demonstrators have a common denominator for their achievements. They are the results of long and complex planning and implementation processes initiated back in 2008 when the **TIGER Project** was conceived. The first initiatives started at that time and continued relentlessly up to the **TIGER Project** end in September 2012 by undertaking investments in infrastructures, equipment, technologies, tools, management systems, processes and training in order to fulfill the declared objectives. The **TIGER DEMO** Project innovative concepts have been the motor for changes in the maritime transport chain from Sea Ports to inland destinations. Private investors have seen through **TIGER DEMO** Project the opportunity of gaining a competitive advantage both on service efficiency and costs reductions and took the opportunity during the recent economic recession to re-engineer their operations. This was done in order to be fully ready when the economic cycle will enter into a new expansion phase. The amount of the total investments in the **TIGER DEMO** Project initiatives on all Sea Ports execution theatres both in Italy and Germany reached several hundred million Euro. The co-financing provided by the EU Commission represents a minor part of these investments although very important. The official backing to the **TIGER DEMO** initiative by the EU Commission has provided the "steering force" for a snow ball effect and for the very important recognition of the Project at European level including the dissemination efforts embracing the whole of Europe and beyond.

It is not the purpose of this Report to undertake a detailed description of the intermediate phases which have characterized the Project development since they belong to the partners themselves who have adapted the technologies, equipment and process innovations to their own production cycles.

The objective of this chapter is dedicated to the execution and achievements of the three **TIGER DEMO** Project Demonstrators into the practical field of operations leading to full market uptake.

9.1 GENOA FAST CORRIDOR – GFC

→ Figure 66: GFC scheme.
Source: **GFC for TIGER DEMO Project**

The results achieved by the **TIGER DEMO** project are multifold. First of all more than 500 shuttle trains from the 3 Genoa sea terminals of TSG, VOLTRI, and MESSINA in ATI, have been performed on RIVALTA TERMINAL EUROPE(RTE) during the TIGER –TIGER DEMO project lifetime. This is a

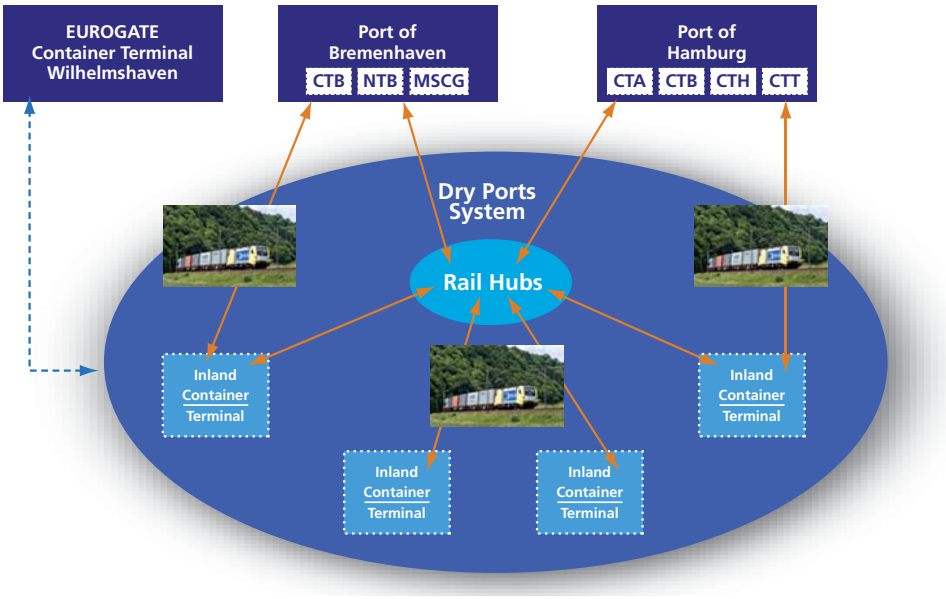
considerable Step Change compared to previous time when these two European co-funded projects were not in existence. The other relevant achievement is related to the costs reduction of the transport chain coupled with better services and substantial reduction of transit time of about 20%. This is due to reduction in dwell time, trains loading and shunting inside the port. This cost reduction will be further increased when the internal Genoa Port Railway system which is in progress will be completed converging on the "Fuori Muro" railway infrastructure. Another very important benefit is the industrialization of the maritime transport chain via RTE combined with a longer and faster competitive reach of the Genoa Port traffic. The achieved benefits will themselves become more visible with the progressive industrialization process of this maritime transport chain, the increased volumes moved to the dry Ports up to full economy of scale industrialization.

To this effect a matrix has been prepared in order to control every dimension of the cost and service components. This is possible by reading at the crossing point of verticals and horizontal coordinates the KPI taken as a tool for measuring the achieved performances. The most relevant results achieved are here below reproduced in the following chart (Figure 67).

→ Figure 67: The main positive impacts achieved by the GFC innovations.
Source: **GFC for TIGER DEMO Project**

INNOVATIONS	GFC RESULTS
INFRASTRUCTURE INVESTMENTS: → RTE DRY PORT € 100 MM for capacity of 1m TEU per year → TSG + RTE € 10MM for GFC operational improvements	→ Additional Capacity Generation → Service Industrialization to RTE contributing to Genoa Port Traffic fluidity. More than 500 Trains executed → Transit/Dwelling time reduction by 20% → Operating costs reduction Genoa-RTE → Service quality improvements and reliability → Accelerate gate activities by reducing/ minimizing rail/truck processing time
SOFTWARE & HARDARE TECHNOLOGIES, ICT MANAGEMENT SYSTEMS → TSG + RTE new operational concepts & business models	→ Shuttle trains loading & dispatching innovative business model → RTE recognized as Genoa Port Customs when shuttle trains are used. E/customs, E/seals, E/freight → Improvement of information flows quality and reliability → Data availability in real time → Intelligent systems for management processes-Track & Trace and Gate operations
LOGISTICS PROCESS RE-ENGINEERING & KPI MANAGEMENT	→ Operational costs reduction for seamless Logistics chain & increased competitiveness on much wider traffic attraction zones → Terminal accessibility improvements and management control systems → Extended Quay concept realization → Planning activities improvement → Integration with shipping lines, operators & Port Community System on hinterland distribution strategies
COOPERATIVE APPROACH Between TSG - VOLTRI - MESSINA in ATI managing 3 separate terminals	→ Traffic bundling from Genoa Voltri, TSG, Messina on shuttle trains to RTE → Sharing of economic benefits between the partners → Resources optimization → Transport planning and operational visibility improvement → Joint marketing and commercial efforts → Reinforced and stronger foothold on the service by benefits and risks sharing → Cooperative approach with far East Ports for total control of the transport chain from origin to final destination
INNOVATIVE MARKETING STRATEGY	→ Stronger and more effective marketing by joint approach → Multi-channel distribution → ncreased competitive reach

→ Figure 68: iPort scheme.
Source: **iPort for TIGER DEMO Project**



The results of the service innovations operated by iPORT concept through the "Close to the Port" and "Close to the Market " approaches are multifold. Some of the pictures indicated above are self-explanatory. The "Close to the Port", approach through the sorting hub of Nienburg and Bremen allows the flows optimization and their industrialization during the whole length of the transit. The CT trains arriving at Nienburg Rail sorting hub in an industrial scale originating from several German inland terminals, are optimized according to the quays of final destination. By so doing the train in the last leg of its journey is transporting only CT traffic destined to a given pier, with no further intervention or handling activities. Time savings of up to 92% have been achieved. Similar operation has been introduced via the Bremen Dry Port of Roland Umschlag Hub. The difference between the two sites is that in Niemburg the traffic sorting and train re-composition is organized by wagons whereas in Bremen Roland Umschlag the traffic sorting and trains composition is performed by traditional lifting of containers and transfers.

For the "Close to the Market " approach a number of distant rail intermodal terminals hubs as well as potential greenfield sites have been identified. The most important selected and demonstrated within the **TIGER DEMO Project** were Munich Riem, Nuremberg, Mannheim, Frankfurt and Stuttgart. Munich Riem is characterized by upgraded infrastructure which is used either as a gateway in case the containers are already in their last mile distribution or as a transshipment hub for reaching more distant places.

The most relevant results achieved are reproduced in the following chart (Figure 69).

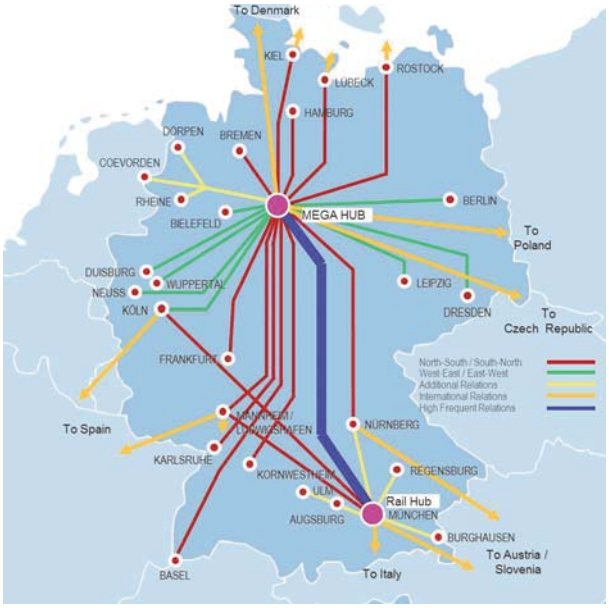
→ Figure 69: The main positive impacts achieved by iPort innovations.
Source: **iPORT for TIGER DEMO Project**

INNOVATIONS	iPORT RESULTS
INFRASTRUCTURE INVESTMENTS & ADAPTATIONS → NIENBURG Rail hub utilization → BREMEN Roland Umschlag	→ Additional capacity generation → Service Industrialization. More than 400 trains are planned in Nienburg and 150 in Bremen Roland Umschlag → Dwell time reduction in Hamburg seaport up to 92% → Slot space terminal utilization in Hamburg port up to 100% & decongestion of Hamburg rail network → Reduction of infrastructure usage fees → Increased existing rail infrastructure efficiency & utilization → Constant maximum train capacity
SOFTWARE & HARDWARE TECHNOLOGIES & ICT MANAGEMENT SYSTEMS → BLU Opti → ICT Tool supporting traffic management	→ Traffic optimization → Customs processes finalization in the hinterland → Transfer and storage management Optimization in the hinterland terminals → Train monitoring with customers' interface → Increased service reliability and consistency → Increased consignees satisfaction by increased fulfillment of their instructions → Introduction of "PULL CONCEPT" for Sea Port / final customer optimal transport timing "BLU" processes optimization in the hinterland terminals "BLU Opti" Optimization of crane movements and storage system in trials/testing period
LOGISTICS PROCESS RE-ENGINEERING & KPI MANAGEMENT	→ Innovative bundling schemes (terminal dedicated trains): No shunting in the seaport → Use of electric line locomotives for train composition purposes in Nienburg instead of diesel shunting in Hamburg leads to ecological and economic advantages → Reduction of operating effort for train formation → Centralized maintenance and repair concept → Integration of external depot for maritime containers with associated shuttle service from/to the rail terminal → Advanced punctuality by avoiding shunting operations → Shift traffic from road to rail on short distances via ACOS concept in Bremen → Buffer logistics: provision of intermediate storage capacity for containers in Bremen

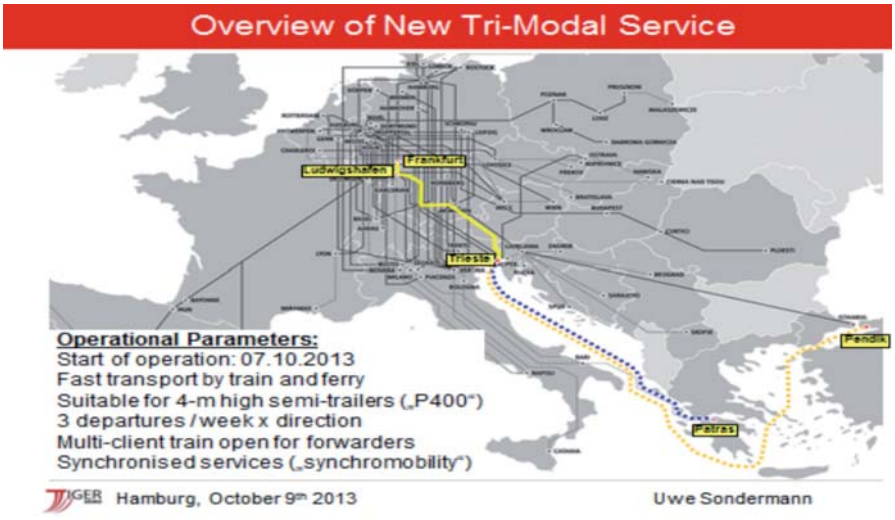
INNOVATIONS	iPORT RESULTS
	→ Bundle volumes of Wilhelmshaven in Bremen in order to link them to the intermodal network of Bremerhaven and Hamburg (planned)
COOPERATIVE APPROACH Between iPort actors and partners in the Intermodal chain	→ Joint specification of market requirements for layout and service parameters for maritime oriented inland terminals (Sea terminal operator, Port Authority, Intermodal Operator, Rail company, Shipping lines, Forwarders) → Multi-functional employment of operational staff in Nienburg due to dedicated training concept → Train consolidation plan. Definition of regular processes, regulations and guidelines for adjustment of rail service to daily changes of the situation in the seaports → Integrated wagon maintenance and repair concept → Optimized cooperation between long haul carrier and last mile rail operator in Hamburg seaport → Process optimization along the hinterland transport chain (close collaboration sea terminal – shipping line/forwarder – intermodal operator –rail company – trucker – customer) → Interfaces for integrating ICT solutions in existing data processing of all actors in Bremen, Munich, Nienburg → Insertion of Bremen Roland Umschlag into the Seaport traffic production chain
INNOVATIVE MARKETING STRATEGY	→ Extension of competitive reach by bundling traffic volumes for less-than-full-train-load-destinations between seaports and hinterland terminals → The buffering of containers close to the market(Munich-Riem) increases supply chain reliability and customers satisfaction

9.3 INTERMODAL NETWORK 2015 + "MEGA-HUB"

→ Figure 70: INTERMODAL NETWORK 2015 – "MEGA-HUB SPIDER" concept. Source: **TIGER Project**



→ Figure 71: INTERMODAL NETWORK 2015 –Frankfurt –Trieste link for prosecution to Greece and Turkey. Source: **Kombiconsult for TIGER DEMO Project**



The **TIGER DEMO** Project original idea was based on a Mega Hub green field new investment in Lehrte near Hanover where full integration could be achieved by combining both the continental/domestic and the maritime traffic. This traffic combination together with the introduction of innovative production system involving train to train operations, would allow the generation of larger economies of scale and the possibility of servicing with regular train links more remote areas where otherwise direct train services would not be possible. However it became apparent during the Project lifetime that the Lehrte facilities could not be ready on time before the Project closure to perform the Pilot tests. Therefore the Pilot tests were performed in Munich Riem where a complete new production module entered into service at the end of 2011 having similar technical characteristics planned for Lehrte (Figure 70). At the time of writing this report the Lehrte Mega Hub is now under construction. In addition to Lehrte DUSS has in construction a new terminal in DUISBURG due to come into production in 2014. DUISBURG has become a very important hub for maritime and continental traffic fulfilling the **TIGER DEMO** objective of industrializing the transport chain.

The technical component and pre-requisite for the Mega Hub Intermodal system management are:

- The Rail Hub Terminal having industrial scale characteristics
- The double sided electrified access for momentum operations
- The high performance gantry crane servicing several rail tracks
- The Information and Communication technology
- The technical management tool
- The capacity management tool
- The train monitoring.

They are instrumental for developing the intermodal industrial production concept, the management of the operations connecting the trains in the Rail Hub, the information and communication system for handling and managing the traffic via the Rail Hub, the integration of the Rail Hub and the regional satellite terminals into the existing intermodal network, the assessment of the Sea Port inland transport traffic complementing the overland one into the Rail Hub with the emerging synergies. All these activities are monitored in real time with the availability of the booking/capacity management, the information and communication systems providing pre-existing information as well as real time progressive production evolutions. The customers are supplied with the communication of their interests covering the entire transport chain. Then the train monitoring system, the capacity management and the Terminal Operation system are integrated into each other for providing a total network visibility.

The ICT Technology is providing the timetabling, Track & Trace on the individual routes while the continuous through-booking provides alternative appropriate routings for the transportation request should the direct link not be immediately available.

Once a routing has been agreed with the customer, the system automatically reserves capacity on the relevant routes for transporting the CTS to final destination. This capacity management is capable of giving immediately visualization of both the reserved and the free capacity on the various routings.

The Intermodal network 2015 of the Lehrte Mega hub conceived in **TIGER** project tested in Munich Riem third new intermodal module, was then supplemented and complemented in **TIGER DEMO** with a new service Link between Frankfurt and Trieste again integrating maritime services with Hinterland terminals. This completely innovative service profile is reproduced in one of the previous slides (Figure 71).

The most relevant results achieved are reproduced in the following chart (Figure 72).

→ Figure 72: The main positive impacts achieved by MEGAHUB innovation.
Source: **HACON for TIGER DEMO Project**

INNOVATIONS	INTERMODAL NETWORK 2015 -MEGA HUB RESULTS
INFRASTRUCTURE INVESTMENTS & ADAPTATIONS → New hubs - Lehrte; Munich Riem and Duisburg. New Trieste Rail service link	→ Double sided electrified frictionless rail access → Transit time reduction origin/destination → Dwelling time reduction in terminal & higher punctuality rate → Operational costs reduction with service quality improvements and reliability → Improved connectivity → New service conception Frankfurt to Trieste for onwards prosecution to Greece and Turkey
SOFTWARE & HARDWARE TECHNOLOGIES & ICT MANAGEMENT SYSTEMS → Technical management tool-Capacity management tool → Train monitoring	→ Industrial chain through high performance gantry cranes → Information flows improvement quality and reliability through Real-time train monitoring with ETA-information → IT-system for managing terminal operation including rail/rail → IT-system for managing train capacity giving hub connections guarantee → Transshipment module in München Riem Terminal → Infrastructure adaptation in terminal with direct train entrance and exit, crane collision protection
LOGISTICS PROCESS RE-ENGINEERING & KPI MANAGEMENT	→ Operational costs reduction for seamless Logistics chain → Introduction of hub concept with integration of medium and small size terminals in national and international networks → Costs reduction and increased competitiveness thanks to optimized train arrival and exit to/from terminal → Additional positive impacts in efficiency and sustainability in competition to truck service
COOPERATIVE APPROACH Between actors and partners in the INTERMODAL NETWORK 2015+	→ Close co-operation between railway undertaking, terminal operator and intermodal operator → Development/implementation of Rail-Hub concepts improving/expanding the continental and maritime intermodal network → Resources optimization → Transport planning and operational visibility improvement
INNOVATIVE MARKETING STRATEGY	→ Accessibility of new intermodal transport markets thanks to innovative marketing strategy

© Courtesy of GPA

TIGER DEMO Project involved Gateway Ports such as Genoa, Trieste, Hamburg, Bremerhaven and Wilhelmshaven. The transshipment Ports of Gioia Tauro and Taranto which participated to the **TIGER** project could not sustain their pilot into a full scale demonstration because of traffic reduction caused both by the economic recession and the competition from the North African hubs. The geographical area of the North Sea Ports and the Mediterranean are featured by diverse business environments posing additional challenges for problem solving.

As integral part of the **TIGER DEMO** project it was agreed with the European Commission that the demonstrated solutions discovered and applied during the project lifetime were to be disseminated at international level in order to promote their replica application in other parts of the EU. The idea was to generate meeting and conference opportunities in several countries so that other Sea Ports, Dry Ports and Rail or Intermodal Operators could understand the **TIGER DEMO** processes and mechanism for studying the needed adaptations for local operational differences so that it could become feasible to apply them locally. For this reason 5 separate workshops were organized in Europe covering a time frame of 19 months starting from March 2012 up to October 2013.

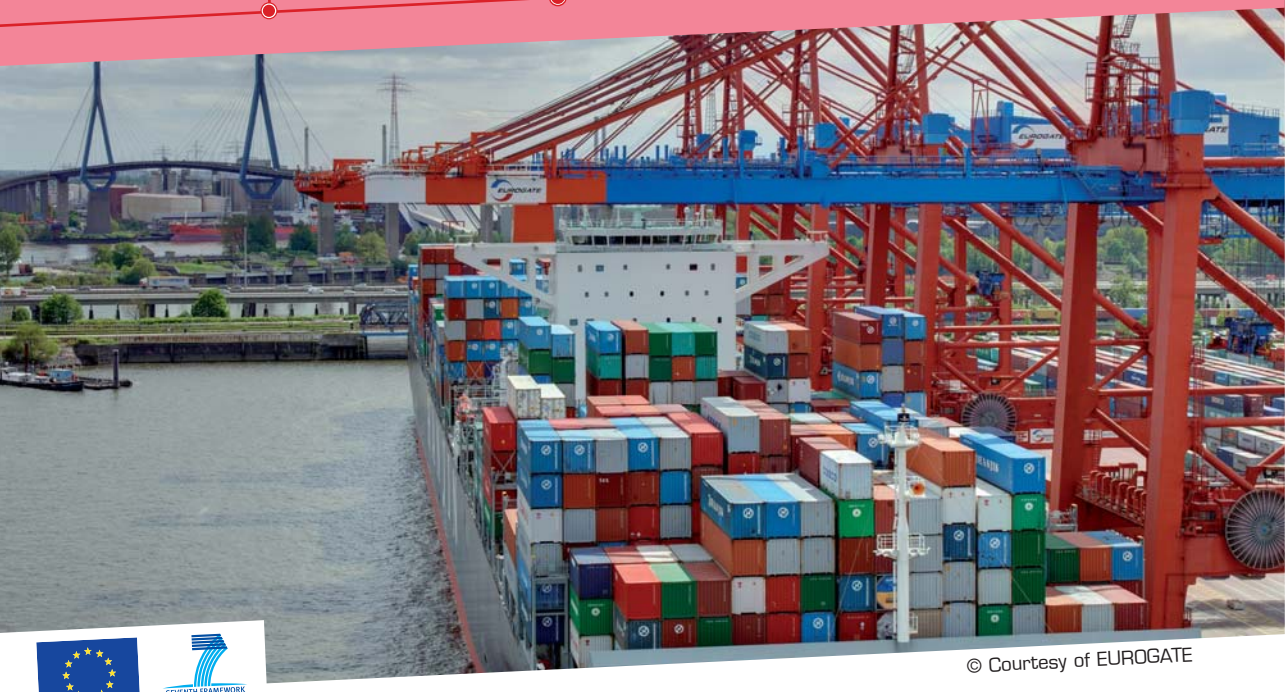
The first one took place in Genoa on March 14th 2012 and was called "Planning workshop". This event hosted by the Genoa Port Authority in their "Sala del Capitano" historical building in the old port sea front, was organized by NEWOPERA in collaboration with FLC, the Italian Freight Leaders Council. This collaboration allowed a widespread attendance. In fact in addition to the **TIGER DEMO** partners other shippers and operators from Italy and Europe participated to the workshop which attracted a lot of interest being attended by over 80 delegates. Each delegate received a folder specifically designed for this workshop containing the **TIGER DEMO** project description, the newsletters already published, the workshop Agenda together with a questions slip. After the presentation of the planned demonstrators the audience interacted with the speakers with questions and answers giving additional opportunities to the operators, agents, forwarders to elaborate and discuss the demonstrated solutions. The workshop lasted the whole day. The afternoon session continued with the FLC members interacting with the **TIGER DEMO** partners. FLC had a particular interest in the **TIGER DEMO** solutions since they had in preparation the issue of a booklet on the whole Italian sea/dry Ports situation and therefore the experiences gained by **TIGER DEMO** project development were of particular interest to them. The presentations were made available to the workshop attendees and uploaded on the project repository. The second workshop took place at NEC in Birmingham on April 24th at MULTIMODAL 2013 which is a worldwide exhibition and conference event. This event attracted Intermodal, Rail Operators Sea/Dry Ports, Terminals and CT operators, forwarders, integrators, outsourcers and shippers. The workshop was hosted by UK Rail Freight Group (RFG) who asked NEWOPERA to make a **TIGER DEMO** ad hoc presentation to their audience of more than 150 delegates. After the presentation the debate was opened with questions and answers giving the opportunity to the delegates to interact with the presenting panel. The cooperation between NEWOPERA and RFG is a long standing one and every opportunity is utilized for cross fertilizing experiences capable of supporting the overall logistics efficiency and in this particular case the Intermodal solutions adopted by **TIGER DEMO** for sea ports decongestion. Also in this case the presentations were made available to the workshop attendees and uploaded on the project repository. The third workshop took place in CATANIA on April 26th and 27th 2013 within the framework of the NORTH/SOUTH Conference on Intermodal Transport organized by CISCO (Council of Intermodal Shipping Consultants). This is a worldwide event organized every year in different locations around the world. This year was the turn of Catania and the venue was the University of Catania in the Benedictine Monastery G.De Carlo modern Auditorium. The **TIGER DEMO** presentation was made in a workshop which took place on Saturday the 27th with attending

authorities such as the Ambassador of the Chinese Peoples Republic and the Indonesian Ambassador. Also a delegate from the Hamburg Port Authority was part of the panel. The event attracted delegates from both North and South America, Europe, the Far East and South East Asia with more than 200 delegates. The workshop took place in the morning and after the various presentations the debate started with questions and answers. The **TIGER DEMO** presentation attracted a lot of interest. The ad hoc presentation prepared specifically for this event was put at CISCO disposal for distribution to the delegates and uploaded on the **TIGER DEMO** repository. Each delegate received a folder containing speakers names, workshops sessions and available presentations.

The forth workshop took place at the Transport & Logistics fair in Munich on the week from June 4th to June 7th 2013. This is a worldwide event visited by many thousands of delegates specialized in every facet of the Transport and Logistic world. Hacon project partner and **TIGER DEMO** project technical coordinator took the opportunity while organizing its own stand to plan a dedicate booth for the European co-funded projects. To this effect a dedicated space was created for **TIGER** and **TIGER DEMO** projects just opposite the Hacon private stand. By so doing a larger spatial environment was generated taking advantage of the corridor in the middle so that the visitors coming into this area were surrounded and obliged to pay attention to the projects logos and the dissemination material available thereon. A large television screen was inserted at the center of the **TIGER / TIGER DEMO** booth. The ad hoc presentation prepared beforehand was available for the various visiting delegates. The **TIGER DEMO** partners alternating themselves at the booth to cover the whole fair duration, made many running of this presentation to the interested visitors. Several dedicated workshops took place during the exhibition in the **TIGER / TIGER DEMO** booth where at the back it was organized a small meeting room catering for 6 people. Several pictures were taken. This important facility allowed to dedicate more attention and care to all those wanting to know more about the project entering into the details of the adopted **TIGER DEMO** demonstrated solutions. Many questions were raised on the adopted solutions and the problem solving activities encountered thereof. Many positive answers were given spreading in Europe the interest for replicating such solutions. The Genoa GFC video was made available for presentation on the television screen while iPort had prepared a specific booklet. The booklet illustrated both by description and by schematic color the images of the implemented solutions delivering successful results in the Hamburg, Bremerhaven and Wilhelmshaven ports. NEWOPERA had prepared a set of specific folders for the Munich exhibition containing the **TIGER DEMO** newsletters, project details, booklets, stencils and all partners logos which were all distributed and exhausted. Some of these folders were left at the Press center. The whole organization was very successful and a lot of exposure and interest generated as a result. The fifth and last workshop took place on October 9th in Hamburg at INTERMODAL EUROPE 2013. To this effect a cooperation agreement was made with the INTERMODAL EUROPE 2013 organizers in order to have the workshop in the Conference theatre of the Exhibition floor. A specific contract was signed between NEWOPERA and INTERMODAL EUROPE 2013 so that the full morning of the second event's day could be reserved to the **TIGER DEMO** workshop. INTERMODAL EUROPE 2013 is a three days International exhibition attracting many visitors worldwide. The visitors involved in Intermodal traffic represent the ideal target for the Internationalization of **TIGER DEMO** demonstrated solutions. The agreement with INTERMODAL EUROPE 2013 included the **TIGER DEMO** Workshop Agenda being publicized on the INTERMODAL EUROPE website and distributed to the 55000 mailing list. In addition an article on **TIGER DEMO** is to be edited in the LLOYDS Loading List. NEWOPERA organized 5 mailing shots before the event to its 4000 mailing list, intensified while approaching the due date. A specific event folder was designed and prepared by NEWOPERA for distribution to the various delegates containing all **TIGER**

DEMO project material. The Workshop took place in the conference theatre of the exhibition floor and was attended by about 100 delegates. Pictures were taken by the INTERMODAL EUROPE official photographer. The **TIGER DEMO** presentations after the welcoming by the project leader, concentrated on the demonstrated solutions adopted by the three project demonstrators. In particular the Genoa video on GFC was shown and iPort projected for the first time a video for their adopted solutions which was prepared specifically for this event. It was certainly very positive that iPort could comment this video since INTERMODAL EUROPE 2013 taking place in Hamburg represented a unique opportunity for describing and showing solutions of great interest for the three ports in the area such as Hamburg itself, Bremerhaven and Wilhelmshaven. The video was of great commercial impact. A public debate took place after the various presentations with questions and answers. INTERMODAL EUROPE 2013 provided an excellent opportunity for Internationalizing the solutions demonstrated in **TIGER DEMO** for their full industrial scale market uptake.

Although the five workshops deliberately benefited from different organizational formats adapting to the local prevailing business environment, they all were very successful in their own right fulfilling the objective of discussing the **TIGER DEMO** adopted solutions with an international specialized audience. Having been able to achieve this in 5 different geographical areas of Europe was quite a result. The most important demonstrated solutions achieved by the 3 demonstrators have been described in details on the previous chapter and have been presented during the various workshops either through dedicated presentations and videos.



© Courtesy of EUROGATE

This Report has the objective of summing up the **TIGER DEMO** Project process development up to full market uptake. **TIGER DEMO** since the project beginning had to face a difficult market situation due to the economic recession. Such situation brought one of the original **TIGER** demonstrator called MARIPLAT to give up its demonstrating efforts because the traffic volumes reductions experienced in TARANTO and GIOIA TAURO Ports were such as to make it impossible the continuation of the **TIGER** Pilot into a full industrial and commercial demonstrator. Despite such volumes reductions experienced in 2010 and 2011 by all European Ports the three remaining demonstrators decided to proceed to full commercial development and such decision was rewarded by substantial positive results since in 2012 the ports of Genoa and Bremerhaven experienced record throughputs, while Hamburg had stable volumes and Wilhelmshaven started its operations ahead of time. One has to say that **TIGER DEMO** satisfied perfectly the European Commission requirements for co-funded projects being capable of exploiting full market uptake possibilities into the market place. The **TIGER DEMO** demonstrated solutions have achieved industrial scale. The number of managed trains during the project life time are counted in hundreds and the number of TEU moved in tens of thousands. The best proof to this effect is supplied by the partners themselves who have invested hundreds of Million Euro in infrastructures and equipment for improving their competitive profile and their reach in geographic areas where they could not operate efficiently before **TIGER DEMO**. The implemented solutions have become for the **TIGER DEMO** partners a vital part of their industrial working cycle and they will gain further momentum after the **TIGER DEMO Project** closure.

The demonstrated solutions adopted by **TIGER DEMO** have been largely internationalized and disseminated throughout Europe with a series of dedicated workshops which took place in specialized worldwide events in order to give the dissemination effort the maximum impact both by physical presence and the press. While the demonstrated solutions have become a permanent feature in the services supplied by the **TIGER DEMO** partners, all those having participated to these workshops had the opportunity to replicate these innovations in their business environment exception made for local peculiar situations. The level of information supplied was quite large. Videos were shown and logistic chains were explained and elaborated. Questions were answered.

CONCLUSIONS WITH MARKET & FREIGHT MOBILITY RELEVANCE

The basic paradigm to be addressed by **TIGER DEMO project** was represented by the economies of scale generated at Sea by the giant CT vessels did not find the same compatibility when the containers had been discharged on the Ports quay Terminals. Therefore the immediate challenge to be overcome is the generation on land, be the modality Road, Rail or Inland Waterways, of the economies of scale compatible with those generated at Sea. Hence the transport industrialization, to/from Sea Ports to hinterland destinations via Dry Ports connected through regular and multiple shuttle trains and when available barges for river navigation, becomes a priority. To this effect **TIGER DEMO Project** has proven to be a forward looking one since road modality which is prevailing in Europe does not seem to be suitable for transport industrialization. Additionally the need of energy and environment conservation are progressively driving towards modal shift and sustainable mobility.

TIGER DEMO Project has proven the validity of the Sea Ports, Dry Ports, Mega Hubs and Freight Villages as freight bundling centers for economies of scale generation. In particular these infrastructures located on major European freight corridors (TEN-T Network or European rail Network for Competitive Freight) constitute the vital nodes where freight multiplication, freight optimization and transport industrialization can become effective. It is obvious that these infrastructures must have capacity characteristics compatible with economies of scale and transport industrialization requirements.

The presence and availability of such Dry Ports/Mega Hubs/ Freight Villages on major European corridors constitute integral part of the Rail Network for Competitive Freight. In fact it is through them that it is possible to connect the peripheral terminals into the whole rail intermodal network creating a capillary distribution system where co-modality can be exploited at its best with long hauls operated by trains or inland waterways and last mile distribution from peripheral terminals operated by road.

The strategic relevance of these nodes is capable of delivering an additional value to the European Network. In fact for decades the traffic development in Europe was concentrated on the axis North-South and vice versa. The expansion of the European Union towards the East and the development of the new accessing Countries having above average growth rate, materialized a greater need of freight exchanges in the West-East direction and vice versa. It is through the intersection of the nodes that the North-South corridors integrate with the West-East ones giving substance to the full integration of the various corridors into the European Network.

The **TIGER** and **TIGER DEMO Projects** assessment of the existing infrastructures in the areas of the project's interest, including local rail network, rail corridors, Dry Ports, Mega Hubs and Terminals, surfaced the need to correct a number of bottlenecks. Such need has been reinforced by the traffic projections 2020. Failing such correction the risk is represented by the inability of achieving the planned traffic optimization and the full implementation of the co-modal productivity approach. Some of these bottlenecks have been identified on main railways corridors involving decision making at National and International policy levels. The local and National Authorities of the Countries involved have been made aware of the necessity of removing such bottlenecks.

Likewise the Shipping Lines Business Model is driven by the reduction of their slot costs achieved through the deployment of giant CT vessels, the Overland Business Model promoted by **TIGER DEMO Project** is driven by the reduction of the unit costs transported through the implementation of transport industrialization achieved through industrial shuttle trains operated between Sea Ports, Dry Ports, Mega Hubs and Freight Villages.

The **TIGER DEMO** Research has evidenced that the Shipping Lines Business Model is driven by reduction of their production costs achieved through the deployment of giant CT vessels. Most of them, in order not to be pre-emptied in the competition game by the more aggressive ones, have embarked in a colossal renewal of their fleets. At the time of writing this report about 150 new constructions have been delivered with capacity varying between 10 to 14000 TEU. A leading Shipping Line ordered to a Korean Shipyard four new CT ships of 18000 TEU capacity and ships designs are already available for vessels having capacity of up to 23000 TEU. These giant vessels produce their competitive advantage while at Sea which entails that they are calling at a fewer number of Ports where they will be performing a higher number of movements. This race towards giant tonnage is bound to bring about further changes in Ports CT handling as well as additional hinterland industrial distribution requirements to/from these Ports.

It appears obvious that in these high capacity nodal points the production tools such as gantry cranes, reach stackers, lifting equipment, maneuvering locos, etc., must allow state of the art loading/unloading and train to train operations compatible to the economies of scale of a totally industrialized production process. To this effect also the rolling stock deployed on the shuttle trains must be of the latest technology allowing longer, heavier and faster trains to be operated between the serviced Sea Ports, Dry Ports or Mega Hubs. Needless to say that repair workshops for both

rolling stocks and containers are available facilities at the nodal point in order to secure a continuous operation during the 24 hours production cycle.

The **TIGER DEMO Project** development process has proven that there is another productivity multiplier in addition to Dry Ports, Mega Hubs, Freight Villages as nodal point of the network. This productivity multiplier is represented by the implementation of innovative and intelligent technologies capable of managing production programs, shuttle trains, capacity optimization, subsequent bookings, alternative routings as well as track & trace and other ICT communication within the customers/users loops.

One of the main **TIGER DEMO** common denominator through the commercialization of the three Pilots Demonstrators was represented by the need of having to re-engineer the production cycles and the business process. Profound modifications were necessary in order to secure a proper migration from the previously existing "status quo" to the new production or service levels. Extensive training and re-training activities were necessary for introducing and/or upgrading the management and personnel skills to the competent usage of the new tools be them software or hardware.

Last but not least the **TIGER DEMO Project** highlighted the existence of a series of bureaucratic and psychological barriers needed to be overcome. Those encountered within the **TIGER DEMO Project** lifetime have been faced and resolved. However outside the Project boundaries both the operators and the competent Authorities have to make renewed efforts for improving the traffic fluidity. Reference is made to self-generated impediments, the "it cannot be done" syndrome, the customs, administrative and security regulations, not always up to date with the use of innovative technologies. Manual, visual and physical interventions are still required in various phases of the transportation process also when new technologies, satellite communications, video cameras remote controls, RFID bar code technologies, X-rays, E-seals, transponders, pods and similar tools make them absolutely redundant, unnecessary, costly and therefore inefficient.

ACHIEVED RESULTS OF THE FULL DEMONSTRATION LEADING TO PERMANENT COMMERCIAL EXPLOITATION INTO THREE SEPARATE OPERATING EUROPEAN THEATRES

The new gigantic dimension of modern maritime transportation, deploying vessels of up to 18000 TEU, dictate an operational pattern of a reduced number of port calls characterized by a higher number of movements. The **TIGER DEMO Project** contributed to maintain the Sea Ports free from congestion by re-forwarding the traffic to the hinterland via the Dry Ports.

The deployment of innovative technologies, both soft and hardware, have contributed to a considerable improvement in the service quality offered to the market place, transit time reduction and performance control through track & trace. Administrative and bureaucratic barriers have been abated through the implementation of E/freight, E/seals, E/customs. The introduction of intelligent management systems governing trains capacity, bookings, loading/unloading, service quality, traffic bundling and schedules improved considerably the trains productivity and the capacity optimization. Security controls have been largely simplified through the adoption of E/seals which can be checked electronically. The progressive extension of this technology to the customs points/ports of origin allows the full guaranteed control of the cargo in transit up to the customs point of arrival. This represents a major step change towards the problem solving of the physical cargo inspection which in the last ten years has been a major cause of additional costs and delays in Sea Ports.

Selected investments inside the terminals and the adjacent quays as well as in the Port areas rail network correcting bottlenecks have proven to be very productive. Rail connections have been upgraded reducing dwelling time, transit time and costs.

As a result of these selected investments, operated by the **TIGER DEMO** partners, the working cycle in the interfaces "Ship-to-Shore" and "Shore-to-Train" has been re-engineered and re-programmed eliminating idle time and interruptions. The duty cycle has become seamless. Several of these barriers have been eliminated favoring the adoption of one contractual interface capable of governing the entire process. This is a vital passage conducive towards transport industrialization.

The Dry Ports, Mega Hubs, Freight Villages have proven to be a vital ingredient not only for the maritime traffic but also as freight bundling point for transport industrialization. Rivalta Terminal Europe, Munich Riem, Lehrte, Bremen, Nienburg, Duisburg, Frankfurt, Nurnberg, Mannheim, Stuttgart, have introduced a new strategic vocation to their mission increasing substantially the span of their business. They have become vital nodal points of the European Rail Network as catalyst of traffic attraction zones either for final hinterland distribution or for re-launching trains to other terminals in the network. In particular in the **TIGER DEMO Project** these Dry Ports have allowed the implementation of the extended quay concept and the traffic industrialization with their reference Sea Ports of Genoa, Hamburg, Bremerhaven, Wilhelmshaven, Trieste.

The identification of the Dry Ports, Mega Hubs, Freight Villages capable of handling rail traffic in an industrial way, combined with the new seamless duty cycle in the Sea Terminals, have made possible the handling of multiple industrial shuttle trains operated between the Sea Ports and the Dry Ports. In particular for Genoa Port the recognition of Rivalta Terminal Europe as fully authorized Genoa customs point allowed the through-transit from the ships to Rivalta without formalities.

The added result demonstrated by the **TIGER DEMO Project** is represented by private companies who have understood both the business development potentiality of the maritime traffic as certified by the projection 2020 and the business development emerging thereof by investing in Dry Ports and Mega Hubs facilities. The involvement of private initiatives in this field is relatively new and it could be taken as an example to be followed for obtaining financial resources for public private consortium in infrastructures investments.

The **TIGER DEMO** Project fully demonstrated the viability of the two approaches: "better use of the existing infrastructures" and "transport more with the available resources" limiting the infrastructures investments to the bottlenecks corrections. These approaches do not at all pre-empt the construction of new rail infrastructures but on the contrary they provide the extra time needed for any new investment to come to market.

Within the domain of "better use of the existing Infrastructures" and "transport more with the available resources" the **TIGER DEMO Project** demonstration proved in practice that not necessarily the shortest distance between a Sea Port and a Dry Port represents the ideal solution. Today International trade exchanges are characterized by the principle of the "virtual distances". This means that the prices or costs charged are not proportionate to the physical distances. Virtual distances are common both in maritime and overland traffic. The driving force of virtual distances is the traffic imbalance between Countries and Continents. Similar situation applies when the shorter rail corridor between two nodal points is totally congested or has to cross major cities where heavy passengers and commuters traffic represent an obstacle for freight trains. In this case alternative longer routes

congestion-free represent a viable alternative both for costs and services. Within **TIGER DEMO** the use of Munich Riem, Duisburg, for re-launching traffic to other terminals represent a practical example.

The objective of achieving traffic industrialization dictates the need of developing techniques of operational standardization. This means that both physical handling as well as information flows through ICT technologies have to be repeated endless time during the production cycle in a "standard format". This approach goes hands in hands with the progressive vehicles standardization worldwide such as, containers, trucks and wagons' sizes deployed on the international trade lanes.

In more practical terms for providing a tangible measure of the **TIGER DEMO** success story in traffic numbers which for the specialists constitute the dimension that counts, the detailed results are the following:

- Genoa Fast Corridor-GFC - 500 shuttle trains were operated during the project lifetime carrying CT traffic volume of about 15000 TEU continuing thereafter.

- Innovative Ports and Hinterland Operations - iPort - handled more than 400 trains via the Nienburg rail hub system during the project lifetime transporting at least 32000 TEU, while via Bremen more than 150 trains were operated carrying more than 10000 TEU and continuing thereafter.

- Intermodal Network 2015+ - MEGA HUB - achieved via Munich Riem a traffic increase of 17% during the project lifetime, while the TRIESTE - FRANKFURT service which started in October 2013 achieved a frequency of 3 departures per week in both directions and continuing thereafter.

The above traffic volumes the new services' success in the market place, the traffic industrialization realized on the **TIGER DEMO** new routings are warranted by substantial improvement in the service performances and the costs reduction resulting thereof. Here below the major KPI achieved on the service performances are described in details:

- Genoa Fast Corridor-GFC - Sea Port dwell time & transit time reduction 20% + further 20% to be achieved when Genoa Ports rail tracks connections are fully completed.

- Innovative Ports and Hinterland Operations - iPort - Dwell time on Hamburg seaport rail net reduced up to 92 % with increased punctuality in the seaport terminals jumped up to 85-90%.

- Intermodal Network 2015+ - MEGA HUB - Integration of „medium-size" and „small-size" terminals into national/international network. Rail-rail transshipment performed in dedicated hubs, operational concepts implementation for train to train transfer, double sided electrified frictionless rail access with direct trains entrance & exit without shunting, allowing improved performances at reduced costs properly quantified per train and reduced time per train in maneuvering.

The above results together with others of more commercial and marketing nature equally if not more important for the long term success of these new **TIGER DEMO** project services, were achieved through substantial investments in both infrastructures, hardware and software systems for which the co-finance supplied by the EU Commission under the FP7 scheme provided the start-up incentive and the dissemination coverage at international level. In order to give the measure in terms of order of magnitude of such investments some gross figures are provided.

- Genoa Fast Corridor-GFC - The Rivalta Terminal Europe Green Field Dry Port complete new infrastructure built by the Gavio Private Group capable of handling one million TEU per year, is an investment in the order of € 100 million. In addition to this investment one has to consider the purchase of the Rivalta RFI rail station, the transfer and lifting gears, specific equipment for rail signaling as well as the software and hardware technologies for E/customs, E/security, E/freight, E/seals for a fully computerized traffic management control and monitoring. In addition Terminal San Giorgio part of the same business Group for completing the **TIGER DEMO** total logistic chain integration, invested in excess of € 10million in port rail infrastructure, equipment and dedicated ICT traffic management systems allowing full track and trace real time trains and wagons visibility and monitoring.

- Innovative Ports and Hinterland Operations - iPort - boxXpress iPort partner of Eurogate invested in the Nienburg facilities which although existing had to be revamped. Long term lease had to be taken in order to achieve a dedicated utilization for the **TIGER DEMO** project services continuing thereafter. Bremen although an existing infrastructure had to be integrated into the iPort service system. In terms of software ICT systems investments were made for the dedicated total management chain, the process optimization, the hinterland customs processes finalization. To this effect the "BLU" system interfaces were put in place allowing optimization of hinterland processes and the train monitoring with customers.

- Intermodal Network 2015+ - MEGA HUB - DUSS the MEGA HUB partner is realizing the greatest effort in Dry Port infrastructure investments. Lehrte new Hub investments which is under construction at the time of writing this report is in the order of magnitude of € 100 million.

- Figure 73: The BREMEN Dry Port of Roland Umschlag in operation.
  Source: **iPORT for TIGER DEMO Project**

- The New Munchen Riem 3rd module utilized for the **TIGER DEMO** demonstration and completed during the project lifetime is about € 25 million investment. The new Hub in Duisburg scheduled for starting operations in 2014 constitutes and investment of € 50 million. The extension of

Hamburg-Billwerder is an investment of € 30 million. Another extension in Köln-Eifeltor is in progress for a further investment of € 40 million. For the ICT Kombiverkehr MEGA HUB partner improved ICT-System in terminal operation including timing control of rail-rail transfer, introduced a new train capacity management system which was rolled out during the project implementation together with ICT system for real-time train monitoring with ETA-information. One could argue that these infrastructure investments had a longer term horizon than the **TIGER DEMO project**. This is true but there is no doubt that **TIGER-TIGER DEMO projects** having introduced the DRY PORT distribution business model acted as the initiator of the "snow ball" effect for this business model implementation.

→ Figure 74: The Tri-modal Combination Road, Rail, Sea on the Germany to Trieste for Greece and Turkey. Source: **Various for Kombiverkehr for TIGER DEMO Project**

RECOMMENDATIONS

TIGER DEMO in direct continuation from the **TIGER** project had the objective of implementing the **TIGER** pilots into full commercial demonstrators. **TIGER DEMO** succeeded for three of the four original pilots to make a commercial success of the planned demonstrators. The exceptional operating results brought by the **TIGER DEMO** partners who invested in this project have been progressively appreciated by the market place to the point that the **TIGER DEMO** demonstrators became permanent services supported by adequate ICT and intelligent management information tools. The natural recommendation emerging from this experience is that the Innovative European co-funded projects must have inside their core activities three pre-requisites. One a strong market uptake development for any technological innovation which must be applicable to transport and logistics operations, the second to make this market up take a realistic objective within the project lifetime and last but not least the presence of important industrial actors inside the consortium capable of injecting their own resources beyond the co-financed part for the success of the planned innovations. By fulfilling these three conditions the European co-funded projects can become a motor for the required step change in freight mobility.

The **TIGER DEMO** partners believed in the project from the very beginning. The recession never hampered the original plan. Investments were made despite the reduced volumes because of the strength contained in project drivers. The key industrial actors participating to **TIGER DEMO** not only appreciated the intermodal chain innovations implemented in the market place but wanted to issue dedicated videos witnessing with real images the success of the operations. A recommendation is to document with undisputed facts through modern communication tools the achieved results so that they can constitute a motivation for the efforts done by all the participants.

Within the **TIGER DEMO Project** Work Packages one in particular dealt with the "Internationalization of the demonstrated solutions". Five separate workshops were organized in different part of Europe for disseminating the demonstrated solutions implemented during the Project lifetime. These workshops took place in Genoa, Birmingham, Catania, Munich and Hamburg. Specific solutions were found, planned, and implemented during **TIGER DEMO Project**. The idea driving these workshops was the elaboration of such solutions, describing how they were identified the description of the challenges to be overcome up to their application in the market place. One recommendation is to make sure that the experiences, the improvements, the solutions adopted in TIGER DEMO could be progressively applied throughout Europe for improving the traffic fluidity.

During the **TIGER DEMO Project** life the partners realized and experimented that the space in Europe is a limited resource. The freight mobility Infrastructures are also limited and because of this they are congested most of the time. The Ports infrastructures cannot be expanded beyond their geographic limits and the costs of investments at sea are far more expensive and with longer return than investments on land. In addition the **TIGER DEMO** partners and the operators around the Ports realized that the Sea Terminals are the most expensive places to keep containers piling up waiting to be dispatched to their final destination. The Ports should regain their original mission of connecting the Sea with Land and in order to make this happen the traffic should be kept moving in both directions. Only by working towards this traffic fluidity objective, the Sea Ports can increase substantially the productivity of their infrastructures making a much more efficient and productive use of the existing resources. Therefore one recommendation emerged from the **TIGER DEMO Project** is the need to increase and improve the connectivity between the Ports and the hinterland through selected investments in the inner Ports Rail/Road network, bridges upgrade, electronic switches, bottlenecks corrections, quay rail interconnections, etc. In addition to the inner Ports network upgrading it is necessary to have inside the Port areas operating rail terminals capable of handling traffic of multiple trains daily in an industrial way.

In order to make realistic the traffic fluidity in the segment ship to shore and from quay CT terminals to hinterland destinations it is necessary to avoid any congestion inside the Ports areas. This objective can be achieved only through the availability of Dry Ports, Mega Hubs, Freight Villages in the freight attraction zones capable of handling traffic in an industrial way. This is a pre-requisite for producing on land volumes compatible with those generated at Sea by the giant CT vessels. One recommendation emerged during the **TIGER DEMO Project** and during the demonstration Pilots is the need to identify and make available these Dry Ports connected by rail to the Sea Ports as vital nodes of the future European Rail Freight Network. In fact the European Rail Network for competitive Freight legislation approved by the European Parliament is a combination of rail corridors and nodal points (Dry Ports, Mega hubs, Freight Villages, Terminals). They are the traffic multipliers through bundling, relaying traffic for last mile distribution. To this effect **TIGER DEMO** has been able to demonstrate that not only "greenfield" hubs are to be considered which require planning permission not easy to be obtained due to environmental consideration, but also "brownfield" adaptations

could serve the purpose. Nienburg is a perfect example of the successful transition of an old unused marshaling yard brought back to life as transit –sorting terminal for maritime traffic. Its use has achieved formidable results in improving the ports terminal performances as already described in other part of this document generating at the same time new value for an idle piece of infrastructure. This is a win-win situation both for the improved logistic cycle and for the taxpayer.

It has become apparent during the **TIGER DEMO Project** lifetime that the deployment of giant CT vessels up to 18000 TEU in sizable numbers changed the traditional business model of road distribution from the Ports based on a one by one container or at best on a 2by2 20' CT distribution. Such business model has encountered three major obstacles difficult to be overcome:

- Every vessel is handling in each Port of call an increased number of movements both in import and export and the service frequencies operated by different Shipping Lines is generating calls in the major Ports nearly every day.

- The road vehicles fleet itself is not expandable having reached a limit of rigidity dictated by shortage of drivers and tariffs competiveness. The driver shortage has proved to be an insurmountable hurdle for those companies wanting to buy new trucks.

- The continuous increase in fuel costs have eroded profit margins for the transport companies hence force reducing the ability for new investments.

The only mode of transport capable of handling containers in an industrial way in addition to the feeder vessels and inland waterways is rail intermodality which can be operated between the Sea Ports terminals and the Dry Ports in the hinterland. Moreover the giant CT vessels calling at an inferior number of Ports, are handling traffic into these Ports with less optimized overland distances compared to the final destination/origin points. This process is generating a demand for longer distance transportation with an increased competitive penetration to the hinterland to and from these ports. Road distribution alone is no longer capable of dealing with this traffic demand for longer distances at competitive costs. One recommendation which has been the driver of the TIGER DEMO project itself is that rail distribution must become central in any European Port for improving traffic fluidity as from now and up to the years to come. The traffic projections 2020 clearly indicate that the expected traffic volumes can be handled only if the rail performance from the ports to the hinterland is increased very substantially. Also road modality will have to increase its own throughput capability although at a slower pace than rail.

If the above recommendation of industrial transportation by rail to/from sea ports to/from dry ports is implemented then a new recommendation is becoming apparent. The road productivity will be enhanced by concentrating on last mile distribution from Dry Ports, Mega Hubs, Freight Villages and Terminals to final destination. This is the so-called "last mile distribution". By implementing this business model, multiple deliveries can be performed in one day from the Dry Ports on short distances, fulfilling both the objective of productivity, equipment turn around, competitiveness, cost reduction together with environment protection by extracting the best possible performance from road (co-modality).

The individual European Government budgetary constraints dictate a much stricter selection of the investment priorities. Investments in new Mega-Infrastructural Projects are to be ruled out for the immediate future, which means that the limited resources are to be channeled towards projects

capable of accruing immediate results and quick capital return. The applicable principle is "maximizing the expected results with the least amount of investments". The **TIGER DEMO Project** has identified a number of bottlenecks encountered during the **TIGER** process lifetime on the rail connection between the sea ports and the identified dry ports. One recommendation is to start immediately the work for correcting these bottlenecks which today represent a source of rail congestion and an impediment towards rail traffic industrialization.

The other major freight multiplier in addition to the Dry Ports, Mega Hubs, Freight Villages, which are vital for traffic bundling, is represented by the technology dimension. The technology innovation has many facets. During the **TIGER DEMO Project** lifetime two major technology families have been implemented: the ICT, intelligent management software technologies and the equipment, handling and rolling stock hardware technologies. These software and hardware technologies alone are capable of delivering the desired results when applied in the right place and at the right time. The **TIGER DEMO Project** has identified the nodal points in which these technologies are capable of impacting positively as freight multipliers. In the **TIGER DEMO** Sea Ports, Mega Hubs, Dry Ports, Freight Villages these technologies have been applied and demonstrated. Intelligent systems such as trains management, capacity management, trains monitoring, service monitoring, track & trace, RFID, electronic transponders have been applied and rolled out for market users. Similarly ICT technologies using satellite communication have been adopted for complementing and supplementing the above intelligent systems. Other innovations such as E/seals, E/freight, E/customs have been identified as measures of success. One recommendation emerged from the **TIGER DEMO** demonstrations is that it is necessary to implement on the rail transport chain a much higher degree of technology innovations capable of delivering immediate benefits in a relatively short period of time. Another recommendation emerging thereof is that the problem areas is not represented by the lack of technology itself but rather more by the lack of implementation. The transport sector fragmentation is not helping either however a major technological effort made by the leading operators not only could improve the traffic fluidity but also constitute a driver towards the transport sector consolidation.

Likewise a variety of hardware technologies have been identified, tested and implemented during the **TIGER DEMO** development process. Equipment, lifting gears, locomotors, train-to-train trans-loader, new technology wagons, have been used in the pilot phase. Both the software and hardware technologies have been instrumental for re-engineering the work processes all along the transport chain simplifying the interfaces and shortening dwell time in the ports, dry ports and transit time with evident costs saving benefits. One emerging recommendation is to take as a permanent objective the progressive modernization of the hardware and software technologies which are instrumental for implementing the management and the monitoring of the service performances in real time and at reduced costs.

The technological dimension allowed to achieve and demonstrate in the **TIGER DEMO Project** how both the security and custom formalities can be grouped together in one seamless process through the adoption of E/seals and E/customs. The traditional way of managing both security and custom formalities is the physical stoppage and inspection of the vehicle in transit. Such old fashioned practice leaves itself open to personnel interpretation of the rules, very slow timing, transfer costs, maneuvers, additional lifting, demurrages. All in all this equates to a cargo victimization generating substantial extra costs, delays, lost orders, lost sales, damages, etc. Through the E/seals, E/customs, transponder technologies, RFID, the entire security and customs process can be controlled electronically through the entire transit. The E/seals applied by the Customs at origin is capable of

guaranteeing the cargo integrity up to the customs of arrival. If the Customs of arrival is in a Dry Port in the hinterland, the loading on the train at the port of arrival is accepted as a guarantee of journey continuation from the ship to the arrival dry port. The customs authority with only one customs clearance at the dry port of arrival is eliminating the intermediate physical examination. The E/seals is controlled electronically and it offers a much higher reliability than any physical visual or manual control. One recommendation is to promote the extensive diffusion of such system since today the technological tools allow such security and customs control much safer than those operated by men.

The Just in Time technique has contributed to divulge into the public perception the idea that shorter distances are synonymous of faster time. This is certainly a true assumption provided no external factors are interfering during transit. These external factors are beyond the control of the actors involved and therefore totally unpredictable. Moreover the elements of unpredictability become almost certain when the shorter routes are structurally congested. This applies to both Road, Rail and Air. The elements of unpredictability in inland waterways is dictated by the level of water in the rivers which could be either too much or too small. One must not forget moreover that our time is characterized by "virtual distances" were the idea of shorter distance is disconnected from two relevant dimensions such as costs and time either together or considered separately. These considerations emerging from the real logistics world and the market place, conduce toward the concept that a longer routing could result in being more competitive in time and costs contradicting the prevailing perception that "shorter is cheaper". One recommendation is to consider in rail transportation between Sea Ports, Mega Hubs, Dry Ports, Freight Villages also secondary lines when the direct lines are congested. During the project lifetime secondary lines have been used effectively in the Pilots demonstration bypassing the bottlenecks.

One of the major problems affecting rail freight has been and still is the fragmentation of operations compared to a door to door service which can be offered by a road truck. Such fragmentation is originating from both historic and psychological barriers. Due to the continuous compression of the Supply Chain, the ultimate customers do not accept any longer that a component of their Supply Chain represented by rail is having within its own perimeter elements of disruptions. Such disruptions are caused by operations, actors, intermediaries which today do not have cause to exist. Reference is made in particular to manoeuvres, handling operations, transshipment, stoppages, local rules, conflicts between governing bodies or Authorities, trade unions or private sidings consortiums. In such a confused operating theatre, each intervening actor is claiming a right of authority and a right of claiming operational dues generating costs with no value for the ultimate customers. The end results for rail are inefficient and costly operations with consequential traffic loss. All of this represents a negative heritage from the past which must be totally cancelled if rail freight is to become competitive now and in the future. In **TIGER DEMO project** similar situation have been encountered and resolved by nominating one unique interface capable of assembling together these interrupted operations into one unique work flow executed at competitive costs. One recommendation emerging from such an experience is to adopt measures during the planning phase of rail freight or intermodal services capable of compacting the whole rail process into one work flow where one single operator is accountable both for costs and services.

During the **TIGER DEMO Project** Pilot demonstration of new services between Terminals, Dry Ports, Mega Hubs and Freight Villages the various operators involved in the intermodal transport chain had the opportunity to appreciate the availability of repair workshops both for rolling stock, containers and swap bodies. In particular the efficient up-keeping of the rolling stock and the

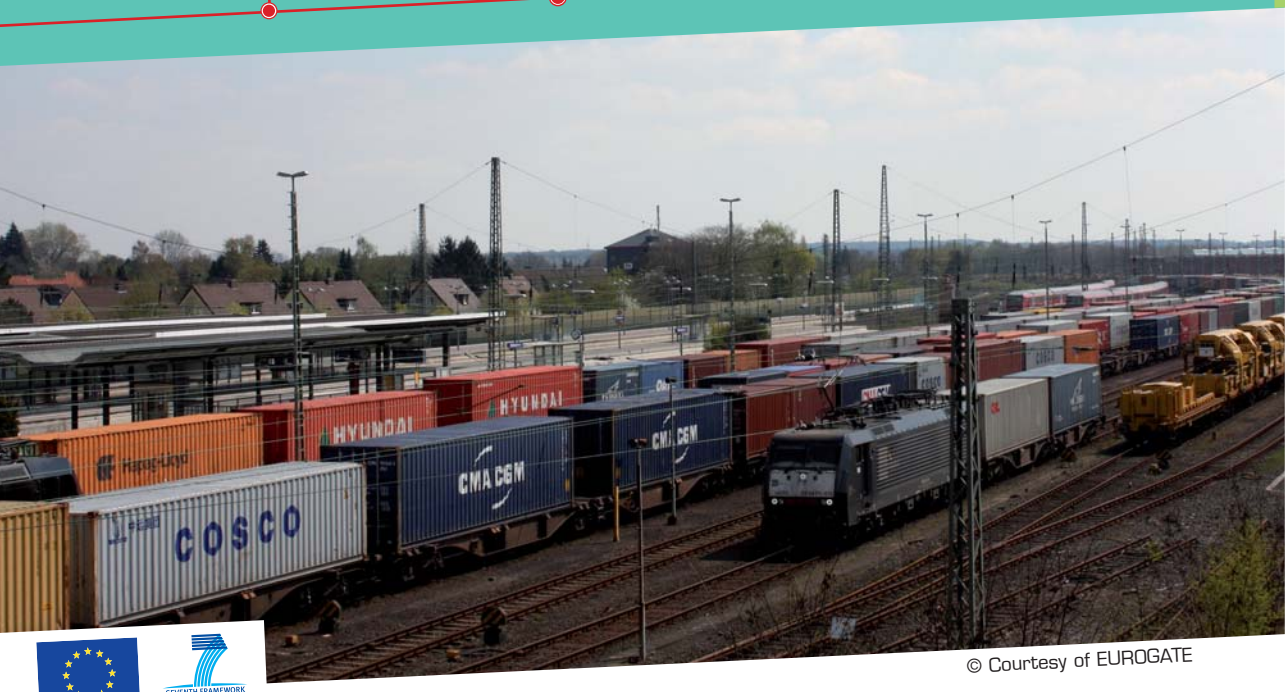
maintenance of the containers/swap bodies is an indispensable element for equipment turn around and for preventing any train stoppages while in transit. Likewise the proper maintenance of the transported boxes is itself a pre-requisite for safe-loading on the ships and /or safe and punctual performance of the last mile deliveries from the inland Terminals. One recommendation is therefore the presence of such service facilities in the Dry Ports, Mega Hubs, freight Villages where regular shuttle trains are operating in an industrial way. By so doing the rail traction company in charge moving the train, is confident that the rolling stock deployed on the service is at the required standard for performing the traction in safe condition and according to the train schedule.

At the time of writing this report it is known that a Project name "MARATHON" has the objective of testing on the operational field longer, commercially faster and heavier trains. This will be possible thanks to new radio communication technologies, innovations on rolling stock, double traction with a second "slave" loco in the middle of the convoy, innovative braking and signaling systems. Although such pilot is outside the **TIGER DEMO project** scope, the **TIGER DEMO** partners recognized this to be a very relevant step change for promoting rail freight transport industrialization between the sea ports to the dry ports in the hinterland. This idea of longer, commercially faster and heavier trains has found support between the **TIGER DEMO Project** partners. Only by lengthening the trains, the transport costs are reduced and additional capacity is generated with marginal investments. One recommendation is that indeed longer, commercially faster and heavier trains must be implemented on the European network between sea ports to/from dry ports or between the Dry Ports, Mega Hubs, Freight Villages themselves situated in the hinterland whenever economy of scale and traffic bundling possibilities are available.

Another opportunity experimented positively during the **TIGER DEMO project** lifetime is the cooperation amongst various actors of the Rail freight transport chain. In different geographical operational theatres several kind of cooperative approaches have been experimented with very successful results. In particular in the North European Ports of Hamburg, Bremerhaven, Wilhelmshaven, the local port Authorities and terminal operators exercised a pivotal role with forwarding agents, rail freight operators, traction companies and other key actors of the port activities in order optimize the port system productivity. Problem solving and barriers abatement were the focus of discussions tending to eliminate administrative, bureaucratic and psychological barriers in the interest of efficiency and costs reduction for the cargo owners. In the Genoa port ships agents, train operators, dry port management, customs and security officials were involved in several dedicated workshops in order to streamline formalities, information flows, security and customs operations. In Genoa 3 terminals are participating to the trains loading to Rivalta Terminal Europe: Terminal San Giorgio, Messina in ATI and Genoa Voltri. New ideas of E/seals, E/customs, E/freight were tested with very positive outcome. These efforts were successful resulting in shorter dwell time, faster transit time, quicker equipment turn around and consequently lower costs. This cooperative approach is very common and largely implemented in other modes of transport. In the maritime field slot charter agreement are common place between competitors. A similar situation is applied since decades by the airlines both in the passengers as well as in the freight traffic. Also competing organizations participate to the efficient co-loading of trucks in the LCL business. In rail freight this practice is almost unknown. One recommendation emerging thereof is the need in rail freight or intermodal traffic to adopt a much stricter cooperation amongst the key actors of the rail transport chain which is necessary for modernizing the sector. The cooperative approach is capable of managing more efficiently the available capacity and introducing new practices in the marketing and commercial organization. The commercial approach must evolve from mono-channel to a multi-channel distribution Business Model capable of achieving an effective service segmentation and a much more efficient selling penetration.

All the above recommendations equate to a major step change in the management of the rail freight traffic. In order to implement these recommendations it is necessary to adopt a new business model based on transport industrialization, economy of scale, traffic bundling and cooperative approach between the key actors of the rail transport chain. The efficient loading of the trains, the capacity management, the ICT and intelligent system technologies are all ingredients for achieving seamless transportation to an industrial scale. The multi-channel distribution approach is capable of understanding much better the ultimate customers' needs for producing services, which are instrumental for the users' problem solving. Rail freight constitutes only a part of the entire customers' supply chain and regular industrialized shuttle services between Sea Ports, Dry Ports, mega Hubs, Freight Villages are capable of providing the necessary guarantee of regularity eliminating the uncertainties which have characterized rail freight up to now. One recommendation is emerging from the **TIGER DEMO project**. A new offer-driven Business Model is necessary compared to the old fashioned demand-driven. In the service industry, services must be available if one wants the customers to buy them. When services are not available, which is the prevailing situation in rail freight, the customers are not in a position to purchase services that do not exist. In rail freight it takes months to produce a new service being rail freight a "closed system". During such lapse of time the customer is finding new solutions, new routings which do not consider rail as a viable proposition. This still is and has been the prime cause of continuous rail freight decline. In all other transport modes be them for passengers or freight, the prevailing Business Model is offer driven. It is almost impossible to understand while in rail freight the European rail system has adopted the long term losing demand driven approach which is not responding to the customers' needs. Once the offer driven Business Model has been adopted the immediate consequence is the need to implement the "selling of capacity" through the multi-channel distribution approach and innovative marketing techniques capable of extracting from the services produced the differential value perceived by the customers. The rail operators have within their own system a very evident example of their own creation. The passengers new high speed services are offer driven, high capacity services and sales segmented with outstanding market success. These services have eliminated the airlines on medium distances through fair and effective service competition. This Business Model must also be applied to freight.

In all three **TIGER DEMO** demonstrators which were implemented in different European geographic theatres, new production processes, duty cycles have been adopted for achieving the Project objectives. New investments in equipment, ICT and intelligent tools, machinery, locomotors, transponders, electronic seals, management systems, computers, wagons, lifting gears, etc. required a lot of training and re-training activities involving both white collars as well as blue collars human resources. The roll out into the market place of such innovations involved trials, experiments, pilots, processes, commercial actions, agreements, best practices capable of bringing the desired results. All these activities entailed extensive training both in theory as well as in practice. Such activities lasted during the whole Project duration since the **TIGER DEMO** partners wanted the new work processes to become part of their company culture. One recommendation emerging from all the three **TIGER** Pilots is the absolute pre-requisite of investing resources on the human element. Specialized people capable of managing the tools at their disposal are key for success. People constitute the element that make the difference in the service Industry. They can produce either success or failure. Europe needs success and the people able to achieve it.



© Courtesy of EUROGATE

- NEWOPERA Project Final Report, Editor Franco Castagnetti, 2008.
- Naples Port Authority, 2010
- ESPO "Economic Analysis of the European seaport system", Prof. Dr. Theo Notteboom, ITMMA 2009.
- European Freight and Logistics Leaders Forum F&L, Working Group on Port Congestion Report, 2009
- EUFRANET Project Final Report, 2001
- HHM, "The Priciple of Traffic Growth", 2010
- IMF "World Economic Outlook Update", 2009
- HHM, "European ports container throughput 2003-2008", 2010
- HHM, "European Port's Container Throughput 2006-2008", 2010
- AXS-Alphaliner, 2010
- Hamburg Port Authority 2009
- Bremenports, www.bremenports.de, Germany, 2009
- Ports Handbook Bremen & Bremerhaven, Imprint: Bremenports, 2008
- Valencia Port Authority, 2010
- SLALA Foundation, 2009/2010
- Genoa Port Authority, 2009/2010
- Medcenter Container Terminal, 2010
- Assologistica Report, 2010
- Taranto Port Authority, 2010
- Genoa Port Authority, Piano Operativo Triennale 2010
- Rivalta Terminal Europa, 2010
- Gioia Tauro Port Authority, "The three-year operational plan 2010-2012"
- EUROSTAT Database, 2000/2007
- Eurostat COMEXT O/D Databases, 2009
- NESTEAR Mathematical Model 2010
- German Trade and Invest, 2010
- Süddeutsche Zeitung, Chinas Export boomt, 2010
- China national customs authority statistics, 2010
- China Ports Statistics, 2010
- Deutsche Bank Research, 2010
- Rheinisch-Westfälische Institut für Wirtschaftsforschung, 2010
- Handelsblatt, 2010
- Hamburger Abendblatt, 2010
- ISTAT, 2010
- Der Senator für Wirtschat und Häfen, Freie und Hansestadt Bremen , Hafenspiegel 2009
- Neue Presse, 2010
- Deutsche Verkehrs Zeitung, 2010
- SPD "Bahnanschluss für Jade-Weser-Port", 2010
- International Transport Forum, Leipzig 2009
- EU Economic projections 2010
- World Bank economic projections, 2009
- DG ECFIN, 2009
- EU White Paper projections 2010/2020
- DG TREN scenarios 2007 up to 2030
- ISEMAR, 2009/2010

© HHM/Breitenbach

GLOSSARY

ABS	Ausbaustrecke (Upgrading of existing lines)
ARA Range	Antwerp – Rotterdam – Amsterdam range ports
ASE	Alte Süderelbe
BCA	Blocco Conta Assi (Axle count)
CAGR	Compound Annual Growth Rate
CIS	Commonwealth of Independent States
COMEXT	Community External Trade Statistics
CTA	Container Terminal Altenwerder
CTB	Container Terminal Burchardkai
CTS	Containers
CTT	Container Terminal Tollerort
DB	Deutsche Bahn
DBNetz AG	German Railway Infrastructure
DUSS	Deutsche Umschlaggesellschaft Schiene-Straße mbH
EDP	Electronic Data Processing
ERA	European Railway Agency
ESPO	European Sea Port Organization
ESS	Extra Slow Steaming
ETCS	European Train Control System
EUFRANET	European Research Study - European Freight RAIlway NETwork
EUK	Eurogate
EUROSTAT	Statistical Office of the European Communities
FP7	Framework Programme 7 (EU)
GDP	Gross Domestic Product
GFC	Genoa Fast Corridor
GNP	Gross National Product
GPA	Genoa Port Authority
HBS	Hamburg Süd
HHLA	Hamburg Hafen und Logistik AG
HHM	Hafen Hamburg Marketing
HOS	Hohe Schaar
HP	Hansaport
HPA	Hamburg Port Authority

IMF	International Monetary Fund
IPORT	INNOVATIVE PORT
ISO	International Standards Organization
JWP	Jade-Weser Port
LCL	Less than Cargo Load
LOA	Length All Out
MARIPLAT	Maritime Platform
MCT	MedCenter Container Terminal S.p.a.
MEDA	Mediterranean Countries
NBS	Neubaustrecke (New Rail Line)
NEWOPERA	New European Wish: Operating Project for a European Rail Network FP6 European Commission Project -
O/D	Origin/Destination
POT	Piano Operativo Triennale (Operational three year Plan)
RFI	Rete Ferroviaria Italiana
Ro/Ro	Roll On/Roll Off
RTE	Rivalta Terminal Europa
S&C	Signal and Control
SCMT	Sistema di Controllo Marcia Treno (Train system control while running)
SECH	Terminal of Genoa Port
SERFER	Società Servizi Ferroviari
SLALA	Association in charge of Alessandria dry port project
SOGEMAR	Società Generale Magazzini Raccordati
TCT	Taranto Container Terminal
TEN-T	Trans European Transport Network
TEU	Twenty-foot equivalent unit
TGR	**TIGER project** code on the repository
TIGER	**T**ransit via **I**nnovative **G**ateway concepts solving **E**uropean intermodal **R**ail needs
TSG	Terminal San Giorgio
TYBRE corridor	Tyrrenian Brenner Railway corridor
WHO	Waltershof yard
WP	Work Package

FIGURES AND CHARTS DESCRIPTIONS

Figure 1:	**TIGER DEMO** Project with Work Packages & Management Structure - Source: TIGER DEMO Project	18
Figure 2:	TIGER interventions areas and actions - Source: TIGER DEMO Project	19
Figure 3:	The Project Management Structure - Source: TIGER DEMO Project	24
Figure 4:	Port Duty Cycle graphic representation - Source: NEWOPERA Project	29
Figure 5:	The Genoa SE Asia/Europe Transport chain - Source: TIGER DEMO Project	30
Figure 6:	The Genoa Fast Corridor "GFC" concept - Source: TIGER Project	31
Figure 7:	Innovative Port & Hinterland Operations "iPort " concept - Source: TIGER Project	32
Figure 8:	Intermodal Network 2015+ "MEGA-HUB" concept - Source: TIGER Project	33
Figure 9:	CAGR-methodology traffic projections for the Genoa Port - Source: TIGER Project	35
Figure 10:	High/Medium/Low scenario based on CAGR and GDP for Genoa Port - Source: TIGER Project	36
Figure 11:	Genoa Port Landside Modal Split according to individual scenario - Source: GPA	36
Figure 12:	Genoa Port Landside Modal Split Visualization according to individual scenario - Source: GPA	37
Figure 13:	CAGR-methodology traffic projections for the Port of Hamburg - Source: TIGER Project	37
Figure 14:	High/Medium/Low scenario based on CAGR and GDP for Port of Hamburg - Source: TIGER Project	38
Figure 15:	Port of Hamburg landside modal split according to individual scenario -Source: HHM	38
Figure 16:	Port of Hamburg landside modal split visualization according to individual scenario - Source: HHM	38
Figure 17:	The Port of Hamburg in full operation - Source: HHM	39
Figure 18:	The Port of Hamburg in full operation - Source: HHM	39
Figure 19:	CAGR-methodology traffic projections for Bremerhaven Port - Source: TIGER Project	40
Figure 20:	High/Medium/Low scenario based on CAGR and GDP for Port of Bremerhaven - Source: TIGER Project	40
Figure 21 -	Bremerhaven Port Landside Modal according to individual scenario - Source: HHM	40
Figure 22:	Bremerhaven Port Landside Modal Split Visualization according to individual scenario - Source: HHM	41
Figure 23:	CAGR-methodology traffic projections for Wilhelmshaven individual scenario - Source: TIGER Project	41

Figure 24:	High/Medium/Low scenario based on CAGR methodology for Wilhelmshaven - Source: TIGER Project	42
Figure 25:	Wilhelmshaven Landside Modal Split according to individual scenario - Source: HHM	42
Figure 26:	Wilhelmshaven Landside Modal Split visualization according to individual scenario - Source: HHM	42
Figure 27:	The Genoa Fast Corridor "GFC" concept - Source: TIGER Project	45
Figure 28:	Genoa Port throughput per Italian Region projected 2015 - 2020 - Source: TIGER DEMO Project	47
Figure 29:	Genoa Port throughput per International areas projected 2015 - 2020 - Source: TIGER DEMO Project	47
Figure 30:	Genoa Port throughput planned 2015 - 2020 with modal split - Source: TIGER DEMO Project	47
Figure 31:	Overall Tiger Demo Project GFC system architecture - Source: TIGER DEMO Project	48
Figure 32:	Genoa Customs operations architecture - Source: TIGER DEMO Project	49
Figure 33:	E/seals applied technology - Source: GFC for TIGER DEMO Project	50
Figure 34:	Automatic reading devices allowing full electronic and CTS management - Source: GFC for TIGER DEMO Project	50
Figure 35:	Genoa centric role together with other Liguria Region Ports of Vado Ligure & La Spezia improving accessibility network to Hinterland destinations via Rivalta dry Port - Source: TIGER DEMO Project	51
Figure 36:	Italian Traffic composition 2010 . Continents in % - Source: CDP on UCTAD data.	52
Figure 37:	The first 30 European Ports for container traffic 2010 - Source: ESPO 2012 & other sources	52
Figure 38:	Competing area identification between North European and Mediterranean Ports - Source: NEA Transport Research 2011	53
Figure 39:	Genoa Port Attraction zone and extended competitive reach via RTE - Source: Nestear for TIGER DEMO Project	54
Figure 40:	Rail traffic projections from Genoa to hinterland destinations enlarged Area of competitive reach after TIGER DEMO Project - Source: GPA	55
Figure 41:	Innovative Port & hinterland operations "iPort" concept - Source: TIGER Project	56
Figure 42:	The Wilhelmshaven new Sea Port facilities - Source: TIGER DEMO Project	57
Figure 43:	Port of Bremerhaven 4680m long quay - Source: Eurogate	58
Figure 44:	The Port of Hamburg in full operation - Source: HHM	58
Figure 45:	Eurogate terminal in operation - Source: Eurogate for TIGER DEMO Project	59

Figure 46:	Optimization of hinterland processes via a "Close to the port" train bundling platform in Nienburg - Source: iPort for TIGER DEMO Project	60
Figure 47:	Optimization of hinterland processes via Bremen Dry Port - Source: iPort for TIGER DEMO Project	62
Figure 48:	The Bremen Dry Port of Roland Umschlag in operation - Source: iPort for TIGER DEMO Project	63
Figure 49:	The BREMEN Dry Port of Roland Umschlag in operation - Source: iPort for TIGER DEMO Project	63
Figure 50:	iPort "Close to the Port & Close to the Market" approaches hubs & spokes - Source: Nestear for TIGER DEMO Project	64
Figure 51:	INTERMODAL NETWORK 2015 - "MEGA-HUB SPIDER" concept - Source: TIGER Project	64
Figure 52:	Connection Hamburg-Bremerhaven - Lehrte - Munich Riem with satellite Terminals & connections - Source: TIGER Project	65
Figure 53:	Advantage of Entrance with Momentum - Source: Hacon & Kombiverkehr	66
Figure 54:	Entrance with Momentum and Direct Exit - Source: Kombiverkehr	66
Figure 55:	Advantage of Direct Exit - Source: Kombiverkehr	67
Figure 56:	New Terminal module in Munich Riem in operation - Source: DUSS	67
Figure 57:	Rail-Hub Munich –Integration into Service Network - Source: KombiConsult	68
Figure 58:	Forecast of cumulated rail freight traffic in million TEU from northern TIGER ports to their respective hinterland in 2010, 2015 & 2020 - Source: HHM	68
Figure 59:	Full Structure of TIGER DEMO new distribution model for Hamburg, Bremerhaven ports - Source: TIGER DEMO	69
Figure 60:	Table of cumulated forecasted volumes assigned from the sea ports of Hamburg Bremerhaven and Wilhelmshaven to the Federal States and to other international countries for the years 2010, 2015 and 2020 - Source: HHM	69
Figure 61:	The Frankfurt to Trieste rail service intermodal link - Source: Kombiconsult for TIGER DEMO Project	70
Figure 62:	The Frankfurt to Trieste rail service intermodal link timetable - Source: Kombiconsult for TIGER DEMO Project	71
Figure 63:	Double Pocket Intermodal Wagon Loading a Semi-trailer - Source: Kombiverkehr for TIGER DEMO Project	72
Figure 64:	Longer and heavier trains. Traction concept - Source: KombiConsult based on Lokomotion for TIGER DEMO Project	72
Figure 65:	Supplied capacity during demonstration period - Source: KombiConsult based on Kombiverkehr for TIGER DEMO Project	73
Figure 66:	GFC scheme - Source: GFC for TIGER DEMO Project	75

Figure 67:	The main positive impacts achieved by the GFC innovations - Source: GFC for TIGER DEMO Project	77
Figure 68:	iPort scheme - Source: iPort for TIGER DEMO Project	78
Figure 69:	The main positive impacts achieved by iPort innovations - Source: iPort for TIGER DEMO Project	79
Figure 70:	INTERMODAL NETWORK 2015 - "MEGA-HUB" concept - Source: TIGER Project	81
Figure 71:	INTERMODAL NETWORK 2015 - Frankfurt - Trieste link for prosecution to Greece and Turkey - Source: Kombiconsult for TIGER DEMO Project	81
Figure 72:	The main positive impacts achieved by MEGAHUB innovation - Source: HACON for TIGER DEMO Project	83
Figure 73:	The BREMEN Dry Port of Roland Umschlag in operation - Source: iPort for TIGER DEMO Project	94
Figure 74:	The Tri-modal Combination Road, Rail, Sea on the Germany to Trieste for Greece and Turkey - Source: Various for Kombiverkehr for TIGER DEMO Project	95

This **TIGER DEMO** FINAL DEMONSTRATORS REPORT BOOK is aiming at providing data, facts, figures, freight mobility researches, traffic projections, suggestions and recommendations for supporting European Institutions, Governments, Decision makers, Infrastructure managers, Operators, Port management, Port Authorities, Railway undertakings, Dry Ports and Service providers in making the correct choices towards the fulfillment of an efficient and effective European freight mobility policy. It is hoped that this objective has been achieved.

Franco Castagnetti
TIGER DEMO Project Leader

→ **Franco Castagnetti**
TIGER DEMO *Project Leader*
NEWOPERA Aisbl President

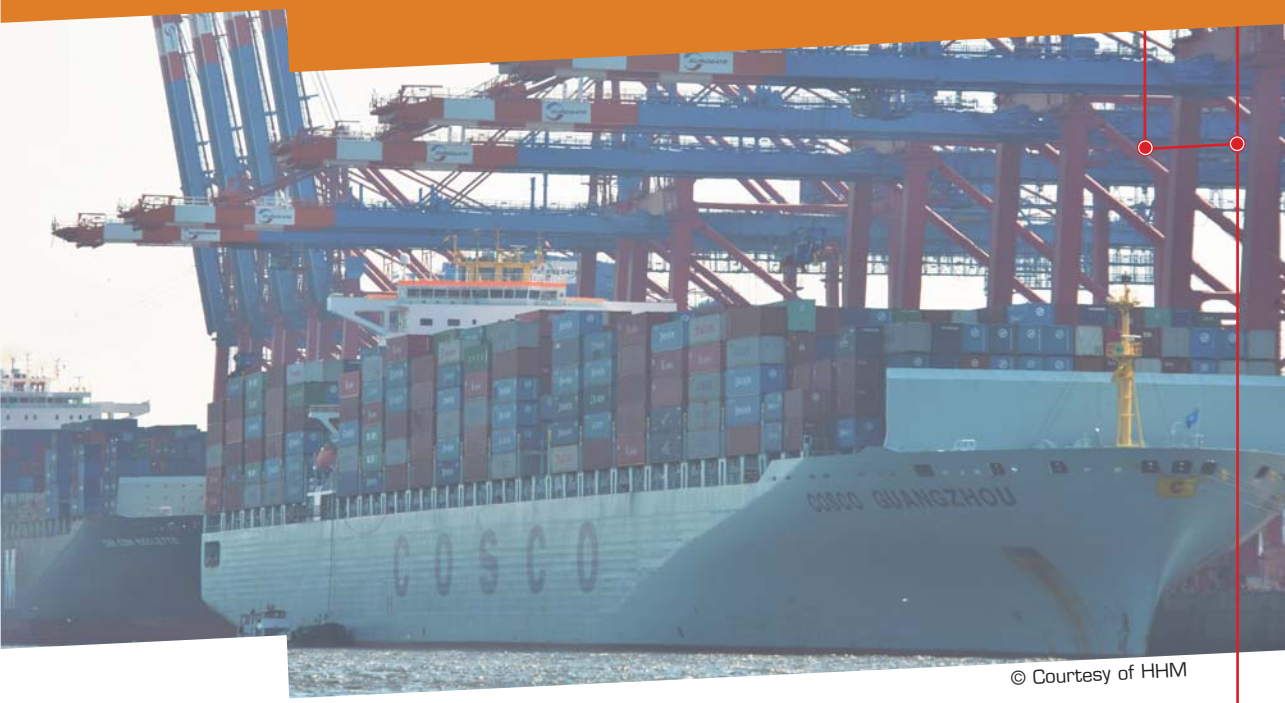
Founder of NEWOPERA Aisbl, Founder of The European Freight & Logistics Leaders Forum, former Director of Procurement & Supply Chain Management of Polimeri Europa Milano (ENI Energy Group) former Managing Director and member of the board of CNM shipping line and several other companies in the European Intermodal industry. Former European then Middle East and America Far East Director of the Merzario Group of companies then former Director General of the same Group leader in containerization.

Former member of the EU Freight Freeways Kinnock's advisory Team and Task Force Intermodality.

Former member of the EU – USA Intermodality team. Former NEWOPERA Project Leader. Former BAC member of the North Western University Transportation Centre in Evanston-Chicago. Alumno of the Columbia University New York.

NEWOPERA Aisbl – BRUSSELS
www.newopera.org
www.tigerdemo-project.eu

© HHM/Breitenbach



© Courtesy of HHM

NEWOPERA

HaCon

Consorzio TRAIN

UNIFE

Hamburg Port Authority

EUROGATE

Kombiverkehr

Autorità Portuale di Genova

DB Netze

Terminal San Giorgio

Rivalta T.E.

Regione Liguria

ACOS

SO.GE.MAR

Interporto Bologna

FS LOGISTICA

TRENITALIA

RFI