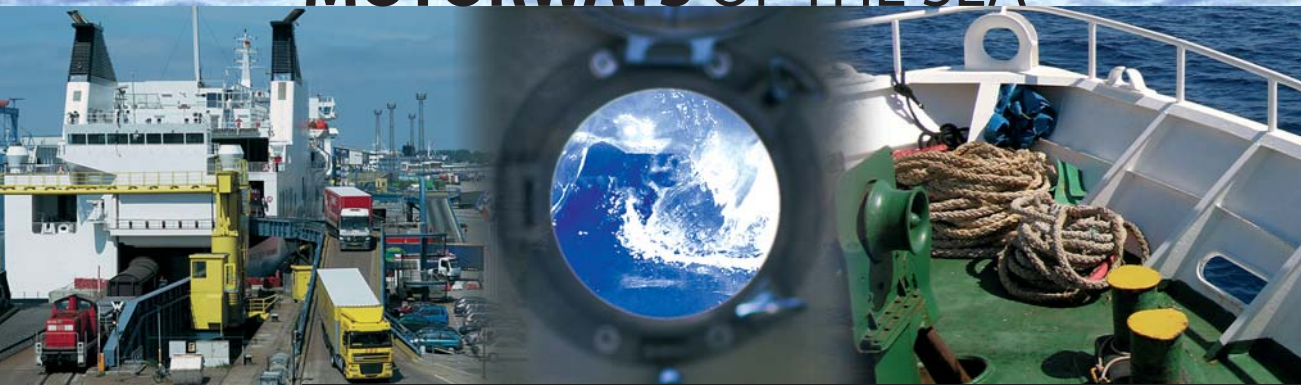
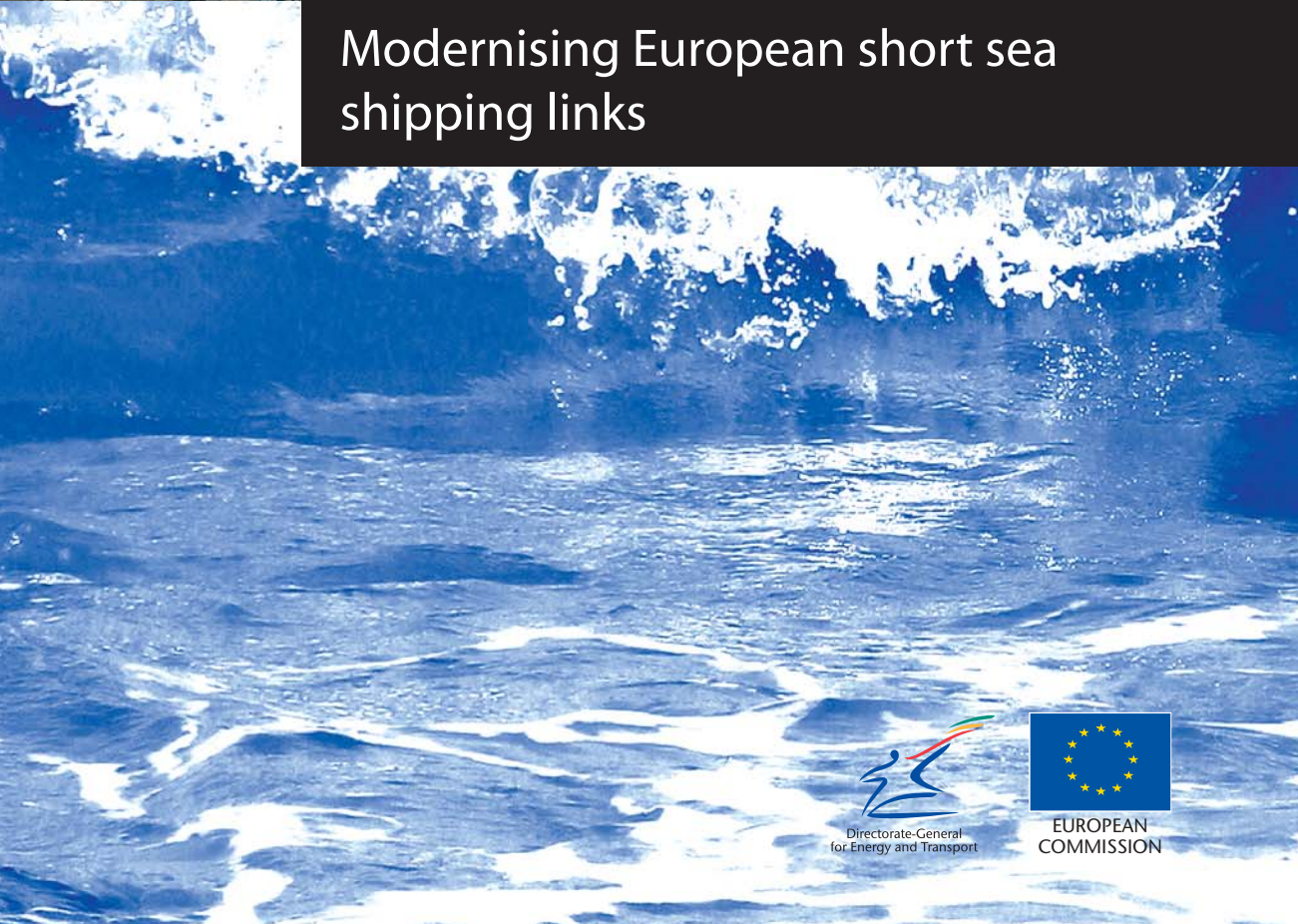


# MOTORWAYS OF THE SEA



Modernising European short sea  
shipping links





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Additional information on transport research programmes and related projects is available on the Transport Research Knowledge Centre website on the European Commission's Europa server:

**<http://ec.europa.eu/transport/extra>**

In addition, a public e-mail enquiry service is available at:  
[helpdesk@transport-research.info](mailto:helpdesk@transport-research.info)

Information on the wider transport activities of the European Union is available on the internet. It can be accessed through the Europa server:

**[http://ec.europa.eu/dgs/energy\\_transport/index\\_en.html](http://ec.europa.eu/dgs/energy_transport/index_en.html)**

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# FOREWORD



It is well known that maritime transport acts as the backbone of international trade. It also offers great potential to serve intra-community commercial exchanges. Presently, the vast capacity of maritime transport is yet to be exploited. In contrast, road networks are overloaded. Traffic congestion in bottlenecks of the road network is at an unaffordable level and could be a barrier to sustainable socio-economic development.

'Motorways of the sea' is a new concept, building on successful short sea shipping experiences, initiated by the Commission as well as EU Member States, to shift cargo traffic from the heavily loaded road network to environmentally-friendly waterways. Through the establishment of frequent and high quality maritime-based logistics services between Member States, motorways of the sea will become veritable alternatives to congested roads.

*In the White Paper 'Transport policy for 2010: Time to decide', it is stated under the section 'Developing motorways of the sea' that sea transport is "a real competitive alternative to land transport" and that "certain shipping links, particularly those providing a way around the bottlenecks in the Alps and the Pyrenees" but also between Germany and Poland, should be made part of the trans-European network "just like motorways or railways". The development of motorways of the sea has already been explicitly expressed as an important policy measure to support sustainable economic growth, social development and protection of the environment.*

Taking it as their primary mission to relieve congestion on major routes, trans-European networks (TENs) were gradually developed in the last decade. In 1994, the Essen European Council adopted a list of 11 priority projects (later extended to 14). Then, the European Parliament and the Council of Ministers adopted a decision in 1996, setting out guidelines for the development of the trans-European network by 2010. In 2001, construction of sea and inland ports was included in the TEN-T. The concept of motorways of the sea was included in the TEN-T through its extension in October 2003, which gave a legal framework for funding motorways of the sea projects (new article 12(a)). In the conclusions of the Ministerial Conference on the Motorway of the Sea, it urged Member

States to give priority to motorways of the sea in the framework of TEN-T programming and to involve the private sector in order to turn the concept of motorways of the sea into concrete initiatives.

To realise the European policy objectives, European research, especially the Framework Programmes, play an indispensable role contributing to the development of the concept of motorways of the sea. In the course of making the concept a reality, research activities and their findings support policy development, international cooperation, cargo concentration, operational optimisation, new technical applications, effective port/terminal operations and maritime safety.

Development of sea motorways will contribute to:

- successive enlargement of the European Union.  
Accessibility of candidate countries in Eastern Europe will be dramatically improved;
- a reduction in road congestion;
- enhancement of cohesion between Member States and an improvement in maritime links;
- traffic shifts from the road to sea waterways, realised through the offer of high quality logistical services;
- encouraging intermodality, which is considered as a policy measure to optimise our transport system and to support sustainable development.





## 1

## POLICY BACKGROUND



Around our coastlines (more than 40 thousand kilometers), the sea is a largely underused resource for transport. On land (3.9 million square kilometers in the EU-25), traffic on the heavily loaded road network has already generated some negative consequences: congestion, economic cost and environmental impact. To support sustainable economic development (a 70% increase of inland freight traffic in EU-15 by 2020), maritime-based modal transport provides a solution for better use of available infrastructure and resources for freight transport between Member States. Sea transport offers effective routes to bypass natural barriers, such as the Alps and Pyrenees on journeys between Italy and Spain, and it also provides shorter and quicker routes to Europe's most peripheral regions.

The concept of motorways of the sea aims at introducing new, integrated,

*"Genuine motorways of the sea are therefore aimed at acting as a substitute for motorways on land, either to avoid saturated land corridors, or to give access to countries separated from the rest of the European Union by seas." This is valid for passenger as well as cargo transport for four European maritime areas (the Atlantic, the Baltic, the Western Mediterranean, and the Eastern Mediterranean) via the use of ro-ro ships (lo-lo/lift-on/lift-off could also be envisaged at a later stage) - Van Miert report (27 June 2003).*

intermodal maritime-based logistics chains with high quality maritime links to connect the limited number of selected ports that are located at strategic points on European coastlines. These chains will be more sustainable, and should be commercially more efficient, than road-only transport, providing regular and high-quality alternatives to road transport and permitting a massive modal shift of freight traffic from congested roads to key routes. Realising such routes should bring about a structural change in our transport system and how it is organised in the years to come.

Motorways of the sea will thus improve access to markets throughout Europe and bring relief to our overstretched European road system. Fuller use will have to be made not only of our maritime transport resources, but also of the potential of rail and inland waterways, as part of an integrated transport chain. This is the Community added value of motorways of the sea.

From a more prospective view, motorways of the sea should be seen as the 'floating infrastructure' that links selected ports in different Member States. These are links of general interest (Atlantic and Mediterranean) with the direct aim of extending the territory to the sea. This idea considers a vessel to be an infrastructure to encourage long-term investment in ships, ports and the system of waterways.

'Motorways of the sea' refers to the four motorways of the sea corridors that are defined in Priority Project 21 of the TEN-T guidelines:

- **Motorway of the Baltic Sea** (linking Baltic Sea states with Member States in Central and Western Europe, including the route through the North Sea/Baltic Sea Canal) (2010);
- **Motorway of the sea of western Europe** (leading from Portugal and Spain via the Atlantic Arc to the North Sea and the Irish Sea) (2010);
- **Motorway of the sea of south-east Europe** (connecting the Adriatic Sea to the Ionian Sea and the Eastern Mediterranean to include Cyprus) (2010);
- **Motorway of the sea of south-west Europe** (western Mediterranean), connecting Spain, France, Italy and including Malta, and linking with the Motorway of the Sea of south-east Europe (2010).

*Short sea shipping (SSS) is the waterborne transport of cargo and passengers by sea or inland waterways as part of the logistic transport chain in Europe and the regions connected to Europe. The main aim in short sea promotion is to support a modal shift from the congested roads in Europe to sea. Short sea shipping is a sustainable transport link in the door-to-door supply chain. Intermodal transport connects different modes of transport, such as maritime transport and transport by rail. Road connections are used as little as possible*

## 2

## RESEARCH NEEDS

The development of conventional short sea shipping, up to now, still leaves a sequence of inherent problems, which limits the maritime solution as a strong competitive alternative to road transport in terms of delivery cost and time. Intra-Europe maritime transport (cabotage) is currently a very efficient mode for mass shipment (bulk cargo) between Member States. Its growth in past years is mainly due to increasing transport demands on bulk cargo, raw materials, semi-finished products and non-scheduled services. With the growth of intermodal traffic, new concepts and technologies are needed to optimise the existing transport system. According to the concept of motorways of the sea, key short sea shipping routes between EU Member States will be modernised by offering **frequent, high-quality services** that overcome the weakness of conventional short sea shipping and increase the attractiveness of maritime-based intermodal logistics.

Motorways of the sea will be at the forefront of intermodal transport, which implies high quality in terms of frequency, punctuality, efficiency of transport services, respect of the environment, exchange of information, speed of the administrative and customs

procedures, efficiency of the equipment in ports and accessibility of ports to good intermodal links with the hinterland, in particular with the rest of the trans-European network.

To realise such goals, a series of challenges is faced in the course of its development.

**Technical barriers** (concerning ships, ports, terminal, telematic supports, intermodal units, hinterland connections, etc.), should be removed to guarantee the interoperability of intermodal units. **Market and policy frameworks** should be established to support fast and smooth intra-European and Extra-European intermodal cargo traffic. **Logistical organisation** should be recalibrated to adapt the new alternatives in their operational optimisation.

**Socio-economic acceptance** should be



promoted to concentrate freight flows maintaining regularity. These questions call for support from European research to provide solutions or assistance in system planning, hub selection, technical innovation, organisational cooperation, social promotion, etc. so as to build up veritable maritime-based alternatives to congested roads.

Research support is desired by both decision-makers and market players (shippers, transports, port operators, logistical organisers, etc.) to deal with the complexity and difficulties in their way of implementing European transport policies. For example, to optimise the logistical system with the integration of sea motorways, it is necessary to have innovative concepts in its planning with reinforced public intervention, including the maritime link, in a planning policy that extends further than a simple commercial transport service. These interventions should not endanger free competition. Currently, sea motorways are one element in what is really a European sea policy, and should be integrated and associated with the efforts already being made in areas such as maritime safety and the management of fish stocks.

Characterised by scientific methodologies and approaches, research activities are desired to sharpen sea motorway initiatives and to develop new system concepts, so as to provide comprehensive and sophisticated concepts that aid policy-making at EU level, common actions taken by local governments, and the participation of the private sector. Regarding the current development of sea motorways,

conceptual changes have already been introduced to concentrate cargo traffic and attract investment. The 'floating infrastructure' concept identifies sea motorways as part of the general interest TEN-T, attracting long-term public intervention and private investments. The maritime-based logistics concept replaces simple transport with a series of high quality services, orientated towards the construction of a veritable alternative to road transportation. The 'International Loading Unit' concept updates the lorry from a conventional transport vehicle to a loading unit that is interoperable between road, rail and maritime modes.

Natural and regional differences in challenges require research to define the focuses of sea motorways in their future development. For example, in Baltic regions, sea motorways are seen as a development of existing networks, while in Atlantic regions sea motorways will create new services that rationalise or increase the density of existing services. All these need research activities, an indispensable tool to identify the technical, economic, regional and natural adaptation of the sea waterways.





## 3

## RELEVANT RESEARCH PROGRAMMES AND SOURCES

Addressing various components of the maritime-based logistical system, European research, especially in the Fourth and Fifth Framework Programmes, invested considerable resources and joined efforts from different European research areas to develop such a transport network and logistical services. In the early nineties, many **COST** Actions (cooperation in science and technology,

shipping). The research activities identified the functions of sea motorways in European freight corridors and provide technical, organisational, and political recommendations for making intensive use of waterway transportation.

In the 'growth' and 'information society technologies' priority areas of the EU's Fifth Framework Programme, research



Europe-related research) started to address the technical and organisational problems of maritime transport. The results of the research actions provide useful solutions; some of them can be considered as essential technologies for the development of sea motorway concepts.

Contributing to the optimisation of transport systems in the Community by means of prenormative and prelegislative research, the Fourth Framework Programme (December 1994 – March 1998 within the sub-area 'transport') dedicated many research projects to maritime transport, intermodal logistics, ports and terminal technologies, and telematic applications in waterborne transportation (maritime, inland waterway, and short sea

projects were orientated to rationalise conventional short sea shipping with new concepts of intermodal logistics, so as to ensure the sustainable mobility of goods and people safely, reliably and efficiently. The motorways of the sea concept was explicitly suggested and developed during the period of this programme. In the Sixth Framework Programme, EU research projects concentrate on the implementation of high-tech and concrete support to the realisation of motorways of the sea.

**Interreg III**, a program financed under the European Regional Development Fund (ERDF), contributed considerably to the development of the concept of sea motorways. In addition



to solutions for institutional coherence, the research activities in this programme drew the attention of local government, transport service suppliers, port industries and transport users in the corresponding geographic regions. Development of sea motorways became a common interest and a necessity for these actors. For example, the Interreg III cross programme **MSUO** (Maritime Safety Umbrella Operation), which provides a European and international network for cooperation on maritime safety, devoted a considerable number of research activities to the safety aspect of motorways in the North Sea.

The European funding programme **Marco Polo**, which aims to support commercial actions in the market for freight transport services and for the enhancement of intermodal transport, gives strong support for the realisation of motorways of the sea. By showing the financial advantages gained by investing and participating in sea motorway services, the programme encourages market actors to make the concept a reality. The ambitious plan to optimise European transport system will, with the funding programme, generate chain effects.

## 4

## RESEARCH RESULTS

The research actions are dedicated to the development of an efficient, clean and economic transport system. Their contribution to EU policies are shown in their assistance to policy development, technological innovation, problem solving, and networking/knowledge exchanges across Europe.

As a part of the trans-European network and as key links in the intermodal transport chains, motorways of the sea become an important research area, attracting the interest of many research activities. Important contributions of research activities to the concept of motorways of the sea can be summarised as:

### Improving logistical organisation and operations

One of the keys to the success of sea motorways is the concentration of cargo traffic, which should reach a considerable scale so that high frequency of services can be economically reasonable and practically feasible. How





do you realise such a goal? Clearly, logistical organisations and operations play key roles in establishing maritime-base intermodal chains.

**Research results** on intermodal logistical chains analyses and typical demonstration cases help to understand, in-depth, the mechanism of mode choices and the driving force behind traffic distribution. They supply knowledge for the decision-makers in their selection/planning of the ports and SSS links to construct sea motorways; they facilitate the removal of barriers that hinder the realisation of the concept.

Intermodal transport quality is a critical factor in the organisation of maritime-based intermodal chains. Studies on intermodal quality in general, and maritime-based chains in particular, are the bases towards optimal planning of intermodal transport and removal of obstacles. Focusing on improvements in interoperability, interconnectivity and accessibility of terminals, research **IQ** deals with both the quality of intermodal terminals and the quality of multimodal networks at segment, national and European level. It indicated that fragmented/inhomogeneous organisation and diversity of national/regional transport policy are key barriers in the organisation of a European level intermodal chain.

Demonstrators from the research activities might play a template role, tutoring followers to master 'smart' technologies to use maritime-base intermodal logistics. The results of **D2D** gave vivid demonstrations, citing real cases, on how to integrate operations of different modes (including maritime-based intermodal chains) when building door-to-door intermodal transport chains.

With the goal of switching long-distance freight from road transport, **PROMOTIQ** targeted opportunities and barriers for the new generation of door-to-door multimodal transport logistical services. New types of coordination between service providers in the logistical chain were proposed. Suggestions,

including the deregulation of transport market and setting up joint operations between shippers and transport providers, were valuable for constructing a new market framework.

The tools and methodologies suggested in **IQ** are useful to elaborate the technological, spatial, economic and institutional improvements to the existing logistic organisations in favour of sea motorways. The demonstrators from **D2D** will play a model role to help transport users integrate sea motorways in their logistic chains. The organisational improvements suggested by **PROMOTIQ** helped set up a new market framework for shifting cargo traffic to sea motorways.

It is widely considered that there is a great potential to improve logistical operations through optimisations. Focusing on port terminals as the node in the transport chain, **EUROBORDER** analysed the potential improvement in information exchange, organisational structure and administrative routines in the terminal and also in relations with its customers and the rest of the port community. Measures and scenarios were developed to support the improvement of maritime-based logistic chains.

To identify operational constraints and the underlining criteria of using intermodal transport, **LOGIQ** searched for the factors that determined logistics operations. Through in-depth analyses of day-day business processes, it found that cost, reliability, flexibility and frequency of service are the criteria that determine modal choices. This finding lightens the task of improving the competitive position of intermodal transport in the market. These criteria were actually translated as the 'frequent and high-quality service' in the concept of motorways of the sea.

**REMARCC**, an Interreg II C cooperation action for the promotion of short sea shipping and

inland waterways as the main component of intermodal transport and on the future maritime development of the North Sea region, further expanded the maritime-based intermodal logistical concept. Higher efficiency of the Northern Maritime Corridor and networks (North Sea and Baltic Sea regions) were suggested to improve logistics competence, optimisation and marketing. By strengthening the port's position, waterborne transport modes can be well integrated into intermodal logical chains. The research findings and suggestions of this research concerning the concept of corridors are very close to the founding principles of sea motorways.

Project Northern Maritime Corridor (**NMC**) funded by two Interreg III B programmes, the North Sea Programme and the Northern Periphery Programme, studied the sea-based

transportation corridor that stretches from northern Norway and north-west Russia to the continent. This corridor connects the coastal areas of the North Sea and the Northern Periphery. Twenty regions in eight countries took part in activities to construct a means of efficient, safe and sustainable transportation. Research activities enhance the regional connection through maritime transport and draw the attention of regional governments to maritime-based transport corridors.

The thematic network **RELEASE** developed technological strategies, methodologies and tools for the European business community and decision-makers in order to encourage the use of short sea shipping. **NMC II**, an extension of NMC, directly addresses the establishment of motorways of the North Sea. The research will concentrate on practical issues concerning the partners' regions.





## Improving efficiency and safety

High efficiency is another characteristic of sea motorways that configures a key component of high-quality services in logistics chains. It is determined by technical conditions (facilities, equipment, storage, handling, etc.) and operational organisation associated with the interfaces between maritime and connecting modes. To reach the desired level of efficiency, European research invests a considerable amount of work to search for innovative technologies that deal with ships, handling, terminals and hinterland connections in order to construct veritable maritime-based logistical chains.

Many innovative concepts were developed through research activities. For example, the **IPSI** project developed new concepts for efficient port/ship interfaces. A new cargo handling system, able to handle the most widely used cargo containment units, was suggested for the terminal. Regarding ships, two innovative types of vessel (IPSI ships for SSS and IPSI barges for inland navigation) were developed to match the highly efficient handling facilities and AGVs (Automatic Guided Vehicles). These concepts led to the prototypes of a future high efficiency loading/unloading system for the motorways of the sea.

With different emphases, each research project focused on specific technical/operational aspects of maritime-based logistics to increase efficiency and safety. For example, **TRAPIST**, addressing the efficiency problems of small and medium size ports, developed a set of routines and tools to increase efficiency and optimise the organisation of shipping; **OSIRIS**, addressing quality problems with the seaport-hinterland connection by train, developed a simulation tool and generic guidance to assist freight operators to increase efficiency. An efficient solution, which includes a rail hub, seaport container

shuttles and long-distance train services for the seaport-hinterland train connections were also developed; **UTI-NORM**, addressing the problem of efficiency and interoperability due to loading units, recommended standardising the future European loading unit in line with ISO standards to facilitate the efficient transfer between current transport modes; **InHoTra**, addressing the issue of promoting new transfer technologies in intermodal transport, validated innovative horizontal transshipment technologies, their interoperability and the possibility to integrate them in current intermodal transport operations; **PRECISE IT**,







addressing the problems of intermodal terminal operational organisation, concentrated on the technical solutions of locating, tracing and positioning of ITUs (intermodal transport units) and/or vehicles in the terminals to optimise operations. The suggested solutions included GPS, acoustic and laser technologies and RFID tags to get real time, error-free information about the position of all stocked ITUs and moving vehicles inside the terminal. This research was the foundation for automatic and high-efficient terminal operations, which is defined in the characteristics of sea motorways. Safety and security issues are of ever greater

concern, especially after recent terrorist attacks. The **S@S** project updated knowledge of risk management in the North Sea region, thanks to new and innovative use of AIS technology to improve navigation and improved procedures for oil spill preparedness, forecast technologies of offshore wind farms and modernised decision support for marine rescue coordination. **SAFEDOR** aimed to supply innovative technical solutions for ship design, shipping operations and navigation safety regulations.

To keep up with the technical changes in the concept of sea motorways, human factors play an important role in the efficiency of transferring traffic to maritime links. Research by **WORKPORT**, after investigation of the influence of new technologies in ports, identified new organisational and management concepts that are needed to support technological changes so as to achieve higher efficiency. It calls for new social and legislative frameworks to support the integration of health, safety and environmental issues in port organisation and management. These results configure the basic elements of the organisation system for the motorways of the sea.

## Breaking barriers in information exchanges

Modern information technologies are regarded as important tools to enhance the integration of intermodal logistics operations. By means of efficient information exchanges, shipping companies, logistical originators, port/terminal operators and transport administrators collaborate together to support the intermodal logistics chains, which are especially important to establish the massive intermodal traffic that defines the basic needs of motorways of the sea.

European research addresses practical problems of implementing the latest

information technologies in intermodal logistic organisation (e-logistics) and helps to break barriers by introducing cutting-edge technologies to the system, standards and services. The following shows the contribution of research activities to implementing information technologies.

Based on a survey of user requirements, the project **INTRARTIP** provided a conceptual definition of full information network architecture, consisting of an information platform, real-time booking services, and

morning/tracing management, facilitating the participation of intermodal actors to use highly efficient intermodal links, such as sea motorways.

To remove barriers of real-time information between actors in different regions, **MARNET** developed a prototype of a real-time logistics information network for multimodal transport operators. Taking examples in Mediterranean maritime ports, **MARNET** proposed many useful services and standards for real-time communications.

The research project **ITESIC** established a prototype of a centralised, web-based communication node that allows handling of inhomogeneous information from various sources in a complex shipment process. It was demonstrated to connect and integrate several transport modes, logistics providers, forwarders, agents and depots into a main 'umbrella' module, successfully improving information flow, trackability and reliability of short to medium distance shipments.

Building on the well-known R&D project **BOPCOM** (Baltic Open Port Communication), which achieved clear success with regard to the development of a new versatile system for interconnecting heterogeneous **EDP** (Electronic Data Processing) systems, **PROSIT** aimed at the development of e-commerce solutions within the framework of existing and forthcoming internet technologies. From the construction of generic system functions, **PROSIT** gave technological solutions for the integration of different application systems, the development of intelligent decision-supporting software and for visibility of cargo and equipment by applied IT.

To remove the barriers of interoperability between different information systems, **INFOLOG** proposed and demonstrated standardised solutions to integrate Electronic



Data Interchange (EDI) and other methods of information exchange along intermodal transport chains. The results are useful for the harmonisation of information flow throughout intermodal operation procedures. Similarly, an integrated information system that manages supplies, transport demands and optimal use of infrastructure was suggested by **X-MODALL** research, which outlined a hierarchical trunk sector networking structure.

As a research and demonstration project, **3SNET** developed a schedule display and cargo booking system for the short sea market within Europe. The system can be integrated in the logistics marketplace and incorporates new communications infrastructures and the internet.

To make intermodal transport more attractive, the research project **CESAR** developed a pilot system for communication between road haulers and freight forwarders. This system allows users to book transportation services and check the status of their loading units.

**MARNIS** developed a maritime information management framework and supporting solutions. Through the implementation of VTM (Vessel Traffic Management), AIS (Automatic Identification System) and European satellite navigation system Galileo, there can be an improvement in safety, security, efficiency, reliability and environmental protection.

Research and development of new information technologies will equip the intelligent system of motorways of the sea for better integration into trans-European logistical services.

## Supporting decision-making

Decision-making plays a crucial role in the success of sea motorways. Decision-support tools are especially important to optimally plan the transport system with the motorways of

the sea in the centre of cargo corridors. To aid decision-making at different levels (European, regional, national) and demonstrate the importance and benefits of sea waterways, European research developed decision-aid tools and methods to assist optimisation of sea motorway systems. **These tools can be classified as follows:**

### *Evaluation tools and guidelines*

**EUROSIL** developed an evaluation framework and software tool to support a structured approach to the assessment of regional development effects. **FREIA** developed general guidelines and principles for the implementation of European freight centres (freight village) and efficient cargo distribution from sea ports.

### *Decision support system*

**EMOLITE** defined the framework for a computer-based decision support system to provide comprehensive strategic information for locating intermodal terminals; **INFREDAT** developed a data management structure and a consistent methodology for collecting intermodal freight transport data.

### *Simulation tool*

**INTRASEAS** developed a maritime network traffic model and a terminal simulation model for decision-makers to evaluate the economic effects of sea routes and test policy measures on the terminals. **PLATFORM** developed a simulation environment to test the main features of computer-controlled freight terminals.



# 5

## BENEFITS GAINED FROM THE RESEARCH

To shift cargo to the maritime-base intermodal chain (sea motorways), **research activities** addressed problems concerning the intermodal logistical organisation, transport system planning, information technologies, new concepts/technical applications, and operational efficiency, safety and security.

**Research results** detailed the concepts from initial wishes to concrete measures of realisation, from the simple promotion of short sea shipping to the construction of veritable alternatives to road congestion. European research's contribution to the concept of motorways of the sea is mainly focused on aspects of

- (1) construction of policy and market frameworks;
- (2) optimisation of cargo traffic and logistical organisation;
- (3) implementation of new information and telecommunications technologies;
- (4) new terminal operational concepts and new type of ships for the efficient and safety navigation;
- (5) development of decision-support tools and methods;
- (6) promotion and concrete technical support to the concept of sea motorways.

Market actors of the motorways of the sea **benefit** directly from research activities by implementing their results, proposals, solutions and experiences. Decision-makers can get support through systems and have the method and knowledge to choose good projects; shipping companies can implement innovative research findings to improve their shipping and navigation; terminal operators can optimise their operations to increase safety, security and efficiency; forwarders can utilise

new logistics concepts to supply cheaper and better quality alternatives; transport users can benefit from high-quality transport services. Currently, many results have already been directly implemented, at different levels, in the course of establishing motorways of the sea.

Conforming to European Union policies, research activities are producing positive impacts on socio-economic developments in the European Union. Through their contribution to the development of sea motorways, which have evident advantages for our sustainable socio-economic development in comparison with that of land motorway, the research activities are impacting profoundly on the future logistical organisation and the way our business is doing. The main socio-economic benefits are:

### Benefits for European economic development

According to evaluations conducted by simulations, there is a great potential to shift traffic to motorways of the sea. Large amounts



of road traffic might be shifted when the sea motorways are really in services with regular ways of operations. The following table outlines the saved scenarios of the evaluation. Even though the amounts saved in terms of ton-km vary between cargo corridors, global saving on European road traffic is rather significant.

Consequently, congestion on the road can be released. The negative impacts of road traffic on the environment (noise, pollution, CO2 emissions) can be reduced, supplying agreeable living and working conditions for sustainable economic development.

The massive shift of traffic to motorways of the sea will bring significant economic effects. As is well-known, the transport cost of short-sea-shipping is much lower than that of road transport. Maritime transport is the most energy-efficient transport mode. When traffic is shifted to the sea motorway, logistics take the cheaper route and the total transport cost is decreased.

In the view of macro-economics, reduction in the logistics cost will generate a sequence of chain effects to increase the competitiveness of our products and productivity of enterprises in the market.

Establishment of sea motorways is much cheaper than that on the land. It was estimated

that only 400 million euros are needed to construct four ships to make round turns in a sea motorway. In contrast, 6 billion euros would need to be invested in rail tunnels in the Pyrenees to transport lorries by train. Apparently, investment in sea motorways will bring a high benefit rate with lower costs.

Nowadays, transport service quality is becoming an increasingly important factor in logistical organisation to meet the modern industry's needs. The motorways of the sea supply more choices for the logistics chain originators by offering frequent, reliable, safe and secure means of transport. Ultimately, sea motorways help to orient the transport market toward a just and optimal one.

Every year, traffic safety problems in roads cost millions of euros. Indirect costs have been estimated to be far more than that. Motorways of the sea, which attract the traffic to the safety routes and reduce its risks on the land routes, will bring huge direct and indirect economic benefits to our society and to our enterprises.

## Benefits for social cohesion and integration

Motorways of the sea might improve access to peripheral and island regions and states and



enhance the relations between Member States. They can link different regions by shorter transport routes, avoiding the necessity to cross natural barriers. It helps the development of regions as well as social cohesion in the European Union.

Ports, as multimodal hubs in the sea motorway system, will be strengthened in their infrastructure, facilities, installations and inter-connections with other modes of transport so as to guarantee congestion-free access between sea motorways and other modes.

Accordingly, activities in the port and around the port region will be created and enriched, benefiting employment and local economic development in the port region. Ultimately, the ports' position as economic centres of development supports the creation of jobs, rebalancing economic developments between regions and good planning of land use. Good distribution of the population, economic activities and resources helps optimise the transport system.

**Saved ton-km in % on total European road transport network through the utilisation of motorways of the sea**

| Freight Corridors  | % of ton-km saved on total European road network |
|--|--|
| Southern Jutland (DK) and German Baltic Sea coast to Baltic States | 0.24%  |
| Poland - East Sweden   | 0.08%  |
| German Baltic Sea coast– Finland                                   | 0.12%  |
| Trieste/ Slovenia - Greece   | 0.15%  |
| Ireland - Spain/ Portugal  | 0.33%  |
| French north coast - Spanish north coast                           | 0.49%  |
| French Atlantic coast - Spanish north coast                        | 0.96%  |
| Belgium/ Netherlands - Portugal                                    | 0.54%  |
| Spain - northern Italy   | 0.1%   |
| France - Italy   | 0.1%   |



## 6

## EUROPEAN POLICY IMPLICATIONS

Since 1992, the **European Commission** has made short sea shipping one of the major priorities for European transport and maritime industries have made it one of their key areas for development. The emphasis of **the role of maritime transport in the desired evolution of freight traffic** in the European Union target are (1) to reduce the saturation of the road networks, (2) to improve access to peripheral and island regions and (3) to encourage more environmentally-friendly modes of transport (Gothenburg European Council in 1998).

**Trans-European Networks** policy was gradually developed during the 1990s. In 1996, the European Parliament and the Council of Ministers adopted a decision setting out the guidelines for the development of the Trans-European Network in 2010. This decision was revised in 2001 to include sea and inland ports. The White Paper considered that one of the primary missions of the Trans-European Network for Transport (**TEN-T**) was to “relieve congestion on major routes”.

The White Paper, aware of the limitations of the spontaneous creation of short sea shipping services, proposed to develop a system of ‘sign-posting’ and to **support start-ups** through European funding (Marco Polo, Structural Funds). A number of new short sea shipping services have benefited from support under the **PACT** (pilot action for combined transport) programme (1997-2001), which is aimed at intermodal transport projects. In 2001, the

**Marco Polo** programme was set up in order to continue startup support for intermodal initiatives and solutions allowing a reduction in road traffic until they became commercially viable. National and European aid can thus be an incentive for maritime operators in reducing their industrial risk and/or in creating a direct price incentive.



Following the **Mont Blanc accident** in March 1999 and the subsequent over-use of the French-Italian border crossing at Vintimille, maritime transport was put forward as an alternative solution to the congestion of difficult road routes (especially mountain crossings).

At the meeting in **Gijón** in Spain (2 June 2002), EU Transport Ministers invited the Commission to **draw up an action plan** for short sea shipping. On 10 April 2003, the European Commission adopted a **14-point programme** for boosting short sea shipping, citing, *inter alia*, sea motorways. This particular aspect has been developed in the proposals made by the **working group** under the direction of Mr Karel Van Miert.

On 1 October 2003, the **European Commission** announced the **extension of the TEN-T** to contribute to the success of enlargement, reduce congestion and encourage intermodality:  
*"A new mechanism for supporting motorways of the sea is proposed to encourage joint initiatives by the Member States to launch new regular*

*transnational cargo shipping lines (...). It will give the sea motorways which improve links with island and countries isolated by natural barriers such as the Alps, the Pyrenees and the Baltic Sea the same importance as motorways and railways in the trans-European network."*

The **Ministerial Conference** on motorways of the sea (24 January 2006) pointed out that "motorways of the sea is a new concept in European transport policy which will build upon this experience... Quality motorways of the sea require new state of the art technology which, if included and promoted accordingly, will attract young people to the maritime profession."

Motorways of the sea will be at the forefront of intermodal transport, which is considered to be an important policy measure to balance the modal shares of the cargo transport system. Setting up motorways of the sea is a European policy measure to support sustainable socio-economic development in the European Union. Research and technical developments are important in achieving quality motorways of the sea.





# FUTURE RESEARCH DEVELOPMENTS

Behind the features of **frequent** and **high-quality** services, technical and organisational support is indispensable to assure the previously defined performance of sea motorways. From the concept to the massive traffic shift, there is still a lot of work to do, a lot of barriers to remove, and a lot of problems to resolve. European research is the essential and active force that is ready to find the solutions to the problems, and to provide support for development. Targeting current and emerging problems in the logistics system of the sea motorways, future research and development will concentrate on:

## Implementation of modern information and telecommunications technologies and systems

Motorways of the sea feature highly efficient information exchanges that are essential links with its users. Continuous adoption and update of the information system with state-of-art technologies will be an important task for research to ensure that sea motorways are in line with modern logistics in the information society. For example, the advance track and trace services will make the service more transparent and attractive to potential users.

## Enhancement of the hinterland connection

Establishments of high-quality connections with the hinterland via different transport modes (rail, road, inland waterways, etc.) are important for the functions of the sea motorway. Future research will assist to improve the connections' technologies (infrastructure, equipment, facilities, etc.), the connection's organisation (in terms of operational optimisation), as well as the connections' performance (time, cost, etc.). In this way, sea motorways can integrate themselves into trans-European freight corridors.

## Modernisation of administration procedures

Cross-border traffic is characterised on the main sea motorways, serving exchanges within the European Community. Modernising and simplifying the administration procedures will be the target of research in the short term, to remove operational barriers and guarantee the safe, secure, and reliable trans-frontiers transportation.

## Improvement in logistical performance

High quality logistics require sea motorways to provide frequent, reliable, and fast services. Research activities will address key technologies (handling, navigation, naval architecture, ports and terminals, etc.) and methodologies (optimisation, organisation, operations) of the logistical chains to improve global performance (cost, time, reliability, and punctuality).

Research activities will continue to contribute to the further development of sea motorways with the objectives of:

- Further concentration of cargo flows. It is the key factor for realising high-frequency connections.
- Efficient integration into freight corridors and logistical routes.
- Cost-efficient transport system with minimised empty trips / units.
- Commitments of all supply chain partners to improve the service quality of intermodal logistical services.

New research projects like **Freightwise** (Management framework for intelligent intermodal transport) are going to be launched by the EU to further sponsor the development of motorways of the sea.





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# GLOSSARY

|                |  |
|----------------|--|
| <b>AGV</b>     | Automatic Guided Vehicles  |
| <b>AIS</b>     | Automatic Identification System  |
| <b>COST</b>    | European Cooperation in the field of Scientific and Technical Research |
| <b>EC</b>      | European Commission  |
| <b>EDI</b>     | Electronic Data Interchange  |
| <b>ERDF</b>    | European Regional Development Fund                                     |
| <b>EU</b>      | European Union   |
| <b>GALILEO</b> | Europe's satellite navigation system, currently in development         |
| <b>ISO</b>     | International Standardization Organization                             |
| <b>ITUs</b>    | intermodal transport units   |
| <b>MSUO</b>    | Maritime Safety Umbrella Operation                                     |
| <b>SSS</b>     | Short Sea Shipping   |
| <b>VTM</b>     | Vessel Traffic Management  |





Maritime transport not only acts as the backbone of international trade, it also offers great potential for intra-community commercial exchanges. The EU now has a policy goal of achieving a clean, safe and efficient transport system, through the development of 'motorways of the sea', a concept of transforming short sea shipping into a real alternative to congested roads.

This brochure aims to show the contribution of European research to the policy goal. Beginning with explanations of the concept and its system of logistics, the brochure introduces research activities and findings on the socio-economic impact, market and financial strategies, operational and organisational optimisation, application of new technologies, effective ports/terminal operations and maritime safety. Conclusions highlight the latest achievements of motorways of the sea and call for decision-makers to support its development.