Motorways of the North Sea

- a project carried out within the European Commission’s Interreg IIIB North Sea Programme
SUTRANET (Sustainable Transport Research & Development Network in the North Sea Region) is a project carried out under the European Commission’s (EC’s) Interreg IIIB North Sea Programme. The project commenced end-2004 and was completed mid-2007.

The vision of SUTRANET is to improve the knowledge base for freight transport systems in the North Sea Region and for transport related policy decisions. The focus has been on transport networks and solutions serving unitised goods transport flows in the region. The assumption is that decisions based on a better understanding and awareness of this field could lead to improved efficiency and sustainability of the transport networks. The rationale behind SUTRANET is that this in turn will enhance regional development and interactions in the North Sea Region, in the form of a strengthened regional competitiveness within the EU and in the global economy, and resulting in more local income generation and employment.

Apart from this brochure about Motorways of the North Sea, SUTRANET dissemination brochures have been issued for the following topics:

- Intermodal Transport Networks
- Transport and Logistics Centres
- Training Programme Development.

1. Motorways of the Sea Concept in the North Sea Region

This dissemination brochure presents findings of the key part of SUTRANET research that relates to Motorways of the North Sea, and this research was led by Napier University Transport Research Institute. The work on Motorways of the Sea (MoS) included investigating the impact of new ferry short sea shipping services and their effectiveness as MoS alternatives to long-distance road transport, in addition to looking at barriers to implementation, plus economic and policy influences for MoS. The research findings make important recommendations based on the evidence for policy initiatives to be introduced and/or adapted in order to assist the start-up of MoS services, thereby generating increased modal shift.
Short sea shipping (SSS) is the only transport mode that has been able to keep up with the growth of road transport. Railways and inland waterways have been unable to slow down the growth of road freight transport. SSS is therefore considered to be the most important mode that can generate significant modal shift in future.

EU policy concerning Motorways of the Sea has been revised through Art. 12a (TEN-T rev. of 29/4/04) which made "Motorways of the Sea" into TEN-T Priority Project No. 21. Motorways of the Sea are defined as:

"...high quality logistics services based on short sea shipping transport which could be compared, because of the quality features, to road motorways..."

Figure 1 demonstrates the challenge faced by SSS, showing the dense road traffic flows throughout the EU. However it also highlights the significance of SSS already, and the scope for SSS to remove even more freight from road.

Four Motorways of the Sea have been proposed, basically covering all of the EU (Figure 2):

- Motorway of the Baltic Sea
- Motorway of the Sea of western Europe
- Motorway of the Sea of south-east Europe
- Motorway of the Sea of south-west Europe

In addition to the EU TEN-T (supporting infrastructure) and the complementary Marco Polo Programme (helping to fund SSS services), Member States have also been asked to bring forward their own MoS schemes. However no Member States have done this so far, and the only states known to be working on a joint initiative are Spain and France. Until now almost all Member States have left SSS/MoS services more or less to the market/private actors to initiate.
3. Major Intermodal Ports in the North Sea Region

The objective related to analysis of major intermodal ports in the North Sea Region during the SUTRANET project was to establish the current position with regard to major seaports and maritime routes in the North Sea Region and identify barriers to further growth (i.e. base case).

The sample of ports selected for analysis each have an annual throughput of above 100,000 TEU (TEU = Twenty-foot Equivalent Unit) or 50,000 RoRo trailers. Geographically the ports considered were only those ports bordering the North Sea Region (NSR). This included ports as far south as Belgium, north of the River Thames, and as far north as east of Scotland and Norway, and to southern Denmark (entrance to Baltic Sea) and west coast of Sweden.

The analysis revealed a very heavily concentrated unitised ports market in the North Sea Region, with forecast port developments expected to result in even higher levels of concentration in future.

In terms of container port capacity, 75% of quay line and 73% of ship-to-shore cranes in the NSR are located at just four ports - Rotterdam, Hamburg, Antwerp and Bremerhaven. The top-5 NSR container ports (i.e. the above plus Felixstowe) together account for 90% of NSR container volumes. Most other ports in the NSR top-25 are very small by comparison, while ports out with the top-25 (i.e. handling below 100,000 TEU/year) have limited significance in terms of overall container traffic and terminal capacity, whilst nevertheless still being of strategic importance in a local sense.

RoRo capacity is very heavily concentrated in the southern North Sea basin area in particular. Two ports - Zeebrugge and Rotterdam - together account for about 47% of RoRo traffic at the major NSR ports. The top-10 RoRo ports combined account for 91% of RoRo traffic at major NSR ports. The relatively small geographic area between Rotterdam, Zeebrugge/Ostend, Haven and Humber, accounts for 75% of RoRo traffic within major NSR ports.

In terms of future maritime intermodal terminal capacity, container handling capacity is expected to double by 2010, to 58m TEU. Some two-thirds of this additional capacity (+30m TEU) is intended to be built at the ports of Antwerp, Hamburg, and Bremerhaven/Wilhelmshaven. By adding in plans for a further two ports - Rotterdam and Felixstowe - these 6 ports will together account for 90% of all forecast additional container terminal capacity in the NSR by 2010.

Forecast RoRo capacity additions are concentrated at Haven, Humber, Rotterdam and Zeebrugge - with these four port areas accounting for 90% of forecast new capacity at all major NSR ports.

Figure 3: North Sea Region
(Source: Interreg III B North Sea Programme)

Figure 4: New container terminal capacity planned for major NSR ports by 2010 (TEU)
Thus, in terms of existing and forecast maritime intermodal/unitised port capacity, covering both container and RoRo, broadly speaking just three distinct geographic estuarial areas account for 90% of NSR traffic, these being:

- Haven/Humber
- Rhine/Schelde
- Elbe/Weser

Forecasts suggest that major ports within these three rather narrow areas will continue to expand and dominate intermodal maritime traffic flows in northern Europe even more in future. This therefore raises questions as to how other areas in the NSR can ensure that their transport connectivity and competitiveness may be improved, and overcoming the congestion and diseconomies associated with routing traffic via the present hubs. This also raises questions regarding the sustainability of current and future transport infrastructure provision in view of the very high degree of continued concentration within relatively few sensitive estuarial areas in northern Europe.

Perhaps there are better ways to serve the peripheral/feeder markets in Northern Europe, for example, via ‘offshore’ transhipment hubs such as proposed for Scapa Flow in Orkney (Interreg III B North Sea Programme, Northern Maritime Corridor Project). Similar types of offshore hubs have been developed in the Mediterranean in an effort to reduce pressure on gateway hubs there, but this concept has yet to be fully taken forward in Northern Europe. More efforts need to be made at EU and Member State level to help such facilities develop, possibly using the various relevant policy mechanisms (e.g. TEN-T, Marco Polo).
4. Economic Barriers, Weaknesses and Challenges for Motorways of the Sea

Short sea shipping, according to the European Commission, is the only transport mode that has been capable of keeping up with the rapid economic growth of the EU. SSS is also regarded by the Commission as the only freight mode offering a realistic prospect of substantial modal shift from road in future, as well as helping to improve competitiveness, reduce environmental damage, and foster cohesion in an enlarged EU. This in large part explains the strong emphasis by the EU in developing its new ‘Motorways of the Sea’ policy.

Nevertheless, it is important for policy-makers and other stakeholders to realise that the seaway is no more a natural highway than are railways or roadways. Ongoing subsidy combined with historic sunk investments applied to roadway and railway infrastructure heavily influences the attractiveness and competitiveness of these modes and results in a distorted transport marketplace. Furthermore, this represents something of a disincentive for the freight/logistics market to readily make use of privately financed and full (or virtually full) cost recovery seaway services that may (or may not) be offered on corridors running parallel to publicly-financed land transport infrastructure.

The seaway-equivalent infrastructure of a roadway or railway is not a seaport, which is simply a node; the seaway-equivalent infrastructure of a roadway or railway is in reality the deck of a ship, most vividly the garage deck of a RoRo ferry. In this regard, ships are just as inseparable a part of maritime transport infrastructure as ports. Acknowledgement of this definition of seaway infrastructure, and acceptance of ongoing market distortions favouring land transport, urgently demands a new approach by policy-makers and other stakeholders towards the issue of modal shift, and in particular the economic and fiscal consideration given to provision of sea transport infrastructure vis-à-vis land transport infrastructure.
Notwithstanding these rather fundamental economic issues, research into the sea motorway concept illustrates the importance of demand analysis and of building the essential service attributes for an effective SSS solution based closely around user needs. Sea motorway case studies demonstrate what can be achieved, with state entities sometimes providing a facilitation and support role, though environmental and geopolitical conditions can have a major influence on outcomes (e.g. the Balkans conflict, problematic border crossings, inadequate roads, geography and distance, road tolls etc.).

Technology is playing its part too, and a new breed of fast-conventional RoRo/RoPax ferry now exists, offering high payloads and hence scale economies (far in excess of railways), faster speeds, fast transit times, high efficiency, plus excellent reliability. Ongoing advances in sea transport technology may be expected to even further enhance the competitiveness of SSS in future.

EU transport policy increasingly recognises and reflects the major role that sea transport can play in helping to develop new improved transport logistics solutions. Through the inclusion of Motorways of the Sea in the TEN-T programme, coupled with operational support for innovative and modal shift actions via Marco Polo, the Commission has put in place mechanisms for an expansion of SSS in Europe. Evidence from sea motorway services elsewhere (e.g. Turkey, Italy, Scotland, Japan etc.) demonstrates the different ways in which such services may be introduced, the role of the public sector, and importance of private sector operations. Member States also need to push forward with their own complementary policies at national level, of which the Waterborne Freight Grant in the UK is a useful (if financially inadequate) example, to help facilitate and enable domestic as well as collaborative transnational Motorways of the Sea initiatives.
These schemes may well lead to some successes for SSS modal shift initiatives. However, they are unlikely to result in any significant modal shift given the current distorted transport market. Effective and sustainable modal shift will require a reappraisal and redefinition of just what exactly is meant by the term ‘seaway infrastructure’, in line with the arguments proposed within SUTRANET that seaway infrastructure is in reality the deck of a ship, whereas a seaport is simply a node, acting in much the same way as a railway terminal or highway intersection.

In order to develop a far more extensive seaway infrastructure (or Motorways of the Sea) throughout Europe, as envisaged by the Commission, will inevitably demand that action is taken to address ongoing market distortions resulting from continuing state financing of roadway and railway infrastructure, with the aim being to provide a level playing field between all surface transport modes. What specific economic and fiscal policy mechanisms this is likely to involve will necessitate further research and debate, though clearly this will need to include some element of greater recovery of costs for freight transport vehicles using state-financed roadways and railways, or the direct subsidisation and/or incentivisation of seaways, or perhaps a combination of both.

Figure 12: Container seaway infrastructure - 800 TEU at 18 knots (Source: Damen Shipyard)
5. Motorway of the Sea Implementation

Transport and logistics sector representatives attending SUTRANET User Group workshops found the example of UN RoRo in Turkey highly informative as an illustration of MoS implementation. UN RoRo is a freight ferry service which is owned and operated by the Turkish road transport association on behalf of its hundreds of members, including both small and large hauliers. The UN RoRo model involved ship chartering in the initial phase, though the company now owns its fleet of ships, all of which were built by Flensburger Shipyard. The ship operation itself linking Turkey and Italy is outsourced to the UK ship management company Blue Water. All UN RoRo haulier-shareholders are charged the same rate per trailer irrespective of how large the trucking firm is. UN RoRo profits are distributed to shareholder truckers in the form of dividends.

Another possible option for start-ups is to provide a MoS service via a joint venture between relevant actors. This might include, for example, the road haulage sector, plus ship manager or ship operator, and perhaps a port/terminal operator.

The kind of change or transformation envisaged may require some form of catalyst in order to drive it forward. The Turkish example highlighted the critical role of the road haulage association in this regard, the latter still effectively managing the UN RoRo operation, and may be viewed as an acceptable organisation to undertake such a task in other areas of Europe.

There is inevitably a requirement to generate traffic flows for a MoS service but the UN RoRo example highlighted how effective that can be through the trucking industry becoming a key integral part of the overall operation.

Forces influencing change, such as strong trucking competition, worsening road congestion, driver shortages, and rising fuel costs, were also viewed as having a positive influence on MoS solutions. However, there are many instances where supply chains would have to be adjusted in order for the MoS to offer an effective solution.

Due to increasing demand for RoRo and RoPax ship types needed to open up new MoS services, this particular type of vessel is currently in rather short supply. As it is probable that many new ships would need to be built for such services in the future, there is a question mark over the available shipyard capacity for such vessels should demand rise much further.

Certain yards are building for the charter market (e.g. Visentini, Italy), whilst German KG funds are specialists in building for the charter market also, albeit with a stronger emphasis on container ships.

Unlike ferries, which are mainly built in Europe, short sea/feeder container vessels are built in both Europe and in Asia. There is also currently high demand for container ship tonnage.

In-depth research is necessary to assess the market size for a proposed MoS service, plus give individual sectoral analyses to clarify specific supply chains in sufficient detail. New ferry and container service start-ups can involve slow development, typically taking 3-5 years to develop fully, and this adds to the financial risk borne by an operator.

State grant schemes designed to help new MoS service start-ups develop are generally insufficient to
cover the high costs and risk involved. Moreover, grant is payable only over the first 3 years of the operation, on a reducing basis, whereas the state subsidisation of alternative roadway and railway infrastructure seems to continue indefinitely. There is also the question of a need for state support for port infrastructure related to MoS services.

As an example, in the UK, assuming a new MoS service attracted 90,000 freight units over a 3-year period (e.g. 20,000 units in year 1, 30,000 in year 2, and 40,000 in year 3), state modal shift grant would equate to just €22 per trailer. Such subsidy levels are wholly insufficient considering the present market distortions (i.e. free UK road use for hauliers, with foreign hauliers also benefiting from cheaper fuel bought on the continent). Hence the present maximum limit for Waterborne Freight Grant (WFG) of €2.0 million in the UK needs to be raised significantly if modal shift start-ups are to happen on the scale envisaged. Assuming a door-door price of €600 per trailer, the subsidy of €22 per trailer is equivalent to only 3.7% intervention. In Italy the proposed Eco-Bonus scheme is envisaged to pay truckers between 20% and 30% subsidy, which is much more realistic in an effort to overcome distortions which favour road transport.

6. Motorway of the Sea Requirements

Within SUTRANET the ‘seaway’-equivalent infrastructure of the roadway and railway has been defined as the deck of a ship. This is in addition to the port interface, which is also maritime infrastructure, but in any event the seaway platform itself has to be a fundamental element to consider. This finding has implications for policy and for state investment in transport infrastructure more generally. Historic as well as continued state funding of roadway and railway infrastructure (both capital and maintenance), yet with no comparable level of state funding applied to seaway infrastructure, serves to worsen market distortions between land and sea transport modes, implying that SSS will become even less competitive than it is today. This goes against the vision of the EU MoS policy for a rapid and substantial expansion of SSS and MoS services in particular.

The (shipping, logistics) market is increasingly willing and able to implement and use SSS services, or Motorways of the Sea (MoS). Recent examples of newly implemented SSS/MoS short-range initiatives reflect some common characteristics, including:

- High service frequency (up to daily or better);
- Increasing use of fast RoPax vessels (23-30 knots), with high freight capacity (100 trucks plus) as well as moderate passenger capacity (300-600 beds);
- Route distances of around 300-500 nautical miles, allowing a ship to achieve one single trip per day (i.e. 2 ships = daily schedule);
- Opportunities also to use low unit cost/high capacity container vessels on certain routes;
- Fixed time departures and arrivals to meet trucker needs;
- Minimal paperwork requirements in port, as with road transport.

However, it should be noted that existing MoS services throughout Europe have generally come about and exist in instances where there are already road tolls, and/or road transport is highly problematic (e.g. via countries of former Yugoslavia, poor roads in Eastern Europe, difficult border crossings etc.). In instances where there are no road tolls and the trunk road is in generally good condition, with congestion not yet too severe, the state needs to consider a more realistic level of intervention to generate modal shift, also bearing in mind the need to rectify distortions caused by ongoing state subsidy of trunk road and railway infrastructure.

The UN RoRo experience highlights the importance of the road haulage sector participating in a MoS operation as owners/shareholders. In this regard the trucking community itself guarantees the traffic volumes to its own ferry operation from Day 1. This has the effect of significantly reducing the level of risk involved in the commercial operation.

Unlike roadway and railway infrastructure, however, new SSS/MoS services are decided on and implemented by the market, not by the state. This means that the state is dependant on the market to come forward and provide
SSS/MoS solutions as an alternative to state-funded land transport infrastructure. At the same time, the state continues to invest heavily in trunk road and railway infrastructure, which results in conflicting signals and market distortions; the market does not provide land transport infrastructure as such, yet paradoxically the market is expected to provide and finance alternative sea transport solutions to subsidised land transport infrastructure. This leads to further problems and barriers for SSS/MoS providers and investors, including:

- Users of alternative roadway and railway infrastructure do not pay the full cost of that infrastructure, even where tolls are applied, and this provides a disincentive to change modes;
- Whereas road tolls are a useful incentive for truckers to use an alternative MoS service, they are not on their own sufficient justification for such a change to occur;
- It can take considerable time (at least 3-5 years) for a new MoS service to become established and reach break-even, with substantial start-up losses having to be paid for by the (private) operator;
- In instances where land transport subsidies are ongoing, logically it may never be possible to have an unsubsidised seaway alternative service.

Currently it can be concluded that state investment in roadway and railway infrastructure distorts the transport market, and this results in a significant disincentive for the private sector to provide and finance alternative MoS transport infrastructure (i.e. ships as well as port facilities).

For MoS to succeed, the state (regional, national and at EU level) needs to rethink what it can do to help alternative SSS services develop. In this regard, a number of strategies can be pursued, perhaps in combination, in an effort to expand the role of MoS, including:

- Introduce subsidy/incentive schemes to help equalise the costs of a MoS service with state-funded road/rail infrastructure, such as the proposed trucker Eco-Bonus to be introduced in Italy (i.e. a payment made to truckers who shift mode);
- Introduce and/or increase trunk road toll charges for freight vehicles;
- Offer realistic start-up aid for MoS services (this needs to be well above the rather low EC Marco Polo levels), which could be promoted and implemented through state/regional government tenders, leaving optimal ship design/port location decisions to service providers;
- Develop new port options (e.g. proposed offshore transhipment terminals) which can lead to modal shift as well as reduce pressure on congested hub ports;
- Provide support for MoS-specific port infrastructure and equipment.

In essence, one of the most important findings from the SUTRANET project is that there still needs to be a fundamental change in the way government at all levels consider the financing of sea transport infrastructure.
The SUTRANET Website and Partners

For further information concerning the SUTRANET project results please consult the website:

www.sutranet.org

All SUTRANET written outputs and publications are available on this website for download - such as articles, reports and papers including the Motorways of the Sea topic, PowerPoint presentations etc. at workshops and seminars, statistics and databases covering all North Sea ports handling unitised goods flow, a maritime emissions calculation tool and documentation, and a training programme on intermodal transport in the form of an e-learning module etc.

The following ten partners have contributed to the SUTRANET project: Aalborg University, Department of Development and Planning (Lead Partner); Napier University Transport Research Institute, Edinburgh Scotland; University of Applied Sciences (Fachhochschule Kiel, FHK), Germany; Swedish Environmental Research Institute (IVL), Gothenburg; the Association of Danish Transport Centres (FDT); Erasmus University, Rotterdam the Netherlands; Institute of Transport Economics (TØI), Oslo Norway; Molde Research Institute, Norway; SINTEF Technology and Society, Trondheim Norway; and Institute of Shipping Economics and Logistics (ISL), Bremen Germany.