Development of Swedish bases for decision-making and ranking of terminal solutions within the TEN and Motorways of the Sea (MOS) programmes

WP5 – Simulation of transport demand and modal split of selected MOS links

BMT Transport Solutions GmbH
Karpfangerstr. 14
D-20459 Hamburg

Author: Ralf Fiedler

Hamburg, February 2008

Contents:

1 Introduction and purpose

The purpose of the report is to present the results of the simulation of the transport demand and modal split effects, caused by the insertion of Motorways of the Sea links between Sweden and other EU-member states.

The simulations have been carried out using a freight flow simulation model (EFM STAN) which works under cost minimisation algorithms. The potential MOS links have been tested regarding their transport demand and their impact on the overall modal split for the year 2012.

A standard set-up was applied for every of the simulated MOS links in order to have comparable results within this study. The set-up for all the simulated MOS links is;

- the links are additional links (additional to the recent supply),
- their frequency is one departure per day per port,
- their capacity is calculated as a multiplication of a standards vessel type (RoRo 1800 lane-metres, LoLo 1000 TEU) times the number of vessels needed on the link to sustain a daily frequency. The length of the link determines the number of vessels needed, thus also sets the capacity on the link.
- the speed of the links (block speed from port to port) is the same default value as for all other RoRo resp. LoLo links.
- all costs elements, transhipment costs, operative and quality costs are the same as for all other RoRo resp. LoLo services in the region.
- ports resp. port regions have been connected via new additional MOS links only within their MOS area given the limits of the study.
- each additional MOS link consists both of a truck ferry link (RoRo) and a container link (LoLo) in both directions and is linked to the respective hinterlands.

The study focuses on potential freight flows and modal shift effects. Cohesion aspects cannot be simulated in the same way, but are accordingly included in the study through an extra scenario.

The findings of this report are based on desk research. The report is part of the MOS-Criteria study within the SIR-C framework. BMT Transport Solutions GmbH (BMT-TS) has carried out the study based on existing in-house experiences and knowledge, and by using third party sources.

Any results, findings or recommendations given in reports are correct to the best of the knowledge of BMT Transport Solutions GmbH at the time and on the basis of the information available to the consultant. BMT Transport Solutions GmbH will use the professional skills available to it when giving advice or information. BMT Transport Solutions GmbH gives no warranty or guarantee relating to any result or conclusion (see also Terms and Conditions as published at http://www.bmt-ts.com/terms.html).

This part of the study was compiled by Ralf Fiedler.

2 Summary and conclusions

- The simulations indicate that the insertion of all the selected MOS links into the system will not have the envisaged modal shift effects of moving freight from road to sea.
- Within this scenario, the transport work on road in Sweden is forecast to rise by 1-2%. The rise in transport work on the road is caused by a detour factor reasoned by the “over attractiveness” of the MOS links. The transport work on rail is forecast to fall by 2%.
- Especially the RoRo short distance links take additional volumes, while long distance RoRo links and most of the inserted LoLo links do not indicate a sufficient transport demand. The current supply of sea transport seems to be largely sufficient.
- The total transport work in Sweden and on the sea links from /to Sweden (total distance to connected port) is forecast to rise by 2-3%.
- All additional MOS-type LoLo links suffer from a low additional demand. Even though, the frequency of these LoLo links is in most cases better than in the existing cases, none of them show a sufficient transport demand.
- RoRo links seem only to be demanded from /to southern Swedish port regions. E.g. all simulated links from/to Stockholm only show a limited demand.

3 Results of Scenarios

3.1 Base Scenario 2012

This scenario does not include any additional or improved MOS links. It serves as the benchmark base scenario. Two matrices have been used per simulated year;

- a regionalised European non-bulk trade matrix, in which all European regions trade which each other and
- a regionalised oversea container matrix, where all European regions trade with oversea nodes (e.g. USA, Asia).

The first one is attributed to the simulated RoRo links, the container matrix is attributed to the LoLo links.

3.1.1 Incorporation of the findings of WP4 into the simulation

The findings of the WP 4 report in terms of costs of damage per transport mode have been incorporated into the EFM STAN cost functions. Since the EFM STAN Model uses less fragmented definitions of cargo types and sea areas, the findings were adopted to fit into EFM STAN. The costs for damage have been integrated as quality costs into the 2nd cost component into the model.

The cargo type “Low Type 1-3” was translated into the EFM STAN cargo definition of “Bulk”. The cargo types “Mid type” and “High Type” were translated into the EFM STAN cargo definition “Unitisable cargo”.

- Truck transports increased their quality costs by an additional costs factor of 0,0024 * length **1,5.
- Rail transports increased their quality costs by an additional costs factor of 0,01307 * length ** 1.5.
- Sea transports increased their quality costs by an additional costs factor of 0,0041 * length ** 1.5.

3.2 Scenario Maximum MOS

3.2.1 Selected links

In this scenario, the following MOS links (selected with WP2 and WP3) are inserted into the multi-modal network of the Europena freight model EFM:

Table 1: MOS links for the Maximum MOS Scenario (marked with an x)

	Port Region West-Sweden	Port Region Skåne	Port Region Stockholm/Ö. Mellansverige	Port Region Blekinge
Port Region German Baltic Sea			X	X
Port Region German North Sea			X	
Port Region Southern Finland				X
Port Region Benelux			X	
Port Region Western UK and Port Region Ireland and Northern Ireland (via UK)		X		
Port Region Jutland			X	
Tallinn	X			
Gdynia		X		

The selection follows two main considerations;

a) Low frequencies today

b) Reasonable geographic directions, meaning, with few exceptions only western Swedish regions are linked to western destination, while eastern Swedish regions are linked to Eastern destination, to avoid large detour factors in sea transport.

3.2.2 Results

The simulations indicate that the scenario with the insertion of all selected MOS links into the system will not have the envisaged modal shift effects of moving freight off the roads towards the sea transport modes.

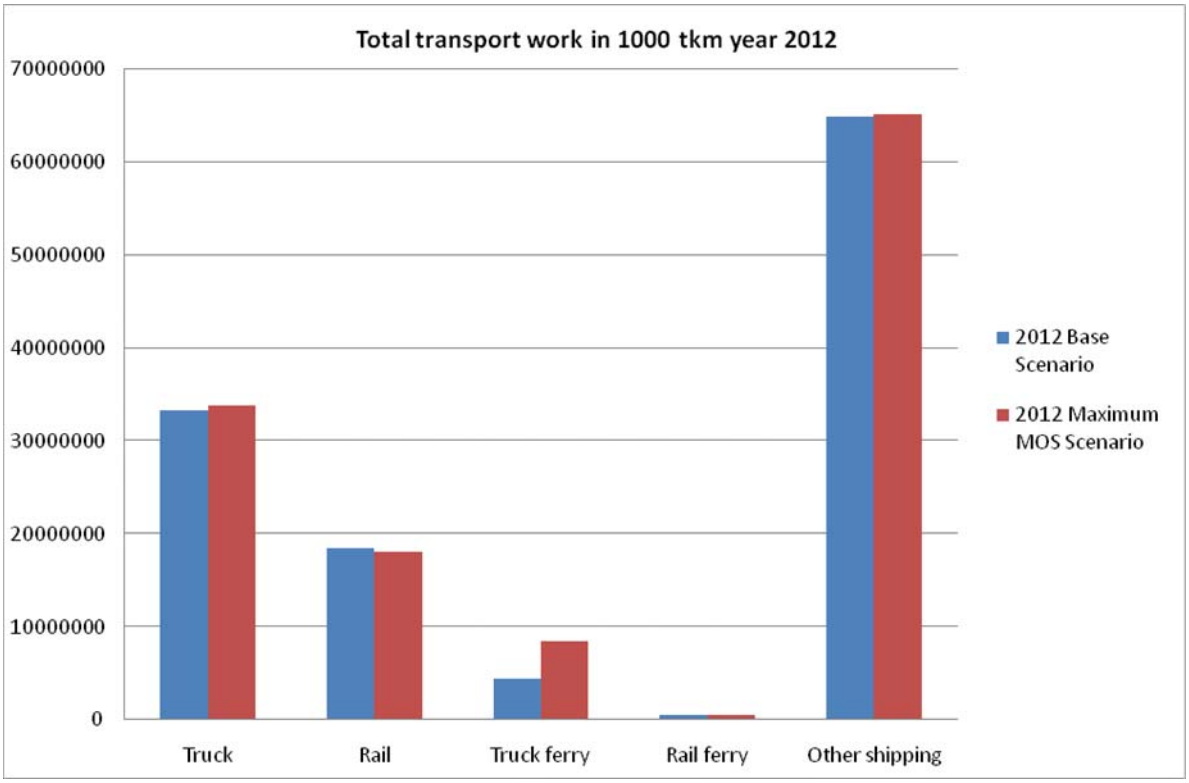
The opposite effect can be recognised. The transport work on road in Sweden is forecast to rise by 1-2%, if all the selected MOS links are implemented at the same time. The rise in transport work on the road is caused by a detour factor reasoned by the “over attractiveness” of the MOS links. Transport volumes originating inland will choose a port further away because of a high frequency departure schedule.

The transport work on rail is forecast to fall by 2%. This confirms findings of previous studies, that there is a clear competition between rail and sea transport.

Especially the RoRo short distance links take additional volumes, while long distance RoRo links and the inserted LoLo links do not indicate a sufficient transport demand.

The total transport work in Sweden (road and rail) and on the sea links from /to Sweden (total distance to connected port) is forecast to rise by 2-3%.

Figure 1:

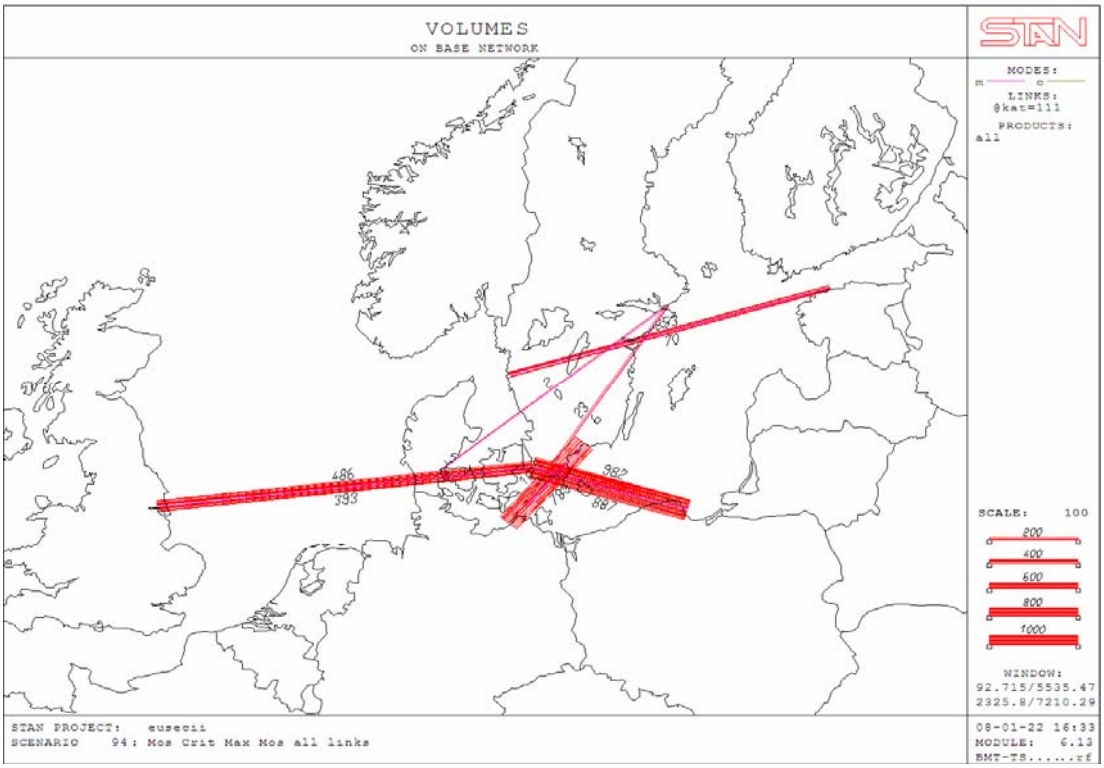


3.2.3 Results per single MOS link

Table 2: Potential transport demand in 1.000 tonnes per year (2012)

		Total annual potential volumes 2012 RoRo in 1.000 tonnes	Total annual potential volumes 2012 LoLo in 1.000 tonnes
Port Region German Baltic Sea	Port Region Stockholm/Ö. Mellansverige	0-500	0-500
Port Region German Baltic Sea	Port Region Blekinge	1500-2000	0-500
Port Region German North Sea	Port Region Stockholm/Ö. Mellansverige	0-500	0-500
Port Region Southern Finland	Port Region Blekinge	0-500	0-500
Port Region Benelux	Port Region Skåne	0-500	0-500
Port Region Western UK and Port Region Ireland and Northern Ireland (via UK)	Port Region Skåne	500-1000	0-500
Port Region Jutland	Port Region Stockholm/Ö. Mellansverige	0-500	0-500
Tallinn	Port Region West-Sweden	0-500	0-500
Gdynia	Port Region Skåne	1500-2000	0-500

Figure 2: Snap shot of the results of the Maximum MOS Scenario[1]



[1] For simplification purposes within the simulation work the links are straight lines. However, their nautical distance is correct, like e.g. the link from Western Sweden to Tallinn sails around Sweden.

3.3 Realistic Scenarios MOS

In this Scenario, a limited number of MOS links is simulated. To be able to judge the impact of each MOS link, the following links are simulated individually. The selection of links is based on the result of the Maximum MOS scenario.

Table 3: MOS links for the Realistic MOS Scenarios (marked with an x)

	Port Region West-Sweden	Port Region Skåne	Port Region Stockholm/Ö. Mellansverige	Port Region Blekinge
Port Region German Baltic Sea				X
Port Region German North Sea				
Port Region Southern Finland				
Port Region Benelux				
Port Region Western UK and Port Region Ireland and Northern Ireland (via UK)		X		
Port Region Jutland				
Tallinn				
Gdynia		X		

The results of this scenario confirm the findings of the Maximum MOS. The volumes are in the same ranges. However, within this scenario it becomes clearer that the most successful MOS links, the RoRo links between the Port Region Blekinge - Port Region German Baltic Sea and Port Region Skåne – Gdynia jeopardise volumes from the existing ones between Skåne and Germany and Blekinge and Poland. Again, this questions the necessity of any additional sea link from/to Sweden.

3.4 Cohesion scenario MOS

Beside modal shift, cohesion is another important aspect in the argumentation for MOS links. In the methodology chosen in this study, the selection of ports and links has been oriented towards traffic volumes and potential modal shift.

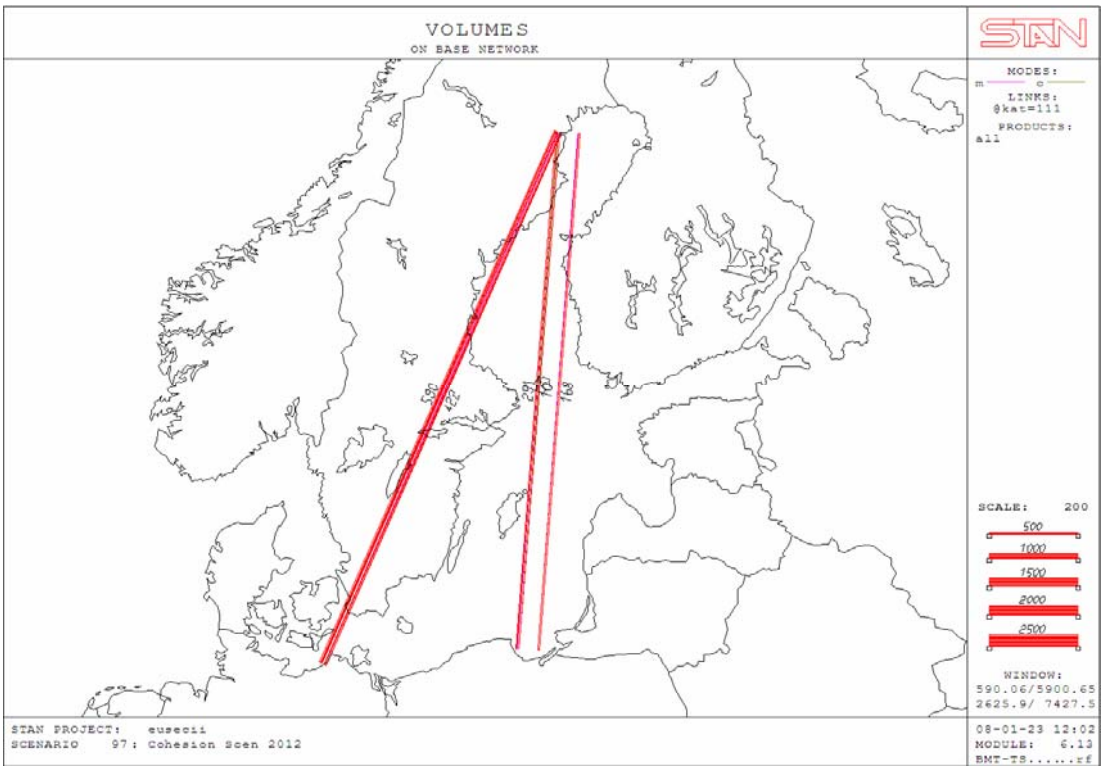
To be able also to provide an assessment on the cohesion aspect, the Swedish port region Botnia with the ports Luleå and Umeå is added to the simulation scheme.

Links from that region to the Port Region German Baltic Sea and Gdynia were simulated.

The results of these scenarios are that some demand can be forecast for additional MOS links from/to that region. A direct high frequency RoRo link seems to be able to attract some 1 million tonnes to Germany and some 0,4 million tonnes to Poland. Within the simulation environment, these links are attractive, since they offer a high frequency of one departure per day and a high capacity of 6 vessels with 1.800 lanemetres each.

However, for RoRo transport the distance is very long. To sustain a daily frequency, a fleet of vessels must be provided that will never be economically worthwhile - even with a forecast yearly volume of 1 million tonnes.

Figure 3: Results Cohesion Scenario



4 Conclusions

For a country like Sweden, to which already a dense short sea network for LoLo and RoRo transports exists, it rather unlikely, that by the insertion of any additional sea links – which might be subsidised in the start off phase – the modal shift would change in favour of sea transport. Interesting enough, in this study it seems even the other way round.

An insertion of additional links like tested in these scenarios is not an optimisation, it is rather a disturbance of a balanced market and its traffic flows.

These negative effects are measurable in

- Rising transport work on road in Sweden by 1-2%.
- Falling transport work on rail by 2%
- Overall rise of transport work by 2-3%.

There seems to be no point in adding any additional MOS-type LoLo links into the existing dense network. Even though, the frequency of these links is in most cases better than in the existing cases, none of them show a sufficient transport demand.

RoRo links seem only to be demanded from /to southern Swedish port regions. However, also in this cases volumes a jeopardised from existing links. All simulated links from/to the Stockholm region only show a limited demand.

The recent MOS programme, as being part of the TEN-T infrastructure funds, can be directed to support infrastructure measures in ports and in hinterlands. The previous ideas behind the MOS – to support the sea leg / the sea mode - are not really a part of this MOS programme anymore.

While the national and the European selection process for MOS is still underway and only few projects have already been started, it becomes clear that the decision tends to support existing transport corridors. The support will be focussed in giving grants to port infrastructure measures or infrastructure, which is close to the port. Based on the findings of this report, the support for existing lines seems to be a better choice than to start any new lines with state aids.

The model approach used in this study, to deploy a route and modal split traffic model, has proven to be suitable. With the help of this model it is possible, to assess globally the impacts of certain MOS measures onto the route and modal slit.

However, a detailed simulation taking into account local effects onto the intermodal terminals in Sweden was not possible within the constraints of this study. To achieve relevant results on the local level, the well calibrated Samgods model (operated by the Sika Institute) might be able to provide such results.