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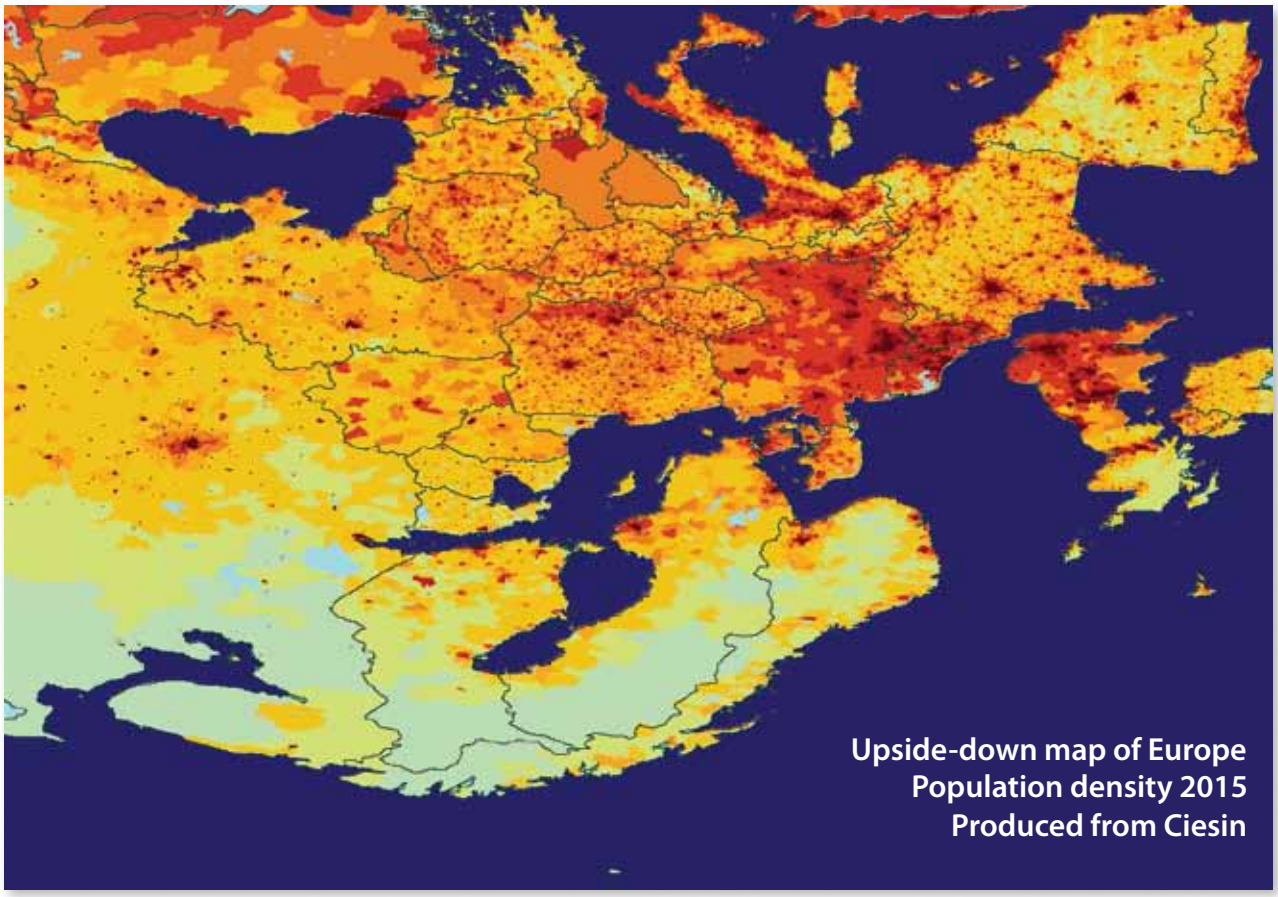
Ronny Klæboe
TØI-Report 1118/2010

Green Handshake

Sustainable rail freight connections between Norway and Europe



Upside-down map of Europe
Population density 2015
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Summary:
85% of the global warming effect of current heavy duty truck transports between Norway and the European continent can be saved by replacing them with intermodal rail solutions. However, this is easier said than done. Imports to Norway increase more than exports and stem from dispersed points of origin. Establishing Rail Ports to Norway at strategic locations on the continent could serve to consolidate the various flows, transferring inbound truck loads to rail. This requires that Norwegian authorities cooperate on several administrative and political levels with EC Member States, regional authorities in Northern Germany, as well as private transport and logistics operators. Users of the new services must be offered a quality of service that makes rail freight attractive.

Sammendrag:
Overføring av internasjonalt gods fra veg til jernbane har positive klimavirkninger. En sparer 85 prosent av oppvarmingen per tonnkm. Å få til en slik overføring er imidlertid lettere sagt enn gjort. Importen av varer fra Europa øker mer enn eksporten, og kommer fra ulike opprinnelsesland og steder. Et nærliggende tiltak for å sikre gode og regelmessige pendelforbindelser som kan ta disse transportene, er oppretting av "Rail Ports" – inngangs¬portaler til Norge på Kontinentet. Her kan vareforsendelser konsolideres og omlastes til jernbane. Et skritt i retning av å få etablert slike portaler er et samarbeid mellom norske myndigheter og deres motparter i EU-medlemsland, delstatsmyndigheter i eksempelvis Nord-Tyskland, og private transport- og logistikk-aktører. Brukerne må tilbys et servicenivå som gjør det attraktivt å bruke jernbane på store deler av strekningene.

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Preface

Consensus is growing among governments worldwide that energy waste and emissions of greenhouse gases must be reduced and eventually eliminated. A gap exists, however, between the *perceived need for policy intervention* in the transport sector and our *knowledge* on the real-world, end-of-chain environmental, economic and societal *effects of the various policy measures* available to governments.

The main aim of the TEMPO research project is to help fill this gap, i. e. to provide policy makers with the information needed for effective policy formulation. Based on systematic, rigorous, high quality interdisciplinary research the project will show how the transport sector could drastically reduce emissions in the next few decades and what political and economic challenges that this would entail.

TEMPO task 4 deals specifically with surface freight flows from the European continent to Norway. Whereas intermodal rail freight boasts 50% market share between major Norwegian cities, rail captures only 5% of surface freight from Europe. The adverse environmental impacts of predominantly truck transports affect EC member states more than Norway, but are often excluded from efforts to reduce "Norwegian" emissions. The current preliminary report from TEMPO task 4 describes a wide range of efforts for providing rail services between European "Rail Ports" and Norway. Since these efforts have the potential of remedying most of the adverse environmental and traffic safety costs of Norwegian imports and exports affecting EC citizens we have dubbed the effort a "Green Handshake".

The report is authored by Dr Johanna Ludvigsen and Dr Ronny Klæboe. The work builds on the innovative approach taken by TEMPO task 1 in estimating climate effects of transport emissions per tonne-kilometre. Trude Rømming has assisted in the production of the report, and Marjan Mosslemi has helped with the litterature references. Quality assurance is by Chief Research Officer Inger Beate Hovi.

Oslo, 12-1-11
Institute of Transport Economics

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Summary:

Green Handshake – Sustainable Rail Freight Connections between Norway and Europe

Intermodal rail freight solutions capture more than half of volumes between important Norwegian hubs such as Oslo–Bergen and Oslo–Trondheim. One could think that the market share on the longer stretches between Norway and our most important trade partners in Europe would be even higher. However, intermodal rail freight has capture no more that 5-10% of this market.

Or, to put it a bit differently: Improved rail services between Norway and Europe could potentially capture the major share of the market, relieving the road network for half a million cross border long distance truck transports each year. This would recapture road capacity, reduce the number of accidents where heavy lorries are involved, and reduce emissions of local pollutants and production of dust particles.

Work undertaken in the first Work Package of TEMPO indicate that a transfer of freight from road to rail should reduce global warming due to green house gases (GHG) substantially. We can double both imports and exports whilst reducing net warming to a third. We are here talking about real emissions, not the figures presented in nationally focussed plans and prognoses where GHG emissions beyond Norwegian borders are deemed inconsequential.

Depending on which role Norwegian industrial and commodity production plays in future Europe, good connections with the European rail network could be crucial for Norwegian partnerships in European production networks.

To transfer goods from heavy trucks to rails, is easier said than done. We have not only the challenges in streamlining the cooperation between national logistic, rail service, and infrastructure provider, but also between infrastructure operators in different countries, and the cooperation between Norwegian and EC-Members States, freight forwarders and shippers.

However, the timing is not bad. Large infrastructure investments such as the Nordic Triangle, TEN-T investments including the plans for a new connection from Denmark to Germany (Fehmarn connection), the modernisation of the European Rail Traffic Management Systems (ERTMS) increase rail competitiveness.

The European Railway packages and directives are also doing away with the strictly nationally oriented technical, organisational, financial and legal mind sets. Focus has changed from purely national interests to what Europeans can achieve together.

A special challenge for Norway is that imports are predicted to increase more than exports. When the points of origin are dispersedly located and stem from different countries, the individual small volumes and geographical spread favours long haulage trucks. A proven strategy for dealing with such disperse flows is the establishment of hubs, and in our case what we have dubbed "Rail Ports" located in the North of Europe and that function as entry ports to Norway. In these terminals, intermodal freight flows are consolidated, and goods arriving by truck, transhipped to rail. When such Rail Ports are equipped with necessary cranes, trucks and IT-solutions, they will be able to consolidate shipments from diverse locations in Europe and providing a sufficient volumes for shuttle trains with reasonably high frequency and regularity. To avoid unnecessary terminal handling in Norway, the shipments should be processed in the Rail Ports, coded for their end destination, and pre-sorted to avoid delays due to unnecessary terminal operations in Norway.

TEMPO Task 4 will work with the authorities in Norway and European Member States, to establish the Rail Port concepts, and increase rail's share of the freight market. The central point is to find locations that can attract and consolidate freight flows, from e.g. China via Amsterdam, Rotterdam, Antwerpen and Hamburg on one side, and from production centres in Central and East Europe on the other. In particular we will be looking for locations with little traffic or marshalling stations that are no longer in use, and that could be upgraded to Rail Ports with modest investments.

Af irst step in establishing this type of collaboration could be to establish a working relationship with international research projects with similar goals. The report contains a short description of the international projects SCANDRIA, SuperGreen og SoNoRA. These projects provide platforms for knowledge and are useful as arenas for establishing contacts with potential partners in Europe having common interests in building a Green Rail Freight Connection between Norway and Sweden, and Central/East and West-Europe.

Sammendrag:

Grønn håndsrekning – bærekraftig godstransport med jernbane til Europa

Containertransporter med jernbane tar vel halvparten av godset på viktige nasjonale forbindelser som Oslo-Bergen og Oslo Trondheim. En skulle derfor tro at markedsandelen på de lange transportstrekkene nedover til våre viktigste handelspartnere i Europa var minst like høy. Her har jernbanen en markedsandel på usle 5-10%. Med bedre jernbaneløsninger vil vi med andre ord kunne spare brorparten av de halv million grensepasseringene med tyngre lastebiler. Det vil frigi vegkapasitet, redusere ulykker med tunge kjøretøy, og gi mindre lokale utslipp av støy, luftforurensning og partikler.

Arbeid i den første arbeidspakken i TEMPO indikerer at overførsel av gods fra veg til jernbane på disse strekningene vil ha en brukbar klimaeffekt. Her er resultatene oppløftende. Vi vil spare 85% av oppvarmingen fra disse transportene dersom vi kan få de over på jernbane. Vi kan doble både eksport og import og likevel sitte igjen med kun tredjedelen av dagens netto oppvarming på grunn av transportutslippene.

Vi snakker her om reelle utslipp, og ikke det som figurer i nasjonale tiltaksplaner hvor utslippene fra godstransporter til og fra Norge, men som skjer i våre naboland, regnes som uvedkommende for Norge.Avhengig av hvilken rolle norsk industri- og vareproduksjon vil spille i fremtiden, vil god tilknytning til det europeiske jernbanenettet kunne være vesentlige for hvor lett norske virksomheter kan inngå i europeiske produksjonssamarbeid.

Å få lastebiltransportene over på jernbane er imidlertid lettere sagt enn gjort. Vi har ikke bare utfordringer knyttet til samarbeid mellom de nasjonale operatører og jernbaneverk som har ansvaret for infrastruktur og slot-tildeling, men også samarbeidet mellom norske og europeiske myndigheter og infrastrukturforvaltere, og ikke minst logistikkselskap og vareeiere.

Forholdene har imidlertid aldri ligget bedre til rette for å få til et skifte fra veg til jernbane på disse strekningene. Infrastruktursatsinger som trekantsamarbeidet, utviklingen av det transeuropeiske jernbanenettverket, storsatsinger som Fehmarnforbindelsen, og moderniseringen av signalsystemene gir godstransport med jernbane et vesentlig bedre utgangspunkt for konkurransen.

Tilretteleggingen for å se trans-europeiske strekninger under ett, bryter opp de tidligere nasjonale tekniske, organisatoriske, finansielle og regulatoriske tankemodeller. Fokus har skiftet fra det snevert nasjonale til hva vi i Europa kan få til sammen. En spesiell utfordring for Norge ligger i at importene øker mer enn eksporten. Når importen også stammer fra ulike steder i flere land sier det seg selv at de individuelle små volumene og den store geografiske spredningen gjør lastebil attraktiv. Et nærliggende svar på denne utfordringen er å opprette det vi har kalt "Rail Ports", inngangsportaler til Norge på kontinentet, hvor intermodal godstrafikk til Norge konsolideres og billaster omlastes til jernbane. Når slike Rail Ports utrustes med infrastruktur for omlastning og IT-løsninger, vil de kunne gi tilstrekkelige godsvolumer til å forvare drift av pendeltog med høy frekvens og høy pålitelighet. Skal en unngå forstyrrende omlastinger på veg til Norge, kan det også være fornuftig at varene IT-kodes og sorteres allerede på de europeiske oppsamlingsstedene før de sendes til leveringsterminaler i Norge.

TEMPO Task 4 vil derfor arbeide med myndigheter fra Norge og andre land for at "Rail Ports" konseptet skal kunne realiseres og bidra til å høyne jernbanens andel av den innkommende godstrafikken til Norge. Tanken er her å finne lokaliseringer som kan attrahere og konsolidere godsstrømmer som kommer fra f. eks. Kina via Amsterdam, Rotterdam Antwerpen og Hamburg på den ene siden og fra produksjonsindustri i Sentral og Øst-Europa på den andre. Spesielt vurderes mulighetene for å kjøpe seg inn i en rekke allerede eksisterende jernbaneterminaler og/eller /ruste opp evt. nedlagte rangeringsstasjoner som kan oppgraderes med relativt beskjedne investeringsutlegg og deretter koples opp mot godsknutepunkter i Norge.

Et første skritt i et slikt samarbeid kan være å knyte kontakter med en rekke internasjonal prosjekter med tilsvarende mål. Rapporten beskriver kort de internasjonale prosjektene SCANDRIA, SuperGreen og SoNoRA. Disse kan både tjene som kunnskapsplattformer og som arenaer for å knytte kontakter med partnere i Europa som deler interessen i å bygge ut en grønn jernbanekorridor mellom Norge og Sverige og Sentral og Vest Europa.

Dr. Ronny Klæboe leads work package 4 "Green Handshake" of the TEMPO-research programme.

Green Handshake

Nearly 90% of surface freight transport to Norway is by road and not rail. In 2007, 464,000 Heavy Goods Vehicles (HGV) crossed Norwegian borders. This number was 32 % higher than in 2002 and 14 % higher than in 2006. Import volumes exceed outbound flows by 70 %. This flow imbalance worsened between 2002 and 2006 and the number of HGV to and from Europe almost doubled in 2007 (Sweden excepted). Projections of future freight volumes, undertaken as input to the Norwegian Transport Plan (NTP) 2010-2019, indicate that imports will increase by another 60% and far more than exports (15%).

This is clearly unsustainable, and the situation is also worsening. On their way to and through Norway long haulage trucks emit CO_2, local pollutants and noise. The risk of severe accidents and road fatalities also increases.

The fourth work package of the TEMPO research project seeks to reduce GHG-emissions from motorized freight transport to and from European mainland by shifting the present structure of Norway-inbound and outbound surface freight from being predominantly road-based towards intermodal rail. Achievement of this goal is contingent on the deployment of several policy measures not only targeting logistics service providers, transport and infrastructure operators, shippers and consignors but also public authorities both in Norway and at European mainland. A special challenge is how to channel the inbound disperse flows into green freight corridors.

Given that considerable efforts are needed to re-structure the current truck-based logistics supply chains, we are looking more towards 2030 than 2020. By then we also expect that the benefits of large investments made by the EU the Member States in Trans European Transport Network (TEN-T) will start to materialise.

The benefits ensue from enhanced connectivity between the different countries' national rail networks, collaborative governance of international corridors, modernisation of European rail traffic management and signalling systems (ERTMS), and seamless transport operations. Since these technical improvements will facilitate rail competitiveness, they will also unlock a broad scope of opportunities for changing modal composition of Norwegian import and export towards environmentally more responsible intermodal rail. More rail transfer will also reduce transit times, cost and complexity of Norway-bound and export shipments, thereby bestowing considerable economic gains on Norwegian industry and citizens.

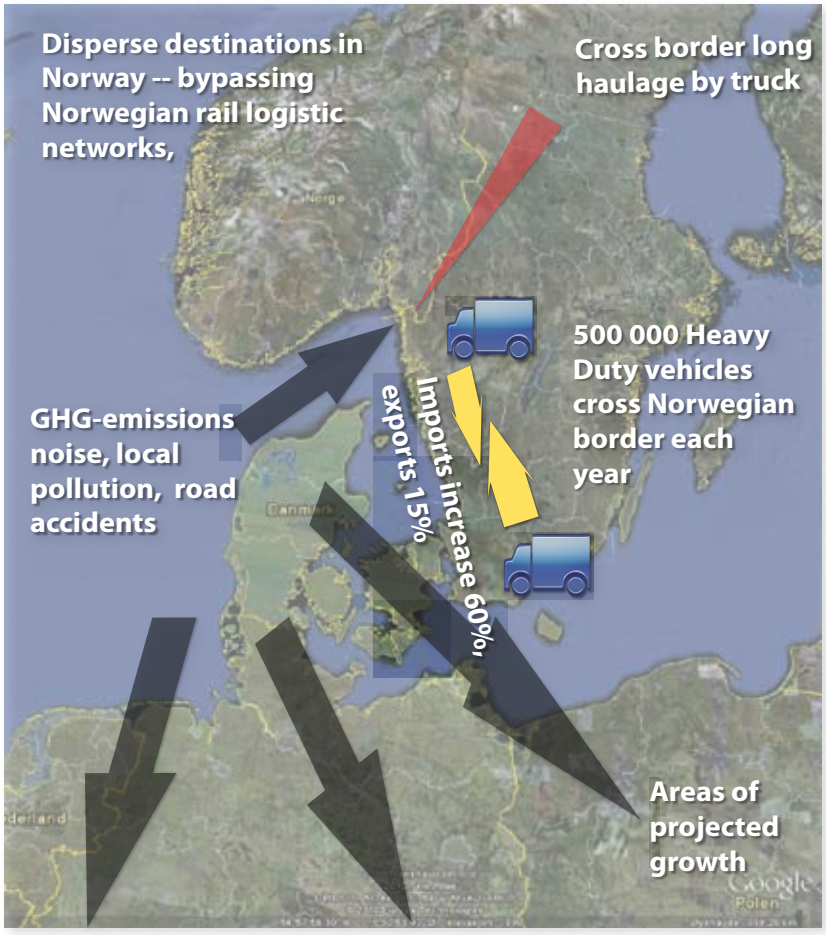


Figure 1: Whereas eighty per cent of freight volumes between Oslo and Bergen are transferred by intermodal rail transport, only 11% are transported between Norway and Europe by intermodal rail -transport - even though the travelling distances in many cases are higher.

Dr. Johanna Ludvigsen is main contributor to the conceptual framework for rail ports

RAIL PORTS
Innovative Logistic Gateways

Invoking policy measures exploiting market forces we propose that Norwegian government intervenes in enhancing railways' competitive position not only in its home territory, but also outside the national borders. This environmentally-motivated policy effort will improve the logistics service infrastructure at European mainland and, over time, facilitate shifts of large volumes of export and import (high-value) cargo away from currently being ferried by truck to intermodal rail. This engagement will considerably reduce the road-rail imbalance in Europe and the scale of socio-environmental harms induced by motorized cargo haulage.

From Shunting Yards to Rail Ports with Gateway Functions

In this context one domain of traditional rail operations is worthy to focus on: the mundane rail freight interchanges or classification yards, which traditionally perform train shunting and train assembling function. Rail freight interchanges receive and decouple trains, and assemble rail cars into new train sets for travel to new destinations. Due to their traditional rail back yard duty and predominantly national character of rail networks, these depots are usually located outside the trunk track lines, remote from major conurbations, industry clusters and/ or commercial centers generating/ attracting large volumes of freight.

Sea containers for transport across the Baltic Sea. Photo Ronny Klæboe

For the same reason, these rail production stations are seldom linked to other segments of transport infrastructure, not to mention the TEN-T corridors or other international freight thoroughfares.

Since the share of rail in pan-European freight transport has declined sharply due to 2008-2009 economic crisis, some of these rail interchanges either became phased out while others have been closed down and abandoned. In addition, rapid build-up of modern logistics facilities in vicinity of newly constructed roads and highways in Central and South-Eastern Europe rendered these facilities geographically inaccessible and functionally obsolete.

Finally, a third category of rail shunting depots may still remain in operations, but will gain in logistics functionality by connections to European gateway ports receiving imported goods from overseas sources and/or inland navigation centres which consolidate and distribute commodities manufactured in Europe but consumed at remote destinations.

An overhaul of these depots' production capacity and liaisoning with European corridors may dramatically increase rail capacity for intermodal service and, over time, enhance the European logistical capability for consolidating and handling of large freight volumes for rail haulage in competition with road.

For Norway as a country, these rail-multimodal-service-provision stations may provide practical solution for re-structuring its import/export shipments from predominantly road-based towards environmentally more sustainable intermodal sea-rail supply.

This objective could be realized by transforming the railway shunting yards into rail ports or multimodal gateways where goods incoming by sea and overland are consolidated and loaded onto freight trains travelling to Norway and (possibly) Sweden.

The rail port concept derives from a dry port solution whose original task was to reduce containers dwell and turnover time by pushing box storage and handling functions out of harbour facilities to geo-strategic hinterland locations, (Rosso,2007). Relieving of sea ports from box congestion caused a dramatic increase in extra- and intra- European trade over 2004-2007, and fostered the establishment of several regional inland freight stations

- **Duisburg and Nürnberg inland ports** for consolidation of barge, sea-containers and road traffic
- **Västre Götland Logistics Centre Skarabord** functioning as inland service centre handling box traffic inflows at Gothenburg
- **Scottish Intermodal gateways in Rosth and Gragenmount** as inland service relief centres for the ports of Aberdeen and Edinburgh
- **English Haven Gateway at Ipswich** serving the sea ports of Felixstowe and Harwich
- **Seaport Harlingen in province of Frysland** as a-sea-cum dry port relief facility for the ports of Amsterdam and Rotterdam, and
- **Dry port at Lehrte** (near Hannover) as consolidation hub for Lübeck, Rostock and Bremmen

Here, the rail port concept is used as traffic organisation tool for converging large volumes of rail, barge and truck-moved European goods from a dispersed point-to- point pattern towards some, carefully selected regional cargo gravitation centres connected to European main ports and destinations in Norway through intermodal trains.

Analyses of trans-European freight landing at ARA ports (Amsterdam, Rotterdam, Antwerpen) and distributed to European inland destinations done by RETRACK project revealed that although road transport dominates the international freight market the share of rail in carriage of eastward flows exceeds those in westward directions destined for shipments out of Europe..

As shown by the graphics, the purpose is to turn the rail port and/or rail-and-sea-port constellations into gravitation centres towards which the large numbers of hinterland shipments will converge. Establishment of rail ports will reduce the number of transportations links between the latter, European ports and logistics hubs in Norway and/or Sweden.

Connections between sea-ports and rail consolidation hubs are critical for effective access to large cargo landings in a need for downward distribution to wholesale and/or retailer networks. In the same vein, rail ports are also critically depending on access to ports docking stations where containers arrive and where shippers leave intermodal units for later collection and/or ocean voyage

Although these policy measures will not totally eliminate or prevent all CO2 and other poisonous emissions, reduction of local pollution, accidents and air emissions still suggest these socio-environmental motivated efforts are worth a trial.

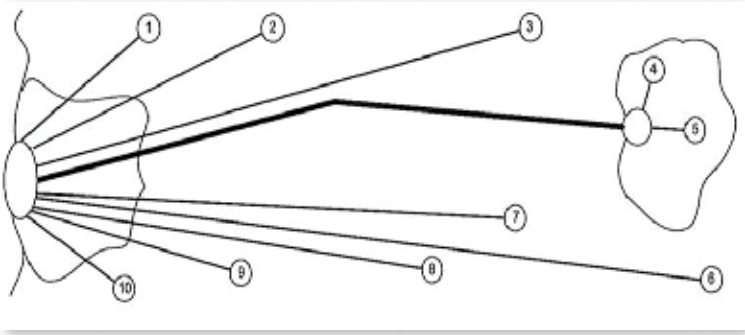


Figure 2: Traditional inland terminal concept which serves flows originating from two geographical locations

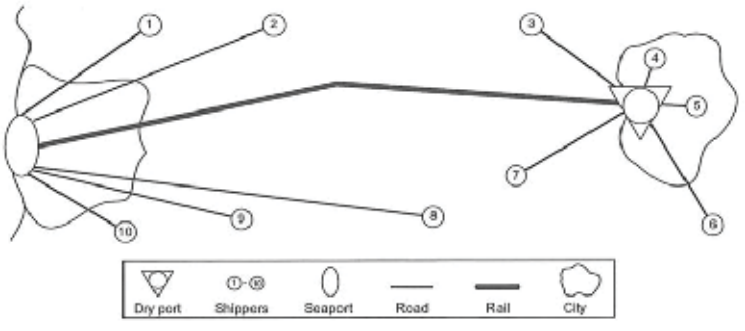


Figure 3: Sea port with a distant dry rail port operating as inland container depot handling cargo originating five shipment stations located within one large city conurbation

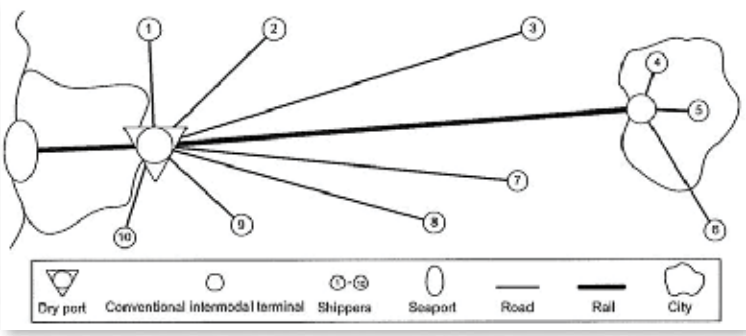


Figure 4: Seaport with a close rail (dry) port

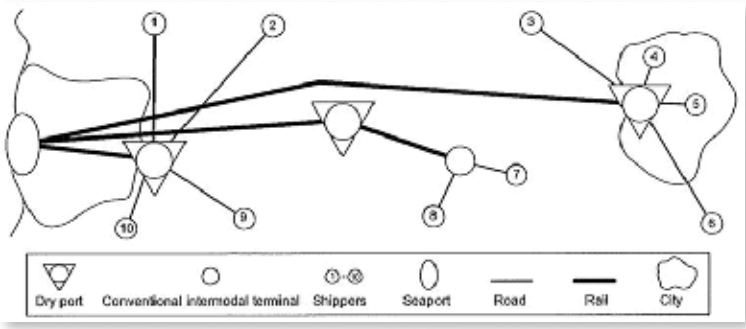


Figure 5: Three rail port concepts with close, mid-range and distant locations from sea port

Shunting Yards' Functionality Enhancements

Since transforming of rail classification yards' into multimodal railports shall take money and time, it is advisable that this process is carefully planned in terms of value adding services, integration with seaport gateways, inland logistic hubs and trans-European corridors and establishment of managerial architecture.

The first step in shunting yards' overhaul process may involve installation of equipment such as mobile cranes, discharge ramps, overhead conveyors, and order-picking-gears needed for handling and lifting the containers and/or other load carrying units. . In addition, the terminal space will have to be enlarged to reconcile the cargo transfer between large numbers of trucks and rail. This will transfer the traditional rail shunting exchanges into intermodal terminals technically capable of receiving and shifting cargo from road to rail, thus reducing the logistical dependence on road. In places where track line electrification is lacking, electrical traction will need to be provided.

The next service expansion stage may involve provision of facilities for sea-and-land-container stuffing and stripping in parallel with cargo storage, handling and processing. The latter may turn these traditional rail interchanges into rail logistics service stations performing cross-docking between trucks and trains, in addition to consolidation of road, rail, barge and seaborn freight.

Addition of cross-docking ramps for containers, semitrailers and swap bodies and construction of warehouse in-frastructure for temperature-sensitive cargo may expand service coverage to all cargo categories flowing through the European mainland. When the ITS infrastructure for inventory identification and follow-up, E-customs and security clearance, and even delayed manufacturing and consolidation of less than container and LTL shipments are added, the next big thing would be the link-up of these logistics stations with the European TEN-T priority axes. Expanding the container repositioning storage, sidings for parking of container undercarriage and/or other rolling stock can also be constructed to increase these assets' availability on short notice. Finally, having in mind that only when large cargo volumes are amassed, these gateways can support operations of scheduled block and/ or shuttle trains, investments in track lines may also be required to make these service plat-forms suitable for handling heavy lifts of maritime boxes (e.g., over 60 feet).

In this connection, investments in augmentation of rail path capacity through increases in other countries' track axle loads (to class C/D for instance), velocity enhancing sidings, and collaboration on ERTMS installation and/or other hardware/ software for automation and capacity increase of interoperable signaling systems may also be considered over time. These improvements may not only remove the bottlenecks hindering seamless freight transfer but also upgrade infrastructure capacity allowing operations of longer (over 600 meters), heavier (over 1,700 tons) fre-quently scheduled trains on corridors connecting Norway with its most important trading partners and/or with freight feeder axes.

A subsequent stage in rail port development will involve equipping these logistics facilities with professional management apparatus as multimodal flows must be reconciled with differences in cargo demand and transport capabilities in terms of capacity and timely availability. A managerial system needs thus to be designed and installed for organization of incoming and outgoing flows, as well as buffer functions between the sea hubs, inland waterways and feeder traffic to/from inductrial zones. Managerial operations have to cater to two different types of dynamics structuring logistics of export and import flows. Export logistics are mainly based on shipment aggregation for upstream supply in highly consolidated fashion. Import-oriented logistics mainly involve de-consolidation arising from the needs for reconciling the inbound load units with commercial flows through assemblying, trans-loading, palletizing and even long-term storage in order to respond to seasonal fluctuations in demand.

For sites not linked with TEN-T axes, investment plans integrating the target nations' railway development schemes with the European Commission's and the European Investment Bank's TEN-T funding programmes may be agreed. Finally, a time frame for transforming of traditional rail shunting depots into sophisticated logistics centers for goods ferried by road, barge and sea-going vessels and feeding them into the rail European trunk system for transfer to Norway needs to be exacted.

Needless to say, both the scope and the types of these investments would need to be adjusted to geographical specifics of the focal operations sites, considering their distance/vicinity to the sea-ports, inland-waterways' load centres, other freight sourcing repositories, plus the quality required for handling all cargo categories shipped to Norway.

European Ports, Inland Rail Ports and Logistic Network Integrators

However, in parallel or even before the technical upgrades of logistics railports are designed, investments started and internal managerial apparatus put in place, the focus of this policy's efforts should be on attracting the OSTIS (Ocean& Short-sea Transport Intermediaries), the block train operators and European logistics network integrators. The latter include freight forwarders, customs brokers and non-vessel operating common carriers (NVOCCs) and 3/4 Logistic Service Providers (LSP), who move and serve international overland freight traffic dispatched by shipping lines to European ports and harbours. As the substantial part of the Norway-bound high-value cargo is ship-borne and arrives at European North Sea ports of Rotterdam, Hamburg and Bremerhaven for cross- Europe distribution before embarking on northbound journey, the relationships between these parties have implications for selection of consolidation hubs serving maritime containers before and after re-routing to regional destinations. Professional decisions of these parties will to considerable degree bear upon the likelihood of whether or not the newly refurbished intermodal service hubs will attract large cargo volumes needed for supporting shuttle and/or block train traffic to Norway. Basic services of OSTIS include documentation compliance for export and import clearance, capacity booking on behalf of their clients, consignment planning for landside and/or inland navigation, container de-consolidation (including container packing and breaking), provision of value-added service and dray-age to end users. The fact that these intermediaries' are vertically integrated with shipping lines makes them capable to push the container logistics out of harbors towards hinterland service hubs and/or dry ports for consolidation of maritime and overland shipments before schedules to final destinations. How the OSTIF and the Europe-wide network integrators, such as DB Schencker collaborate with Maersk, Hapag-Lloyd, Evergreen, ZIM and/or COSCO calling at German North Sea ports of Hamburg and/or Bremerhaven may either foster or damage business fortunes of the newly upgraded rail ports. Figure 4 illustrates working relationships between these parties who first, receive maritime and overland freight boxes on behalf of shippers and consignors, then consolidate the commodity-specific container traffic at European hubs before breaking them down into load dispatches destined to regional and sub-regional service centres and onward to national logistics service depots and/or retailer outlets.

Figure 7: Hamburg harbour – rail freight terminal (presentation picture Hamburg Port)

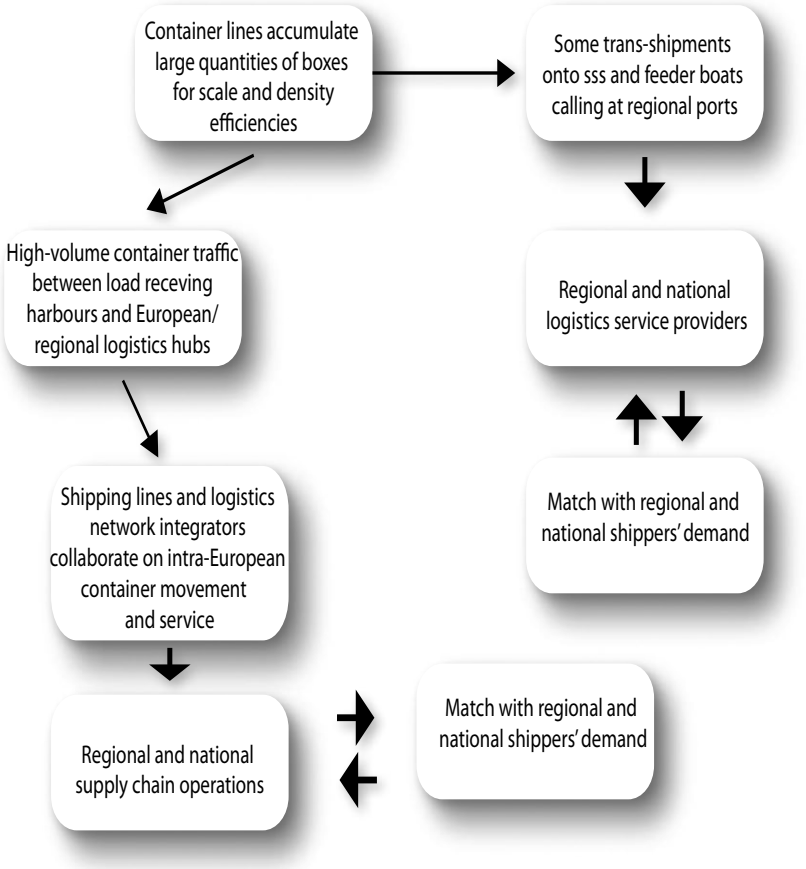


Figure 8: Two pronged freight flow management through Europe

Figure 8 shows a-two-pronged pattern in sea-born container flow distribution after arrivals at European harbor docks. An overwhelmingly larger portion reaches major European hubs for service and re-routing to regional destinations. A considerably smaller flow is transshipped at large harbors onto feeder and/or short sea vessels for travel to more remote European regions (such as Scandinavia and/ or Russia) for intra-regional logistic service and distribution.

DB Schencker and other large European scale logistic operators rely primarily on human resources and vast geographical service coverage for growth in size and scope of logistics networks and business bonds with shipper clients. Working links with container lines enable them to capitalize on demand for intermodal transport moving cargo between harbors docks and inland destinations. By taking over large volume container traffic, they consolidate loads for shuttle trains to which they sub-contract hub-to-hub transport, and thereby control the train operating companies. In addition, they bridge the piecemeal structure of supply chains and thereby spare the shippers or consignors from separate agreements with single-mode carriers. Finally through door-to-door freight supply along entire shipment trajectory based on single consignment contract they apply a particular shipper perspective into organization of supply chains. Accommodation of their clients' needs through a myriad of geographically integrated and commodity-tailored logistics service lines, rewards them with market power which confers discretion over choosing locations, facilities and modes for load consolidation, handling, storage, transfer and delivery.

Seldom (but not always) the decisions about logistics network design and modal composition of transportt flows travelling across pan-European corridors are taken from the perspective of final destinations. Even for Scandinavia, the structuring of logistics operations is done with an eye on regional incoming flows and needs for reconciling imbalances between inbound and outbound container numbers, but not the specifics of national traffic.

Summarizing, the likelihood that Norway-bound shipments will travel daily by scheduled shuttle or block trains will increase when the inland repositories of maritime and European containers are linked to bulk-breaking centers serving truck-ferried goods and when these are loaded onto ITS –equipped trains providing freight visibility along the entire travel trajectory and possibility for on-line inventory management.

Rail Ports' Economic and Environmental Benefits

When the seaport facilities are relieved of container storage, handling and repositioning, they may use the newly re-gained space for improving the stevedore services, reducing container dwell time, and increasing numbers of trains shuttling between the docking areas and the inland service centres such as rail-cum-dry ports. When efficiently connected to large-scale hinterland markets, the dry ports may even allow for operations of longer/heavier trains (exceeding 15 tonne/axle and 700 meters) between multiple international locations.

Container relocation benefits may thus relate to modal shift from road to rail, reduction in congestion at seaport gates, within the seaport service areas and the immediate harbor surroundings. Since one train can substitute roughly 35 trucks, it can substantially reduce the negative socio-environmental externalities of motorized traffic. The other positive outcomes may arise from expansion of dry ports' hinterland which, thanks to amassing higher freight volumes can offer shippers lower costs and higher level of service. This value offering may even attract some traditional truck-ferried cargo over to middle-range rail haulage (Rosso, 2006).

Benefits for Norway

Because 90 p.c. of Norway-bound consumer goods is sourced at European mainland and originates either from extra-European or intra-European trade, higher quality of trans-European transport infrastructure will confer considerable benefits for Norwegian consumers, logistics service providers and transport operators moving high-value goods to Norway. These benefits will emerge from lower level of congestion, higher speed of freight movement, ICT-enhanced efficient freight transfer, and lower inventory costs due to shorter transit time.

TEN-T and ERTMS investments expand the national railways networks by linking together international and inter-regional goods production and sourcing centres. This opens new opportunities for railways to serve regional freight markets demanding long-distance cargo haulage. All these outcomes will boost rail competitiveness in the European freight market, and considerably improve the socio-environmental profile of Norway as a country with environmentally sound freight transport. By streamlining traffic flows, increasing tonne-kilometers of undisrupted rail transfer, these inland logistic centers may also generate many second-order benefits for European shippers and citizens.

Thus, the Norwegian investments in overhaul and expansion of traditional rail shunting depots may produce sophisticated logistics centers that will economically support the environmental benefits making greener transport alternatives to Norway also commercially viable. The latter is essential for attracting interests of logistics integrators who consolidate and manage large volumes of high-value cargo.

Over longer time perspective, the Norwegian public means may also be channeled to increase the gauge clearance accommodating high cube containers on other nations' rail networks fostering thereby longer haulage (over 1,500 km) of large volumes highly consolidated maritime cargo and the subsequent reduction of unit tonne-km cost of rail freight.

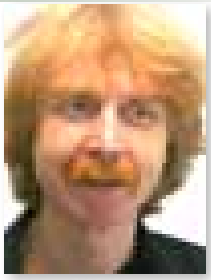
Although the selection of rail port locations should be decided by logistics service cost-effectiveness, the Norwegian government may also seek collaboration with regional development agencies of the countries where the focal installations are/could be located. This will integrate these sites into the enlarged Norwegian transport infrastructure development, widen the scope of collaborative engagement and attract additional alliance partners. One candidate for ally is the Swedish transport administration which already succeeded in transferring considerable volumes of container traffic out of Gothenburg port to hinterland logistic centers and thereby considerably decongested and de-carbonized the inland distribution of overseas freight (Roso et al, 2007).

Figure 9: Gothenburg deep sea harbour with terminal facilities and large cranes for handling large containers. Photo: Are Wormnes.

As a result, additional direct and indirect investments projects can be added to the Swedish government's transport plan.

All together, Norwegian investments in development/overhaul of multi-modal inland dry ports may foster large-scale volume shifts towards eco-friendly rail goods transfer over entire Europe. Given that that this will result in a reduction of the volumes carried by motorized long freight haulage, it will also reduce the socio-environmental harms associated with truck. In this respect, this Norwegian environmental policy initiative may directly contribute to fulfillment of the European Transport and the Environmental Protection Policies, and thereby benefit all European citizens.

Finally, the demand for infrastructure funding in Europe has grown rapidly since 2009 due to the financial crisis. This forced many governments to divert national money to financial institutions and industrial activities. The large budgetary deficits that emerge as a consequence of these placements caused a high level scarcity of public capital in, among others, rail sector. In this situation, Norwegian authorities stand a good chance of making profitable deals which may enhance both the environmental sustainability and the economic efficiency of Norwegian freight transport.



Dr. Jan S. Fuglestvedt leads work package 1, and in charge of the research input on GHG emission modelling

Climate Research Motivation for Modal Shift

Improving the connectivity and robustness of surface freight transport between Norway and our most important trade partners, and reducing the cost of freight transport, serve Norwegian regional, trade, competition, and business policies. Facilitating sustainable rail freight solutions with good service quality can also be seen as strengthening Norwegian freight and logistic industry. Here we focus more narrowly on the climate case for promoting modal shift.

Inventories of measures to reduce Green House Gases (GHG) often rank them according to their cost-effectiveness. Measures that cost relatively little to implement relative to the amount of GHG reductions accomplished, should be implemented first.

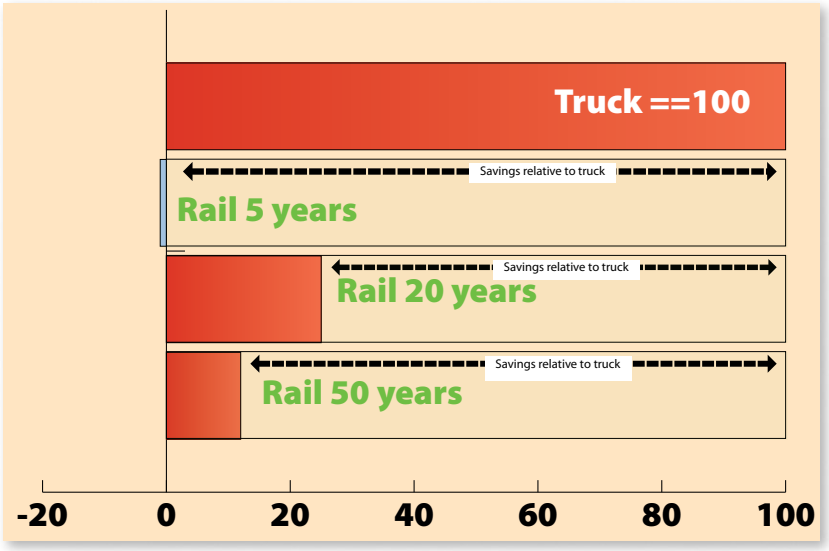


Figure 10: The relative global warming effect of each tonne-km hauled by intermodal rail freight transport relative to heavy duty truck when accumulated over three time scales. (After: Borken-Klefeldt, Berntsen, and Fuglestvedt 2010)

Such rankings don't automatically take into account other effects than GHG-emissions. However, it is well known that shifts from long haulage truck to rail have a number of additional beneficial socio-environmental effects, such as quality of life associated with reduced noise and vibrations from transportation, improved pulmonary and respiratory health associated with lower concentrations of particulate matters, and reductions in toxic and carcinogenic compounds.. Reduced risk of cardiovascular diseases and fewer fatalities, and serious injuries due to road accidents are additional important motivators for reducing the number of heavy goods vehicles.. Such benefits could be incorporated into narrower-scope cost effectiveness calculations by letting these policy areas cover part of the "cost" of the GHG measures .

Mode specific GHG-emission figures are often provided as the weight of the emitted gas or compound per unit of transport work (tonne-kilometre). However, this approach fails to take into account the time history of direct and indirect effects of the different emission components and their interactions with atmospheric/photo/chemical processes. Here the work in TEMPO WP1 provides new insights. By applying new methodological and modelling approaches the warming impacts over different time horizons can be assessed directly. Considering emissions produced from passenger and freight transport during a calender year as an impulse, and multi-year emissions as a train of such impulses, the net accumulative warming effect of added global emissions from surface transport can by calculated for various future points in time. For surface transport the relevant figures are illustrated – See Figure 10.

Rail transport is shown to have a warming effect over fifty years of only 15% that of long haulage truck transport. Or to put it differently – on connections and routes where it is possible to transfer goods from road to rail, double the freight can be carried with 30% of the emissions from the haulage itself. The calculations are for relative and not absolute performance. This should mean that the benefit calculations are more robust against model changes than the absolute figures. What can change is the time history and the points in time when the benefits materialise themselves.

Business Case for Intermodal Rail Freight Transport

Logistics industry practice indicates that as compared to truck, railways are more cost-efficient at moving large volumes of recurrent cargo over long distances, such as those travelled by inland and maritime containers in inbound traffic to Norway. At the same time, however, research shows that rail intermodal scores much worse on transit time and reliability in international transport as compared to door-to-door truck and, that this can be an important factors causing that almost 90 p.c. of goods imported over land to Norway still enters the country by road (http:// www.reorient.no).

Financial consequences of poor transit time consistency and the lack of supply punctuality may be quite grave in terms of loss of business confidence and financial liability. Railway professionals and managers often mention not only ruptures of supply contracts but also legal liabilities for business losses incurred by stock-outs, severed production continuity or downtime of manufacturing lines which they have to pay for .

Yet despite substantial quality shortcomings, intermodal container transport between the European landing ports and regional hinterland hubs represents the most rapidly growing revenue stream for the European railways (www.retrack.eu). Though per-container-profit margins in intra-European trade may be lower than those generated by intermodal block trains carrying loads between harbours and inland logistics gateways, the REORIENT project has documented that rates for rail haulage of TEUs with high-value cargo such as foodstuffs and manufactured articles shipped between 10 pairs of EU- countries exceeded those received by truckers (http://www.reorient.no).

This shows that rail intermodal competes with motorized transfer for long haulage of high-value cargo. However, this competition occurs on unequal footing because railways suffer from lack and/or poor quality of infrastructure, rolling stock and access to regional inland gateways, port terminals and intermodal freight consolidation depots. Yet, pressures to compete in the European freight market force railways to reduce cost of operation, increase level of service and production capacity. Thereby, the rail-generated competitive advantage of much lower than truck average tonne-km cost can be unlocked for the good of Norwegian and European shippers, logistics operators, citizens and ecosystem. In this context, availability of and access to new/ more modern and better located rail logistics service facilities may motivate logistics companies who typically handle freight on behalf of European shippers to increase their reliance of rail for higher volumes of international shipments.

Containment of road transport dominance will thus require that European logistics industry, which influences modal split of goods transferred within Europe, draws to higher degree its competitive advantage from rail transport offering lower (than truck) tonne-km cost for freight haulage over 1,000 kilometres (http://www.reorient.no).

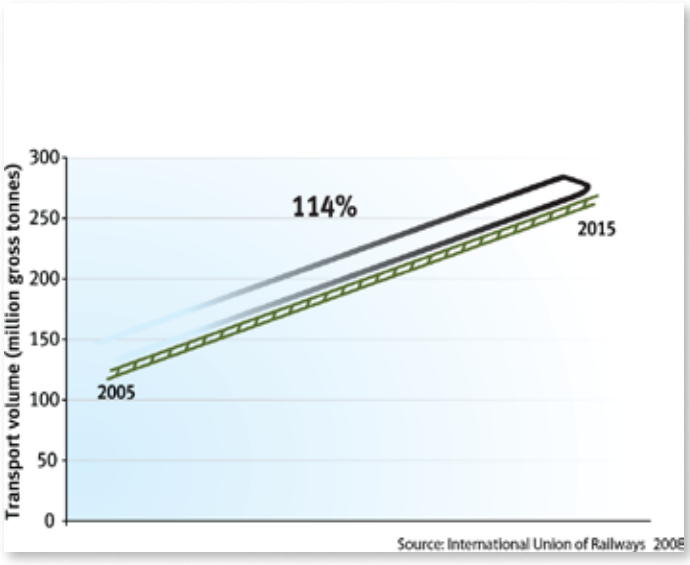


Figure 11: Projected growth from the rail industry.

Institutional Framework for Norwegian Green Investments

Considering that the Norwegian sustainability policy aims not only at curbing the country's domestic GHG emissions but also the European-level environmental pollution, it is reasonable that Norwegian authorities engage themselves in development of freight handling infrastructure at strategic geo-locations where cargo destined for Norway could be consolidated, handled and trans-loaded onto rail. As mentioned, reasons for such policy interventions are both strategic and environmental.

Strategic justification derives from the fact that decisions affecting modal composition of international and domestic freight transport in Norway are taken by global shipping lines and large European logistics companies which bring goods from overseas sourcing sites and distribute cargo to regional and national destinations at European mainland. The same companies perform also logistics on behalf of European manufacturers which supply the pan-European market by designing and executing of freight distribution at regional and national levels.

The environmental rationale stems from the needs to reduce not only the carbon emissions generated by Norwegian national consumption but also by long travel that goods destined for Norway undergo during supply from external production sites and/or sourcing locations. To prevent that this policy initiative invokes reservations from the target country government(s), it will need to be subjected to broad consultations and agreements with the recipient nations' administrations in addition to the EC and regional institutions responsible for enforcement of environmental and socio-economic cohesion programs within the area of interests. In this respect it we consider how the transport infrastructure projects which already are under implementation and/or in the planning modus may affect the sourcing patterns and freight transfer solutions in Norway-bound trade.

Growing demand for goods manufactured at and/or imported from European mainland makes Norway highly dependent on technical, economic and social feasibility of existing and forthcoming European transport investments. The TENT-T Nordic triangle rail/road axis and the "Rail Baltica" line shall upgrade the inter-regional rail/road networks to higher speed, increasing thereby the freight-flow-capacity and reducing travel time to production and import sites at European mainland.

However, new infrastructure investments such as the second Øresund bridge, Motorways of the Sea linking North Sea, Baltic Sea and the Barents Sea regions together and Fermarn Belt Railway Intermodal fast link shall expand the existing networks with new overland and sea-land-connections bridging Germany, Denmark, Sweden, Russia, Poland and the Baltic countries together into one intermodal transport infrastructure system. These investments shall access new sourcing and manufacturing centres in North-Eastern, Central and northernmost Europe. The new intermodal thoroughfares equipped with ICT- traffic management systems may not only alleviate congestion and time losses for the existing Norway-bound trade but also change the sourcing and trading patterns and thereby, markets feeding the north-wise supply chains. Re-routing of freight streams from the existing mainly south-western trade lanes towards North-Eastern and Central European locations may ultimately reduce the freight travel distances and open for rail freight which due to lower functional risk levels could move goods more efficiently and (perhaps) also more cost-effective. Besides, the six trans-European corridors to be equipped with ERTMS for south-north freight travel across European mainland will increase capacity for European railways with relatively limited resources, and thereby bring large logistics and strategic benefits to Norway through improving rail connections with the existing business partners. Given Norway's dependence on international traffic, an efficient international transport system

Figure 12 Map of Via Baltica Ten-T project(s).

consisting of interoperable national networks and interconnect all modes' operators will serve Norway-bound trade well. In addition, the European Commission's initiative to prioritise freight on lines that combine passenger freight transport may also make Norway-destined trade to travel more efficiently. Provision of dedicated infrastructure for large freight volumes either in the form of reserved path and time widows or through prioritisation of freight-trains on busy international goods movement lanes will reduce transit time for all shipments and reduce inventory costs for Norwegian consumption products provided rail manages to increase its share of Norway-bound high-value flows .

In this context, upgrading of the existing systems through installment of new rail logistics centres will add to consolidation of freight in and around large cities, and can in many cases be the cheapest way to streamline the freight transfer and reduce environmental pollution. Given the overarching consensus between the Norwegian and the Common European Transport and Environmental Protection Policies both seeking to reduce the scope and the scale road transport to the advantage of environmentally more responsible rail intermodal and/or short sea voyage, Norway's participation in these initiatives will enhance its own interests. More specifically, the Norwegian external rail investments may also enhance its political clout from alliance with Sweden and Denmark (through which the most of the Norway-bound freight transits), and who are EU members highly committed to European environmental sustainability.

Two collaborative vehicles recently established for improvement/ modernisation of transport (road and rail) infrastructure within the Nordic countries and between their northern neighbours may institutionally accommodate the above policy initiative. The first is the Nordic Axis partnership between the Nordic countries, Belarus and Russia's Barents Sea Region. The second is a collaboration between the Baltic Sea Region countries which, in addition to Poland, the Baltic States, Russia and Germany, also includes Nordic states (eu.baltic.net)

The Northern Axis Partnership composed of the member states' transport ministries has been formalised in 2010 through an inter-governmental accord. As a result, an agreement with the Nordic Investment Bank has been signed and a secretariat will open in Helsinki in spring 2011.This partnership shall identify and select horizontal projects for national investments, which will improve the quality of transport infrastructure connecting its members. At the present stage, this collaboration does not foresee investments in other countries' transport infrastructures, restricting itself merely to development of joint procedures for managing border-crossing traffic, and (possibly) criteria for evaluation of national projects.

Against this backdrop, the Baltic Sea Region Collaboration is

Figure 13: The Fehmarn Belt link can be designed as a two-level composite bridge in steel and concrete. Trains will run on the lower deck with cars on the upper deck. Illustration: Fehmarn LInk A/S.

an institutional arrangement which aims at the enhancement of the region's economic performance through considerable investments in transport links. This collaborative vehicle adopted clear-cut goals for integration of the member states' long-term infrastructure and transport planning as a measure preceding joint selection and funding the transport projects with region-wide socio-economic impacts. The recently published EU Strategy for the Baltic Sea Region (EUSBSR) signifies investments in sustainable and "smarter""transport as policy instrument fostering regional growth, economic integration, social convergence and protection of natural environment. An Action Plan for Baltic Region Development intends to involve the Structural Funds Managing Authorities in addition to other public and private actors in mobilisation and discharge of E-funding in addition to other financial schemes. The Ministry of Finance of Republic of Lithuania together with the Swedish Agency for Economic and Regional Growth (Tilväxtverket) and the Swedish International Development and Cooperation Agency (SIDA) are all involved in alignment of different sources of funding for attainment of the EUSBSR's transport policy goals.

Both institutional vehicles can provide collaborative and organisational platforms for accommodation of the Norwegian external investments and regulation of this policy legal format, technical scope and market focus.

Private-Public Partnership Options

Depending on the legal status of transport infrastructure in the target countries, Norwegian authorities may strike three types of public-public and/ or private-public partnerships. Both the World Bank and the EC have identified these types of partnerships as effective financial instruments for increasing the capacity and quality of transport infrastructure as well as service level of trans-European network projects: joint ventures, concessions and hybrid arrangements. In the hybrid projects a public SPV (special purpose vehicle) is in control of the overall project. Depending on the investment project, each of these instruments offers different forms of engagement and control mechanisms.

European research on development of trans-European corridors shows that policy interventions such as eco-friendly investments mobilised through legal and financial instruments of public-public and/or private-public partnerships (PPP) can be used to contain the socio-environmental harms afflicted by truck transport (COM (2009)44 final).

Policy hearings on the level of social support for financing and implementation of trans-European corridors and TEN-T projects provides clear recommendations on how to organise the different phases of the PPP process in order to deal with the possible barriers and allocation of specific risks among partners. Advises related to user charging and assessment of network-level effects in cross-border projects with both private and private parties have also been provided by research on trans-European corridors.

Although Norway is not a member of the EU's TEN-T programme, it "participates" in its Nordic Triangle Project by nationally funding Oslo-Svinesund-Stockholm rail/ road networks.

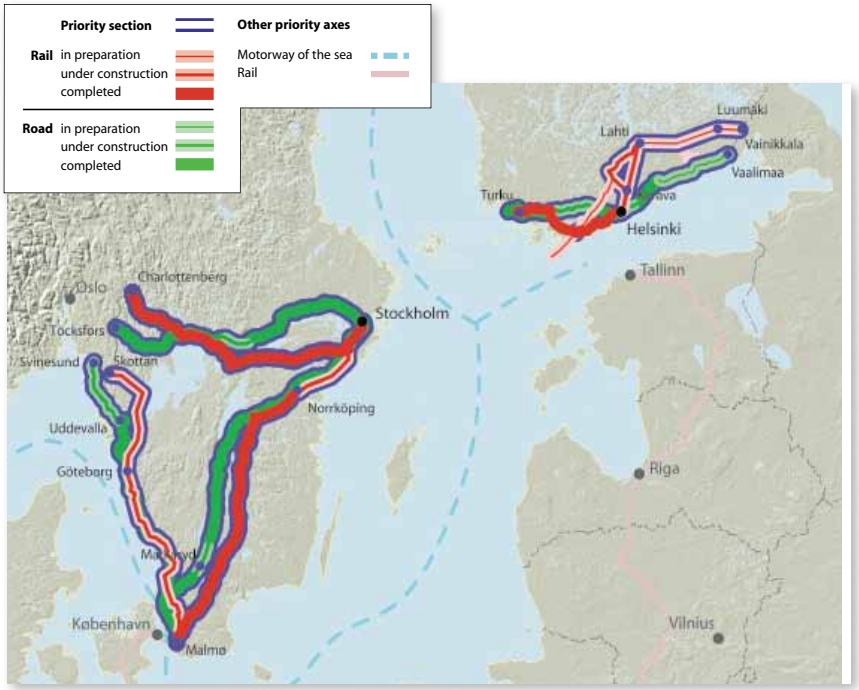


Figure 14: TEN-T investment projects: Completed and in Progress – Nordic Triangle

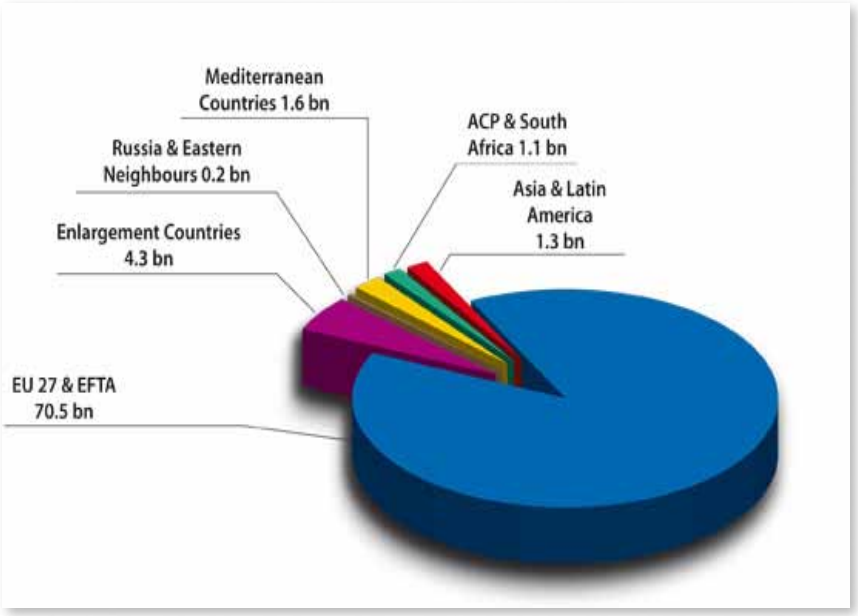


Figure 15: European Investment bank investments in EU 27 and outside

From Governing to Governance

The Norwegian authorities's external policy outreach towards private and public stakeholders may find compelling precedence in contemporary European sectorial policies which have been profoundly transformed as regards focus, instruments and modes of enforcement. One such instance is the EU's environmental policy which over the past decade has drifted from predominantly governing to governance (Peters, 2006). Governance means that policy formulation, implementation and enforcement happen to a lesser degree through "topdown" regulative ordains. Rather, horizontal measures such as economic incentives, self-regulation and voluntary agreements combined with enhanced public participation and rising of social awareness have gained ground (Knill & Lenschow, 1999).

The participatory modus opened possibilities for collaborative engagements with significant stakeholders from the late-modern society. Especially in the field of environmental protection and ecological sustainability, contemporary public policy has been both formulated and enforced through formal, informal, permanent and ad-hoc instruments fostering extragovernmental involvements. Sjöblom (2009) argues that more frequent use of non-permanent and collaborative structures such as negotiations, cooption, and engagements reflects social demands for more open government, which also is effective at achievement of tangible results.

Governmental programs, partnerships, joint ventures and other inclusion initiatives aim at outcomes whose attainment depends on collaboration and alliances with actors from the different sectors and levels of society. However, the new policy devices which achieve public goals through interactions with non-administrative agents received little attention from research on contemporary environmental policy (Sjöblom, 2009).

New governance policy measures have also been used in promotion and enforcement of long-term sustainable transport (Spangenberg, 2004). The growing stock of government-run programs encompass tools that allow for quick and precise interventions and/or highly targeted responses to particular problems (Sjöblom, 2009). These action-focused policy measures allow governments of forming task forces, networks and partnerships with stakeholders endowed with resources, competencies and power requisite for dealing with particular issues.

As mentioned, at least two drivers institutionalize proliferation of governance measures. First, accountability requirements make that when budgets, measures and time frames are pre-defined, the effectiveness of interventions aiming at specific outcomes is easier to assess with regards to anticipated effects. Second, growing recognition of environmental concerns at European level (exemplified by e.g., climate change and pan-European pollution) requires that governments in different countries engage with and seek support from at least five types of stakeholders: supra-national institutions, regional collaboration organizations, local administrations, semi-public bodies and industry (Marden, 2006; Pierre and Peters, 2000).

2001/12/EC
Access rights for international freight services. Independence between RUs and IMs
Separation of accounts for passenger and freight operations.
Separation of transport operations from capacity allocation, infrastructure charging, and licensing

2001/13/EC
Licensing of RUs

2001/14/EC
Allocation of railway infrastructure capacity
Levying of charges for the use of railway infrastructure. Safety certification

2001/16/EC
Technical Specifications for Interoperability (TSIs)

Links to EC Infrastructure Investments

The Trans European Network (TEN-T), consists of corridors spanning two or more European regions. The surface corridors encompass both road and rail. A criticism has been that funding and prioritization was left too much up to national priorities and not focussed enough on providing the EC with a core network. More recently the EC and Member States have delineated a serios of Priority Projects.

Before 2020 it is expected that in all € 395 billion will be have been spent on 30 priority projects. The projects that are of most interest to Norway are:

PP01 Berlin-Verona
PP11 Øresund (*completed*)
PP12 Nordic Triangle
PP20 Fehmarn belt
PP23 Gdansk–Vienna
(accessible via ferry from Karlskrona)

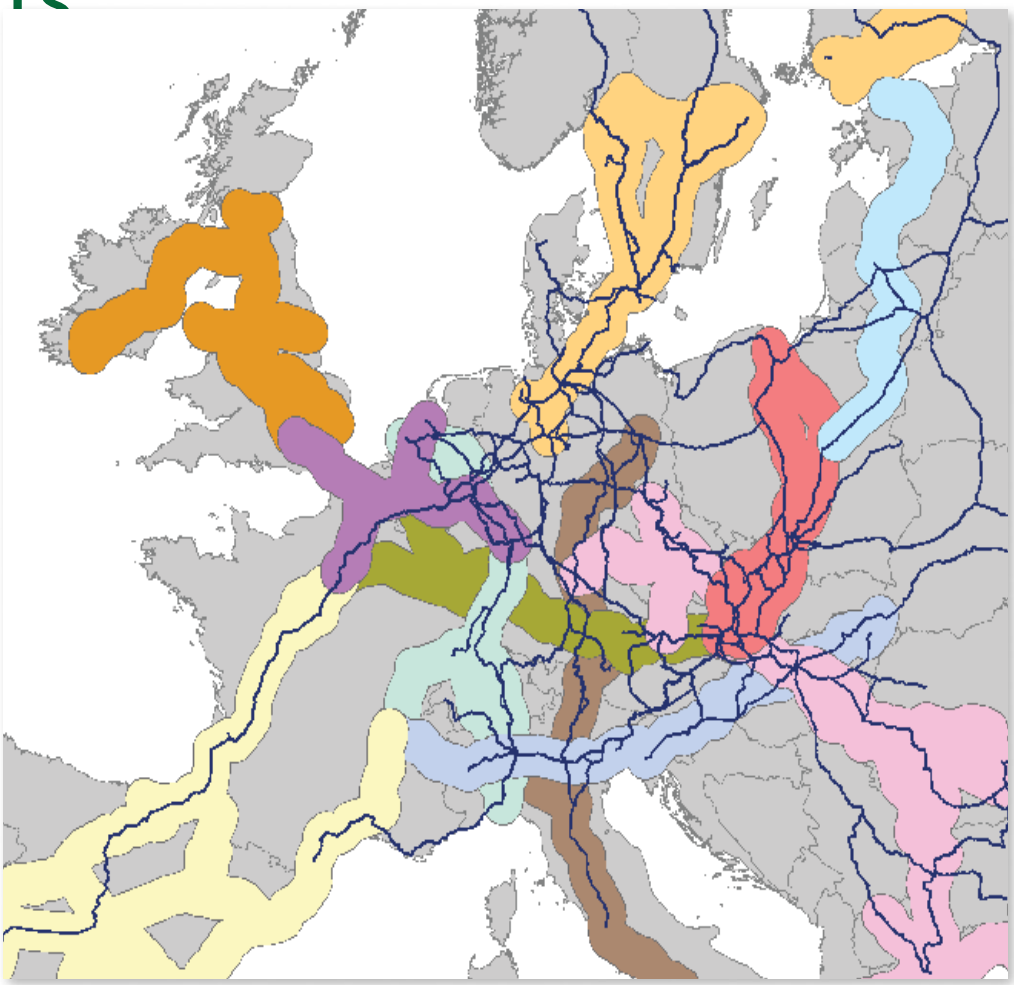


Figure 16: A survey undertaken as part of the REORIENT project among leading forwarding companies in the EC demonstrated that conseignment routes for typical shipments follow TEN-T corridors. The implication being that improvement in the TEN-T network will improve service quality and reduce costs

Table 2: Previous and future investments in key infrastructure projects linking Norway to Europe

EXCERPT

Priority Axis	Member State(s) involved	End of works	Total cost in € million	Total invested before 2009 in € million	Total estimated investments for 2009 in € million	Total foreseen investments 2010-2013 in € million	Total foreseen investments after 2013 in € million
PP01 Railway axis Berlin-Verona/ Milano-Bologna-Napoli-Messina-Palermo	DE, AT, IT	2022	51,849.97	26,919.49	1,916.57	9,694.90	13,319.01
PP11 Øresund fixed link (COMPLETED)	SE, DK	2000	2,700	2,700	-	-	-
PP12 Nordic Triangle railway/ road axis	SE, FI	2020	12,738.61	7,069.82	622.35	1,556.84	3,489.60
PP20 Fehmarn Belt railway axis	DE, DK	2020	7,363.64	232.46	158	1,822	5,151.18
PP23 Railway axis Gdańsk-Warszawa-Brno/Bratislava-Wien	PL, CZ, SK	2025	4,450.15	2,668.97	51.95	1,105.25	623.99

ERTMS Corridors

The structural changes in the European rail networks (cfr. Figure 17), opens up for transporting higher freight volumes over longer distances thus favouring rail. However, the service quality and performance of the stretches are also crucial.

Technical improvements of European rail infrastructure are mandatory for unlocking the competitive advantage of intermodal freight transport over truck, develop rail capacity for coping with high growth in international freight traffi c, and improve productivity of railway undertakings (RUs).

The EC have proposed the following six trans-European ERTMS corridors:

- A Rotterdam – Genova (Italy)
- B Oslo-Stockholm- Bologna
- C Antwerp-Basel/Lyon
- D Valencia-Ljubliana(Slovenia)
- E Dresden-Budapest
- F Duisburg- Terespol/Medyka (Poland)

These serve as experimental axes for implementation of ERTMS, network capacity enhancement, establishment of new intermodal and logistics service terminals and improvement of infrastructure parameters contributing to higher train length, axle load, loading gauge, and max speed.

For Norway, corridor B Oslo-Stockholm-Bologna with extension to Napoli and common intersections with corridors A, C, E and F is a crucial pipeline for rail freight movement.

SuperGreen networking action

Whereas the TEN-T rail network defines the available core infrastructure of rail freight transport in Europe, the sustainability of the train operations depend on the coordination between infrastructure managements, incumbent and new railway undertakings, the efficiency of the managment and signalling system, and the tiers of logistic management. An EC coordination and support action SuperGreen seeks to define Key Performance Indicators for what constitutes sustainable operations on the network. Data collection and analyses will be confined to some example corridors. For a map of 15 pre-selected corridors see Figure 18.

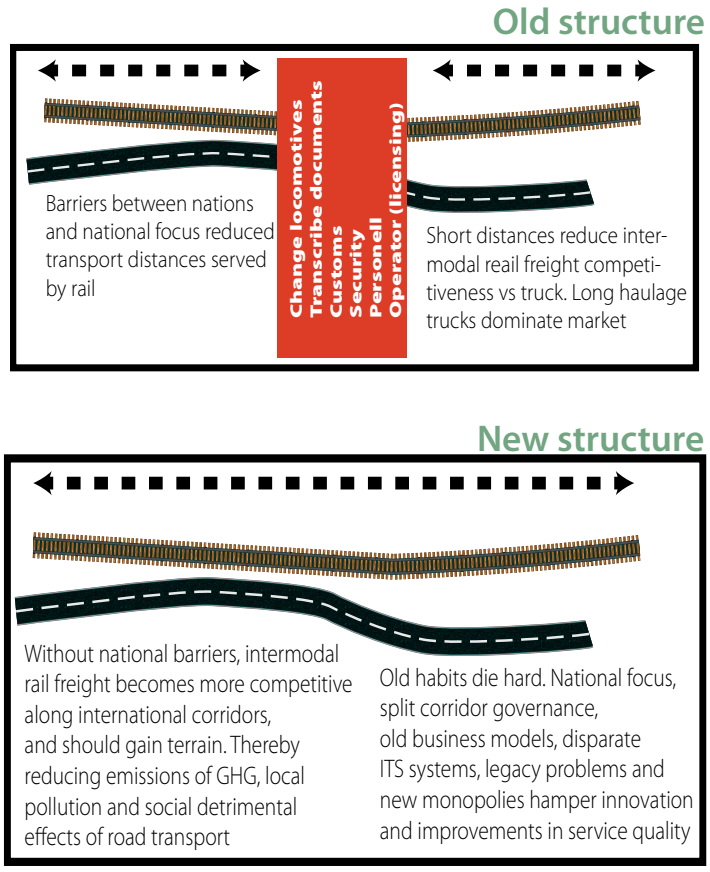


Figure 17: Changes in the spatial structure of international rail freight transport

Figure 18: Preselected corridors in the SuperGreen project

How to make it happen
European Projects and International Initiatives

A broad set of issues need to be addressed to achieve significant shifts from road to rail. Green international freight corridors cannot usefully be established through, uncoordinated efforts. Their implementation require a concerted, multi-layered approach. Here, international cooperation, trade, regional development, infrastructure and transport services are seen in conjunction and developed longitudenally. Measures need to be focussed spatially and temporally and tailored to achieve required service levels and match projected flows. Corridor projects have multiple beneficiaries and multiple contributors with conflicting interests. It is difficult to see how this type of project can materialise without high level negotiations with respect to sharing the financial and organisational burdens, finding compensation mechanisms, overall solutions that work, and that distribute benefits and costs so that Green Corrdidors becomes politically, financially, and organisastionally feasible.

The approach taken by TEMPO task 4 mirrors the approach taken by large international EC-projects such as REORIENT, TREND and RETRACK facillitating the establishment of new intermodal rail services on European Transport corridors. This is a also a perspective that acknowledges that solutions must be negotiated beween Norway and EC-Member States, regional authorities, and transport and terminal service providers.

How then to proceed? The first steps are obviously to forge relationships with stakeholders and parallell projects working towards similar and related goals. We list below several large European collaborative ventures whose participants, competencies and resources may be useful for the implementation of the TEMPO Task 4's concept of Rail Ports.

SUPERGREEN

http://www.supergreeproject.eu

SuperGreeen is an EU co-funded collaborative support action aiming to promote environmentally less invasive and socially less harmful freight transport & logistics in Europe through applications of technical, economic and social innovations. The project shall develop a set of key performance indicators qualifying for the Green Seal CRITERIA to be used for classifying transport corridors i.e., their infrastructure, operations and/or service provision facilities in terms of environmental sustainability and ecologically conscious management in order to guarantee at least eco-neutral impacts. Standardised KPI values shall then be incorporated in various policy instruments that national and/or European regulators may use to enforce implementation of "green" logistics hardware, software and systems management. Application of "greener" solutions shall not however compromise commercial and financial standards required by shippers and/or other logistics service end-users from providers of ecologically sustainable freight transfer, storage and supply. The project encourages practical usage of the following technical breakthroughs:

Green technologies involving new propulsion systems, alternative fuels for powering of vehicles, rolling stock and sea-going vessels, cooling and heating of freight en route and in rest at warehousing and storage facilities, less-energy intensive hoisting and lifting solutions for cargo handling, trans-shipments and stowage.

Green materials for infrastructure construction, exploitation and maintenance, building of powering units, assemblage of load carrying platforms and/or containers capable of multiple and versatile usage.

Miniaturisation techniques, nanotechnology and commercial innovations in order to reduce consumption of materials, energy and space in load carrying equipment, storage and handling facilities, and packaging.

"Smarter" ICT solutions for more efficient organization, management and planning of supply chain operations contributing to better utilisation of storage and warehousing installations, energy savings and lesser emissions from motorised freight carriage.

SoNorA

www.sonoraproject.eu

SoNorA project (South-North Axis) is a large transnational cooperation network co-financed by the European Region Development Fund within the framework of Central Europe's Growth Programme. The network works on improvement of transport connections between the Baltic Sea and the Adriatic Sea regions connected through a set of intermodal axes. The project seeks to facilitate investments in multimodal transport infrastructure for environmentally sustainable logistics to better serve the trade flowing between the northern territories of Central Europe and Italy's Veneto Region. SoNorA partners include 25 participants from Germany, Poland, Austria, Slovak

Republic, the Czech Republic, Hungary and Italy and 36 associated institutions representing higher education/research sectors and governmental administration. During the first 1 ½ year of its life, SoNorA produced a position paper which proposed considerable revision of the TEN-T Network investments plan taking into account the enhanced demand for environmentally more sustainable transport from rapidly growing central European regions of Poland, Hungary, Slovakia and Austria and the corresponding needs for transport infrastructure. These postulates have been well received by the TENTEA, the European agency responsible for TEN-T infrastructure development. The relevance for the TEMPO consists in SoNorA's ability to establish transnational coordination mechanisms for joint planning and effectuation of transport infrastructure and corridor management projects.

The SoNorA- stimulated investments shall cover the corridor segments cutting across several participant countries as well as territories of individual partners. These schemes shall be funded through the TEN-T budget, the EU's structural and economic cohesion programmes as well as individual participant's budgets. A Joint Statement of the Nordic-Baltic Ministers of Transport on Commission's Review of Trans-European Transport Network Green Paper was adopted in Riga, Latvia on September 11th, 2009 September.

Through this collaborative initiative, transport ministers and the high-level public servants from transport ministries of Sweden, Norway, Denmark, Iceland, Latvia, Estonia and Lithuania committed themselves to agree on principles for defining common needs for development of particular segments of European priority network (TEN-T axis) and to work jointly on resolutions of transport problems in econSomically relevant areas which either have been omitted from the above investment scheme or have not been recognized as strategically important for the Nordic and Baltic countries and, thus, lack the necessary funding. Another task adopted by this initiative was to work jointly on establishment of good transport connections with neighbouring EU member states significant as transit territories and/or origin/destinations for export/import trade.

SCANDRIA

http://www.scandriaproject.eu

SCANDRIA project "The Scandinavia-Adriatic Corridor for Innovation and Growth" is an international initiative of mainly German, Swedish and Finnish regional authorities who work jointly on enhancing the volumes and the efficiency of freight exchanged between the Germany's north-eastern regions, the southwestern Sweden and the southern Finland. All parties committed themselves to make provisions for environmentally responsible cargo movement and supply. An interesting development with relevance for the TEMPO Port Rail concept is that Scandria participant managed to formalize their commitment through the "Berlin Declaration for Intensified Cooperation in the Scandia Corridor" toward green transport projects and policy measures facilitating more sustainable goods mobility within the Baltic Sea Region. This agreement is a stage preceding a more concrete Joint Action Programme poised to create over the next five years common corridor development scenarios for spatial integration of business, transport infrastructure and social planning between the SCANDRIA's German, Swedish and Finnish regions.

Figure 16: The Scandria Project are committed to the provision of environmentally responsible cargo movements and supply.-- Web-site photo.

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