Infrastructure planning

- A challenge for cross-border cooperation

Andreas Forsgren

Jonas Westin
# TABLE OF CONTENTS

1. Introduction .................................................................................................................. 1  

2. Background .................................................................................................................. 2  

3. Transport planning in the Nordic countries ................................................................. 2  
   3.1 Finland .................................................................................................................... 3  
   3.2 Sweden .................................................................................................................. 4  
   3.3 Norway .................................................................................................................. 4  
   3.4 Comparative analysis of the planning processes in the Nordic countries ............... 4  
      3.4.1 Responsibilities ............................................................................................... 5  
      3.4.2 Transport planning processes ......................................................................... 5  
      3.4.3 Cost-benefit analysis ...................................................................................... 6  
      3.4.4 Guidelines for the distribution of benefits ....................................................... 6  
      3.4.5 Financing of infrastructural projects ............................................................... 6  

4. Tools for decision making ............................................................................................ 7  
   4.1 The role of transport models in CBA ..................................................................... 7  
   4.2 Finland .................................................................................................................. 8  
   4.3 Sweden .................................................................................................................. 8  
   4.4 Norway .................................................................................................................. 9  
   4.5 Transport models in cross-border transport planning ............................................ 9  
      4.5.1 Transport network and regional division ....................................................... 9  
      4.5.2 Data on transport demand ............................................................................. 10  
      4.5.3 Model specific effects ................................................................................... 11  
      4.5.4 EU level as a solution to cross-border transport investment problems .......... 11  

5. Discussion .................................................................................................................... 13  

6. Conclusions .................................................................................................................. 14  

7. References .................................................................................................................... 16
1 INTRODUCTION

Even though transport networks to some extent always have been international, the construction and maintenance of modern transport infrastructure in Europe has generally been the responsibility of national authorities. As a consequence, a large part of the European road and rail networks are planned from national perspectives and are hence constructed to primarily support domestic demands. In the Nordic countries, the national focus has resulted in a north-south oriented infrastructure network, while east-west bound infrastructure is far less developed.

The strong focus on national boundaries in the planning systems risk to create a comparative disadvantage for cross-border regions since there is no established procedure for developing cross-border transport infrastructures. Cross-border projects hence risk to fall outside of the national planning frameworks of the participating countries and the evaluation of the projects often gets complicated due to insufficient access to relevant statistics on transport demand. Instead these projects tend to treated in an ad-hoc manner. In addition, cross-border transport infrastructure projects generally involves actors from multiple countries facing different political, administrative and economic conditions which increases both the complexity and the risk of the projects (Fujimura, 2004).

Increased regional focus in the European Union has emphasized the importance of cross-border transport infrastructure at both a national and a regional level. The new European Union infrastructure policy highlights the importance of transport infrastructure for the operation of the inner market, the mobility of persons and goods and for the economic, social and territorial cohesion of the European Union. To strengthen the European transport network and facilitate cross-border transportation, the EU has established a core transport network (TEN-T) built on nine major corridors with the aim to “transform East–West connections, remove bottlenecks, upgrade infrastructure and streamline cross-border transport operations for passengers and businesses throughout the EU” (European Commission, 2013). The TEN-T core network is supported by a comprehensive network connected to the core network at regional and national level. At the regional level, the increased cross-border transport focus of the EU has therefore presented border regions with opportunities to obtain support and co-funding through the EU regional development funds.

The purpose of this paper is to analyze prerequisites, opportunities and challenges for cross-border transport infrastructure planning in Northern Europe. The paper compares the transport planning processes in Finland, Sweden and Norway and analyzes to what extent existing national analytical frameworks, transport models and cost-benefit guidelines can be used to evaluate cross-border transport projects. In a case study we compare a Norwegian analysis of a cross-border railway project between Norway and Sweden using the National Norwegian freight transport model with the outcome when the same project is analyzed in the Swedish national freight transport model. The paper will address the following research questions:

- How are the transport planning processes structured in the three countries? What are the differences and similarities between the countries?
- How well are the transport planning processes adapted to handle cross-border transport projects?
- Are existing analytical frameworks, CBA-guidelines and transport models suited to analyze cross-border transport projects in a way comparable to purely national transport projects?
- Can traditional infrastructure planning processes be applied to cross-border infrastructure projects or do cross-border projects require special consideration?
Section 2 provides a background of the Botnia-Atlantica area and earlier work on cross-border transport. Section 3 describes and compares transport planning in Finland, Sweden and Norway. Section 4 describes tools for decision making and the use of transport models in the three countries. Section 5 discusses implications for cross-border transport planning. Section 6 concludes.

2 BACKGROUND

The Botnia-Atlantica area is situated in Northern Europe and is composed by the Ostrobothnian regions and the Satakunta region in Finland, the county of Västerbotten, Västernorrland and the municipality of Nordanstig in Sweden, and the Nordland region in Norway. The geographical area borders to the Atlantic Ocean in the west and eastern Finland in the east, neighboring northwest Russia. Historically trade have been of great importance for the region. Lacking a sufficient population base to get offset for production and experiencing vast distances to markets in western Russia and Central Europe, infrastructural development has been of outmost importance for the regional economy.

Even though the transport infrastructure in the region is relatively extensive and well-functioning, the transport infrastructure is mainly developed to supply north-south transport flows, whereas cross-border infrastructure in the east-west direction is not equally developed. The design of the national systems for transport subsidies in all three countries have also favored north-south transport flows (ÅF Infraplan, 2010).

The White Paper on transports (European Commission, 2011) points out transportation as fundamental to the European economy and society. Since the modern transport sector operates at a global level, the White Paper highlights the importance of international cooperation. The directives are focused on reducing emissions and the environmental impact from transport, lessen the oil dependence of the EU and to continue to improve the infrastructural network. The White paper stresses the importance of a “core network” of multimodal corridors to carry large, consolidated volumes of freight and passenger traffic between the EU capitals, other main cities, economic centers, ports, airports and key land border crossings. The policy focuses on the completion of missing links, mainly cross-border sections and bottlenecks in the network causing congestion, on upgrading existing infrastructure and on the development of multimodal terminals. To realize the core network, several EU funded programs and projects have been initiated to strengthen cross-border cooperation at a regional level and to co-finance transport infrastructure projects in the Trans-European Transport Networks (TEN-T). The EU transport policy hence gives border regions opportunities to apply for co-funding for cross-border infrastructure and building platforms for cross-border cooperation.

Regional actors have for a long time worked for increased cross-border cooperation in order to strengthen the east-west dimension and improve communications in the area. Several potential projects have been identified in this process including a missing railway link between Sweden and Norway which restrains multimodal railway transports in the area, and limited ferry capacity and frequency for crossing the strait of Kvarken (BEAR, 2013; NLC, 2013).

3 TRANSPORT PLANNING IN THE NORDIC COUNTRIES

At the political level, the governments in the Nordic countries set political goals for the transport system. The present goals for the transport policy stated by governments in Finland, Sweden and Norway are similar and can roughly be summed up into four categories; Efficiency and Accessibility, Environment and Health, Traffic safety and Regional development. In Sweden and Norway, the
goals are ratified by the parliaments whereas in Finland, the goals are decided by each new
government (Trafikanaly, 2011a). Based on the transport policy and planning directives provided
by the governments, traffic authorities and regional actors develop long term plans for the
transport system that spans periods of roughly ten years. The plans are revised and updated
regularly.

3.1 Finland

The Finnish state is responsible for development and maintenance of the public roads, railways,
waterways and airports. The responsibility is administered through the Finnish Transport Agency
(FTA) and the Finavia Corporation. At the start of each electoral period, the Finnish Ministry of
Communications (MTC) begins to prepare a strategic plan for the transport policy based on the
program of the new government (MTC, 2008). The work is led by the ministers of the concerned
ministries. The Finnish transport planning process is hence more directly tied to the electoral cycle
than the planning processes in Norway and Sweden, even though the Finnish transport plan spans
longer than the four-year parliamentary term. The current report on transport policy from 2012
does for instance set out policy lines for 2012-2022 (MTC, 2012). The strategic planning process is
supplemented by long term plans from the FTA, allowing a longer time horizon for transport
planning.

To control and steer regional and local land use planning, the government issues National Land Use
Guidelines, which the regional and local actors have to take into account in the planning process.
At the regional level, the Act on Regional Development (1651/2009) dictates that the regional
councils, where the municipalities are represented, are responsible for management and
coordination of transport planning. The transport planning process at the regional and municipal
level is linked closely to land use and is regulated in the Land Use and Building Act (132/199). The
regional transport plan is developed in collaboration with the Regional Environment Centrals (ELY
centrals) whom are a part of the state administration and are responsible of guiding and
supervising land use planning and building activity, as well as environmental issues (ELY, 2014).
Regional land use plans are submitted to the Ministry of the Environment for ratification. When
ratified, the regional plan is used as a guideline in drawing up and amending local master plans and
local detailed plans, and when any other measures are taken to organize land use (Land Use and
Building Act (132/199)).

The parliament decides on the financing of transport infrastructure maintenance, which is financed
through the state budget. The MTC directs funds to the FTA which organizes the maintenance of
roads, railways and waterways. The parliament takes particular decisions on major investments
such as new transport infrastructure and extension of old infrastructure during the budgetary
treatment (FTA, 2014). As in Sweden, Finland have adopted the Four Step Principle as a base logic
to solve transport problems in a quicker and more cost-effective manner (MTC, 2007).

Transport planning in Finland is currently in a transformation process, called “the Transport
Revolution” (MTC, 2011). The main focus in this concept is service and in particular the service level
delivered to the end user. There is also a holistic approach in the sense that decision-making is not
about effects of a single infrastructural project, but instead to determine how to achieve a certain
level of service or functionality to the users. Intelligent Transport Systems (ITS) will be an important
measure to increase the service level (MTC, 2013). In order to address transport planning in this
manner, reforms take place in transport and urban planning, transport system funding and user
prices, service level acquisition and service production (MTC, 2011). Thus, this structure stresses
the importance of involving actors at different levels, both public and private, in the process.
3.2 Sweden
In Sweden, the state and the municipalities share the responsibility for planning and financing the transport infrastructure. The ongoing regionalization process have caused a decentralization of the planning process to the regional level, where responsibility of public transport has shifted to the regional level. The current Swedish National Transport Plan (STP) was approved by the government in mars 2010 and covered the period 2010-2021. In addition to describing the economic framework for development, operation and maintenance of the national road and rail network, the plan contains a number of defined projects to be started during the period. The plan is currently under review and will be prolonged for the period 2014-2025 (Trafikverket, 2013).

To initiate construction of a new STP, the government directs the traffic authorities and regional actors to construct long term plans for national and regional transport infrastructure. The traffic authorities compiles propositions at the national level, while the regions create regional transport development plans. Cost-benefit analysis (CBA) is used in order to evaluate the socio-economic benefit and rank the competing projects, even though other factors, such as political considerations and regional distribution, also influence the final decision of which project that are included in the final plan. After public consultation, the government decides on the STP and the associated economic framework (Eliasson and Lundberg, 2012). The STP is operative for a period of twelve years, but can be subject to revision during this period (Trafikverket, 2013). The Swedish government and parliament have adopted the Four Step Principle in Swedish transport policy. The Four Step Principle provides a basic logic for implementation of a policy at lowest cost to society (VTI, 2012).

3.3 Norway
The Norwegian state owns the national road network, the railroad network, most of the airports and is responsible for the waterways. In 2010 responsibility of most highways were transferred to the regional level (Fylkeskommun) who also provides public transport.

The Norwegian National Transport Plan (NTP) is produced every four years, covers a period of ten years and aims to provide a hierarchical decision framework and technical basis for decision making (Norwegian Ministry of Transport and Communications, 2009). The procedure to develop the plan begins when the Government informs the Public Roads Administration about its policy objectives immediately after publishing the previous plan. The regional offices of the Public Roads Administration then provide a list of projects in their regions that can help to meet the defined policy objectives. Based on the priorities made by the regional offices and in cooperation with the Norwegian National Rail Administration, the Norwegian Coastal Administration and the owner of the Norwegian public airports, Avinor AS, the regional offices assemble a proposal for the next NTP and submit it to the government. After receiving and reviewing stakeholders’ comments, the Government assembles the NTP and sends it to the Parliament for ratification (Hanssen, 2012). The proposal for the next NTP will cover the period 2014-2023 (Stortingsmelding 26, 2012-2013).

3.4 Comparative analysis of the planning processes in the Nordic countries
On a general level, the national transport planning systems in the Nordic countries share many similar features. However, there are a number of important differences that can affect cross-border projects. In all three countries, the planning process can be divided in two phases. First a strategic phase, resulting in a national transport plan where infrastructural development projects are prioritized and selected based on achievement of policy goals, socio-economic evaluation and political priorities. Second an implementation phase, where actual construction and land use matters are addressed. Furthermore, the main focus of the national transport plans in all three countries is to prioritize and appoint national infrastructure projects, which means that the
transport planning process is not designed to deal with cross-border transport projects in a comparable way. Instead, discussions on cross-border matters have been held in organizations such as the Nordic Council of Ministers which has been an important actor for cross-border cooperation in the Nordic countries since the early seventies. Other international organizations such as the Barents Euro-Arctic Council could potentially function as an arena for intergovernmental cross-border cooperation and a more integrated approach to transport planning in the region through the development of a Joint Barents Transport Plan (BEAR, 2013).

3.4.1 Responsibilities
The Swedish Transport Administration (Trafikverket) is responsible for construction, operation and maintenance of the state road network and the national railway network. The administration is also responsible for the long-term planning of the transport system for all four transport modes. The Finnish Transport Agency (Liikennevirasto) has a similar responsibility for the government’s road and rail networks as well as for the waterways that is under national control. In Norway the responsibility for the transport system is divided between several administrative agencies under the Norwegian Ministry of Transport and Communications. For road and rail, the Norwegian Public Roads Administration (Statens vegvesen) is responsible for the planning, construction and operation of the national and county road networks and the National Rail Administration (Jernbaneverket) is responsible for developing and operating the rail network. The national transport agencies in Sweden and Finland therefore both have intermodal responsibilities whereas there in Norway is no common agency that is responsible for all transport modes.

3.4.2 Transport planning processes
Comparing the transport planning processes in the three countries, the Finnish transport planning is more centralized compared to the Swedish and Norwegian processes, both having a stronger regional emphasis. Transport planning in Finland is also more closely tied to the political process compared to the planning process in Sweden where the planning is carried out more independently by the transport authority based on planning directives. However, even though the planning process in Sweden and Norway is more loosely tied to the political level, the final selection of investments in the transport plan is still a political decision.

A major difference between the three countries is related to project financing. In Sweden, the parliament generally decides on a national transport plan containing an aggregated list of specified projects. The Swedish Transport Administration thereafter implements the content of the plan within its given budget. The Norwegian financing process differs in a high extent from the Swedish in the sense that there is a clearer project connection linked to financing, primarily for projects considered as major (over 750M NOK). These projects require a more detailed evaluation process that includes a clearer cohesion of the economic and physical planning. Smaller projects are treated in a similar manner as in Sweden. This means that decisions are taken continuously on individual projects and not intermittent for a whole transport plan. The Finnish financing model lies somewhat in between the processes in Sweden and Norway. Like the Norwegian process, Finnish projects can be approved and financed continuously during the planning period, although the same requirements on a detailed evaluation process as in the Norwegian system (Trafikanalys, 2012).

While Sweden controls the planning process by setting goals and directives. The governments and the ministries in Finland and Norway have a more direct role in the planning processes. One reason for this is that the Swedish Transport Authority has a higher degree of independence versus the government compared to its Norwegian and Finnish counterparts. The Norwegian transport authorities, Statens vegvesen and Jernbaneverket, are for instance formally an integrated part of the Norwegian Ministry of Transport and Communications (Trafikanalys, 2012). However, the final
decision on which projects to include in the transport plan is nevertheless a political decision in all three countries.

3.4.3 Cost-benefit analysis
In all three countries, CBA is a common method for evaluating public investment projects in the transport planning processes. Several studies have analyzed the influence of CBA on the final ranking in the transport plan. Studies on Norwegian data indicate that the relationship between the results of cost-benefit analyses and the ranking, made by the National Public Roads administration of infrastructure projects, of projects is weak at best (Odeck, 1996; Fridstrøm and Elvik, 1997). Projects with a positive net benefit were not found to have a higher probability of being prioritized than projects with a negative net benefit. Similar results have been found in Sweden (Eliasson and Lundberg, 2012).

The seemingly weak relationship between CBA and investments has been explained by a reluctance among politicians to accept the normative premises of CBA since politicians would make themselves redundant if they were to simply accept the result of an expert technique (Sager and Ravlum, 2005; Nyborg, 1998). The seemingly weak explanatory power of CBA can also be explained by the fact that the maximization of social welfare is not the only objective of the transport policy, e.g. regional distribution is typically not included in a standard CBA.

3.4.4 Guidelines for the distribution of benefits
Fosgerau and Kristensen (2005) shows that the benefits from reduced transport costs on a cross-border link are shared between the exporting and the importing country where the allocation depends on market conditions. The national focus in the CBA guidelines means that the benefit from cross-border transport projects may be treated in a different way than strictly national projects. The national guidelines for CBA in Sweden recommends that the benefit from cross-border transport flows are halved. The motivation for this is that half of the benefits are assumed to belong to foreign countries and are therefore excluded (ASEK, 2012). Norway does not provide guidelines for how to distribute benefits from cross-border transports, nor does it specify any geographical limits for the analysis. However, the guidelines recommend that the geographic scope are limited to suit the analyzed project. In Finland there are guidelines stating that that only effects for Finnish citizens and companies should be included in the CBA. This means that the benefits related to transit traffic is excluded (Mellin et al. 2013).

Given that the benefits from cross-border transport projects are distributed over multiple countries, adaptation of the national guidelines, where only national benefits are accounted for risks to generate a sub-optimization of cross-border infrastructure investments. In order to avoid under-investment, the guidelines must be accompanied with a system for analyzing the distributional impact of the investment and distributing the costs accordingly. The guidelines must be consistent across multiple countries to avoid that the benefits are double counted or systematically underestimated.

3.4.5 Financing of infrastructural projects
Even though the road and rail infrastructures to a large extent are state owned, the methods for financing infrastructure differs. While Norway have a long tradition of using road tolls (bompeng) to finance infrastructural projects, there are no such examples in Finland. In Sweden, road tolls are used in the congestion charging system in Stockholm and Gothenburg. The main purpose of these tolls are to reduce congestion and emissions in the inner city areas even though the toll revenues also were important arguments when the road tolls were implemented (Eliasson et al. 2009).

Road tolls will also be used to finance the construction of a new bridges in the municipalities of Sundsvall and Motala (SOU 2012:60). This is going to be the first time where road tolls are used to
finance an entirely national infrastructure investment in Sweden. This development has been subject to public debate, which makes future policy on road usage charges in Sweden uncertain. In contrast, when dealing with large scale cross-border infrastructural investments in the Nordic countries, many of these are financed through tolls. Tolls provide an appealing solution to the distribution question of benefits and costs. Examples of toll financed infrastructure are the fixed connection between Malmö and Copenhagen and the Svinesund Bridge.

4 TOOLS FOR DECISION MAKING

Cost-benefit analysis (CBA) is a methodology for quantifying costs and benefits associated with a project or a policy. The analysis is typically used to evaluate whether the benefits of a project outweigh the costs by calculating a net present value. The benefits in a transport CBA are generally derived from cost savings and willingness-to-pay estimates whereas the costs both can include direct and indirect investment costs as well as external costs for emissions, noise, accidents and the environmental impact of the project.

The Nordic countries use transport models to support transport planning and decision making. Models are used for analyzing effects on efficiency, accessibility, safety and the environment from proposed transport policies. Transport models also plays an important role in CBA of transport infrastructure investments. CBA is an important tool to evaluate and compare infrastructure investments and is a mandatory part of the national transport planning process in all three countries. Cost-benefit ratios are however not the only factor that influence the final decision of what projects that are included in the national transport plans (Eliasson and Lundberg, 2012; Nyborg, 1998).

4.1 The role of transport models in CBA

CBA in the transport sector relies to a large degree on transport models. Figure 1 illustrates a principal framework for how transport models are used in CBA.

To produce results, a transport model needs input data that describes the transport network, costs linked to using different transport modes and specific links, such as road tolls, terminal costs, harbor fees etc., and demand functions that describes how much goods or people that utilizes the network in different situations. To analyze long term effects on transport policies or infrastructure projects, the data needs to be complemented with a forecast of economic growth, future transport
demand, trade patterns and transport costs. Based on the input, transport models are used to estimate effects on traffic volumes, modal split, total transport or logistics costs and environmental impact etc.

To complete the CBA, the resulting effects are evaluated into a monetary value using a CBA framework that contains guidelines for which costs and benefits to include in the analysis and how to aggregate them. The guidelines generally include valuations for travel time savings, emissions, noise and traffic safety, parameters for discount rates, capital costs and the marginal cost of public funds etc. as well as recommendations on which effects to include in the analysis.

4.2 Finland

The Finnish Transport Agency does not have an official freight model similar to the logistic models of Sweden and Norway, even though a passenger-transport simulation model similar to the Swedish SAMPERS model is under construction. A STAN-based national freight transport model called FRISBEE is owned and developed by the consultant companies WSP, Matrex and VTT on the behest of the Finnish Transport Agency. The development and use of the model is more ad hoc. (VTI, 2011; Trafikanalys, 2011b). This implies that private consultant firms have a more central role in the Finnish transport planning system compared to Sweden and Norway where the transport models are nationally owned. In addition to the STAN-based transport model a number of other models are used by the Transport Agency and the Regional Environment Centrals to aid in their evaluation such as the TARVA safety evaluation tool and the IVAR model for impact assessment of infrastructure projects.

Traffic models are generally used when the object-evaluation can be expected to have a significant impact on route selection, orientation and modal split, e.g. urban road and rail projects, as well as the national railway projects. Regional transport system models have been drawn up for many urban areas and some provinces. A cost-benefit analysis is also made for each proposed project (and its alternatives). All investment alternatives' costs should be compared on the same price level.

4.3 Sweden

Transport models are used in Sweden to support the decision making processes for allocation of national funds to infrastructure investments, operation and maintenance as well as for measures for increased safety, improved environment and taxation. The model used for passenger travel is called Sampers (Trafikverket, 2009) and the freight model is called SAMGODS (VTI, 2009). In addition to these two larger system models, there are also a number of object focused models such as the EVA model for road projects, BANSEK for railroad projects and SAMKALK (Trafikverket, 2009).

The SAMGODS model is owned by the Swedish Transport Administration (SAMPLAN, 2001). In the beginning of the 21st century a number of shortcomings in the old STAN-based freight model led to the decision to construct a new national transport model. One of the main reasons was that the former transport model operated purely at aggregate level and could not simulate logistic decisions at the firm level, which implied that the producer choice of transport route, mode and consolidation was not considered properly at firm to firm level. In 2008 the road and rail administration received the first prototype of the new SAMGODS model including a new logistics module functioning in a very similar way as the Norwegian national transport model. The SAMGODS model requires input data describing the infrastructural network, transportation costs and transport demand in the form of PC-matrices describing the freight demand between producers and consumers in the model. The input matrices are estimated using data from the Swedish Commodity Flow Survey and trade statistics (Edwards, 2008).
Based on the input data, the model calculates the optimal transport chain and shipment size at the firm level by cost minimization. During this process, the model takes into account commodity specific attributes, multimodal transport chains and consolidation at specific consolidation centers. In the final stage all of the chosen transport chains are aggregated at zone to zone level and distributed onto the infrastructural network (Significance, 2010).

**4.4 Norway**

The transport forecast models in Norway are similar to the models in Sweden. The planning tools are used both for analyses of investments and other measures, focusing on changes in transport volume, modal split and environment. To cover the Transport Authorities’ need for analysis several transport models are used. For passenger transport this includes both a Regional Transport Model (RTM) for short trips and a National Transport Model (NTMS) for longer trips. To model freight transport the National Norwegian freight transport model (NFTM) is used (Significance, 2013). For assessing smaller road objects the Norwegian EFFEKT-model is similar to the Swedish EVA-model.

The purpose of the National Norwegian freight transport model (NFTM) is to assist the Norwegian government in its long-term planning of interurban freight transport (Vold and Jean-Hansen, 2007). This is achieved through the output of the model which is forecasts of future transport flows, per mode, in Norway. As such, the model can be used to measure the effect on transport flows of infrastructure investments, toll roads etc. The NFTM is made up of three independent modules; PINGO, The Logistics Model and a network model. PINGO is a spatial general equilibrium model used to make projections about future freight flows and provides commodity flow matrices for all forecast years. These matrices are subsequently used as input in the logistics model. The Logistics Model calculates the choice of transport solution based on the assumption that businesses seek to minimize their logistic costs. In the final step a network model is used to visualize mode-distributed freight flows in maps and to calculate the freight transport (tons transported) on Norwegian territory. By putting information about planned infrastructure investments into the logistics model, the effects of these investments on commodity flows can be observed. The final output of the NFTM is an overview of future freight flows, per mode and commodity group, between all the zones included in the model (Hovi, 2007).

**4.5 Transport models in cross-border transport planning**

The transport models used in Finland, Sweden and Norway are all designed to make predictions at a national level. This means that they aim to forecast effects on primarily domestic transport flows and goods flows related to national import and export. International goods flows related to transit are therefore in general not as well represented in the models. Another important fact to consider when analyzing transport corridors using transport models in border regions, is the structure of the transport network itself and the structure of regional divisions. There are primarily three problem areas to consider when dealing with cross-border investments in the national models, the level of detail of the transport network and regional division, the data usage and model specific effects when operating across country borders.

**4.5.1 Transport network and regional division**

The transport network and regional division are often more detailed inside the nation itself than in neighboring countries. In the Swedish SAMGODS model, Sweden is divided into 290 zones (corresponding to the municipal level) while there are 18 and 19 zones respectively in Norway and Finland (County level). The ruling principle is that the network gets less detailed and the regional division gets larger when the geographical distance to the national state increases. In the Norwegian model, the zone level is in a corresponding way more detailed in Norway than in
Sweden and Finland. Obviously the above stated facts implies that usage of national transport models in cross-border regions needs to be done in a cautious way.

Figure 2 shows that the transport network in the SAMGODS model is far more detailed inside Sweden than in its neighboring countries. Especially the transport network along the Norwegian coast is considerably less detailed. From a regional perspective this implies that several important harbors and transport nodes are missing. In Nordland and Nord-Trøndelag, only the harbors of Bodø and Trondheim are included in the model. The total distance between these harbors is 700 km. Meanwhile the harbors of Mosjøen and Mo-i-Rana who, situated along the route in between Bodø and Trondheim, are excluded from the network.

The lower spatial resolution in neighboring countries make analyses of transport investments in border regions more uncertain, especially in rural areas where the zones cover large geographical areas. The low resolution in the transport network also introduces biases when analyzing and comparing the effect of investments in different transport corridors.

4.5.2 Data on transport demand

The national transport models include data on domestic transports, import and export. In the Swedish SAMGODS model, only a limited set of transit demand are included in the model dataset. This data could also be said to be associated with a high degree of uncertainty because of a non-transparent decision process for selecting which transport demand to declare as transit goods.

Since many of the used freight transport models only redistributes existing transport flows, only transport flows that are included in the base matrices are included in the analyzes. Since the base matrices often only contain domestic transports, import and export, this means that transports in bordering countries that could potentially use transport routes in other countries not included in the models. For example, Swedish roads are in several situations to transport Norwegian fish transports, which are not captured by existing Swedish model system. This means that the models
may underestimate the total effect of transport investments where transports in neighboring
countries are affected.

To illustrate this we conducted a case study where we compared the outcome from an existing
study of a new railroad between Mosjøen and Storuman using both the Norwegian Freight
Transport Model and the Swedish SAMGODS model. In the Norwegian analysis, the new
infrastructure reduces the annual total freight transport cost with 139 million Norwegian kroner
compared to the base scenario for 2040 and increases the rail volumes in Northern Norway with
roughly 10 percent (Jernbaneverket, 2011). When the same infrastructure is analyzed in the
Swedish SAMGODS model, the effect is virtually zero. The reason for this is that since both models
use fixed demand matrices, the models only redistributes existing transport flows. Since the
Swedish model neither includes internal Norwegian transport flows nor Norwegian export and
import to other countries than Sweden and (to some extent) Finland, the Swedish analysis will
underestimate the effects in Norway from the new transport infrastructure. The Norwegian model
risks in a similar way to underestimate the effects in Sweden depending on how the model’s
transport demand is calibrated.

Depending on how the models are calibrated, the data quality regarding for instance speed limits,
transport demand, costs etc. can also be higher inside the national borders the models focus on
making effects on international transportation more uncertain.

4.5.3 Model specific effects
At an international level, CBA analyses suffer from comparison difficulties between countries. This
depends on differences in the valuation of cost-benefit parameters such as value of time, discount
rate and guidelines for calculation of the costs and benefits. These differences makes it problematic
to aggregate results from model systems in different countries into a coherent system being able
to simultaneously rank and compare national projects with cross-border projects and projects in
foreign countries. Differences in the valuation of cost-benefit parameters can lead to situations
where the aggregated net benefits of a project are positive in one country and negative in another.
One such example is given in WSP (2013) where the benefits of a cross-border transport
investment between Kongsvinger in Norway and Torsby in Sweden was found to outweigh the
costs in the Norwegian analysis, but not in the Swedish methodological framework. Ranking and
prioritizing transport projects in a cross-border setting is therefore far from trivial.

National guidelines for how to include effects on international transport flows into the cost-benefit
analysis can also disadvantage cross-border projects compared to national projects where the
effects are primarily on domestic transport (ASEK, 2012).

4.5.4 EU level as a solution to cross-border transport investment problems
TRANS-TOOLS (Tools for Transport Forecasting and Scenario testing) is a European transport
network model covering both passengers and freight for 42 countries (VTI, 2011). It is funded by
the European Commission Joint Research Centre’s Institute for Prospective Technological Studies
(IPTS) and DG TREN and is the main model for policy analysis of transport issues at the EU-
level. The model combines modelling techniques for transport generation and assignment, economic
activity, trade, logistics, regional development and environmental impacts (Nielsen, 2013).

Previous studies using the model has indicated that even though the model has a good
geographical coverage at an European level, the transport networks are outdated and it is not well
suited for analysis of regional multimodal transport flows. Since it operates at a NUTS 3 zone level
it also has problems with territorially large regions in northern Europe, resulting in geographically
unrealistic transport flows at the regional level (TransBaltic, 2012). There is an ongoing
development work considering known model problems in the model which is summarized in (European Commission Joint Research Institute for Prospective Technological Studies, 2009).

The EU-level and TRANS-TOOLS may present an alternative that avoids the country specific valuations described in the model specific problems section, associated to comparing results between national models. Unfortunately the TRANS-TOOLS model has some weaknesses such as a coarse spatial resolution of the model, making it problematic to use to evaluate regional transport investments.
On a general level, the national transport planning systems in the Nordic countries have many similar features. The transport policy in all the studied countries are clearly linked to stated goals for the transport system set by the governments. The overall goals of the transport system are very similar, demonstrating a similar political will and thus a sound basis for cooperation. All of the examined countries use a transport planning process which roughly can be divided into a strategic phase and an implementation phase. The national funding of infrastructure projects is approved by the parliaments. How the approval is made differs between the countries. The Swedish parliament accepts one national transport plan for each planning period, while the parliaments in Finland and Norway can approve state funding continuously during the planning period.

The traditions of transport planning somewhat differs. The Finnish planning process is more centralized, whereas the regional focus is stronger in the Norwegian process. Larger infrastructural projects are treated in a more project oriented way in Finland and Norway than in Sweden, both having the opportunity to receive state funding in a more ad hoc manner. Also, the control system of the government differs, while the Swedish government tries to control the executor by goals and directives, the ministries have a much larger impact on the process in Finland and Norway.

Finally Finland and Sweden have merged their transport authorities into one agency, whereas Norway still have a separate transport agency for each transport mode. In comparison, the Swedish Transport Administration enjoys a more independent role in the planning process with a lower level of attachment to the ministries compared to its Finnish and Norwegian counterparts. Structural differences in administrative responsibilities between the countries can impede cooperation and make it difficult to find a suitable interface between representatives from different countries.

Transport planning is based on the creation of national transport plans in all three countries. Since the main objective of the national transport plans is to compare and prioritize national infrastructure projects, the planning processes are not designed to handle cross-border transport projects in a comparable way. Cross-border transport planning is in general also more complex since it requires coordination between multiple planning processes in different countries with different planning traditions, division of responsibilities, project financing, requirements and decision cycles. Analyses of the distribution of costs and benefits becomes essential for cross-border transport projects when the investment costs are shared between multiple countries. This may require adaptation of existing analytical frameworks and transport models to put more emphasis on the distributions of costs and benefits in a cross-border context.

Historically larger cross-border projects have been treated in an ad hoc like manner, where the concerned nations jointly have agreed upon a suitable investment plan. The most well-known examples are the fixed connection of Öresund and the Svinesund Bridge. Both examples are financed through user charges which have presented the participating nations with an appealing solution to distribute revenues and hence indirectly distribute investment costs. However, by using user charges to finance the investment, the cost for using the infrastructure will be higher than would be the situation if the investment was financed directly by the nations.

Cost-benefit analysis is widely used in all of the Nordic countries and provides a recognized method for comparing the costs and benefits of different projects in monetary terms. Transport models play has a central role in CBA to analyze the effects of different transport policies and infrastructure investments. The strong focus on national transport demand in the national transport models makes the model systems poorly adapted to analyze effects from investments in cross-border transport infrastructure. Since the transport networks used in the national models are less detailed and the zones for transport demand are larger outside the national borders, this can make results
from the transport models more uncertain in border regions. The examples in section 4.6 also showed that the national model systems may underestimate transport flows in neighboring countries and thereby also underestimate the total welfare effect of an investment affecting cross-border transport flows.

At the national level there exist additional differences related to guidelines for CBA usage, evaluation of CBA parameters, forecasting methods, data availability etc. This complicates the task of ranking and comparing cross-border transport projects in a consistent way across countries. Ultimately this may lead to situations where projects being considered profitable in one country, are considered unprofitable in another. Thus harmonization of data input and estimation methods are crucial in order to achieve a consistent evaluation of cross-border projects. The national dissimilarities in CBA guidelines also means that the benefit from cross-border transport projects may be treated in a different way than strictly national projects.

The strong national focus of the transport planning systems, together with the revealed difficulties to analyze and compare cross-border infrastructure projects in an equivalent manner to strictly national infrastructure projects, can create a comparative disadvantage in border regions where cross-border traffic have a large impact. The national focus in the planning systems may therefore lead to a sub-optimization of the transport infrastructure, both from a national and a European perspective.

To overcome these problems, the analytical frameworks need to be improved. On the model side, the transport models must be better at capturing effects related to cross-border transport flows and spillover effects generated in neighboring countries. In addition to improving the transport models, the national guidelines for CBA must also be updated to handle the distribution of benefits from cross-border transport in a consistent way across multiple countries. The national planning processes must also strive to handle cross-border transport projects in a more comparative way as national transport projects.

International organizations with connections into the national ministries such as the Nordic Council of Ministers or the Barents Euro-Artic Council can play a role in formalizing and coordinating the process of cross-border transport planning at the national level.

6 CONCLUSIONS

The clear national focus of the transport planning processes, transport models and CBA guidelines in the Nordic countries implies that the decision process is not designed to evaluate and compare cross-border infrastructure projects in a manner equal to strictly national projects. Historically, major cross-border infrastructure investments have therefore been treated in a more ad-hoc manner compared to the planning processes used for national transport investments. Together with the increased complexity and need for coordination between multiple countries often associated with cross-border transport projects, this can both create a comparative disadvantage for border regions and lead to a sub-optimization of the transport infrastructure from both a regional, a national and an international perspective.

To reduce the risk of sub-optimization in the transport system, it is therefore important to create international arenas for evaluating and comparing cross-border transport infrastructure projects in a more systematic way. Several steps in this direction have been taken within the European Union, especially the new EU infrastructure policy, the TEN-T network and the TRANS-TOOLS model. For Northern Europe, organizations such as the Nordic Council of Ministers or the Barents Euro-Artic Council can here adopt a similar role in creating a functional arena for intergovernmental and interregional cooperation around cross-border transport projects.
The national transport models in Finland, Sweden and Norway are poorly suited for forecasting effects of cross-border infrastructural investments. In order to provide acceptable forecasts, a first step would be to create tools for decision making that can be used to analyze, rank and compare the effects of cross-border transport projects on the same terms as national projects.

In order to achieve such a solution we see two possible paths. One path includes creating a joint Nordic transport model which can assume the role of a more refined TRANS-TOOLS model for the Nordic countries or Northern Europe. Using the established freight models in Sweden and Norway as a basis would also remedy some of the known issues with the TRANS-TOOLS model, such as the low spatial resolution and underestimation of transport demand linked to non-consumptions goods common in the Nordic countries, i.e. the raw material industry. Another available path would be widening the geographical scope of the existing national transport models. This can be done by providing more comprehensive infrastructural networks and transport demand data of the neighboring countries in the national models. Thus creating transport models capable of forecasting effects of cross-border projects in a way comparable to classical national projects.
REFERENCES


NLC (2013). BESKRIVNING AV PROJEKTET.


Statens offentliga utredningar. Avgifter på väg och elektroniska vägtullssystem. SOU 2012:60.


CERUM Reports

1. Lars-Olof Persson, Erik Sondell (1990) Från Lantbruksföretag till lanthushåll
3. Ulf Wiberg (ed.) (1994, på engelska) Marginal Areas in Developed Countries
26. Gunnar Brandén, Andreas Forsgren, Marcus Holmström och Fredrik Olsson-Spjut (2011) 39 000 anställningar till och med 2020 En studie av rekryteringsbehovet i Västerbottens län
30. Jenny Röngren (2011) Omvärldsbekavning i Västerbotten
34. Johanna Edlund och Marcus Holmström (2011) Kommunala och regionala löner, fastighetspriser och attraktivitet – En studie av lönekostnadsutjämnningen
35. Lars Larsson och Nils-Gustav Lundgren (2011) Socialt kapital i Västerbotten
36. Roger Filipsson (2011) Sport Region Västerbotten – En analys av sportsektorn (sportnäringen)
37. Tommy Lind (2011) Olika uppfattningar om livs villkoren i stora och små kommuner i norra Sverige
Centrum för regionalvetenskap vid Umeå universitet, CERUM, har till uppgift att initiera och genomföra forskning om regional utveckling, bedriva flervetenskapliga forskningsprojekt samt sprida forskningens resultat till skilda samhällsorganisationer. Forskningsprojekten sker i interaktion med de många vetenskapliga discipliner som berör det regionalvetenskapliga forskningsfältet.