

Steering cities towards a sustainable transport system in Norway and Sweden

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Abstract

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Keywords

Co-financing; cycling; sustainable cities; public transport; infrastructure investment; state-local cooperation; city planning

JEL Codes

D70; H54; H71; R11, R42, Q54



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1. Introduction

City environmental agreements and city growth agreements (CEAs or CGAs) are co-financing agreements used by the central governments of Sweden and Norway, respectively, to influence transport-related decision-making by municipalities and regions. While both agreements aim at encouraging sustainable transport solutions at a local level, they differ in many ways. For one thing, the Norwegian system is much older, and the amounts of money involved are vastly greater in Norway than in Sweden. Secondly, in Sweden, support goes only to public transport (PT) and cycling infrastructure projects, and from 2020 to sustainable freight projects. In Norway, pedestrian, road, and railroad projects, too, can be included in CGAs, and since the agreements cover several municipalities or an entire county, they constitute a more holistic view of the development of the transport system. In Sweden, most of the CEAs are an agreement between the state and only one municipality. Thirdly, projects along highways in Norway are co-financed from road toll revenue, which is not the case in Sweden. The closest comparison to the road tolls in Sweden is the congestion charges in Stockholm and Gothenburg, both of which enter the central government budget but are supposed to be earmarked for infrastructure investment projects in the respective cities (road, rail, and PT). In Norway, the collecting municipality/municipalities and the county control road toll revenues. Finally, in Sweden, while the financing of the CEAs is tied to the National Transport Infrastructure Plan (NTIP), it is not tied to specific objects in the plan in a manner similar to that in Norway. Instead, the NTIP for 2018–2029 contains a financing frame that can be used by the state to co-finance local investments depending on which project applications are sent in.

The main aim of the present paper is to evaluate the organizational and financing models related to the CGAs/CEAs by doing case studies of Norway and Sweden. The case studies are done by answering a number of questions based on the CGA agreements in Norway and the CEA applications in Sweden. The answers will then be discussed in relation to different theoretical frameworks, e.g., the fiscal federalism theory (Oates, 1972; Besley & Coate, 2003; Helland & Sørensen, 2009; Hammes & Mandell, 2019), delegation models (Bendor, et al., 2001; Bendor & Meirowitz, 2004), and political

economy models (Cadot, et al., 2006; Helland & Sørensen, 2009; Hammes & Nilsson, 2016). The present paper focuses mainly on comparing the parts of the Norwegian CGAs and the Swedish CEAs that are similar; this means that the emphasis lies on the building of PT and walking and cycling infrastructure and not, in Norway, on the building of railroads.

The rest of the paper is organized as follows: Sub-sections 1.1 and 1.2 describe the history and background of the city environmental and city growth agreements. We also shortly discuss other, related, environmental and climate policies. Section 2 describes the methodology used, and above all, we present the questions that we seek answers to. In Section 3, we describe the city growth agreements in two Norwegian areas, Trondheim and Stavanger, and in Section 4 we do the same for two Swedish cities, Lund and Uppsala. In Section 5, we discuss and compare the findings in Sections 3 and 4. The final section concludes the paper.

1.1. City Environmental and Growth Agreements

The predecessors to the Norwegian city growth agreements (*byvekstavtale*), namely the city pacts (*bypakkene*) and thereafter the city environmental agreements (*bymiljøavtale*), have a rather long history and go hand-in-hand with the financing of infrastructure investments using revenue from road tolls. The first agreements, the city pacts, are from 1986 in Bergen, 1990 in Oslo, and 1991 in Trondheim, the last of which is one of the case study areas in this paper. In these early agreements, half of the financing to build new roads was set to come from the Norwegian state and the other half from road toll revenue (Norheim & Svensson, n.a.). Road toll collection takes place within the confines of CEAs, CGAs, or, as in, e.g., Trondheim, an environmental pact (*miljøpakke*). Since 2013, these agreements have been used as policy instruments to reach the goal of having all growth in the transportation of people in the metropolitan areas occur in the form of PT, cycling, and walking, i.e., that transportation by car should not grow in net terms (*nullvekstmålet* or the “zero-growth goal”) (Regjeringen.no, 2013; Samferdselsdepartementet og Kommunal- og moderniseringsdepartementet,

2017).¹ Thus, the zero-growth goal has led to a change in focus from building roads to expanding the PT system. Moreover, the zero-growth goal is expected to reduce the numbers killed or severely injured in the transport system (Samferdselsdepartementet, 2019).

Other goals for the CGAs are more efficient use of land and more attractive urban areas. Moreover, in conjunction with the CGAs, the state in Norway pays for the so-called reward funds (*belønningsordning*), which provide time-limited and result-dependent operation cost support for the regional PT systems (Norheim & Svensson, n.a.).

In Sweden, CEAs (*stadsmiljöavtal*) as a policy were introduced in 2015. They are regulated by the Regulation (2015:579) on Support for Sustainable City Environments. The goal of the CEAs is to increase the share of PT and cycling. These modes of transport are expected to be energy efficient, with low emissions of greenhouse gases (GHGs), and help the achievement of a nationally declared environmental objective called Good Built Environment.² The investment that the CEA co-finances must solve a general local or regional transport problem. CEAs can also be used for demonstrating or trying out new transport solutions (Swedish Transport Administration, 2019a).

In Sweden, a CEA is granted by the Swedish Transport Administration in response to an application by a municipality or a region. In Norway, the process is a negotiation between the Norwegian state through the Ministry of Transport and the Ministry of Municipalities and Modernization on one hand and the municipalities and the county on the other. For the nine biggest urban areas, a CGA or a CEA is required for receiving funds from the state (Sager, 2018). The negotiation results in a formal agreement that details the goals and content of the agreement, the projects included, and the sums

¹ That transportation by car should not grow in net terms means that if car travel in one part of the agreement area increases, it can be offset by decreases in other parts.

² See, e.g., <http://www.swedishepa.se/Documents/publikationer6400/978-91-620-8620-6.pdf?pid=6759>.

of money involved. In Sweden, these items are included in both the application to the Transport Administration and its decision.

From 2015 to 2018, the Swedish Transport Administration received 172 CEA applications. Seventy-seven applications covering about 60 municipalities or counties were approved. About 253 million EUR in support was paid out (Swedish Transport Administration, 2019a). In 2019, the Administration received 27 applications of which 17 were either fully or partially approved, the total subsidy amounting to 142 million EUR in 2019 price terms (Swedish Transport Administration, 2019d).

In the NTIP for 2018–2029, the Swedish state reserves about 97.5 million EUR in 2018 price terms per year for the CEAs (Swedish Transport Administration, 2019a). Starting in 2020, it is also possible to apply for support for sustainable freight transport solutions (Swedish Transport Administration, 2019c). The proposed budget for the freight part of the CEAs is about 39 million EUR over four years. The investments and co-investments must be finished by 2029 at the latest. Moreover, besides planning and paying for at least half of a project that gets state support, the municipalities also have to commit themselves to undertake complementary measures at their own expense. These additional actions contribute to increasing building of housing or the share of sustainable transport modes, and it must be possible to follow up on them (Swedish Transport Administration, 2019a).

1.2. Other relevant policies

Given the differences between the CGAs in Norway and CEAs in Sweden, it is of interest to also consider other transport-related climate policies in place. What one country achieves with a CEA/CGA, the other may try to attain with other policies. In the discussion in this section, the focus is on influencing municipal decision-making.

The main goal mentioned in the Norwegian CGAs is “zero growth in car travel.” Besides transport infrastructure, the agreements also cover city planning, especially the issue of densification and concentrating jobs and visitor-intensive services to PT hubs. There is no direct GHG emissions reduction goal, however. Instead, the general target of a 40 percent reduction in such emissions by

2030 compared with 1990 levels applies. The main policies to reach the climate goal are measures to influence technology and fuels, measures to reduce transportation of people by car in urban areas, and measures that reduce emissions from the building of infrastructure (Samferdselsdepartementet, 2017, p. 79).

In Sweden, the overarching climate goal for the transport sector is to reduce GHG emissions from the transport sector by 70 percent from 2010 levels by 2030. Other relevant policies in Sweden are the National Negotiation on Housing and Infrastructure, and the related Stockholm Negotiation. The total investment cost resulting from these negotiations is about 6.8 billion EUR in 2018 price terms, of which 6.65 billion EUR is reserved for the building of PT projects and 175 million EUR is for bicycle projects. As a counter obligation, the cities included have promised to build 271,130 new dwellings by 2035 (Swedish Transport Administration, 2019b).

2. Methodology

The methodology used in this paper consists of case studies through document studies. We seek to describe the organizational and financing models underlying the CGAs/CEAs. To this end, we will answer the following questions:

- What types of decision support documents in terms of assessment of costs and benefits and their distribution between municipalities, regions, and the national government are used?
- How are the CGAs/CEAs intended to be followed up on?
- How does cooperation between different actors, especially the public and the private sector, work?
- Who does what regarding infrastructure investments?
- Who does what regarding rolling stock?
- Who does what regarding travel behavior?
- How can the local and regional levels exert influence?
- Interaction between transport system planning and planning for housing.

Once we have answers to these questions, they will be related to a theoretical framework that fits respective question best. Relevant theoretical frameworks include the fiscal federalism theory (Oates, 1972; Besley & Coate, 2003; Helland & Sørensen, 2009; Hammes & Mandell, 2019), delegation models (Bendor, et al., 2001; Bendor & Meirowitz, 2004), and political economy models (Cadot, et al., 2006; Helland & Sørensen, 2009; Hammes & Nilsson, 2016).

In Norway, we examine two CGAs from slightly different time periods, namely the ones for the Trondheim area, which entered into a CGA in 2019 that will run until 2029, and Nord-Jæren (Stavanger area), whose CGA will be in effect 2017–2023. Nord-Jæren was one of the first two areas to enter into this type of agreement. The other area, from 2017 onwards, was Bergen. While Nord-Jæren is not a large recipient of funds per capita, the Trondheim area was the third-largest recipient over the period 2004–2016 (Norheim & Svensson, n.a.).

The Swedish municipalities in the case study, i.e., Lund (about 72.7 million EUR) and Uppsala (about 23.6 million EUR), were chosen among the biggest recipients of the CEAs. Lund is interesting also because the municipality is involved in the National Negotiation on Housing and Infrastructure. Moreover, the two fairly large municipalities lie in two different parts of the country.

3. City growth agreements in Norway

3.1. Trondheim area

This section is based on Samferdselsdepartementet (2019) if not otherwise mentioned. The CGA for Trondheim is an agreement between the Ministries of Transport and Municipalities and Modernization on one hand and the municipalities of Trondheim, Malvik, Melhus, and Stjørdal, as well as the county of Trøndelag, on the other.

The main goal of Trondheim's CGA is to act as a policy instrument in order to reach the zero-growth goal. The CGA also contributes to more efficient land use and more attractive city and urban areas. It contains a goal for the bicycle share of transportation in the city area to reach 20 percent. Finally, the

municipalities and the county have their own goals, e.g., lower CO₂ emissions, increased share of environmentally friendly travel, and reductions in the need to travel and the number of deadly or very serious traffic accidents.

A consequence study was carried out in 2010 for the main PT project included in Trondheim's CGA, namely a bus rapid transport (BRT) system called *Metrobuss* (Wendelborg Fremo, 2011).³ The study consists of two parts: a "possibility study" and a "consequence analysis." Neither part examines the socio-economic profitability of the system, however. Instead, the consequence analysis focuses on consequences for different groups of road users, land use, the impact on businesses along the route, the need for upgrading side streets, possibilities for parking, the bus stop structure, etc. The economic consequences have instead been studied by Fearnley et al. (2008), who calculate costs and some benefits but do not perform an outright cost-benefit analysis (CBA). They note that a BRT system would be cheaper and more flexible than a rail solution. A CBA was carried out for highway projects on the E6 highway by Nye Veier AS.⁴ The analysis indicates a negative net present value of the investment of -142 million EUR (Samferdselsdepartementet, 2017).

Table 1 shows the measures included in the Trondheim area CGA. The CGA specifies total funding amounting to 966 million EUR over an 11-year period of which 706 million EUR is covered by road toll

³ The *Metrobuss* project is part of an earlier 2016–2023 city environmental agreement between the Norwegian state, the city of Trondheim, and Sør-Trøndelag county. It consists of building three PT routes with "good levels of service." The total cost is calculated to equal 263 million EUR in 2018 price terms. The project is financed by state funds for large county-level infrastructure projects for PT and by the municipality of Trondheim and the county. Municipal and county funds include road toll revenues, municipal and county funds, and/or private funds. The responsibility for planning the *Metrobuss* and for a financially rational operations management lies with the municipality of Trondheim and the Sør-Trøndelag county (Samferdselsdepartementet, 2016).

⁴ Nye Veier AS is a state-owned limited company specializing in road projects. Private contractors do the actual building of the road.

revenues. The state pays 100 percent of the completion of railroad projects, while the building of highway projects is also funded by road toll revenues. The state covers 50 percent of the total cost of completing the *Metrobuss* project. Alternative funding sources, such as landowner contributions and other private contributions, can also be included. The road tolls collected around the city of Trondheim can be used in the entire contract area. The operation costs of PT are covered by the ordinary operation subsidy from the Trøndelag county, the reward funds-system, and from road toll revenues.

Table 1. Projects included in the CGA for the Trondheim area, million EUR 2019–2029. Prices in 2018 price terms.

| MEASURE | COST |
|--|-------------|
| STATE SUBSIDIES TO IMPORTANT COUNTY-LEVEL PUBLIC TRANSPORT PROJECTS (METROBUSS) | 174 |
| MEASURES TO IMPROVE PUBLIC TRANSPORT, BICYCLING, AND WALKWAYS ALONG HIGHWAYS | 377 |
| REWARD FUNDS FOR THE OPERATION OF PUBLIC TRANSPORT | 279 |
| DEVELOPMENT OF RAILROAD SERVICES ON TRØNDERBANEN | 422 |
| DEVELOPMENT OF JUNCTIONS AND AREAL PLANNING | |
| - TRONDHEIM'S STATION | 21 |
| - JUNCTIONS IN MELHUS, HOMMELVIK, AND STJØRDAL | 8 |
| ROUTE, FEE, AND TICKET COOPERATION | - |
| HIGHWAY PROJECTS; STATE FUNDED | |
| - E6 JAKTØYA - KLETT – SENTERVEGEN | 101 |
| - RV 706 SLUPPEN BRU WITH CONNECTIONS | 84 |
| MEASURES BY MUNICIPALITIES | |
| - TRONDHEIM | 21 |
| - MALVIK, MELHUS, STJØRDAL | 6 |

The highway-building and PT parts of the CGA are shown in diagrammatic form in Figure 1. Topmost in the figure is the Norwegian state through the two ministries, and the municipalities and the county involved. Under this is the Contact Committee, as described below. The three boxes with thick borders represent the measures included in the CGA. The other boxes represent the other actors involved. The text next to the arrows describes the types of action taken by the different actors.

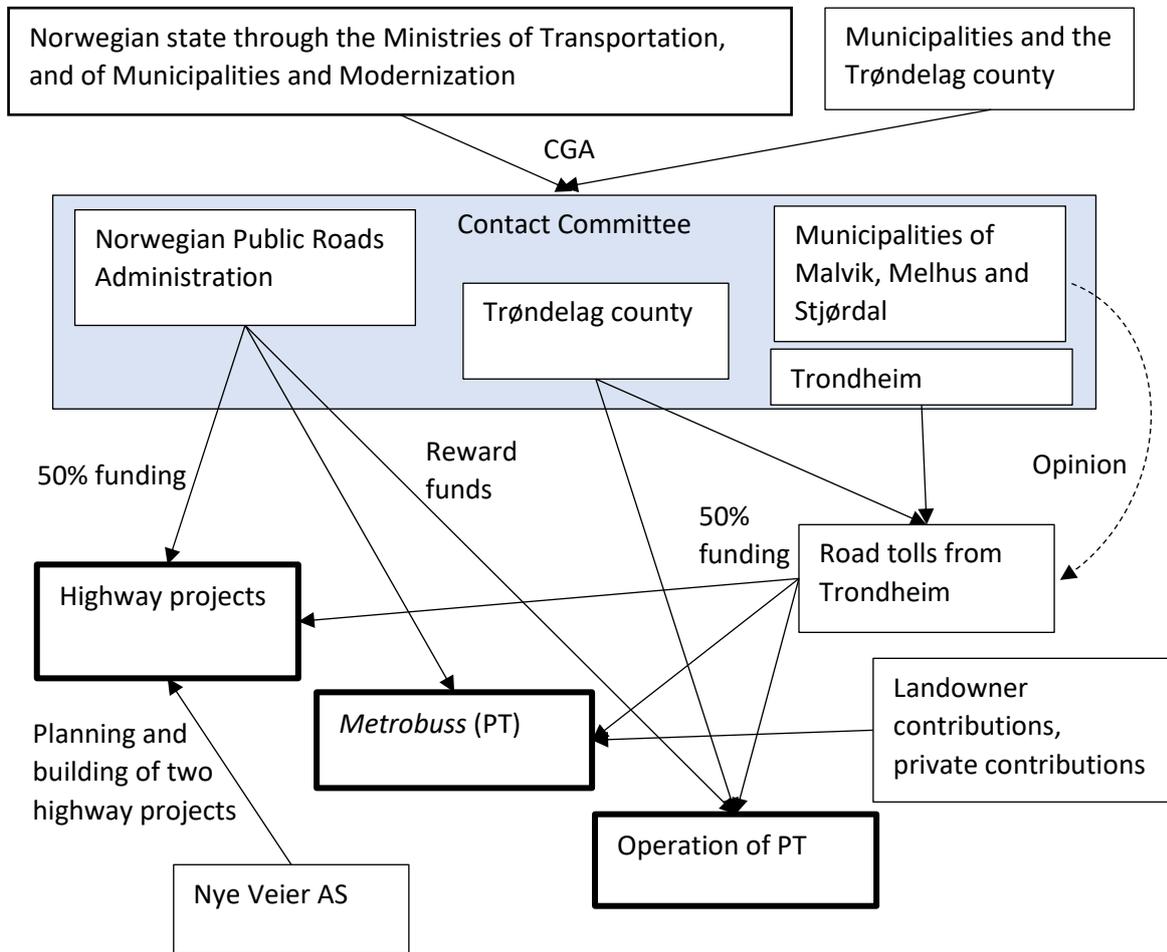


Figure 1. A diagrammatic description of the structure of the highway and PT measures in the CGA for the Trondheim area.

Trondheim’s CGA not only includes investments in physical infrastructure as shown in Table 1 but also other measures and policy instruments. First, the county of Trøndelag, the local PT authority

(PTA) AtB, and the Railway Directorate have agreed to create a unified PT system. Second, the municipalities and the county will develop a coordinated parking policy. Third, an important decision is the localization of county and state agency offices, which must be easily reachable by PT, cyclists, and pedestrians. Fourth, the road tolls are a central policy instrument, and the municipality of Trondheim and the Trøndelag county have full authority over them. This means that all decisions about the fees, toll station locations, and use of the revenues are made by the municipality of Trondheim and the Trøndelag county.⁵ The three other municipalities that are parties to the CGA, Melhus, Malvik, and Stjørdal, have the right to express their opinion.

The parties to the pact shall attempt to influence citizen attitudes, with the goal of changing travel behavior. Especially the period over which the E6 highway east and south of Trondheim is built out is considered to create a possibility for changing travel patterns.

City planning is also included in the CGA. In Trondheim, the plan is to develop two underdeveloped areas, Sluppen and Nyhavna, close to the downtown area. While the state and the county are paying for the development of the road system in the two areas, private landowners are involved in the planning process. Moreover, the Sluppen area is part of an EU research program, Smart Cities and Communities. The development of new buildings in all four participating municipalities will be concentrated to prioritized urban areas and, preferably, close to junctions, as this gives/will give residents easy access to public transportation and existing roads. Areal planning will have to take the zero-growth goal into account and new developments in Malvik, Melhus, and Stjørdal should lie within walking and biking distance from the municipal centers. Moreover, visitor- and workplace-intensive businesses should be located in the municipal centers. The municipalities of Malvik, Melhus, and Stjørdal should define a long-term and predictable boundary of their urban areas. The

⁵ An exception is the toll on the E6 highway.

PT solutions, which the county is responsible for, have to contribute to the zero-growth goal and a common housing and labor market region.

The measures besides those in Table 1 are presented in diagrammatic form in Figure 2. Three measures are identified in the boxes with thick borders: coordinated parking, location of agencies and service points, and city planning. Which one is affected by which participant is indicated by arrows. In the box on the right-hand side are the actors participating in the building of the E6 highway. Where there seems to be an arrow missing (e.g., from coordinated parking to the zero-growth goal), the connection was not explicitly mentioned by Samferdselsdepartementet (2019).

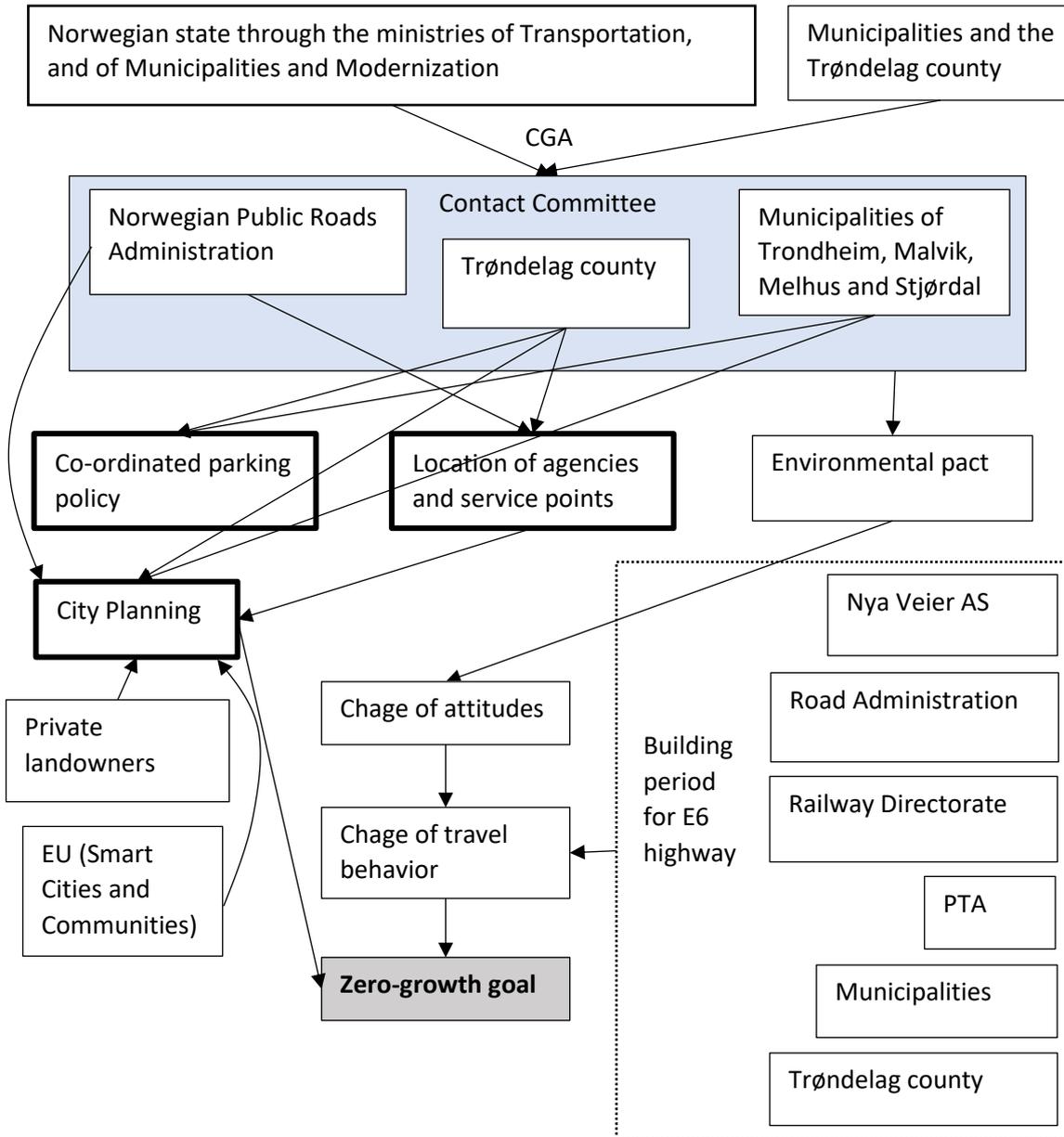


Figure 2. A diagrammatic description of the structure of the measures besides infrastructure and other investments included in the CGA for the Trondheim area.

The prioritization of projects within the agreement is determined using portfolio management. The measures are prioritized based on socio-economic profitability, disposable funds, state of planning, the availability of adequate resources for planning and implementation, and a valuation of how much

they contribute to the zero-growth goal. Besides the planning of projects within the CGA, each participating municipality manages its own portfolio of projects.

The central government finances studies and initial planning of the implementation of pedestrian, cycling, and PT measures along road networks with national highway function. They also finance the studies and initial planning of measures that can be included in the next NTIP (2022–2033) and those pertaining to road junctions for all transport modes in Sluppen. The municipalities and the county together finance opportunity analyses, investigations, and general plans with a view to documenting the need for measures.

The CGA is followed up on by an organization consisting of several tiers. At the top is a political steering group, which leads the work with the agreement and has the overall responsibility for a four-year work program and the yearly budget. Below this group is an administrative so-called contact committee, which is responsible for following up on the CGA, e.g., through goal management and project and portfolio planning and by reporting results and creating a unified budget and action program. Below the contact committee is a program council, which ensures that the cases presented to elected bodies and the contact committee are properly investigated and decisions implemented. Finally, a secretariat leads the cooperation on behalf of the governing bodies and prepares the issues discussed by the other groups.

The CGA includes several indicators used for follow-ups. The most important of these is a continuous city travel behavior survey, which is a short version of the national travel behavior survey. The state of Norway covers half of the cost of the travel behavior survey and the county and the municipalities cover the other half. Moreover, a traffic index for road transport, based on fixed traffic registration points on highways, county roads, and municipal roads, is constructed. Light freight transport and pass-through traffic are excluded from the traffic index as these types of transportation are not included in the zero-growth goal. The number of cyclists is counted using existing fixed counting points. The Railway Directorate is responsible for counting rail passengers, while the Trøndelag

county through the PTA is responsible for other PT. Emissions of GHGs are assessed using statistics from Statistics Norway. Finally, indicators for land use and parking are used. The municipalities of Trondheim, Malvik, Melhus, and Stjørdal along with the Trøndelag county are responsible for reporting the indicators, while the Public Roads Administration is responsible for reporting the travel behavior survey and the traffic index.

3.2. Nord-Jæren (Stavanger)

This section is based on Samferdselsdepartementet og Kommunal- og moderniseringsdepartementet (2017) if not otherwise mentioned. The CGA for Nord-Jæren consists of two parts, an overarching “city growth agreement” and a “city pact.” While the main goal of the agreement is the zero-growth goal, the pact also strives for good accessibility with the main weight being put on PT, cycling, walking, and freight transport. The agreement for Nord-Jæren covers four municipalities: Stavanger, Sandnes, Sola, and Randaberg.

The background to the city pact for Nord-Jæren can be found in the concept selection study (*konseptvalgutredning*) for the transport system in Jæren in 2009. The socio-economic profitability of the main elements of the CGA has been assessed by Atkins Oslo Economics (2016). Table 2 summarizes the results and also shows the measures included in the city pact for Nord-Jæren. The total cost of the package is 3,256 million EUR in 2018 price terms. The central government pays for the reward funds, rail projects, and funds reserved for city environmental and city growth agreements. The measures are based on the framework given by the NTIP for 2014–2023 and updated to the framework of the NTIP for 2018–2029 in 2018.

Table 2. Measures included in the city pact for Nord-Jæren, million EUR in 2018 price terms. Net present value (NPV) in the fourth column when information is available, net benefit cost ratio (NBCR) in the fifth.

| MEASURE | COST | STATE FINANC- ING | NPV | NBCR |
|--|-------|-------------------------|------|-------|
| ROAD MEASURES | 1 285 | 214 | | |
| <i>TRANSPORT CORRIDOR WEST</i> | 461 | | -288 | -1.02 |
| - <i>FV 505 FOSS EIKELAND - E39</i> | 80 | | | |
| - <i>E39/RV 44 INTERSECTION/ ROAD EXPANSION STANGELAND</i> | 21 | | | |
| <i>E39 ÅLGÅRD - HOVE</i> | 380 | | -168 | -0.81 |
| <i>E39 SMIENE - HARESTAD</i> | 343 | | -144 | -0.49 |
| BUSSVEIEN (BRT) | 771 | 546 | -642 | -0.91 |
| OTHER PUBLIC TRANSPORT MEASURES | 359 | | | |
| BICYCLE EXPRESS WAY STAVANGER - SANDNES | 139 | | -45 | -0.41 |
| PROGRAM AREA MEASURES | 337 | 137 | | |
| <i>PUBLIC TRANSPORT</i> | 112 | | | |
| <i>BICYCLE EXPRESS WAY STAVANGER - SANDNES</i> | 112 | | | |
| <i>TRAFFIC SAFETY, WALKING, ENVIRONMENT</i> | 112 | | | |
| OPERATION OF PUBLIC TRANSPORT | 337 | 82 | | |
| BUILDING OF ROAD TOLL STATIONS | 21 | | | |
| TRANSPORT SYSTEM SANDNES EAST (PLANNING) | 5 | | | |
| RAILROAD MEASURES OVER PERIOD 2014-2023 | 56 | 56 | | |

Source: Samferdselsdepartementet og Kommunal- og moderniseringsdepartementet (2017), Atkins Oslo Economics (2016).

An ambition of the agreement is that 70 percent of the funds reserved for the CGA shall be used for PT, cycling, and walking measures. The local governments refer to a yearly need of 21 million EUR of

reward funds to cover the operational costs of PT in order to increase services on the bus rapid transport (BRT) project *bussveien*,⁶ including measures to influence mobility, to ascertain the climate neutrality of the services, to coordinate the ticket systems between bus and rail, and for new technologies. However, in the CGA, the central government provided only 18 million EUR in 2017 and 10.7 million EUR per year 2018–2023 in reward funds. The central government contributes to the further development of the train services together with the local PTA Kolumbus AS, and to cooperation on bus and train tariffs. External quality control is as a rule a prerequisite for funding from the central government.

The county council and the municipalities are responsible for other financing within the CGA, with the main funding sources being road tolls, loans, and local tax revenue. The net income from road tolls is calculated to 2,249 million EUR over the contract period. The local partners finance 50 percent of the *bussveien* from the road tolls. There is a possibility to borrow 750 million EUR, and repay the loan using road toll revenue. Borrowed funds are not to be used to cover PT operations costs or to avoid real prioritization of objects within the portfolio management of the projects; the principles of portfolio management were discussed in conjunction with Trondheim and will not be repeated here.

County and municipal tax revenue is used to cover the cost of road investments, planning, and the operation and maintenance of the road network. Rogaland county pays about 27 million EUR per year in operational costs for PT. It also pays for a number of other transport-related measures.

The road- and PT-related measures in the CGA are summarized in Figure 3. The figure contains three objects: investment in and operation of PT, and highway projects.

⁶ *Bussveien* is a project for building three bus corridors in Nord-Jæren (Atkins Oslo Economics, 2016). Traffic on the *bussveien* will be administered by the local PTA Kolumbus AS. The PTA is also in charge of acquiring buses, infrastructure, and arranging a control center (Rogaland fylkeskommune, 2020).

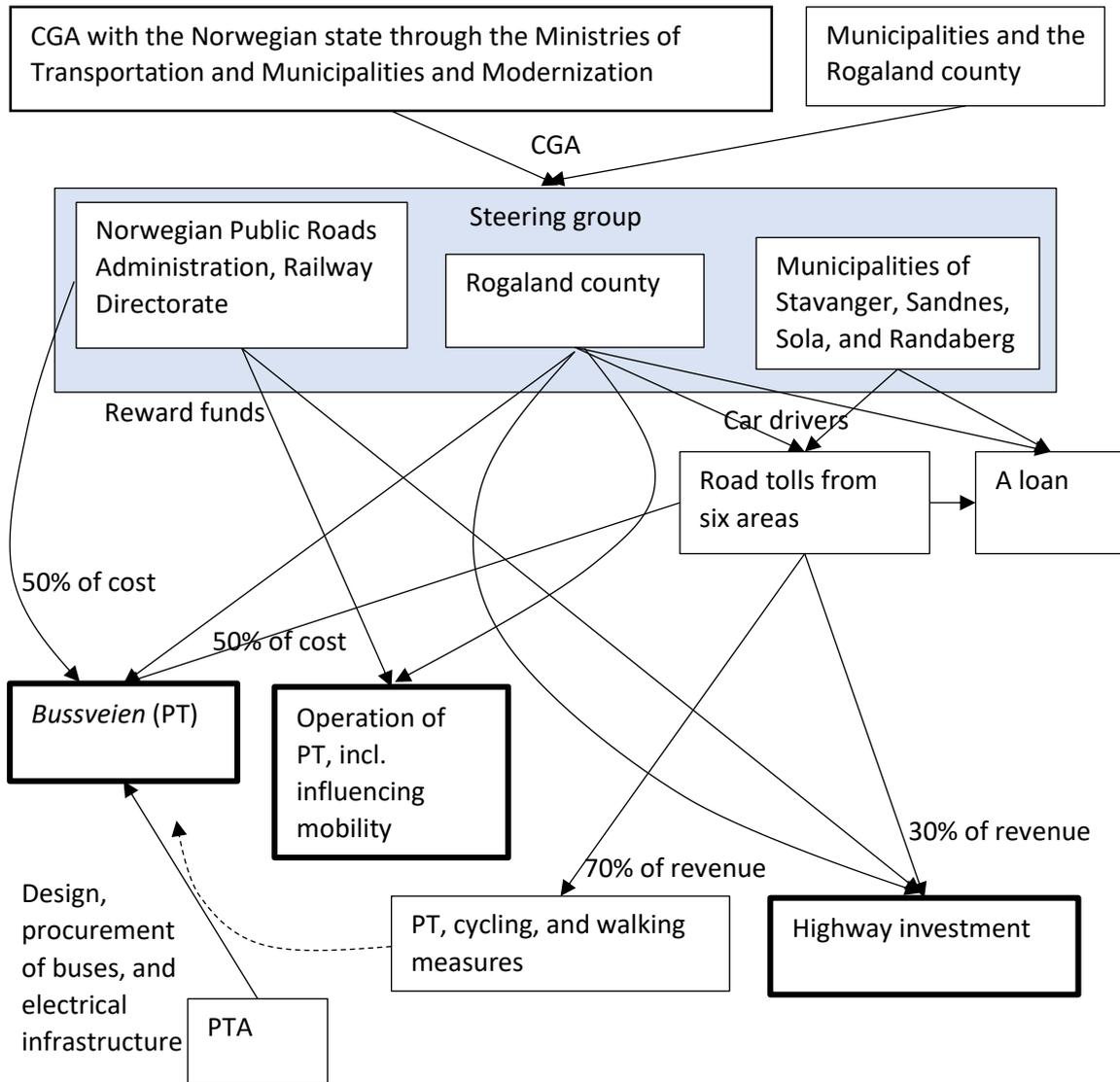


Figure 3. The structure of the CGA for the road- and PT systems in Stavanger area.

Areal planning is part of the CGA. The regional plan for Jæren was approved in 2013. The goal of areal planning is densification, coordination with transport planning, and transformation with high urban and residential quality in a manner similar to Trondheim.

The agreement also details a number of indicators used for assessment of results, which are similar to those used in Trondheim’s agreement. However, the agreement in Nord-Jæren also includes indicators used for assessing land use and parking. These two indicators are not used for determining achievement of the goals of the agreement.

The CGA is followed up by a steering group. The main task of this group is to prioritize projects within the portfolio, and to see to the implementation of the agreement.

The city councils of the municipalities involved, and the Rogaland county council, have made decisions about the maximum loan they are willing to accept, the use of the road toll revenue to finance both infrastructure investments and the operation of PT (they did not agree on whether to allow use of the road toll funds for the operation costs), the road toll fees (again, there were some disagreements between the municipalities), the location of toll booths, the composition of the steering group, and some other practical matters. How much the municipal decisions have influenced the final agreement is unclear, however, especially with regard to issues where the municipalities disagreed. Moreover, the source material does not explain how the process and negotiations before the municipal decisions have been undertaken. The infrastructure investment projects are included in the NTIP, which is decided on by the Parliament. Moreover, since the city pact is implemented according to the principles of portfolio management, there may be changes in the pact over time. According to the agreement, these changes must be based on “rational progress and good financial management.” Portfolio management work takes place through an annual rollout of an action program with a main emphasis on goal and result management.

The responsibility for the design and procurement of buses and possible electrical infrastructure lies with the local PTA. Before procurement, the matter must be dealt with politically in the county council, where also decisions about the ownership of the buses and possible infrastructure are made. The division of costs between the state and county is expected to be such that the county covers the cost of the procurement of buses and the operational costs. The infrastructure for electric buses is expected to be covered by the state and road toll revenues.

4. City Environmental Agreements in Sweden

4.1. Lund

The facts in this section come from the municipality of Lund's application to the Swedish Transport Administration (Lunds kommun, 2015) if not otherwise mentioned. The CEA project that Lund requested support for consisted of the establishment of a tram line between the Lund central station and a future suburb, Brunnsög. The project was approved in 2015. The total cost was estimated to 76.2 million EUR, of which state co-financing covered 30.5 million EUR in 2018 price terms, or 40 percent of the total cost. The support was conditional on the municipality of Lund taking complementary measures. Wilhelmsson et al. (2015) conducted a cost-benefit analysis (CBA) of the project at the behest of the municipality of Lund and *Spårvagnar i Skåne* (an organization promoting the building of tram lines in the Scania region) and found a net benefit cost ratio (NBCR) of -0.45, i.e., the project is unprofitable from a societal point of view.

The complementary measures that the municipality of Lund agreed to take did not include a price estimate. They included the densification of *Kunskapsstråket*, an area stretching from the old inner city of Lund to Brunnsög, building of the area of Brunnsög, and the rebuilding of the Lund central station. Moreover, the municipality agreed to develop the inner-city bus network, build four defined bicycle lines, and implement other measures for walking, cycling, and PT. Finally, the municipality was to change speed limits in the city and engage in mobility management during the construction of the tram line.

The first of the complementary measures, densification of *Kunskapsstråket*, is a measure that requires the municipality to present detailed building plans and prepare land for building. The building itself was undertaken by private construction companies. Development of the inner-city bus network was implemented in cooperation with the local PTA, Skånetrafiken. The framework program for rebuilding the central station was taken by the local housing committee. With the framework program as a basis, the different parts of the project were then developed in dialogue with the

municipality, Jernhusen,⁷ Skånetrafiken, the Swedish Transport Administration, and other stakeholders. While the municipality is responsible for most of the construction of pedestrian and bicycle lanes, there is also a “super bicycle lane” between Malmö and Lund built in cooperation with the Swedish Transport Administration and the municipalities that the lane passes.

The CEA project should be seen as part of a larger transport strategy that has been ongoing in Lund since the 1970s. The first strategy for an environmentally friendly transport system, LundaMaTs, was approved in 1999, and in the subsequent strategy approved in 2006, the focus moved to a sustainable transport system. The present strategic plan, LundaMaTs III, is from 2014 and includes goals of increased modal shares for walking, cycling, and PT and also for car travel per inhabitant in the municipal street network to fall by 1 percent per year. Besides the strategic plans, the town council has decided on two climate goals, namely to cut greenhouse gas emissions in half by 2020 compared with 1990 levels and to achieve a level of emissions near zero by 2050 (Lunds kommun, 2014).

In Sweden, municipalities have far-reaching responsibilities for areal planning. Consequently, the municipality of Lund is the “owner” of the project and the planning that precedes it, including the planning of the *Kunskapsstråket* and Brunnsbögen as well as all areas in between. Among the goals decided by the town council are that one third of all transports to and from Brunnsbögen are to be by car, one third by PT and the last third by foot or bicycle.

The municipality has been responsible for completing a pre-study of the proposed tram line along with a detailed plan and a design of the line, and even a design concept for the tram cars and the stops. It ordered and financed the CBA conducted by Wilhelmsson et al. (2015). The municipality did not plan the tram line alone, however but it was planned in cooperation with *Spårvagnar i Skåne*

⁷ Jernhusen is a limited company owned by the Swedish state. It owns mainly railroad-related real estate such as stations, depots, and terminals.

until May 2014. Partners in Spårvagnar i Skåne were the municipalities of Malmö, Helsingborg, Lund, and Region Skåne. The work was partly financed by the European Investment Bank (EIB), within its ELENA energy program. EIB's support for the planning of the project amounted to about 3 million EUR. The municipality of Lund was responsible for the infrastructure, while Region Skåne was in charge of the purchasing of vehicles, building of a tram depot, and operating the tram system.

The building of the tramway was procured from a private entrepreneur. The municipality of Lund, which was responsible for the procurement, used procurement form extended co-operation/partnering.

The main form of cooperation with the private sector, besides the companies building the infrastructure, is with real estate developers. One of their demands was that a decision about the building of the tram line had to be made before they would start building. Consequently, once the decision about building the tram line had been made, the municipality intensified its efforts to plan the land near future tram stops and then to sell building rights on the planned land.

Figure 4 summarizes the main project organization and financing. The figure shows the three-tiered decision-making and financing structure, with the Swedish state/Swedish Transport Administration, which made the decision about co-financing, at the top. The CEA financing goes from the Transport Administration to the municipality of Lund, which, however, has had a shared project organization with Region Skåne and the municipalities of Malmö and Helsingborg. The building of the tram line in turn was financed by Lund, partly from the CEA, and partly from own sources, and built by private construction companies.

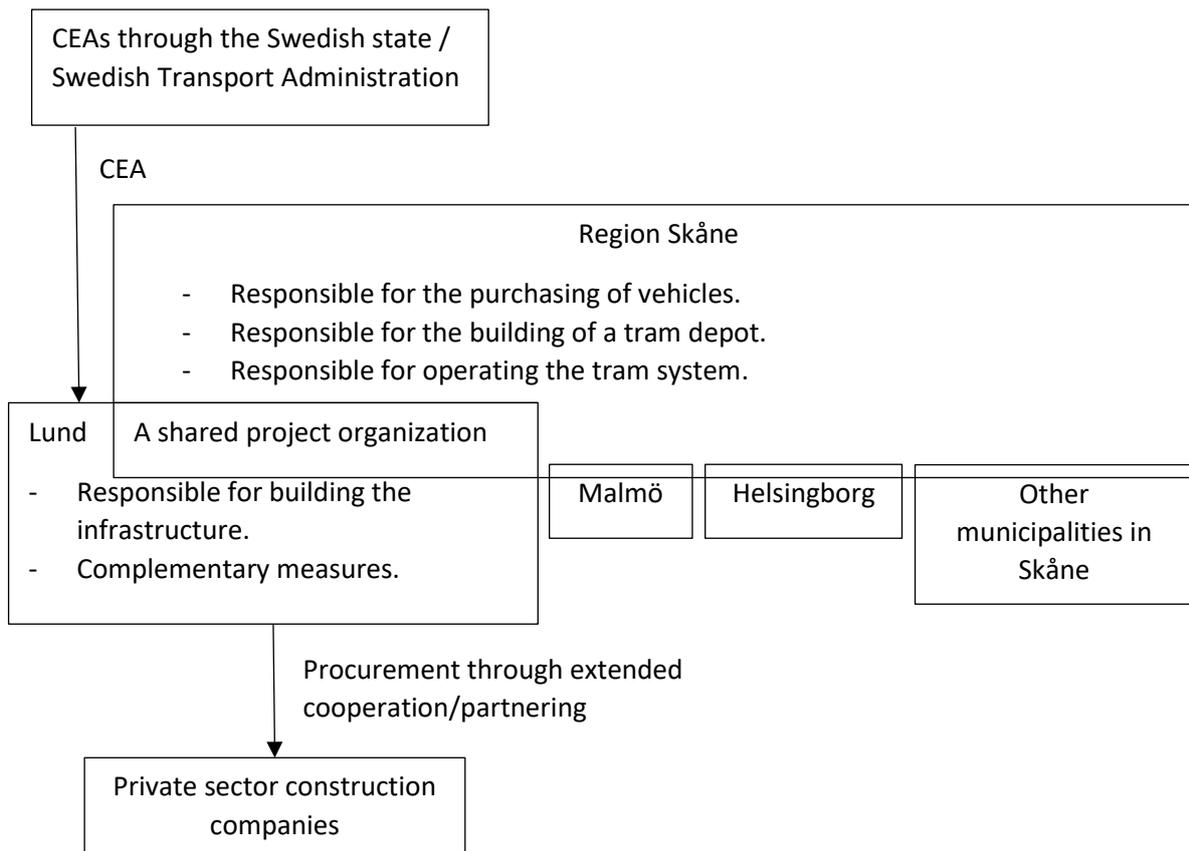


Figure 4 A diagrammatic illustration of the CEA decision-making and financing structure for building a tram line in Lund.

4.2. Uppsala

The facts in this section come from the municipality of Uppsala’s application to the Swedish Transport Administration (Uppsala kommun, 2017) if not otherwise mentioned. The municipality of Uppsala received CEA project approvals in 2016 and 2017. However, the project proposed in 2016 was changed by the municipality and delayed, which led the Swedish Transport Administration to cancel its decision.⁸ For this reason, the project focused on in this paper is the one with a decision made in 2017.

⁸ The project proposed enhancements in the physical PT system with new bus lanes, bridges etc. The budget was about 12.3 million EUR.

The CEA projects that Uppsala requested support for were the establishment of four new bicycle lanes, a bicycle garage at Uppsala central station, and a bicycle bridge over the river Fyris at a total cost of 5.1 million EUR. State support equaled about 2.5 million EUR in 2018 price terms after the Transport Administration disapproved of project part 2 and reduced the budget eligible for support. State support thus constituted 48.6 percent of project cost. The support was conditional on the municipality of Uppsala taking complementary measures including the building of about 1,200 dwellings in Ulleråker, 5–6 parking areas for cargo bikes in central Uppsala, and two-story bicycle racks in several locations in the inner city and at the city travel center plus the expansion of existing bicycle racks to two-story ones. Moreover, the municipality was to replace a parking lot with a bicycle parking at three locations and revise speed limits both in the main city area and in the densely built parts of the municipality outside of it.

The background to the CEA project is Uppsala's rapid population growth. The municipality has a political goal of growing by about 3,000 persons per year and has built about 3,000 new dwellings per year. The plan is to build 60,000 new dwellings by 2050. In order to accommodate an increase in population of this size, the municipality wants to promote space-efficient transport modes.

Otherwise, congestion, noise, and increased GHG emissions will cause problems (Uppsala kommun, 2017).

The construction of bicycle lanes is a project that is part of the municipality's bicycle transport strategy, which was established by the town council in 2013. At the same time, the municipal executive board approved guidelines for work with bicycle transportation. The four bicycle lanes included in the CEA are the responsibility of the municipality alone, just like the complementary measures. Only the last measure, i.e., the building of a bicycle bridge over the river Fyris, involves a cooperation partner, namely the Swedish University of Agricultural Sciences.

The bicycle lanes will be built by private contractors following a public procurement process. The municipality works actively to change people's travel behavior; according to the travel behavior

survey from 2015, 36 percent of all trips in central Uppsala are made by bicycle. The municipality estimates that this figure can be further increased, however. For this to happen, the bicycle network will have to be further developed; the standard has to be raised and the network will have to be linked together in several places.

5. Discussion

In this section, we relate the findings in Sections 3 and 4 to the questions posed in Section 2. We start by noting that the scopes of the two systems differ vastly – the CGA for the Trondheim area is worth 966 million EUR over the agreement period 2019–2029 with total investment expenditures of 1,574 million EUR, and the projects tied to the CGA for Nord-Jæren will cost a total of 3,256 million EUR to complete over the period 2017–2023. The CEA for Lund is worth 30.5 million EUR in state funding for the tramway project, the total investment cost being about 76 million EUR, and that for Uppsala is worth 2.5 million EUR in state funding for the bicycle lanes, the total investment cost being about 5.1 million EUR.

Decision-supporting documentation and a **cost-benefit analysis** (CBA) have been completed for some projects: for Nord-Jæren by Atkins Oslo Economics (2016) and for highway E6 in Trondheim by Nye Vejer AS. All projects in Norway have a negative NBCR, however. That Norwegian transport infrastructure investments tend to have a negative NBCR has been found in several other studies (Welde, et al., 2013; Sager, 2016; Halse & Fridstrøm, 2019; Helland & Sørensen, 2009; Olsson, et al., 2019). This probably explains the Norwegian use of portfolio management to prioritize among projects – using multi-criteria analysis (Ahern & Anandarajah, 2007; Wei, et al., 2016) may make it possible to prioritize among projects that should, on economic grounds, not be carried out. For the tramway in Lund, a CBA was performed by Wilhelmsson et al. (2015), showing a negative NBCR. No known socio-economic assessment has been made regarding the CEA project in Uppsala.

The CGAs are multi-year, multi-project agreements with a strictly defined **system for decision-making within the agreement**, well-defined procedures for project choice, and clearly defined levels

of management, including at least a steering group, and in Trondheim a four-level governance system. In both Norwegian agreements, a large number of indicators have been defined in order to be able to **follow up on the agreement**. In Lund, decisions about the CEA were made in the joint project organization with Region Skåne. The state's role is to serve as a funding source; nevertheless, the cancellation of one of the CEA projects in Uppsala shows that if the municipalities do not follow the agreement, the state can intervene by cancel its financing. For Uppsala, no steering organization besides that within the municipality itself is specified. Both the Norwegian and the Swedish systems, with co-financing from the state to municipal-level transport infrastructure investments, can be rationalized using the fiscal federalism-based (Oates, 1972; Besley & Coate, 2003) model in Hammes and Mandell (2019). Both the CGAs and the CEAs formalize the system by which local actors can influence central decision-making, the CGAs through a formal negotiation process and the CEAs by simplifying the matter into one of sending in an application to a government agency. Following Hammes and Mandell, this will likely increase the investment volume in Norway where the CGAs concern large municipalities, and probably also in Lund and Uppsala, compared with a situation without co-financing. Moreover, unproductive lobbying can be reduced, increasing efficiency. Since the CEAs are municipality specific, and tend to support infrastructure with very local benefits, there are probably few spatial spillovers to neighboring municipalities. Then, the central government should not co-finance infrastructure that the municipality has an incentive to provide by itself at the optimal level. Whether the spatial spillovers in Norway suffice to make the investment level optimal cannot be judged at the present level of knowledge.

Steering systems differ quite fundamentally between Norway and Sweden. In Norway, lower level committees are responsible for the steering committee for CGA execution. This system might be understood in light of a principal-agent or a delegation model (Bendor, et al., 2001; Bendor & Meirowitz, 2004). In Sweden, the municipalities "own" their projects and are, in the end, accountable to voters.

The private sector plays a rather small role in both countries, being mainly that of an infrastructure constructor. Nevertheless, the private sector also to some extent participates in city planning.

The responsibility for transport infrastructure investments lies partly with the state and partly with the municipalities involved in both countries. The large road and rail projects are planned by the state in Norway – in fact, this is the same in Sweden, but in Sweden these projects are not included in the CEAs. Road and PT projects are co-financed from road toll revenues in Norway; in Sweden, this is the case only in Stockholm and Gothenburg, the two largest cities and not studied in this report. Even in these cities, the road toll revenue is not connected to the CEA. Otherwise the state is responsible for the financing of national road and rail projects in Sweden, with the exception of some co-financing from municipalities (Hammes, 2013; Hammes & Nilsson, 2016). The CEA projects in Lund and Uppsala are financed by the respective municipality using municipal sources of income.

The responsibility for rolling stock for the PT system in both countries is similar; it lies with the local PTA and/or the county (the electric buses in Nord-Jæren). The PTA tends to be responsible both for purchasing buses and trams and for the running and maintenance of them.

Attempts to influence travel behavior in Trondheim are included in a special part of the CGA, the so-called environmental pact, of which the CGA parties also are parts. Moreover, it is explicitly mentioned that during the highway E6 construction project, those involved will work to change travel patterns. In Nord-Jæren, the municipalities are responsible for influencing travel behavior. In Uppsala, too, travel behavior is mentioned as one of the tasks of the municipality. In Lund, however, no mention of travel behavior has been found. Thus, it seems that the municipality relies on infrastructure investments for changing travel behavior.

Finally, **the interaction between the transport system planning and the planning for housing** is integral both in the Norwegian CGAs and in the Swedish CEAs. Thus, all four agreements mention the building of new housing. Unlike in Norway, in Sweden there are provisions about densification in the CEA for Lund but no provisions to limit urban sprawl.

6. Conclusions

As was noted at the outset, the CGA in Norway and the CEA in Sweden, despite their similar names, are two quite different policy instruments. The CGA in Norway is a fairly holistic package of measures agreed upon between the state and the municipalities in a region. Such agreements cover all the main cities in Norway and are an important part of the national transport infrastructure planning. In Sweden, the CEAs are case-by-case project applications within a framework of municipal planning, and they are much smaller than their Norwegian counterparts. Still, there are some similarities between the systems, especially regarding the drive to create more sustainable transport systems, both by investing in PT, walking, and cycling infrastructure and by the importance given to areal planning (in Norway) and the building of new housing (in Sweden). Thus, in Lund, the building of the new area Brunnsbögen is integral for the CEA; in Norway, the building of new areas is not necessarily involved, but densification of existing urban areas and the localization of activities are.

Both the CGAs and the CEAs can easily be considered within the framework of a fiscal federalism model, i.e., the study of the optimal level for making decisions about and financing public infrastructure. In Norway, the focus is on internalizing spatial spillovers. Thus, the state is present in all decisions regarding the building of railroads, which is probably the mode with the most significant spillovers over regional borders, highways, PT, and even walking and cycling paths along highways. The level of co-financing required from the local partners varies from zero percent for railroad investments to half for highway, PT, walking, and cycling investments, and possibly even more for the operation cost of PT. Consequently, the more local the benefits, the larger the share paid by the local government(s) for the investment.

In Sweden, both projects studied are local with few spillovers to other municipalities or regions. In Lund, commuters from neighboring municipalities will also benefit from the tramway, but the spillovers from this are covered by cooperation within the common project organization. In Uppsala, the only third partner is the Swedish University of Agricultural Sciences, also a local actor. In both

cases, it would be optimal, according to the fiscal federalism model, for the municipality to finance the investment by itself (in Lund together with the region), and it is unclear why central government financing is needed, or indeed granted, for either project.

To understand the Swedish system, a political economy model is therefore called for. A prediction arising from the fiscal federalism model is that central government financing of infrastructure raises demand at the local level (Oates, 1972; Besley & Coate, 2003). Hammes and Mandell (2019) note that co-financing can either raise or lower the investment volume compared with full state financing, depending on parameter values. Moreover, if municipalities have to finance the entire cost of a project, they invest up to a point where the marginal benefits to their own inhabitants equal the marginal costs. External financing can then raise the investment volume. This is beneficial as long as there are spillovers to other municipalities, which seems to be the case in Norway where commuters to larger cities have to pay road tolls. In this conjunction, the road toll system in Nord-Jæren stands out as particularly interesting, considering that toll cordons are placed around several regional centers. The spillovers in Sweden appear to be much smaller, however. Therefore, it seems that the CEAs are used merely to increase investment volumes and, at least in the case of the tramway in Lund, to cover up for the unprofitable part of an investment.

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