Sustainable Nordic cities with focus on climate smart mobility



Nordic Council of Ministers

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Preface

All Nordic countries should adapt their transport sectors to become fossil-free and to build sustainable cities. With increasing urbanisation more Nordic citizens will live in cities. The role of cities in driving the transition to a fossil-free, attractive and sustainable societal development in the Nordic region is central. The limited space that cities can exploit needs to be used more efficiently and both space-efficient and climate-smart transport will be required. Growing cities pose a major challenge and increased urbanisation ramps up emissions of carbon dioxide and air pollutants and gives rise to noise pollution. However, the fact that more and more people live close together can also mean that transports can be carried out more efficiently. In cities, there are many opportunities that will enable us to overcome many of transport´s, climate and environmental challenges through physical planning and by applying new technologies and digital solutions that promote the sharing economy. The entire city must be accessible to everyone from equality, gender equality, security and innovation perspectives.

This Swedish presidency project promotes climate-smart mobility in Nordic cities. The aim is to contribute to sustainable urban development by supporting the transition to fossil-free transport in these cities and urban regions. Such a transition requires increased share of zero-emission vehicles and charging infrastructures as well as urban planning for long-term sustainable accessibility, but also innovative mobility solutions that underpin a transition to public transport, walking and cycling in cities and their surroundings as well as promoting efficient city logistics.

The project has involved collaborating and exchanging experiences between the Nordic countries. In this report, we highlight lessons learned, conclusions, good examples, recommendations and policy recommendations that have emerged in the exchanges of experiences and investigations within the project.



Robert Andrén, General Director Swedish Energy Agency



About the project

Sustainable Nordic cities with a focus on climate-smart mobility is one of four projects launched under the Swedish Presidency of the Nordic Council of Ministers in 2018. The aim of the project is to contribute to a sustainable urban development by supporting the transition to fossil free and sustainable transportation in Nordic cities and their surrounding regions. The project involves collaborating and exchanging experiences with other Nordic countries to find solutions for charging electric vehicles and creating attractive and climate-smart urban transport. The project has been led by the Swedish Energy Agency in collaboration with the Swedish Transport Administration and in dialogue with the Swedish Transport Agency, the Swedish Environmental Protection Agency, the Swedish National Board of Housing, Building and Planning and the Swedish Agency for Economic and Regional Growth. A Nordic reference group has also been attached to the project to further include the Nordic added value and participation in the project.

In order to better grasp the complexity of the transition to climate- smart travel and transport in Nordic cities the project has been split into five sub-projects. The methodology applied under the different sub-projects varies, ranging from written reports to workshops and webinars, but a common denominator is a focus on an exchange of experiences between the Nordic countries. The sub-projects are as follows (all activities are presented in Appendix A):

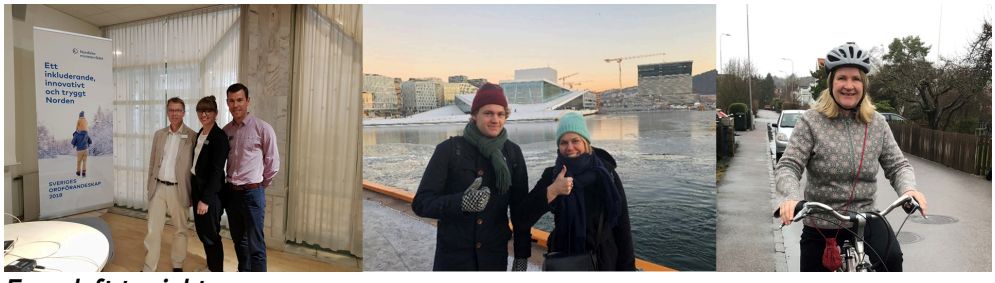
1. ***Zero-emission vehicles in cities***: A study of policy instruments and measures on how to increase the share of zero-emission vehicles in Nordic cities. The definition of a zero-emission vehicles varies between the Nordic countries where it is used in different contexts. In this sub-project focus is on electric cars, buses and heavy vehicles, but vehicles fuelled with renewables are also included. The study highlights good examples and provides policy recommendations. The full study can be requisitioned from IVL (2020).
2. ***Attractive and climate smart transportation in cities***: Has the aim to create dialogue meetings and exchanges of experiences on how to create the conditions for attractive, sustainable and climate-smart modes of transportation in cities and urban regions. This includes walking, biking and public transport but also other mobility services that are available in a sharing economy and underpinned by sustainable city logistics. The activities in this sub-project include compiling conclusions and providing recommendations and good

examples. This sub-project is summarised in Swedish in a report by Trafikverket (2020).

3. ***Charging of plug-in electric vehicles in cities:*** The aim of this sub-project is to explorer the role Nordic local public actors have in promoting the use of plug-in electric vehicles and facilitating the deployment of the charging infrastructure. This project has engaged with the pioneering cities and regions in the Nordic countries, explored the role public housing and parking companies and involved private stakeholders play in order to better understand how local public actors can promote the usage of plug-in electric vehicles in cities.
4. ***Database for charging stations:*** Focuses on developing the Nordic database for charging stations, NOBIL, to be more efficient for data suppliers, adapt the data format used to international standards and thereby make it more valuable for users. Today, NOBIL shows public charging stations in Norway, Sweden and Finland, but the technical solutions need to be developed. The ambition is to develop a database that will cover all the Nordic countries and increase the number of charging stations to include more operators.

Contact

Energimyndigheten
Gredbyvägen 10
Eskilstuna
Sverige
registrator@energimyndigheten.se



From left to right:
1. Anders Lewald, Martina Wikström and Erik Svahn Swedish Energy Agency. ***Photo:*** *Vibeke Svärd*
2. David Mowitz and Hanna Sundqvist, Swedish Energy Agency. ***Photo:*** *Svend Søyland*
3. Alice Dahlstrand, Swedish Transport Administration. ***Photo:*** *Bert Olsson*

Summary

The project - Sustainable Nordic Cities with Focus on Climate-Smart Mobility - aims to contribute to sustainable urban development by supporting the transition to fossil-free transport and accessibility in Nordic cities and urban regions. The potential to organise the Nordic society to be more transport-efficient is significant, and the remaining transports must become increasingly fossil-free. A transition like this requires several changes in our societies: an increased share of plug-in vehicles with deployment of charging infrastructure will be necessary as well as urban planning for long-term sustainable accessibility. Innovative mobility solutions that promote a transition to public transport are also requisite, as well as the promotion of walking and cycling in cities and surrounding areas in addition to promoting efficient urban logistics.

This report has been compiled from some of the most interesting applicable examples found in the Nordic countries. In here we present policy recommendations and good examples on how to accelerate the transition to climate-smart mobility and accessibility based firmly on these Nordic exchanges of knowledge and experiences. The Nordic cities and municipalities are leading the way. We see that Nordic cities want to be frontrunners in this field; however, they typically rely on national support to create favourable market conditions as well as to set examples - in terms of legal framework – in order to promote shared mobility.

This project shows, that there is plenty of relevant know-how in the Nordic countries. However, the ability to learn from examples and implement subsequent policy measures relies on the capacity of authorities to convey this knowledge into operational practice. To invest in local authority capacity-building, ensures the conditions to implement policy measures in scale. Which is necessary in order to reach national climate goals as well as the Paris agreement. This project has identified urban logistics, electric mobility and gender equality together with the needs and perspectives of the young and elderly as being particularly important.

This project wants to emphasise the potential to learn between the Nordic countries. These countries are often at different levels of change, an advantage which provides good opportunities to learn by comparison. There has been great interest in what is being done in other Nordic countries and the participants have expressed hopes of continuing to exchange experiences for knowledge of what is going on each other's nations. Measures for more sustainable mobility requires cross-border collaboration. These boundaries can be national but there is also lineation between academia with business and public activities, which provides many benefits to cooperate.



View of the Grand Hotel Oslo and people crossing the road near it. ***Photo:*** *Mostphotos.com*

1. Introduction

Mobility and accessibility are central components of our society. They enable connections between people, cities, regions and countries and underpin the distribution of goods and services. In many ways they make a city attractive letting inhabitants take part in community life and giving them the opportunity to thrive and flourish.

In the Nordics as well as globally, more and more people live in cities and urban regions. The limited available space must therefore be organised in a more transport-efficient way and the remaining transports must become increasingly fossil-free. Cities are important actors in this transition but collaboration with and support from other actors such as regional and national authorities as well as private actors and academia are crucial. The Nordic region is seen as frontrunner when it comes to taking climate action, but the Nordic countries are sometimes at different levels of change in the transition towards fossil-free mobility and accessibility. This, in combination with things they all have in common, such as city autonomy, similar societal structures and cultures, constitutes a good foundation for mutual learning.

The project *Sustainable Nordic cities with focus on climate-smart mobility* aim to contribute sustainable urban development by supporting the transition to fossil-free transport and accessibility in Nordic cities and urban regions. In this report we present policy recommendations and good examples of how to accelerate this transition. Our findings are based on Nordic exchanges of knowledge and experience carried out during the project.

The following three chapters are organised under the following three different themes. First, how mobility and logistics can enable an accessible and attractive city. Second, how cities can play an active role in the transition to climate-smart transports and finally, the importance of collaboration between different actors and authorities.

We hope you look at the content of this report as a Nordic smorgasbord of possible solutions and inspiring examples.

"Ultimately, it's about programming our cities for sustainability"

Patrik Faming, Chairman of the Nordic Council of Ministers' working group for sustainable cities.



What are the benefits of collaborating on climate smart mobility in the cities of the Nordic countries?
There are major collaborative gains in coordinating Nordic work linked to urban development and construction. We have different strengths and competences in the Nordic countries, but we have policies and laws which are quite comparable, and we face similar challenges.

How does your work contribute to climate smart mobility in a sustainable city?
When investing in methodology and policy development in urban (green) areas, conditions are given for an increased priority for climate-smart and sustainable transport such as public transport, walking and biking. Areas currently used for car traffic and parking can be transformed into new sustainable areas, giving room to health-promoting means of transport, increased biodiversity and recreation.

What can the Nordic countries learn from each other?
We can inspire one another by sharing good examples and learning from each other's processes and the way we organise and budget for sustainability. Ultimately, it´s about programming our cities for sustainability – the relationship of viable cities and transport is a key issue.



Aleksanterinkatu/Alexandersgatan is one of the main streets in Helsinki and the city´s most famous shopping street. Apart from taxis, the street has no car traffic but lively tram traffic and pedestrians. ***Photo:*** *istockphoto.com*

2. Climate smart mobility and logistics in accessible and attractive cities

Accessibility is crucial in our society. Being able to access services, work and school and participate in civil society is closely linked to people's wellbeing and quality of life. An accessible and attractive city also depends on the delivery goods and services as well as the removal waste and recyclable material.

This chapter focuses on policy recommendations and practical examples of how to create efficient and climate-smart mobility and logistics in accessible and attractive cities. This is done by addressing the following: How can the urban street area be designed for more sustainable mobility? How can we prioritise equality and take into account the needs of young and elderly? How to promote the use of virtual meetings in an organisation in order for it replace transport? And how do we plan for well-functioning and sustainable urban logistics?

2.1 How to use the urban street area

The right to on-street parking has historically been undisputed in Nordic cities. However, the legitimacy of stationary cars is now questioned. Nowadays, flows of people and goods as well as more transport-efficient ways of travel are prioritised, for example, pedestrian streets and bicycle parking are now taking precedence. Many Nordic cities have started to re-distribute public space as a local policy instrument as this has a significant potential for promoting sustainable mobility, such as walking, biking and public transport. Another effect of reallocating space is that on-street parking for charging could enable "home charging" for residents in the city. However, on-street parking should mainly be governed as a marketplace for charging point operators to provide charging services.

Policy recommendation: Align the city's on-street charging strategy with the overarching goals of the future urban transport system

Why is this recommended?

Governing the public space is one of the primary tasks of a city, and when it comes to promoting the deployment of charging points at on-streets parking, cities need to be particularly strategic in offering the on-street parking space to market actors to develop their businesses and deploy charging stations. Throughout the activities in this project, representatives emphasised the importance, but also the challenge, of balancing different interests in the city.

On one hand, this is a way to facilitate charging for inhabitants living in urban apartment buildings. On the other hand, inviting market actors to develop their businesses could lock-in usage of that space for some time to come. Therefore, it is very important that this aligns with the overarching goals of the future transport system.

How can this be achieved?

If we are to work strategically and make space available to market actors, however, this process must align with a vision for the future development of the transport system. The process and criteria for establishing public on-street charging stations must be clear to both the city and the charge point operators.

Examples of how to use the urban street area more sustainably

Here we have here gathered some examples from different Nordic cities on how to use urban streets in flexible and more sustainable ways.

Balancing interests in the city

Today's situation: In 2018, Reykjavik already had several stations for on-street charging in the city centre and now the city wants to increase the number of sites.
Solution: Reykjavik invited citizens to nominate locations and received over 800 suggestions. These sites were then evaluated by experts and city officials, to find locations that both suitable from a strategic perspective and convenient for citizens.
Implementation: The locations identified were published in an open public tender in 2019 (Friðriksson, 2019).

"Our key takeaway has been to always couple the sustainability agenda with other high-priority agendas"

Morten Skou Nicolaisen, Programme Manager Grøn Mobilitet, Aarhus municipality, Denmark

How does your work contribute to climate-smart transports in a sustainable city?

In Aarhus, we focus on three types of initiatives that are designed to foster a more sustainable transportation system. Type 1 is reducing the overall traffic volume through a more restrictive land-use plan aimed at higher urban population density and thereby reducing distances. Type 2 is a shift towards an increased modal share for active (walking/cycling) and public travel options as well as ridesharing options. A denser city will itself achieve some of this shift, but we try to enhance the effect by investing heavily in high-class transit options and cycling infrastructure. Type 3 is an increased share of zero-emission vehicles by ensuring sufficient charging capacity for electric vehicles as well as converting our entire transit operation to electric vehicles.

What benefits do you see with a Nordic co-operation?

The many cultural similarities among the Nordic countries make it easier to transfer innovative solutions from one city to another. There are so many good projects and initiatives to be inspired by. Our primary challenge is staying up to date with recent projects in cities similar to Aarhus, which we should try to copy. We have had plenty of pilot projects – now we need to sort what works and what doesn't so we can focus on getting value for money.



What can other cities in the Nordic region learn from your experiences?

Aarhus has in recent years been successful in reducing vehicle traffic in central areas. This has created a more sustainable transportation system, but the primary motivation has been a focus on urban liveability, green spaces and retail. Our key takeaway has been to always couple the sustainability agenda with other high-priority agendas, so the measures have enough positive effects that elected officials are willing to accept compromises that could otherwise prove difficult to find broad political support for.

2.2 An attractive city – equal, accessible and safe for all

For urban mobility to be both climate smart and attractive, it is important that it also is inclusive, safe and equal. In order for people to get the important target points of everyday life such as to work, school and services, accessibility for different societal groups must be guaranteed. Hence, accessible transport is a fundamental waypoint on the way to equality (Henriksson and Lindkvist, 2020).

In this chapter we present policy recommendations and good examples on how to include everyone in the transition to fossil-free mobility, with focus on the young, the elderly and gender equality. The recommendations and examples are taken primarily from the two publications Nordens välfärdscenter (2018) and Saarinen et al. (2020).

Policy recommendation: Include different perspectives early in urban transport planning

In order to take into account, the different needs of various societal groups they need to be introduced early in the transport planning process. There are various methods available to do this and they can be used to leverage a more inclusive and sustainable transport system. In this chapter we focus on gender, the young and the elderly.

Why is this recommended?

The transition to fossil-free mobility calls for an acceptance by most users and citizens of implementation of measures, and this means that levels of inclusion must be high. However, those who plan and make decisions of urban transport often lack an understanding of the everyday conditions of commuters and travellers, as well as their particular needs (Henriksson and Lindkvist, 2020).

Young people are often assumed to play a key role in driving societal development, to stand up for new perspectives and act in a quite different way than previous generations – especially when it comes to climate change. But they are rarely invited to participate when transport systems are planned and implemented. Public transport is often an important mode of transport for youth. If the adults of tomorrow feel that public transport are not attractive enough, this is an obstacle that may stand in the way of making the transport system more space-efficient and sustainable. In general, important factors to consider are punctuality and reliability, as well as comfort, efficiency and affordability. The perception of being safe and secure from a whole-trip perspective is also important

The Nordic countries have an aging population and transportation is a key factor that impacts the possibility of active and healthy aging (Eurostat, 2020; WHO, 2007). Therefore, it is important to integrate this growing group into our societies by creating accessible cities and including them in the transition towards fossil-free mobility. Finally, the gender perspective must also be taken into consideration when we strive to create socially sustainable cities. Including this perspective here is motived by, for example, the different travel habits of men and women and the impact these can have on accessibility to work and education.

These perspectives are important for increasing the perception of an equally accessible and safe transport system, since accessibility and affordability in a city are important factors for social and civic participation.

How can this be achieved?

The key is to capture different perspectives and, by increased knowledge to be able to create inclusive solutions. To gather statistical data is one approach, but also to encourage public participation by, for example, involving individuals or associations representing target groups in an active dialogue around urban transport planning. Some methodologies on how to conduct this for the three groups in focus here are presented below.

Gender equality: The gendered landscape method developed by the municipality of Umeå, Sweden, is a way of making statistics come to life and to demonstrate concrete effects of the struggle for gender equality. This is done by visualising statistics of women and men in a geographical context, such as income, the rate of participation in the labour market and accessibility to services. This gives an overview of where gender has been successfully addressed and where it needs to be addressed further. For this to be feasible, it is important to make sure that gender statistics are available in documents used for policy decisions, planning process and analysis (Gendered landscape, 2020; Sjögren and Edenius, 2018).

Young: Youth are to a large extent dependent on public transport, and here they have different experiences and views that are closely tied to geographical and socio-economic factors. There is a lack of Nordic research on the younger generation´s experiences of and perspectives on mobility. Hence, more knowledge about young people's mobility is needed, and an understanding around this should shape the design of future transport systems. In general, important factors to consider are punctuality and reliability, as well as comfort, efficiency and affordability. The perception of being safe and secure from a whole-trip perspective is also important, and this also includes safe pedestrian and cycle paths to access public transport (Saarinen et al., 2020). There are various guidelines available on how to involve young people in transport planning, for example, from the Swedish Agency for Youth and Civil Society presented below (MUCF, 2016; MUCF & SKL 2019). Some ways of including a youth perspective is to employ young adults in your organisation, to give them a mandate and clear responsibility to work with this issue, to implement the findings of the project into to the day-to-day activities of your organisation and to show faith in the young participants (Saarinen et al., 2020; MUCF & SKL, 2019).

Elderly: Network and efforts in line with the WHO checklist for age-friendly cities and communities provide one source of inspiration. The checklist consists of eight prioritised areas, including transport, outdoor spaces and buildings which are relevant in the mobility context. Amongst others, this highlights how important it is that public transport is reliable and affordable, that there is good accessibility to safe transport stops and stations, and that there are enough safe pedestrian crossings, also for people with different levels of disability. The checklist emphasises that if measures are to be effective, elderly people must be actively involved in the process (WHO 2007). Today, at least seven Nordic cities participate in this network: Stockholm, Oslo, Trondheim, Tammerfors, Reykjavik, Uppsala and Gothenburg (Nordic Welfare Centre, 2018).

Examples of how to create an attractive and inclusive city

Here we present a few inspirational examples on how to include and work with the young and elderly in creating more attractive cities and how to incorporate gender equality into urban transport planning.

Use a checklist to integrate a youth perspective

Today´s situation: One challenge is to integrate the youth perspective into transport planning.

Solution: Use a checklist to integrate a youth perspective.

Implementation: There are several checklists and guidelines on how to integrate a youth perspective in decision and planning processes. In one guide from the Swedish Agency for Youth and Civil Society (MUCF) from 2016, three steps are recommended:

1. Goals and governance: Examine how directives coming from management are written, how evaluation of goals is conducted, what resources are being allocated and how your work is anchored and communicated inside the organisation.
2. Education: Check whether you have an adequate methodology for initiating a dialogue with your target group, and if your organisation has set up routines for the collection of statistics. Check if there is a plan for assessing the skills you require from your employees and how the organisation will ensure that they get the training they need, and support with implementing it.
3. Support and collaboration: Explore collaboration and support that already exist within your organisation. Is there further need for support initiatives? Should you set up a forum where your employees can share what their experiences?

Even if you start out with a good checklist it can be challenging to encourage people to join. For example, in the Lund municipality in Sweden, they have tried something called "*inflytandecaféer*". These are short and informal gatherings organised to hear the views of young people on various topics. They also offer non-oral means of communication, such as drawing, graffiti and performance. (MUCF, 2016).

Close collaboration with seniors to discover the most appropriate measures

Today's situation: The growing proportion of the elderly in our cities means that we must take their needs and expectations into consideration when designing transport systems for attractive cities.

Solution: To work in close collaboration with senior citizens to find suitable measures.

Implementation: In Norway, both Oslo and Trondheim are part of the WHO network of Age-friendly cities and communities. These cities have taken several steps to improve mobility for the elderly. In Oslo they have developed an action plan, introduced pink busses that drive from door-to-door; this increases accessibility and encourages social interaction. By giving this group digital tools, for example tablets, that enable them to record different traffic environments and capture situations that need to be adjusted. In Trondheim, there is close collaboration with a senior council, drivers have been taught how to provide a better service for people suffering from dementia and other debilitating illnesses. Timetables are still printed on paper for those with limited access to the Internet. (Norden Välfärdscenter, 2018)

Visualise your city's social sustainability and gender equality

Today's situation: The municipality of Umeå can boast a long and successful record of tackling gender equality. Umeå's work has been selected by the URBACT programme as a good example in Europe when it comes to addressing gender equality, especially in relation to sustainability issues (URBACT, 2020).

Solution: A bus tour of the gendered landscape.

Implementation: A guided bus trip around Umeå utilises the Gendered Landscape

approach, both virtually and physically, in an attempt to highlight the gendered power structures that are baked into our society. One of the stops along the way is the pedestrian and bicycle tunnel that provides access to the railway station. Here the architects have incorporated a gender perspective into the design itself, one that allows a greater inflow of light, with rounded corners and a large entrance in the middle that fosters a feeling of safety in a setting traditionally experienced as threatening. The tour also showcases long-term gender equality work and exposes areas that are still gender unbalanced. The tour raises important questions around how the city is developing, the ways in which we plan and build new structures and infrastructure. An important aspect of the gendered landscape method is that it embraces a participatory approach. Collaboration is important, and in this example, it encompasses Umeå university and the inhabitants of the city itself. This method is now being used to educate and create awareness about the importance of a cohesive understanding of gendered power structures and the way this impact urban planning. This method is an interesting and innovative way of raising awareness and revealing gender equality issues in a city. You can join the tour online and find out more at the Gendered Landscape website (2020).



Student at bicycle parking outside University of Turku, mother with her daughter on roller blades in Helsinki, elderly woman walking in Turku. ***Photos:*** *Mostphotos.com*

2.3 Virtual meetings

To meet, learn and discuss online can replace face to face contact, and this is one way of cutting down on travel while maintaining accessibility. In recent years, the demand for virtual meetings has increased and the use of them have exploded exponentially during the 2020 pandemic.

The Nordic countries are forerunners when it comes to virtual meetings and digital collaboration, due to an early adoption of digitalisation (ETLA, 2019). Many initiatives promote virtual meetings and emphasise the role these have in reducing CO_2 emissions. The policy recommendations and examples presented here are based on the DigiNord project (Arnfalk et al., 2020) – an activity conducted within this Nordic project.

Virtual meetings can *substitute* travels. Several companies and organisations have reported substantial reduction in business travel and have lowered their greenhouse gas emissions subsequent to an increased and enhanced use of virtual meetings. Many of the organisations that managed to cut back on travel found that virtual meetings per se do not significantly reduce travel. To achieve a reduction of travels a determined effort to develop the organisation's meeting and collaboration culture, led and supported by the top management is needed. This also includes more strict acceptance and reporting routines for travel, temporary travel stops as well as cutting business travel budgets.

However, virtual meeting can also act as a *complement* to meetings requiring travel, and help generating more travel, as you are able to have a larger number of more distant contacts, which at some point might require a face-to-face meeting. The net travel reduction from replaced travel has been counteracted and outweighed by an increase in travel demand due to economic growth, growing markets, cheaper more available means of travel etc. (Arnfalk et al, 2020).

Policy recommendation: Implement a policy that promotes climate-smart virtual meetings.

Instruct public agencies and authorities to increase the share of virtual meetings and collaborations.

Why is this recommended?
Public authorities can constitute a good example for other organisations in society, by leading by example and inspire them to move towards climate-smart solutions. There are numerous reasons for an increased and enhanced use of virtual meetings in the public sector, this leverages collaboration within the agency itself and promotes inter-organisational collaboration between agencies and other organisations, including government ministries. Virtual meetings offer cost-efficient, time-saving and low-carbon alternatives to business travel and a sound utilisation of public funds.

How can this be achieved?
The Government can, as in Sweden, give direct instructions to public agencies to increase their share of virtual meetings, asking them to work according to the REMM method. This also includes to monitor progress in annual reports, in this instance as part of environmental management reporting to the Swedish Environmental Protection Agency.

Another approach is to engage agencies in a programme similar to the Green Steps (Græn skref), developed for government agencies by the Icelandic Environment Agency with the overarching aim of decreasing environmental impacts from daily operations in the public sector.

The REMM method[1] (*Resfria Möten i Myndigheter* or *Virtual Meetings in Public Agencies*) is based on experiences from successful implementation and management of virtual meetings in public and private organisations. The method consists of ten steps, and the point (or step) at which your organisation enters into this process depends on its progress and maturity in terms of managing virtual meetings. It is not overly important to go through all the ten steps in order, rather that you apply a systematic approach. This method is also applied in a network of Swedish cities and region called **REDI** (*Resfria Digitala Möten i Den Offentliga Sektorn*).

The 10 steps of the REMM method

1. Analyse the point of departure.
2. Get management commitment and resources.
3. Establish a multidisciplinary workgroup.
4. Identify the organization's virtual meetings' needs.
5. Map out the technical infrastructure.
6. Select and acquire appropriate virtual meetings equipment.
7. Establish routines and procedures.
8. Appoint designated staff.
9. Inform and sell the idea of virtual meetings.
10. Follow up and visualise.

Policy recommendation: Integrate virtual meetings in the organisation's meeting culture

A range different of measures are needed to push the transition from a travel intensive organisation to an organisation where virtual collaboration substitutes for a significant number of physical meetings. This implies adopting a meeting and travel policy that includes both virtual meetings and business travel, while explicitly promoting the former. As well as integrating virtual meeting into the organisation's management systems and routines for monitoring and reporting. This is strengthened when there is support from top management and leading by example. To inform, educate and train employees to have good, productive and pleasant virtual meeting has also been shown to be an important factor.

1. https://www.remm.se/english-summary/

Why is this recommended?
A policy is a high-level steering document and should be approved by top management, it announces a switch to virtual meetings and the importance of introducing them across the organisation. On one hand it underpins coordination between funding, function and personnel associated with travel and (traditional) meeting management, and on the other virtual meeting technology and its administration. For instance, money saved on reduced travel cost can then more easily be invested in good equipment and support for virtual meetings.

How can this be achieved?
To facilitate implementation of this policy and for it to have effect it must be accompanied by concrete guidelines; not only around business travel, but also for how and when virtual meetings should be implemented. Quantifiable goals and ways of following up on compliance should also be set up (see the Copenhagen University example). This can be done by integrating the policy into existing management systems, for example, those concerned with quality and environmental issues. This means using indicators and establishing routines for monitoring and reporting both travel and the use of virtual meetings, this will make it easier to compare the two. Quality aspects around meetings in general and virtual meetings in particular should be scrutinised (see examples from WWF in Finland).

Policy recommendation: Establish a Nordic network around climate-smart virtual meetings and collaboration

The recommendation here is to establish a Nordic network around climate-smart virtual meetings and collaboration coordinated by a national agency in one of the Nordic countries.

Why is this recommended?
Many of the challenges surrounding the development of a digital infrastructure and routines for virtual collaboration are very similar in all the Nordic countries. The region has a well-developed technical infrastructure, an advanced and successful IT-industry, high digital maturity with advanced and frequent users. Organisations in both the public and private sectors are to a large extent dependent on well-functioning and seamless digital communication, in which virtual meetings increasingly are an important part. Digital networks and services also offer an improved Nordic integration through simple virtual access to work, health care, education, shopping, entertainment etc., in another Nordic country. At the same time, the Nordic countries are relatively small and have limited capacity and "weight" to investigate and may find it difficult keep updated of new developments, for example, cyber-security issues and to negotiate agreements with large international IT-corporations.

How can this be achieved?
Collaborative efforts are already ongoing in university networks (e.g., NORDUnet, a collaboration around technical infrastructures and services). A joint Nordic drive to reduce climate emissions with the increased and enhanced use of virtual meetings, might be promoted by holding regular virtual meetings between environmental ministers – leading by example. When tested and streamlined this could be expanded to include a number of other high-level meetings, collaborations and fully digital Nordic conferences. The Swedish Transport Administration could be a suitable coordinator in this regard, the agency has nearly ten years of experience in developing and coordinating the Swedish REMM-project across more than 80 public

agencies.

The Nordic countries could also make a joint effort to establish and push for more virtual collaboration in European and international projects. In practice, this might involve investing in studios for virtual live events with equipment and supporting personnel for an increased and enhanced virtual representation in Brussels (this is being promoted by the Swedish Environmental Protection Agency and the Swedish Transport Administration).

Examples of how to promote virtual meetings and collaboration

Here we present the examples mentioned in the policy recommendations above on how to promote sustainable virtual meetings and collaborations.

University of Copenhagen's travel policy with a compliance follow-up mechanism
Today's situation: University of Copenhagen (UC) has launched Green Campus 2020, an ambitious strategy for achieving resource efficiency and sustainability. This strategy allocates an important role to virtual meetings in reaching CO_2 emissions targets around transport. Approximately 7–9 per cent of UC carbon emissions come from air travel. The university's 2020 target is a 65 per cent reduction of CO_2 emissions from energy consumption and work-related transport (including air travel) per employee, relative to 2006.
Solution: Implementing a travel policy with a follow up mechanism for compliance.
Implementation: When researchers at UC take part in conferences or carry out field work, they will be required to consider the climate impact of their journeys and to make sure it is absolutely necessary for them to travel in order to avoid undue impact on the environment. UC employees must account for why it is not possible for them to participate through virtual solutions instead. UC recognises that this requires a new culture concerning air travel, and the necessity for event planners and host to consider virtual solutions. This is facilitated as more and more universities are working in line with this. (Arnfalk et al., 2020)

Green Office Programme – an environmental management system with focus on reducing travel
Today's situation: In Finland, the World Wildlife Fund (WWF) runs an environmental management system called the Green Office Programme. The programme aims to reduce workplace carbon footprint. One of the seven focus areas of the Green Office Programme is travel.
Solution: Implement the Green Office Programme environmental management system.
Implementation: The Green Office Programme encourages and provides specific tips on how organisations can work with virtual meetings. Participating organizations report back to WWF on their environmental goals and how they are working with them every third year. The programme works with public authorities, municipalities, universities, companies and other associations. In total, in May 2019 the Green Office programme covered 143 organisations including, among others, the Ministry of Environment, Finnish Transport Agency, Finnish customs, and the Tax Administration. (Arnfalk et al., 2020)

Green steps – a programme to reduce environmental impact of workplaces in Iceland
Today's situation: The Icelandic Government offices' Climate Policy from April 19, 2019 states that all ministries must reduce their greenhouse gas emissions by 40 per cent before 2030 with 2018 as base year. Emission reduction is to be achieved, inter

alia, by reducing the number of flights both within and outside Iceland by 47 per cent and 24 per cent respectively. Virtual meetings are seen as an important tool to reach these goals.

Solution: Implement the Green Step programme to reduce environmental impact.

Implementation: Iceland launched Green Steps (Græn skref) in 2014, a programme initiated and run by the Environment Agency. Green Steps focuses on reducing the overall environmental impact from the daily operations of the public sector and includes, among other measures, virtual meetings. All the participating organizations must submit a Green accounting report, which includes statistics on air travel and sets up appropriate goals. The agency is currently working on guidelines for participants in the Green Steps programme for reporting the number of virtual meetings attended, as well as general guidelines for a successful implementation of virtual meetings, modelled on the Swedish REMM project. (Arnfalk et al., 2020)

"I would like to raise the importance on looking beyond traditional mobility, and instead set focus on sustainable accessibility"

Peter Arnfalk, Associate Professor, Lund University, Sweden (Add to section 2.3)

How has the pandemic affected the use of virtual meetings and climate-smart mobility?

The pandemic has rapidly increased the number of virtual meetings and given us a unique opportunity to establish more sustainable ways of working. Where digital collaboration has become the norm and not Star Trek anymore, and telework, virtual meetings, workshops and conferences is commonly accepted and applied.

This rapid increase has, however, come for many with very little or no support. It can be illustrated as we've been getting in the car and started driving, without any driver license, no safety belt, together with other cars that has been built with different standards, on roads that are poorly maintained and sometimes too narrow, without any road side assistance.

What we need to improve now is learning how to plan, design and both work and arrange meetings, and other forms of collaboration, in a way that is nice, fun, innovative, inclusive, safe and building trust. This can be done by evaluating our experiences during 2020 and share knowledge between each other. One example of this REDI, a sister project to the Swedish national authorities' network REMM. In REDI – travel free digital meetings in the public sector - the focus is set on cities and regions and how they improve the use of virtual collaboration to decrease work related travels.



The impact on the transport system during 2020 has been significant and affected nearly half of our commuter transport volumes in Sweden. According to our work this year, there is a projected reduction in business travel of 50 per cent and a new norm for telework of 2–3 days per week for office workers.

What benefits do you see of Nordic co-operation?

The Nordics can be seen as digital tigers, since they are frontrunners in both digital collaboration and sustainability. This gives a competitive advantage in for example international projects, trade, education as well as research and development. A Nordic co-operation in this field can strengthen our collaboration as a region, especially in challenging and sometimes diverging times like these.

What can other cities in the Nordic region learn from your experiences?

First, I would like to raise the importance on looking beyond traditional mobility, and instead set focus on sustainable accessibility, that is to actively include digital accessibility in the planning and discussions.

Further, it can also be good for cities to gather and share experience in this field. Especially since virtual meetings have been given very little attention outside the pure technical aspects. Such as cultural, legal, safety issues and compatibility. As in the example of REDI mentioned above.

2.4 Sustainable urban logistics

Urban freight is crucial for liveable cities but are also the cause of negative impacts such as greenhouse gas emissions, air pollution, congestion, accidents and noise. For example, activities in connection with urban logistics account for more than 60 per cent of the total CO_2 emissions from distribution organizations (Bohne and Ruesch, 2013). Therefore, it is important that the transportation of goods, equipment and waste is made sustainable and has a minimal impact on the local, regional and global environment.

The policy recommendation and examples presented here are mainly based on presentations at the conference on climate-friendly urban logistics in the Nordic countries arranged by the Swedish Transport Administration together with Closer (Closer and Trafikverket, 2019). Closer, based in Sweden, is a neutral platform for collaboration, knowledge and innovation for increased transport and logistics efficiency (Closer, 2020).

Policy recommendations: Include urban logistics early in the urban planning process by using practical guidelines

Include logistics in the municipal urban planning processes in general, and specifically in the early planning phase, by implementing developed guidelines to increase knowledge around freight transport and logistics in the municipalities. Increasing knowledge is not enough to create change, but civil servants and decision-makers must convey this knowledge into operational practice.

Why is this recommended?

Freight transports are responsible for a significant amount of greenhouse gas emissions and are expected to increase over time. Addressing these emissions and freight flows can also generate co-benefits such as a reduction of air pollution, noise and congestion. However, these transport flows have not been a central issue for many cities, and there is often a lack of human resources to tackle this challenge (Boverket, 2020; TØI, 2020). Hence, raising awareness and knowledge around climate-smart logistics at local authorities is key to getting this perspective integrated early in the urban planning phase. This can enable more sustainable solutions in municipalities.

The transport infrastructure in cities set the boundaries on how logistics can be planned. A growing problem is traffic congestion on routes around, in and to cities. The availability of spaces for freight vehicles to park for loading and reloading must be considered. This, especially when businesses that generate an increased flow of goods are established within city boundaries. Lack of parking areas for these vehicles can lead to difficulties in maintaining driving and rest times, as well as risking that parking takes place on other spaces such as residential streets, ramps and industrial areas. This means that heavy vehicles may traffic a road network not intended for them.

How can this be achieved?

This can be achieved by capacity building - the process of improving an organisation or an individual's ability to govern a relevant issue - in this case civil servants and decision-makers at municipalities, county administrative boards and regions who are governing the development of sustainable transport policy. It implies a greater

understanding of the influential factors, obstacles and possibilities. One tool to build capacity on urban logistics is by developing practical guidelines for the planning and coordination of freight transport as done in Sweden and Norway (Boverket, 2020; TØI, 2020). These guidelines, with practical and best-practice examples of how freight transport should be managed in urban contexts are a good way of increasing knowhow. It is also a good idea to establish a common platform in which municipalities and regional actors are given the opportunity to exchange experiences.



Tourists walking on Gamle Bybro - The Old Town Bridge in Trondheim, also known as Lykkens Portal (Portal of Happiness). ***Photo:*** *Mostphotos.com*

Examples of how to enhance sustainable urban logistics

Some examples of how cities in the Nordic countries are working to make urban logistics more sustainable are presented here.

User-friendly guidelines for a Sustainable urban logistics plan

Today's situation: There is a lack of public data about urban freight operations. This typically results in municipalities, regions and counties having limited insight into urban freight operating patterns when attempting to develop suitable strategies and policies. If logistics and planning know-how remains low, there is a risk that improvements will not be implemented locally.

Solution: The solution is to develop user-validated guidelines for achieving appropriate sustainable urban logistics plans in cities and urban areas. The Sustainable Urban Logistics Plan (SULP) guidelines are a policy support tool that is aimed at the large number of small and medium-sized cities in Europe. This since they may not have the resources for major policy assessment and modelling work for sustainable urban logistics.

Implementation: The NORSULP project has developed a methodology for a SULP in Norway. The guide describes challenges, trends, supply chains and stakeholder groups in urban logistics. The guide also presents approaches on how municipalities can contribute to more sustainable urban logistics. Within the project, they have also organised workshops between municipalities, politicians and private companies. Further, a forum has also been provided, to enable discussions on what is being done today and what is currently missing in the planning process and lacking in the implementation of urban logistics (TØI, 2020; ENCLOSE, 2015).

Stockholm city's freight plan

Today's situation: Freight transport is facing challenges related to their climate and environmental impact. In Stockholm's inner-city the infrastructure has reached a critical point, generating also an accessibility challenge.
Solution: Develop a freight plan for the entire city, along with a concrete action plan to leverage adaptability to a reality in which conditions are rapidly changing.
Implementation: The City of Stockholm has developed a Freight Plan for 2018-2022, setting forth a holistic approach to freight issues throughout the city and showing a path forward. This will be done by communicating the city´s plans for addressing freight transport issues clearly and actively promoting achievable expectations amongst key industry stakeholders.

It sets out these main planning directions:

1. Accessibility and predictability around freight transport must increase.
2. The negative impact of freight transport on the environment and the city's attractiveness must be reduced.
3. Freight transport must be developed in close collaboration between the City and key stakeholders.

The action plan specifies six focus areas: regulation and instruments, freight transport expertise, strategic land use, space-efficient urban logistics, freight by rail and water and innovation and new technology.

"The collaboration between City administrations and companies is a prerequisite for ensuring the sustainable development of freight transport." (p. 10, Stockholm Stad 2018a).

Some examples of activities in the plan are: to raise the level of knowledge and awareness around freight transport among city technical and administrative staff, to develop new methods for monitoring freight transport metrics to better asses volume, to develop the collaboration of *Älskade Stad* further and promote the use of light electric vehicles for last-mile transportation (Stockholm Stad, 2018a).



Parking facilities are suitable for deployment of charging infrastructure as well as other mobility services. Vulkan P-hus, Oslo. ***Photo:*** *Aspelin Ramm / Finn Ståle Felberg*

3. Local public ability to accelerate the transition to climate-smart mobility

In cities many interests, needs and actors are accommodated in a relatively small area. This poses several sustainability challenges as well as possibilities to solve these. Long-term sustainable cities must be built and restructured to create attractive and robust living environments where people can and want to live (Naturvårdsverket, 2020).

Nordic cities have several opportunities to stimulate a transition to fossil-free and space-efficient transports. The latter refers to, for example, walking, biking and public transport that needs less space than cars. They have the overall responsibility of urban planning, from comprehensive plans to building permits, as well as traffic planning via local regulations and design of the street areas. These policy instruments can – and must – be used to accelerate the transition to a more transport-efficient and climate-smart society.

This chapter looks at different ways for cities to progress and the steps they can take to accelerate this transition. It recaps good examples and policy recommendations around the charging infrastructure, ways to increase the share of zero-emission vehicles, urban planning and innovative city logistics.

3.1 Accelerating the electrification of the transport sector

The Nordics is a pioneering region in the field of electric mobility. The top-three market shares for new sales of plug-in electric vehicles are found here (Norway, Iceland and Sweden) and the region has one of the highest ratios of plug-in electric vehicles per capita in the world (IEA, 2020). Contributing factors are favourable incentives but also the active role played by Nordic cities and municipalities.

However, no local incentives can compensate for the lack of national policy. This became evident when the Danish government-imposed changes to the purchase incentives for plug-in electric vehicles between 2016 and 2017, resulting in almost total drop in sales. Not until late 2018, were the Danish plug-in electric vehicle sales back at the levels they had in 2015 (IEA HEV-TCP, 2019). The policy conditions have since then improved. The current EU policy framework with CO_2 emissions performance standards for vehicles will result in increasing numbers of plug-in electric vehicles on the European market (EU 2019/631; EU 2019/1242).

Given the production scale-up challenges for vehicle manufactures, they will most likely not exceed EU targets on CO2 standards for vehicles, and this may result in a limited number of plug-in electric vehicles entering the EU market. The diffusion of these vehicles to EU member countries will vary significantly. As several countries jack up their decarbonising ambitions, national policies will have a significant impact on the allocation of plug-in electric vehicles.

The Nordic governments have in a variety of ways supported the deployment of the charging infrastructure. All countries have implemented national investment support schemes, but the eligible actors vary. Historically, large focus has been on public charging and both public and private companies have been involved.

The electric vehicles charging business is a deregulated market in the Nordic countries. However, there are still expectations that electricity will to a certain extent be provided without cost in some Nordic markets. The objective for this is to promote electrification, but the cost for deployment of charging stations motivates national investment support schemes. Not entering on market-based terms will impact development in the long run.

The policy recommendations and examples presented here are based on case studies and valuable shared insights, both practical and strategical, between civil servants and representatives from publicly owned companies in the Nordic countries. They originate in discussions around conditions for local public actors to accelerate the electrification of the transport sector at conferences and round table discussions that took place in the Charging of electric vehicles in cities sub-project (see Appendix).



This report distinguishes plug-in electric vehicles, i.e. battery-electric vehicles and plug-in hybrid vehicles, from other electric vehicles that don't interact with the electricity grid. Only plug-in electric vehicles utilise charging infrastructure.

Policy recommendation: Invest in capacity building for local policy makers and civil servants

The recommendation emphasises the importance of investing in capacity building for local policy makers and civil servants. In the meaning of the ability of organisations to govern and apply knowledge and techniques in their everyday operations.

Why is this recommended?
All the civil servants that have contributed to the project recounted that they met with a high degree of expectation and enthusiasm from the public when it came to the promotion and facilitation of electric mobility in their cities (Swedish Energy Agency, 2019a). However, many were still uncertain as to exactly how to do this. There are examples of cities bringing in outside expertise, but the most long-lived measures for promoting electric mobility have been carried out in cities that have obtained this expertise themselves. Capacity building of local civil servants and policy makers will lead to better strategic and political decisions and hence increase the impact and cost-effectiveness of the measures implemented.

How can this be achieved?
Capacity building is a necessary investment, there is no way of getting around that fact. However, as we inevitably enter a more electrified future, many public authorities will soon have to decide how to get hold of knowledge and expertise by themselves. Here, the project strongly recommends capacity building in their own organisation. Larger cities seem to have the advantage, but smaller cities have showed great resourcefulness by acting through regional actors, such as associations for local and/or regional authorities or engaging with national associations, for example, cooperative and public housing associations.

Policy recommendation: Get involved in research activities

This recommendation is one way of contributing to the capacity building strategies touched upon in the previous policy recommendation.

Why is this recommended?
The electrification of the transport sector is a technological paradigm and the need for an improved understanding of the implications involved is enormous. Nordic local public actors are recommended to engage in research activities coupled to this transformation. The Nordics has favorable conditions for continuing being a leading test bed for electric mobility and demonstrations in Nordic cities and surrounding regions, and collaboration between Nordic cities are a vital part of this excellence.

How can this be achieved?
Many Nordic cities are already profiled in a wide variety of research and demonstration projects but the various collaborations with other public actors including industry and academia need to be endorsed by the political leadership. Even though the project has seen great examples of smaller cities involving themselves in innovative projects, it is evident that the larger Nordic cities are much more able to participate in already established networks. We would like to encourage all local political decision-makers to get involved in the research arena. Aim for cross-sectoral consortiums and join new collaborative efforts.

Start by focusing on facilitating the deployment of the off-street charging infrastructure

Why is this recommended?
Instead of focusing on the deployment of on-street charging stations, which is tempting because they are extremely visible, but as they are also expensive, our

recommendation is to focus efforts on the deployment of charging infrastructure at off-street parking facilities. Primarily because this makes more economic sense. Off-street parking facilities already have a well-defined business model, parking facilities and charging stations are service upgrades that benefit existing customers. Developing the charging infrastructure at these sites has several advantages. The ownership situation is less complex compared to on-street parking, and the installations are less expensive. A cost-effective deployment, which enables home-charging for local households in multi-family dwellings, is also an evident contribution to the local community.

How can this be achieved?

Cities have three major roles to play here. First of all, as fleet operators. Second, to deliver civic benefit through housing and parking companies. And third, but not least, as a catalyst for awareness among local companies and citizens.

1. Expand the charging infrastructure by procuring plug-in electric vehicles for the city´s own fleet
2. Cities with public housing- and parking companies can make investments that contribute to the community by enabling the charging infrastructure, most importantly overnight home charging, for their citizens. About 50 per cent of Nordic citizens live in apartment buildings owned by public, private or co-operative tenant-owned corporations. Deploying a charging infrastructure via local public housing and parking associations is a strategy likely to promote plug-in electric vehicles among households in multi-family dwellings.
3. The Nordic cities and their civil servants are perceived as reliable and impartial information disseminators. Most Nordic citizens consider municipalities to be a neutral source of information. Municipalities that have the capacity to be active in this field have had a great impact not only on individual citizens, but also for example, on private property owners. Both commercial companies, that offer home or workplace parking facilities, and private housing cooperatives appreciate guidance from the city authorities.

Align parking policies designed to promote plug-in electric vehicles with other visions for sustainable mobility

Why is this recommended?

Non-fiscal incentives have also contributed to the popularity of plug-in electric vehicles. For example, some Nordics countries allow cities to reserve certain on-street parking spaces for plug-in electric vehicles and there are instances where this parking is offered for free. Other countries are more restrictive with exceptions. Parking policy is a bigger issue then promoting plug-in electric vehicles, hence the need to align parking and promotion activities with the overarching goals of the development of the transport system.

How can this be achieved?

In the eagerness to promote plug-in electric vehicles, care must be taken to align this with a well-thought-out parking policy. This to avoid increasing the overall demand for cars or locking-in parking spaces to specific users, the crucial objective being to enable sustainable mobility for all citizens and businesses actors.



Local public actors can accelerate the deployment of overnight home-charging for residents in multi-family dwellings. ***Photo:*** *Maskot.se*

Examples of how cities can accelerate the transition towards climate smart mobility

In this section we have collected a few best-practice examples that show how local authorities can be part of and accelerate the transition to fossil-free mobility by enabling electric mobility.

Guidelines for local public authorities on electric mobility

Today's situation: It's difficult to navigate the expectations on the local public authorities and electric mobility is no exception. To begin the orientation, there's a need for publications and/or guidelines aimed for local public authorities in particular, otherwise the scope risk to fail to be concrete enough or irrelevant by being to far-reaching.

Solution: There are several comprehensive and informative publications published in the different Nordic countries, addressing local public authorities and where the contributor is a regional or national authority aiming to raise the knowledge in the field of electric mobility and the role of local public authorities.

Implementation: This can be exemplified by two cases, both of which have managed to penetrate the complexity of operating within a local public authority and present this in a tangible way; a knowledge synthesis for Swedish conditions *Ladda för Framtiden* by the Swedish Association of Local Authorities and Regions (SKL, 2017), and the guides to municipalities in which Region Hovedstaden and Copenhagen Electric (2019) elaborate the role of Danish municipalities as public authorities, fleet-owners, employer, property owners and builders.

Off-street charging in housing associations in Augustlund

Today's situation: Many of the inhabitants of Augustlund, a community close to Copenhagen, live multi-family dwellings. The municipality now wants to expand the charging infrastructure for these residents.

Solution: Augustlund has launched a multi-stakeholder project to help housing associations build a charging infrastructure for associations for the benefit of

residents.
Implementation: As a result, Augustlund has established a process to further collaboration between the municipality and the housing companies involved (Grinvalds Harbro, 2020).

Tampere to deploy off-street charging for its fleet vehicles
Today's situation: Since 2010 Tampere has rolled out a series of demonstration projects designed to promote plug-in electric vehicles. In 2014, the City council decided to become the national frontrunner and adopted an Electric Vehicle Action plan in 2018.
Solution: Among different measures, an important action was to increase the use of plug-in electric vehicles in the public fleet, both passenger vehicles and buses.
Implementation: By increasing the share of plug-in electric vehicles, the municipality simultaneously deployed off-street charging infrastructure for the fleet vehicles (Stenman, 2019).

Linköping expands public charging network at off-street parking facilities
Today's situation: The city of Linköping wanted to deploy charging infrastructure for the residents. In its portfolio, Linköping has a public property company, St Kors, which owns a public parking company, *Dukaten*, and a public utility company, *Tekniska verken*.
Solution: Ownership directives from politicians have pushed for a market-driven deployment of the charging infrastructure and active collaboration between the public companies involved.
Implementation: *Tekniska verken* is the co-owner of the publicly owned charge point operator Bee, and in close collaboration with this company has strategically expanded the charging network in parking garages in central Linköping (Böök, 2019).

The city of Stockholm: "Charging streets"
Today's situation: Today, cities are expected to promote the use of plug-in electric vehicles by facilitating, or in some cases building and operating, on-street charging stations. Although it is mostly public actors that operate as charge point operators, the deployment implies a significant investment and the on-street parking space will be lock-in for this usage for a period.
Solution: Cities need a strategy in the allocation of on-street parking space for deployment of charging stations.
Implementation: The City of Stockholm works with a concept called Charging streets. The city inventories public on-street parking in the city centre and matches these with specific criteria, for example, minimum pavement width and an appropriate distance to large trees to prevent damage to the root system. The result is an updated map of where market actors are welcomed to deploy charging stations in the city. By making this map publicly available, all market actors are given the same opportunity to develop their business in the city centre. It also delivers predictability, both in terms of available space but also in terms of how the responsibilities are shared between the charging point operator and the city (Sunnerstedt, 2018).

"Be courageous when experimenting and trying out new services and solutions"

Heini Viljanen, project offices, CIVITAS ECCENTRIC, City of Turku, Finland.

How does your work contribute to climate-smart transports in a sustainable city?

For the last three years, I have been working in an EU-funded project called *CIVITAS ECCENTRIC* which aims to promote sustainable and smart mobility in the city of Turku and four other European cities: Stockholm, Munich, Madrid, and Ruse (Bulgaria). I have coordinated a pilot in which the personnel of Turku were able to test nine different light electric vehicles and electric carpooling. The results can be utilized when developing sharing policies regarding the city's fleet.



What benefits do you see with a Nordic co-operation?

I believe the co-operation is very fruitful. The relationship between the countries is very warm and supportive so we can all learn from each other. The policies and cultures are very similar, so lessons learnt in one Nordic city are easy to adapt in other cities. I really wish to see even more co-operation between Finland and the other Nordic countries in the future.

What can other cities in the Nordic region learn from your experiences?

Be courageous when experimenting and trying out new services and solutions. Reach out to your peers to find out what they have done: you might not need to reinvent the bicycle. For example, car sharing has great potential. The city staff can use the vehicles during office hours and in the evenings and weekends the fleet is open to all the citizens. The rental can even lower the monthly rent paid by the city. This is a great example of resource wisdom but also a modern service arranged by the city to benefit its residents. I recommend not owning the vehicles yourself, just buy the all-inclusive service.

"The tax policies must be designed so that it pays to choose green"

Marius Råstad, ASKO AS, Norway

How does your work contribute to climate-smart transports in a sustainable city?
ASKO aims to have an emission-free transport fleet by 2026. Over the next three years, we will have up to 75 electric trucks to be put into daily operation. They will handle transport assignments in several Norwegian cities and their surroundings. In freight transport, ASKO is at the forefront of testing electric trucks. We work purposefully and in close collaboration with truck suppliers, providers of charging solutions, public authorities, and political representatives. Over the next few years, a large part of our city distribution in Oslo, Bergen, and Trondheim will be carried out with electric trucks.

What benefits do you see with a Nordic co-operation?
Nordic co-operation can have several advantages. Transferring experience between the other Nordic countries is useful. Being able to coordinate the need for vehicles will also be useful in getting a broad demand for zero-emission trucks, which in turn can stimulate increased production.



What can other cities in the Nordic region learn from your experiences?
It is important to have green policy instruments that stimulate the transition to emission-free transport solutions. The tax policies must be designed so that it pays to choose green. Buyers of transport services must to a greater extent make demands on carriers to choose emission-free solutions and be willing to contribute to covering extra costs as a result of choosing emission-free. It is also important to facilitate the development of charging infrastructure so that the freight transport's need for charging is met.

3.2 Increased share of zero-emission vehicles

In this chapter focus is on ways of increasing the share of zero-emission vehicles. The definition of zero-emission vehicles varies between the Nordic countries and is used in different contexts and largely depends on the purpose. In here, we focus on electric cars, buses and heavy vehicles, but vehicles fuelled with renewables have also been included. Electric vehicles here refer to fully electric (battery or fuel cells) or plug-in hybrids. Since plug-in passenger cars in normal use, to a lesser or greater extent, are driven on petrol or diesel some definitions of zero-emission vehicles include only heavy vehicles with plug-in technology (e.g. the Swedish legislation on environmental zone class 2). This is motivated since their routes normally are predetermined, for instance a city bus or a distribution vehicle and thus can be driven on electricity to a higher extent

To ramp up the share of zero-emission vehicles, cities should utilize their various formal and informal roles. As a public authority, cities can regulate traffic, control urban planning and land use to promote zero-emission vehicles and space-efficient mobility. As procurers, cities can accelerate the introduction of zero-emission vehicles in certain market segments, for example transport and taxi services. A city can also try to strengthen the range of mobility services with car and bicycle pools. And as facilitators, cities can support and coordinate both private and public actors, such as energy companies, the automotive industry and property owners. Pilot projects and test arenas are examples where a city can facilitate activities that bring together different actors.

By using local policy instruments and measure, considerable progress is possible at local levels. Findings in the study by IVL (2020) indicates the use of both the stick and the carrot to promote the development of zero-emission vehicles.

The following policy recommendations and examples are gathered from the subproject on zero emissions vehicles presented fully in the report IVL (2020).

Policy recommendation: Introduce a package of several measures for an increased share of zero-emission vehicles

The policy recommendation for cities is to put together packages deploying a raft of measures that mutually reinforce one another. These should aim at improving charging or tank infrastructures, setting public procurement requirements and complementary measures to address accessibility issues. Complementary measures can, for example, be done by enhancing public transport, extend the bicycle infrastructure and provide support for the carpool market. Subsidised parking can also be a justified measure in cities where the proportion of zero-emission vehicles on the roads is still low. Under the right conditions the more ambitious cities can implement a more comprehensive policy package with a combination of various forms of zero-emission zones or fee systems.

Why is this recommended?

The Nordic cities have an important role in the transition to a climate neutral transport sector and to increase the share of zero-emission vehicles. A policy package will allow cities to prepare the ground for an increase in the share of zero-emission vehicles. Experience suggests that several policy instruments that push in the same direction reinforce one another and create a positive spiral. The suggested

measures and policy packages provide an opportunity for companies, organisations and academia to utilise the city as a test arena or living lab. Further, ambitious Nordic cities joining forces in different constellations and organisations with clear ambitions and proposals for action, can have an influence on the EU´s efforts to set climate goals and determine the funding of research and innovation projects. Finally, increasing the share of zero emission vehicles via a policy package with complementary measures to ensure accessibility can also reduce health impact as well as promoting an increased share of walking, biking and public transport (IVL 2020).



The public housing company Väsbyhem in Upplands Väsby north of Stockholm inaugurated in the autumn of 2020 the municipality's first electric carpool. This pilot project is a collaboration between the electric carpool supplier Move About and Public Housing Sweden's mobility project. The purpose is to reduce climate impact and offer tenants alternative solutions to owning a car. The first carpool consists of two electric cars that can be used by both Väsbyhem's tenants and the general public. The project will be studied by researchers at the Royal Institute of Technology, KTH, in Stockholm. ***Photo:*** *Väsbyhem*

How can this be achieved?

By using a package of measures cities can enable the use of zero-emission vehicles and hence increase the share. By ensuring a supply of filling and charging stations and subsidised parking, where the share of zero-emission vehicles is still low, can make it easier and cheaper for individuals to use these kinds of vehicles on a daily basis. Procurement requirements will make contractors compelled to switch to zero-emission vehicles if they want to continue serving the city. As acting as a forerunner, the city´s own fleet can be converted to zero-emission vehicles. Cities can also make a determined effort to make it easier for residents to live and work in the city without having to own a car. This through, for example, environmentally controlled parking policies, speed limitations, public transport improvements, cycle paths and measures to stimulate the growth of car sharing and other mobility services. For cities that wants to be forerunners and achieve a bigger impact on vehicle use a

policy package including zero- emission zones or environmental fees is recommended.

Policy packages that contain zero-emission zones and/or environmental road fees can be introduced in both medium-sized and large Nordic cities. This since experience from existing environmental zones for light and heavy vehicles indicates that local effects on traffic and the environment can be substantial with emission zones (Stockholm Stad, 2018b; Transport & Environment, 2019). Also experiences from environmental road fees shows that they can increase the share of zero-emission vehicles, but with a lower impact on accessibility compared to zones (Bruvoll et al. 2020; Vägslitageskattekommittén, 2017). However, these packages should be adjusted to local conditions around congestion, air quality and public transport. The type of measures a city should select is also determined by how far it has progressed with the introduction of zero-emission vehicles it decided to support. Socio-economic factors must also be considered. If a policy package is to succeed, it is important to clearly communicate the purpose behind it and the benefits it is expected to deliver

Examples of how to increase the share of zero-emission vehicles

Requiring suppliers to commit to using zero-emission vehicles by including environmental requirements in public procurement can accelerate the share of such vehicles in the city. Even if the scope of the measure is naturally limited to city and contracted vehicles. This is also supported by the updates of the EU Clean Vehicle Directive (EU 2019/1161) which requires a minimum share of clean vehicles and in the long-term mandates zero-emission vehicles. As the degree of electrification increases for cars, it becomes more important to concentrate on sectors where market forces are still weak and/or where the public sector has a significant impact. One example of this the market for city buses. Examples of this and other implemented measures to increase the share of zero-emission vehicles are presented here.

Mix of measures to increase the share of zero-emission vehicles
Today's situation: Nordic cities have the ambition of increasing the share of zero-emission vehicles in harmony with social, environmental and economically sustainable mobility.
Solution: Cities are advised to put together packages deploying a raft of measures using both the stick and the carrot to promote an increased share of zero-emission vehicles.
Implementation*:* Norwegian cities as Oslo and Bergen have been using substantial incentives to make it more beneficial to drive zero-emission vehicles, i.e., by waiving toll charges and providing free parking, while the toll charge system limits the total traffic volumes. As the number of zero-emission vehicles increases these incentives are gradually phased out and zero-emission vehicles now must pay a reduced road toll. At the same time, investments have been made in public transport using funds from toll zones and the Urban Growth Agreement (*byveksavta*l) sets a common goal at both the city and the federal level that car traffic should not increase (Zero Growth Target). Urban Growth Agreements is a development of the previous Urban Environmental Agreement (*bymiljøavtal*) – a national financial investment available to cities via negotiation to improve public transport, walking and biking. The development of these agreements constitutes a new way of organising the collaboration between central, regional and local authorities in major urban areas,

where local parties commit to land-use planning that contributes to increased benefits of the investment in sustainable mobility in order to achieve the zero growth target (Ruud and Dahle, 2019). The cities also take measures to constrain car traffic generally. In Oslo there is ongoing work to achieve a car-free inner city which includes the removal of more than 1 000 parking lots since 2017. Also, no parking places will be demanded by the city in connection with the planning and building of new houses and apartments.

Procurement of zero-emission public transport

Today's situation*:* City bus fleets in major Nordic cities have the potential to have a large share electrified by 2030, if public transport procurers set the necessary procurement requirements over the next few years. The market for electric buses is now mature enough to satisfy the needs of city traffic.

Solution: Set requirements in public procurement on the use of zero emission vehicles in public transport. Close cooperation and good foresight must exist between public transport authorities, city planning offices and network owners to set aside land and electric power for the new depots and stops needed for charging the buses.

Implementation: With traffic start in December 2020, Western Sweden´s regional public transport company *Västtrafik* has procured 160 electric buses for service in Gothenburg and surrounding urban areas. This is the largest electric bus procurement carried out in Europe so far. Prior to the procurement, together with, inter alia, the City of Gothenburg extensive preparations have been carried out to secure land for the bus depots and electricity supplies to serve them. The procurement has also been facilitated via the project ElectriCity, a test bed and a cooperation on electric urban transports between the 15 partners from industry, academy and society in Gothenburg (ElectriCity, 2020).

"There is a need for coordinated research on the effects of different instruments and measures"

Håkan Johansson, Swedish Transport Administration

How does your work with urban environmental agreements contribute to climate-smart transports in a sustainable city?
To reach the climate target for the transport sector in a sustainable way, society needs to be more transport efficient. This is stated in several documents such as SOFT, the Climate Policy Council and the Government´s Climate Action Plan. Urban environmental agreements contribute to this both through investments in cycling and public transport infrastructure, but also largely through the contributions for more sustainable urban development.

What benefits do you see with a Nordic co-operation?
The Nordic countries have similarities in terms of economic welfare models, urban structure and also policy support similar to the Swedish urban environmental agreements, which has not least become clear during this project. Therefore, there is great value in continuing to learn from each other.



What can other cities in the Nordic region learn from your experiences?
There is a need for coordinated research on the effects of instruments and measures. The different models for the conversion are also interesting. What are the objectives? Norway´s zero-growth target for car traffic vs Sweden´s climate targets for the transport sector. How does this affect how we view the planning of the transport system and cities? How governing is the state? How is business involved? How are citizens involved in the transition? What impact does it have on reaching climate goals and social sustainability? How does this affect the tension between city and country? It is definitely an interdisciplinary field of research.

3.3 Urban planning – customised infrastructure and cycle highways

According to the review of *Swedish Transport Administration's* climate scenarios, sustainable urban planning has good potential for reducing traffic flows of cars, by substituting a more space efficient transport system (ÅF 2018).

Urban planning is an important tool for cities, since the development of sustainable transport requires both gradual improvements and entirely new planning methods to organise urban needs, functions and infrastructures.

For example, thoroughfares are built for faster and often heavier traffic with transport to cities, but also for transport between cities, ports and other target points. As cities grow, urban development is being reassessed. More and more cities have plans to convert centrally located traffic routes into living city streets that, instead of dividing the city, connect surrounding neighbourhoods. In order to create accessible, walk-friendly and recreative urban environments with new attractive locations that contribute to sustainable growth, the design of traffic routes needs to be adapted to new conditions. In this section we focus on. customised infrastructure and cycle highways.

3.3.1 Customised infrastructure

A customised infrastructure may be implemented when it is necessary to diverge from traditional road design practices to facilitate transport efficiency across a larger area by enabling transport-efficient urban planning (Trafikverket, 2019a)· The policy recommendation and examples are fetched from Nordic exchanges around customised infrastructure (NVF, 2019).

Policy recommendation: Early collaboration at both local and national levels to customise city infrastructure

As cities continue to grow, an increasing number of them plan to create accessible and recreational urban environments where walking, cycling and public transport are given a higher priority. This means that the design of traffic routes needs to be modified to fit in with new conditions. It is thus important to combine national and local perspectives as cities do not own all the roads that serve them. Thoroughfares are built for transport to cities but also for transport between them, and between ports and other destination points. Work on customised infrastructure requires collaboration at an early stage between both state and municipality.

Why is this recommended?
It is important to address potential conflicts between cities and the state. The national transport authorities strive to fulfil set transport political goals and to secure national and regional accessibility. Parts of the national road network are often integral parts of cities as well. This leverages a high degree of accessibility, but it is also a potential barrier to the development of more space-efficient mobility within cities. Hence it is important for the state and the municipality to collaborate to transform the transport infrastructure in the cities.

How can this be achieved?

To promote fruitful collaboration around customised infrastructures it is important to meet both national objectives designed to achieve overarching transport accessibility and the desire that cities have to develop an attractive urban environment while simultaneously delivering sustainable mobility. To leverage this, it is important to have access to exhaustive background material to underpin decision making. This can be in the form of strategic city plans that specify the desired land use, a strategic mobility plan and a regional outlook review.

Examples of how to work with customised infrastructure

Municipalities are well able to develop their respective urban areas, even if they do need to collaborate at the national level. Two examples, from Aarhus and Reykjavik, of how this has been carried out in practice – with the aim to create sustainable, attractive and efficient use of the available transport infrastructure - are presented here.

Measures designed to reduce car traffic in central Aarhus

Today's situation: In Aarhus, the municipality has developed an inner-city mobility plan, which attempts to retrofit the current system and free up space by using more space-efficient modes such as public transport, walking and biking.
Solution: Implement different measures to make it less attractive to drive in the city centre and build public transport with high capacity.
Implementation: In Aarhus the goal is zero car traffic growth in the inner city, instead car traffic is encouraged to use the national road network. A light rail transit (LRT) service replaces several car traffic lanes along the main thoroughfare that follows the coastline, this is a first step in connecting the city with the waterfront. The introduction of the LRT line transferred 60 per cent of traffic volume along the coast to the ring road. Another measure designed to decrease the attractiveness of the car in the centre is to remove some car parks and use the newly available space for other purposes, for example, bicycle parking, social and green areas. This is applied, for example, at street corners where sidewalks are expanded into the road space to reduce walking distances. They now call these areas "dog ears". The purpose of these measures is also to reduce the speed of cars, without reducing the signposted speed limits. Some streets are also converted into pedestrian streets, inspired by summer pedestrian streets in Sweden. Restaurants and cafés are interested in this type of newly created areas along pedestrian streets, but also at street corners, the so-called "dog ears", however, safety is an important factor that must be consider in the design. (Skou Nicolaisen 2019)



Summer pedestrian street in Reykjavik.
Photo: *Mostphotos.com*

Transition from car dependent to sustainable mobility in Reykjavik
Today's situation: There is an ongoing process of changing Reykjavik from a car-dependent city to a city with more sustainable mobility. Since Reykjavik is a very car-friendly city that originally dedicated 48 per cent of its land area to the road infrastructure and has an extremely car-dependent population, this is the biggest transformation undertaken by the city to date.
Solution: Build an equal and inclusive city by extending public transport, biking and walking infrastructures.
Implementation: The objective is to transform Reykjavik to a city that is sustainable, lively and inclusive. Also, to be competitive with other European cities: denser, polycentric and walkable. Focus is on sustainable mobility, since all homes use renewable energy sources for both electricity and heating. But also, to make the sustainable choice the easiest and most suitable and put people first. One of the measures that will be implemented is a bus rapid transport (BRT) system which was chosen instead of a train system (light rail transit) as the population is not currently big enough to support it. There is a written agreement between the municipalities surrounding the city of Reykjavik around the BRT implementation, and the government is also prepared to co-fund it. Making it the biggest infrastructure project ever in Iceland. The plan also includes new housing and pedestrian streets that will create walkable neighbourhoods. Further, the bicycle infrastructure is being extended and the numbers of people taking to the saddle are increasing thanks to this. Micro mobility options are also being ramped up. Policy makers are keen to improve street design, for example, even more pedestrian streets but it is still a challenge to change established norms that favour the private car. (Ívarsdóttir, 2019)

"Iceland is an interesting testing place for researches regarding transport and climate solutions because we are so isolated."

Lilja Guðríður Karlsdóttir, City of Reykjavik, Iceland

How does your work contribute to climate-smart transports in a sustainable city?

I´m currently working as a project manager for a new Bus Rapid Transit (BRT) system, *Borgarlinan*, in the Reykjavik Capital area. The aim of that project is to provide a real transport alternative to the private car to facilitate a change in modal split in the area. Borgarlinan is supposed to run on domestic sustainable fuel and since almost all production of electricity in Iceland is sustainable, we are aiming for either electricity or hydrogen solution. This is a long-term project with a 15-year time frame, at the moment we are finishing the conceptual design phase and aiming for starting preliminary design in 2021, detailed design in 2022 and hopefully construction by the end of 2023. Borgarlinan is not only going to contribute to emission reduction, because the main focus of the project is the connection to the urban development where Borgarlinan will be the backbone of future urban development in the capital area. Around Borgarlinan there are plans for dense urban development, making it easier for people to run errands in the close neighborhood and thus aiming to reduce the need for long car travels and thereby contributing to a more sustainable city.

What benefits do you see with a Nordic co-operation?

Nordic cooperation is essential for exchanging ideas and experiences. Our common culture also makes it very easy for us to cooperate and appear to the wider world as a unified region pursuing the same goal of a sustainable world.



What can other cities in the Nordic region learn from your experiences?

This one is a bit tricky because I often feel that we are way behind the other Nordic countries in most aspects relating to climate and solutions. I though think that Iceland is in a way an interesting testing place for researches regarding transport and climate solutions because we are so isolated.

3.3.2 Cycling superhighways

Cycle traffic plays an important role in a sustainable transport system. Cycling has a lower climate impact than other transport modes and also contributes to positive health outcomes. Since cycle traffic takes up less space on the roads compared to cars, it also makes urban environments more attractive. These perspectives were discussed during a Nordic exchange at the cycle conference in Helsingborg, Sweden (SKL & Trafikverket, 2019).

Policy recommendation: Consider cycling as a means of transport over longer distances

It is important to focus on cycling even for longer distances (> 5km) and not only look at it in a local perspective. This since the bicycle is a viable mode of transport even at longer commuting distances.

Why is this recommended?
Planning for cycling has in most Nordic countries been seen as a municipal responsibility, and for this reason it is not common practice to plan cycle routes at national and regional levels as it is thought that people are unwilling to ride long distances. For this reason, the issue has been seen solely as a municipal responsibility; however, this is changing. Cycle superhighways are now being included in regional planning. Regional cycle routes can be an enabler for increased bicycle use, and the associated climate and health benefits mentioned above. The increased share of electric bikes has also made longer commuting possible.

How can this be achieved?
There are many different types of measures able to promote the cycling. Cycle superhighways are longer lanes that connect cities, larger urban areas and different districts with each other. These are particularly effective as they enable different groups of cyclists to get around quickly, smoothly and comfortably all year round. Cycle superhighways are in principle intended to mirror regional transport networks similar to those available for trains and cars. When planning cycle superhighways, it is recommended that the most important regional or connecting routes are prioritised ahead of ones that are best standard today. Success factors for the cycle superhighways are mainly good signage, bicycle parking, roadside pumps and high-quality bike lane surfaces (SKL & Trafikverket, 2019).

Examples of how to increase cycling by setting up superhighways

Different groups of cyclists have different priorities. In general commuters seem to appreciate quick access to longer and faster routes, while leisure cyclists primarily appreciate a pleasant environment. Safety and security are important aspects of bike lanes. If cycling is to become an attractive mode of transport, connectivity both locally and regionally is important, the network must provide access to relevant destinations. This will be an improvement for those who have already discovered that bicycles leverage shorter travel times and increased road safety. At the same time, more people may be encouraged to start cycling (Regeringskansliet, 2017).

Cycling highways in Helsinki
Today's situation: Helsinki has abandoned its legacy and obsolete perspective around cycling and is currently actively planning new cycle superhighways.

Solution: To work actively and see cycling as a separate mode of transport.
Implementation: Traffic planning for cycling in Helsinki has been strengthened through the Action Plan for Bicycle Traffic 2014 and the Design Guidelines 2016 (Helsingin kaupunki, 2016). The most important projects in this respect are the Target Network 2025 that addresses the city centre, and the cycling highway plan (Baana network) 2013. Helsinki has focused on the latter because it has the highest rated potential. The goal is to create a uniform network of those routes already used by many cyclists or those with a high (hidden) potential. The Baana network is the name of a 130 km long cycle superhighway that reimagines an old railway cutting and which, when completed, will slice through most of Helsinki. The plan is to create a high-quality cycling network specifically designed to provide for longer (5-20 km) travels and connects large residential areas and workplace areas in the Helsinki region. The network consists of both new and existing routes, and it will be possible to cycle at different speeds. The network today runs from the port to the city centre and has become very popular. The old route was poorly maintained, and the idea now is to create a straight route with a high standard. The number of cyclists utilising the new highway has already doubled, and the potential is assumed to be huge when the entire network is in place. (Pasanen, 2019)

Cycling highways in Greater Copenhagen

Today's situation: The idea behind a cycle infrastructure to deliver a regional transport network similar to regional transport systems for trains, cars and other vehicles. An important observation is that people are willing to cycle long distances. The average travel distance on cycle superhighways is 11 km, which is much longer than the 4–5 km which conventionally is considered to be the maximum for cycle routes. The reason thought to be behind the newly awoken interest in cycling is thought to be that people want to squeeze physical training into their daily schedules, so they to be time-efficient even during their daily commutes. This also explains why many people are willing to spend longer time in the saddle, considering that a 11 km cycle trip is not probably the fastest travel mode.
Solution: It is important to focus on cycling in a regional context, for the bicycle is a serious mode of transport even at longer commuting distances.
Implementation: The cycle routes in Greater Copenhagen are a collaboration between 26 municipalities and supported by the region. The city has opened eight cycle superhighways and another eight are in the pipeline, the plan is to create a network with a total of 750 km of cycle superhighways. Every other person in Greater Copenhagen has 10 km or less to work, which illustrates the potential for cycling. The observed effects of the cycle superhighways so far in the Copenhagen area are that cycle traffic increased by 23 per cent after the opening. Among the new cyclists, 14 per cent drove a car earlier, and if everyone in the region stopped cycling, there would be 30 per cent more car commuters. The cycle superhighways thus have great importance for the city's traffic situation and the risk of congestion. The conclusion is that regional planning is very important, but when it comes to Denmark there are no regions other than Copenhagen that have a coordinated regional cooperation on the issue. Instead, Copenhagen looks to other Nordic neighbours for inspiration, such as Region Skåne and Stockholm and Helsinki (Bjur Hjuler, 2019).



The so-called "Cykelslangen" or "Bicycle Snake", is a cycle superhighway that facilitates daily commuting in the central part of Copenhagen. ***Photo:*** *Ursula Bach*

3.4 Innovative urban logistics

Even though urban logistics are mainly carried out by the private sector, municipalities have an interest in introducing the negative impacts mentioned earlier. Some new technical and digital innovations, for example, geofencing, and smart delivery boxes in public spaces have also opened the question of which infrastructures the municipalities should provide in the future. These types of innovations can have a large impact on urban planning (Yström et al. 2020).

The formal and informal roles cities take on as authorities, procurers and facilitators, will support them in implementing innovative and sustainable urban logistics. This could be done through regulating traffic and land use via urban planning and setting environmental requirements when procuring transports. As facilitators, cities can also utilize collaborations between private and public actors, and act as enablers of so-called living labs, where new and innovative ideas can be tested in real-time scenarios.

Rethinking and innovation are necessary to develop sustainable solutions for urban logistic – this was ventilated in different Nordic perspectives at a conference on urban logistic held in Gothenburg (Closer & Trafikverket, 2019).

Policy recommendation: Enable good conditions for climate-smart urban logistics via packages of measures

Why is this recommended?

The development of new logistics solutions has the potential to create more efficient freight transport within cities, but the impact of these solutions in the long term and on a larger scale is largely determined by how the relevant actors are coordinated. Cities have a key role here as mentioned above, for example, as enablers of land use, procurers of transports and facilitators.

Recently there has been a marked increase in freight transports, this is due to the current trend of increased numbers of light transport vehicles along with increased e-commerce and customer preferences for fast deliveries. This is a problem for the coordinated delivery systems that have already been implemented by the major suppliers, which, among other things, use heavy vehicles in order to offer a high degree of consolidation. Municipalities and other actors need to cooperate closely and paint a clear and well-thought-out picture of how the logistics should work. The supply chain must function smoothly, from the moment goods are shipped until they reach their recipient. It must be easy to access terminals and there must be enough space for co-distribution, reloading and parking (Boverket, 2020).

How can this be achieved?

Here, several measures can be applied. This includes how to use policy instruments such as spatial planning, procurement of goods and services, as well as develop urban logistics plans and enhance participation with business actors (TØI, 2020). In Sweden the guidelines provide advice on how to work with freight transport to promote sustainable development, contribute to more efficient land use and to a more attractive urban environment (Boverket, 2020). Another measure is to introduce a selective emission zone that only targets light commercial vehicles. This can serve multiple purposes. On the one hand, a shift to more climate-smart vehicles is accelerated, but also a development towards consolidation and a more efficient handling of goods. Studies find that light commercial vehicles do not consolidate efficiently. This results in un-coordinated logistic flows in the city. Setting higher environmental requirements for light commercial vehicles, could enable efficient consolidation in the cities. Read more about consolidation in section 4.2.

Examples on how to create innovative urban logistics

Here we highlight several examples of how to implement innovative urban logistics in practice.

Recycling Barge

Today's situation: The principle recycling stations in cities are often situated far from the centre and are only accessible by road vehicles. Heavy vehicles are used to pick-up waste from various recycling stations and transport them to sorting facilities, generating transport flows which give rise to both congestion and emissions.
Solution: Use the potential of urban waterways in cities where this is possible.
Implementation: In Gothenburg the river flows through the central parts of the city and in relatively close proximity to a land-based sorting facility Here there was an opportunity to build a floating recycling station. This could create a higher degree of recycling and reduce road congestion (both trucks and cars). Quay accessibility and maintenance were identified as key challenges prior to this proof of concept demonstration, and the environmental impact was dependent on the fuel used onboard. On the plus side the experiment created social values and more correct recycling. (Andersson & Björkman, 2020; Svanberg et al. 2019). This demonstration project was carried out within a research project called DenCity – which is a collaboration between academia and private and public actors (Closer and Trafikverket, 2019).

Oslo City Hub

Today's situation: Urban freight is on the rise due to trends such as e-commerce and urbanisation.

Solution: Support and make land available for a central logistic hub/depot subject to rigorous climate and environmental requirements and reduce the transport kilometres resulting from the so-called logistic sprawl.

Implementation: The city hub in Oslo is a flexible construction that enables redistribution of goods from larger trucks to smaller electric vehicles, such as small trucks/vans and cargo bikes. Identified criteria for success of this city hub have been the simple and flexible design of the hub (transfer possibilities), trust between all project partners, expert knowledge and a suitable and available location as well as public sector support (TØI 2020; Ørving 2019).

Environmental requirements in procurement

Today's situation: Transports in the city of Oslo impact the local environment and the global climate.

Solution: Adopt standard climate and environmental requirements to be used in public procurement of goods and services that include transports.

Implementation: The municipality of Oslo aims to reduce emissions of greenhouse gases by 95 per cent by 2030, using 1990 as a base year. Minimum requirements must be set for the use of zero-emission and biogas vehicles, or an allocation criterion is given for "climate-friendly" vehicles. Examples of minimum requirements are that all vehicles to be used in this contract must be either zero-emission vehicles (in this case battery-electric or hydrogen) or biogas vehicles that at least meet Euro class 6 / VI. Such a minimum requirement will be mandatory for the municipality's procurements of goods and services that include transports from 2025 (TØI, 2020).



A solar powered electric carpool in Helsingborg. A cooperation between the electric carpool supplier Move About and Öresundskraft an energy company owned by the municipality of Helsingborg. ***Photo:*** *Moveabout.se*

4. Collaboration accelerates the transition to climate-smart mobility

The transition to sustainable mobility in cities which requires close collaboration between, for example, the local authority, private actors and the general public. But also, with authorities at both regional and national level in housing and transport planning, and with policy makers. This to enable policy implementation, adopt innovation and ultimately create behavioural changes in our societies.

This chapter highlights recommendations and good examples on how: an increase of shared mobility can reduce car traffic, freight transports can be more efficient via consolidation, generate smooth sustainable border crossings, and a trustworthy Nordic data base for charging infrastructure can support the transition to climate-smart mobility.

Policy recommendation: Set mandatory legal requirements for sharing mobility data

Why is this recommended?
Sharing transport related data are a prerequisite for the development of attractive mobility services, to be able to go from demonstration projects into profitable business models.

How can this be achieved?
In Finland the state has implemented major legislative modifications which have been brought together in a unified act called the Transport Code. This code includes a mandatory claim for transport operators to publish data and booking services in order for third-party operators to be able to package new services. It also leads to a simplification of ticket sales for MaaS-suppliers such as Whim (2020). Apart from the legislative interventions, Finland has funded MaaS pilots for collaboration between different actors who will deliver these kinds of services (Smith et al. 2018). However, complementary policies are also needed to enhance demand of the

services. This can be achieved in various ways such as public procurement of carpools for employees' business trips, instead of using an own car fleet. To work with urban planning to create mixed and dense cities with focus on walking, cycling and public transport, with the aim to integrate carsharing, can make private ownership less attractive. See examples of this below.



Finland is the world leader in Mobility as a Service, MaaS. With the Whim app, travelers in Helsinki can plan and pay for trips across public transportation, bikeshare, taxis, and carshare. ***Photo:*** *Istock.com*

4.1 Sustainable shared mobility

Cars are one of the main sources of greenhouse gases from domestic transport. In cities, they also generate other impacts such as congestion, noise and air pollution. The current use of privately-owned cars is on average very low and they are parked approximately 23 h per day (Swedish Energy Agency 2019b).

Shared use of cars and bikes as well public transport, which is the backbone of shared mobility, is a more space-efficient way of transportation. It enables a more efficient use of resources, increases accessibility and causes a shift from private-owned cars to shared mobility solutions. This can, for example, be carpools and Mobility as a Service (MaaS). MaaS is a concept that brings different kinds of modes together into a single mobile application, which combines mobility options from different providers – including everything from travel planning to payments. It aims to make worries about route planning, parking and car maintenance a thing of the past. The MaaS concept was born in Finland where it plays a key role in the national transport policy.

However, the Nordic countries have different levels of integration of shared mobility services available. Challenges to increase the share of sustainable shared mobility services include changing current behaviours, attitudes and values of individuals

concerning travels as well as for companies to share mobility data.

The policy recommendations and examples in this section are based on the presentations from Nordic exchanges on this topic at the conference Persontrafik (2018) as well as the webinar and report Shared mobility (Trafikverket, 2019b).

The policy recommendation here is to enable the increase of shared mobility by making the private ownership of cars less attractive, and simultaneously making the use of alternatives more attractive. One of the success factors identified during the Nordic exchange is the possibility to share data, which there can be legal obstacles for that needs to be reviewed. Another measure is to introduce flexible parking requirements when constructing new buildings, that is a possible to set up fewer parking spaces than what is customary in the city's parking policy.



The public bike share Bycyklen (The City Bike) in Copenhagen are electric bikes with a touchscreen tablet which can be used for navigation, payment and guidance to points of interest. Oslo Bysykkel (Oslo City Bike) is a public bicycle sharing system which is owned and operated by Urban Infrastructure Partner on behalf of Clear Channel Communications and in collaboration with the city of Oslo. The municipality makes outdoor advertising space available, which is used for city bike space. ***Photos:*** *Mostphotos.com*

Policy recommendation: Introduce flexible parking requirements

To introduce flexible parking requirements in a city means that it is possible for a building contractor to choose to set up fewer parking spaces than what is customary in the city's parking policy.

Why is this recommended?

Some of the main challenges, in order for carsharing to grow, is the lack of experience, a shortage of attractive parking and the ease of owning and driving a privately-owned car.

How can this be achieved?

One policy measure that addresses all these challenges is the introduction of flexible parking requirements. When constructing new housing and office buildings, there are good opportunities to make it less attractive for privately-owned cars and increase

the attractiveness for services for shared mobility. Flexible parking requirements are therefore used by many municipalities to reduce the number of new parking spaces in the city. Instead they can require shared mobility services by the developer. One example is *Cykelhuset Ohboy*, in Malmö, where approximately 50 apartments were built without any parking spaces. The usual cost of building parking spaces was instead diverted to include carpooling membership, bike friendly storage and equipment for maintenance, and subsidised public transport cards that are covered in the rent of the apartments.

Connected to this, one challenge identified to promote carsharing is the lack of a legal definition of a car used for carsharing. With a legal definition in place it can also enable municipalities to promote carsharing easier by, for example, allocating attractive parking (Trafikverket, 2019b).

Examples of sustainable shared mobility

The development of sustainable shared mobility services requires effective collaboration between both public and private actors, some examples from actors who have overcome these challenges are presented here.

Mobility Points and reserved parking spaces for carsharing
Today's situation: There is a challenge in obtaining attractive and affordable parking spaces for car and bike sharing companies. This is one of the reasons that two major car sharing services left the market in Stockholm.
Solution: Reserve attractive land area for parking space for shared mobility solutions.
Implementation: In Bergen the first so called Mobility Point was created in Norway. This is an ar-ea where carsharing from three different actors, public transport as well as the city's bike sharing scheme are co-located. The reserved parking spaces are located in a central area of the city, which also helps promoting carsharing through visualisation. The importance of reserving attrac-tive land for parking of sharing vehicles close to residential areas and workplaces, is also stressed here.

Authorities as users of carpools
Today's situation: A challenge for carpool companies business models is to have an even demand of their services over the day. This holds true especially during normal office hours.
Solution: Create demand during off-peak via municipalities or other authorities.
Implementation: Several carpool companies are addressing this challenge by collaborating with companies to use their fleet for business travels during daytime. This is also one way for local, re-gional or national authorities to support carpooling. One example of this is the Swedish Public Employment Service which has procured carpooling instead of using their own vehicles in several cities in Sweden.

"By joining forces, we can speed up the sustainable transformation and create business opportunities"

Laura Eiro, The Intelligent Transportation Society of Finland

How does your work contribute to climate-smart transports in a sustainable city?

I'm working at a forum with representatives from various areas of smart mobility: public authorities, cities, businesses, and research institutions. The mission is to work towards the wider deployment of smart mobility solutions to make the transport system safer, smoother, more efficient and sustainable. I am the program director for the National Growth Programme for the transport sector, with the main aim to promote the transport sector's business-driven growth ecosystems based on sustainable solutions. It involves the six largest cities in Finland. There are many ways for cities to act as platforms for climate-smart transport, for example, by providing testbeds, conducting pilots and encouraging innovation through public procurement.

What benefits do you see with a Nordic co-operation?

We see many benefits in sharing best practices and developing the Nordic market and know-how together. We are collaborating very closely with the other Nordic ITS associations as well as ITS Estonia. Nordics are forerunners in climate-smart mobility and by joining forces we can speed up the sustainable transformation and create business opportunities and export. I would like to see a Nordic brand to be developed around 1,5-degree mobility solutions and circular economy: If it is developed in the Nordics it is sustainable.



What can other Nordic regions learn from your experiences?

In Finland, we have a long tradition of fruitful public-private partnership approach, and cities are very much at the heart of that collaboration. The sustainable transition needs business-driven solutions whilst cities set the goals and provide an operational environment for the companies. An open early-stage dialogue is fostering innovation and the Greater Helsinki Area fostered and attracted many new mobility solutions.

4.2 Consolidation of goods

Well-functioning freight transport is a prerequisite for society to function, both the supply of goods and the removal of recycled materials and waste. Consolidation is one part of the solution. A consolidated shipment is the result of combining multiple smaller shipments from various shippers into one full container or truck-load shipment. In an ideal case both carriers, shippers and the environment benefit as it helps to reduce the cost of shipment, makes delivery of goods quicker and with fewer vehicles and emissions as a result.

It is therefore important to set environmental requirements when procuring logistic services that enable consolidation as mentioned in section 3.4. An efficient way to deal with both delivery and collection is consolidation of goods on the outbound transport in combination with collection of packaging for recycling on the way back.

Policy recommendation: Demand environmental requirements on logistics service providers

Instruct and encourage municipalities and other public authorities to set environmental requirements on logistics service providers, such as requirements of fossil-free vehicles, biofueled or electric vehicles, consolidation of goods or high-level Euro-class trucks.

Why is this recommended?
When municipalities set environmental requirements on their logistics service providers and follow up on the result, emissions of greenhouse gases can be lowered, and it can also lead to positive effects on local air quality. The impact can be even higher if several neighbouring municipalities collaborate with each other or one municipality collaborate around several services.

How can this be achieved?
Municipalities, in for instance a region, could create a collaborative platform to both share experiences and to conduct common procurement. Such as in the example of the eight municipalities of Södertörn, explained further in the next section.

Examples of collaboration on consolidation of goods

Here follow three examples on different measures and ways on how consolidation of goods and waste in cities are being implemented through collaboration among several actors.

Nordic cities call for zero-emission delivery of goods
Today's situation: Emissions from goods delivered to the public sector represent almost 5 per cent of the total emissions in the Nordics (Innovative anskaffelser, 2020). The public sector purchases cause considerable freight traffic in urban areas. For example, product deliveries in Copenhagen lead to nearly 4.5 million vehicle kilometres within the city per year.
Solution: Several cities in the Nordics have made a joint statement that they will work to procure zero-emission delivery of goods. The effort is supported by several agencies in the Nordics including the Nordic Council of Ministers.
Implementation: The cities have created a joint statement as a signal to the market on their ambitions and demands regarding procurement. The intention is to examine common needs and challenges and thereafter have a dialogue with the private actors to discuss viable solutions and challenges. They will start to test and procure

practical and innovative solutions that contributes to zero-emission delivery of goods from 2020 onwards. (Innovative anskaffelser, 2020)

The example of Södertörn: collaboration through procurement

Today's situation: Several different private actors deliver goods to municipalities, and there is a patchwork of different logistics solutions. Often the delivery costs are included in the costs for the goods, creating no incentive for consolidation of goods.
Solution: Collaboration through procurement between municipalities.
Implementation: In Södertörn, eight surrounding municipalities (Södertälje, Haninge, Nynäshamn, Botkyrka, Salem, Huddinge, Tyresö and Nykvarn), with approximately 500,000 inhabitants, decided in 2014 to join forces and set environmental requirements on logistics services as well as cooperating on consolidation of goods. The targets for the collaboration was to lower emissions of CO_2 and pollutants, reduce the number of trucks in the area, increase safety and improve the work environment for employees in the municipalities that receives goods and perform heavy lifting (e.g. kitchens at schools or nursing homes). A tender was prepared with the different requirements decided upon by the municipalities. One challenge during the project was to separate the delivery cost of the goods as this was included by default in the price of the goods making the municipalities who consolidated the goods pay for the delivery multiple times. Separating the delivery costs from the cost of the goods was a way of taking away a sub-optimisation in the built in procured system.

The goods of the municipalities are consolidated at one local terminal, creating more efficient logistic flows. The Södertörn municipalities also require trucks to run on renewable fuels such as HVO or biogas (Closer and Trafikverket, 2019; IVL 2017). Between the years of 2014 and 2017, fossil carbon dioxide emissions associated with distribution of goods (municipal and private) in the municipalities decreased by 73 per cent, which is mainly due to increased use of bio-based fuels (IVL, 2017). Further, the emissions of carbon dioxide per delivered goods decreased by 28 per cent in 2019 compared to 2017 (Closer and Trafikverket, 2019). Corresponding driving distance was reduced by four per cent. One further result from the study by IVL (2017) is that the benefit of consolidation is greater when you have several suppliers before you implement consolidation. The procurements are now jointly handled by *Upphandling Södertörn* (Södertörn procurement), a unit based in one of the Södertörn municipalities (Closer and Trafikverket, 2019).

Beloved city: consolidation and collaboration on goods and waste

Today's situation: "Last mile" is the transportation of goods from a hub to its final destination, for example, a private residence. Last mile is currently considered expensive, ineffective and stressful and results in an unsafe environment and increased emissions of carbon dioxide, air pollution and congestion (Roumboustsos et al., 2014; Bolminger, 2019).
Solution: Collaboration between several actors to consolidate goods and waste.
Implementation: *Älskade stad* or "Beloved city" address several practical examples of collaboration to consolidate goods and waste in three Nordic cities: Stockholm where is originated, Malmö and Oslo. The initiative was taken by businesses in the waste management industry together with transporters of goods, real estate owners and in some cases the municipality. The collaboration between these actors is a key for the success of the initiative. During the conference on climate-friendly city logistics *Älskade stad* was lifted by some of the presenters as one of the measures that will impact and change the city logistics in the future (Closer and Trafikverket, 2019; Wastesson, 2019). In Stockholm *Älskade stad* has a joint loading

centre, which serves five zip codes and Stockholm's old town. Each month about 4,500–5,000 parcels are delivered, and 12 tonnes of waste are picked up. The waste is business-related, and separation has been done at the source. Electric vehicles or cargo bicycles are used for the transports. The emissions of carbon dioxide per kilo goods transported was reduced by 73 per cent through this initiative (Elander et al., 2017).



Älskade stad (Beloved City) combines parcel delivery with the collection of recycling material in small electric vehicles. Älskade stad originated in Stockholm and is today also available in Malmö and Oslo. ***Photo:*** *Martin Olson*

CityLogistik: consolidation of goods in one pass by

Today's situation: For the inner city to be a vibrant area with good business opportunities and pleasant for people, many municipalities try to lower the intensity of road traffic. Still, deliveries of goods are made mainly with non-coordinated and fossil fuelled vehicles, and the current planning process is still dependent on the old physical structures (Bolminger, 2019).

Solution: One solution is consolidation of goods in one vehicle passing the same neighbourhood, instead of different delivery vehicles for mail, e-commerce, florist, grocery store and so on.

Implementation: Such a solution has been implemented in, for example, Gothenburg through *Stadsleveransen* and in Copenhagen through *CityLogistik.* In these examples, the climate and environmental impact is reduced by using fewer and cleaner vehicles, for example cargo bikes or zero-emission vehicles. *CityLogistik* consolidates shipments to Copenhagen's inner city, the historic part of the city. Initially, they conducted a series of analyses to evaluate the current delivery pattern and the potential for a consolidation centre. It is estimated that a joint loading centre will need 150 stores to go "break-even. (Citylogistik-kbh, 2015)

"It is possible to reduce freight transport by consolidated deliveries"

Olof Bohlin, Upphandling Södertörn, Sweden.

How does your work contribute to climate-smart transports in a sustainable city?
We aim to support sustainable city development by applying consolidated deliveries to the municipalities' entities (pre-schools, schools, care for the elderly, etc). This kind of distribution is applied to all goods used by the municipality. Schoolbooks, office equipment, food, etc. are sourced from many suppliers and delivered via a distribution solution procured separately and used for consolidated and coordinated last-mile delivery, using modern trucks (minimum EURO VI) and renewable fuel.

What benefits do you see with a Nordic co-operation?
We need to share knowledge between the Nordic countries on logistics solutions for municipalities and regions. Another field is how to co-operate in a way that is beneficial to both municipalities and the business sector. When it comes to consolidated deliveries this requires the municipalities' suppliers to change their own logistics solution, and more importantly increase data sharing and integration. We also need to cooperate on standardisation, especially when it comes to transport data integration.



What can other Nordic regions learn from your experiences?
The over-all tip is that it is possible to reduce transport generated by the supply chain. In addition to lowering emissions, it also helps to highlight transportation and logistics questions within the organization. How many deliveries are needed to meet the demand? How much transportation is taking place? Is it possible to coordinate transportation to specific areas? Municipalities in Sweden that apply consolidated distribution cooperate via a national knowledge centre that works as a meeting point where know-how is shared, and practical challenges discussed. A similar arena for cities in the Nordics could be an interesting opportunity.

4.3 Climate-smart transportation cross national borders

There are several examples of cooperation across national borders with the aim to solve common issues of climate-smart transportation in the Nordics. Here we report on the co-operations between Sweden and Finland in Provencia Bothniensis, between Denmark and Sweden in Greater Copenhagen as well as between Sweden and Norway in the Fyrbodal Association and their project Fossil Free Border Region 2030.

Policy recommendation: Create a common organisation to strengthen the cross-border collaboration on sustainable transport

Create a common collaborative organisation in order to achieve a long-term co-operation that can be successful in promoting a transition to fossil-free transportation across national borders.

Why is this recommended?

Nordic cities situated close together, even with national borders between them, usually have an integrated labour market and economy which generates substantial traffic flows. Some of the challenges of promoting fossil-free mobility are difficult for a city to deal with on its own, and collaborations at various levels can be key for generating sustainable mode choices. Göran Wigren, representative from the City of Haparanda, expresses the motivation for their cross-border collaboration with Tornio in this way: "We have a strong collaboration between Sweden and Finland to get better train connections since this is a key issue for us to be able to switch to fossil free transports in Haparanda and Tornio".

How can this be achieved?

In order to achieve a good cross-border collaboration it is important to find solutions to common challenges, where working together generated synergies and benefits for the involved partners. How this can be achieved is illustrated by two cases from Haparanda and Tornio and Greater Copenhagen.

The two municipalities Haparanda and Tornio have developed fruitful collaboration together through their common organisation Provincia Bothniensis. The organisation was founded in 1987 with the aim to develop, deepen and increase the cooperation between the two cities and their inhabitants. Their collaboration includes amongst other things both passenger and freight transport. This since the inhabitants of the two cities are commuting on a regular basis across the border for work and school, as well as for shopping and pleasure. Thanks to relatively similar planning processes in Sweden and Finland, with similar regulatory framework, a common municipal planning has been possible. Further, there are common needs for the inhabitants where they also can see the benefits of a collaboration; in the sense of sharing costs and have access to a greater supply of for example public transport. There are many benefits with the collaboration between the cities. As Kirsi Ylipiessa at the City of Tornio expresses it: "We are two nations and two cities, but we are like one family with open borders. It is a strength to work together like this, and many can learn from our way of collaborating. It has become a part of our branding."

The collaboration in Greater Copenhagen is also enabled by a common organisation, a committee with representatives from the regions and municipalities. The Committee and activities are led by a political board. Greater Copenhagen was

founded in 2015 and includes Region Skåne, Region Halland, Region Hovedstaden, Region Sjælland with their 85 municipalities. The collaboration covers five key areas: green transition, labour market, digitalisation, life science and infrastructure. In the latter, mobility and accessibility are highlighted and the use of public transport to build sustainable travels (Greater Copenhagen, 2020).

Examples of how to achieve climate-smart cross-border transportation

Below, three examples of cooperation are presented from cities in neighbouring countries and regions on how to promote fossil free mobility and transportation.

Collaboration between Swedish and Norwegian municipalities for increased share of biofuels and plug-in electric vehicles

Today's situation: In total, 39 Norwegian and Swedish municipalities in Fyrbodal, Östfold and Follo have joined forces and share a joint political commitment to achieve fossil free transports by 2030. This includes both passenger and goods vehicles.

Solution: To run collaborative projects between the regions by using Norwegian expertise on electric mobility, combined with Swedish expertise on biogas.

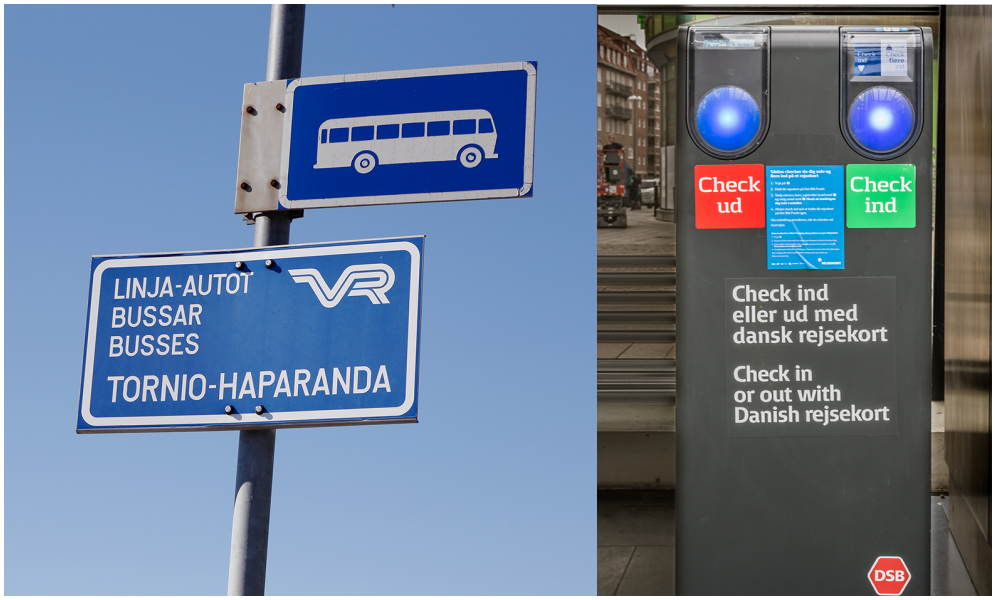
Implementation: Based on previous accomplishments, the current on-going project called Fossil Free Border Region 2030, is focusing on the local authorities' role to facilitate business development and local business value in the transition to become fossil free. In Sweden, the Fyrbodal Association of Local Authorities has led the dialogue between different actors, both public and private, in defining the need for deployment of charging infrastructure, identifying suitable locations and throughout the establishment of the charging stations (Rennerfeldt, 2019).

Connect cities via improved options for sustainable mobility solutions – Haparanda Tornio

Today's situation: There is a long collaboration between the so-called twin cities Haparanda and Tornio, on for example sustainable passenger and freight transports this due to the many travels and transports conducted daily between the twin cities.

Solution: Increase the number of sustainable mobility and transports options between the cities.

Implementation: For passenger transport they work to increase the share of more sustainable transport modes. This has been achieved by, for example, building a common travel centre where all local, regional and national buses stop which gives a smoother transfer and facilitates commuting with public transport. The cities have also been further connected via publicly co-funded pedestrian and bike lanes. The cities are also collaborating to achieve better train connections for passenger trains to their region, both day and night services, which is a key issue in order for people to switch to fossil free transportation in the region. Since it gives better commuting possibilities both for work and education within the region, but also for tourism. Since the decisions on for example improved rail tracks are made on national and regional levels, the local authorities have less influence on this issue. Hence, it is perceived as more difficult to achieve, compared to improve and increase the public bus services, as well as pedestrian and bike lanes. To achieve better train connections, a good collaboration with the regional and national levels are required, and also a cross-border collaboration between the transport administrations in Finland and Sweden.



The two municipalities Haparanda and Tornio have developed fruitful collaboration together through their common organisation Provincia Bothniensis. The collaboration has for example led to a greater supply of public transport. In Malmö central station you can check in with a danish card on a signpost. The collaboration Greater Copenhagen includes 85 municipalities and covers five key areas: green transition, labour market, digitalisation, life science and infrastructure. It highlights for example the use of public transport to build sustainable travels. ***Photos:*** *Mostphotos.com*

Collaboration to increase the share of cycling in a cross-border region.

Today's situation: Greater Copenhagen comprises four regions and 85 municipalities in Denmark and Sweden with a common vision of growth and creation of new jobs. Efforts are being made to remove the border barriers by, for example, coherent public transport and increase cycling lanes, which will make it easier to live, commute and travel more sustainable in Greater Copenhagen.

Solution: To collaborate in order to implement measures to facilitate cycling across regional and national borders, such as priority at traffic junctions, develop better signposting, cycling lanes and cycle maps. The aim is to increase the share of cycling in a larger region.

Implementation: The collaboration "Øresund as a cycling region" was initiated with the purpose to create a common identity in increasing the share of cycling for both commuting and leisure, develop common solutions and learn from each other. Different measures were taken such as giving priority to cyclists at traffic junctions, developing cycling lanes, better system for signage, produce bike maps and online based navigational tools. One lesson learnt from this collaboration was the need to raise the bicycle perspective in other collaborations than in pure cycling project, and the importance of including other competences from, for example, public health, business development, tourism development and academia. The contacts between urban and traffic planners in Sweden and Denmark have been useful in their own work and a basis for continued cooperation. Also, the understanding of the cultural differences between the countries increased.

4.4 Joint Nordic action to improve the conditions to locate charging stations

Today, information regarding the locations of charging stations in the Nordics are found in several different databases, whom are governed in different ways. In addition to the individual charge point operators, and the wiki-based databases, there is the state-owned Norwegian database NOBIL.

Within this project, a subproject had the aim to develop NOBIL to become more efficient for data suppliers and to make it more valuable for the users, with the long-term goal of having a good representation of public charging stations in all Nordic countries

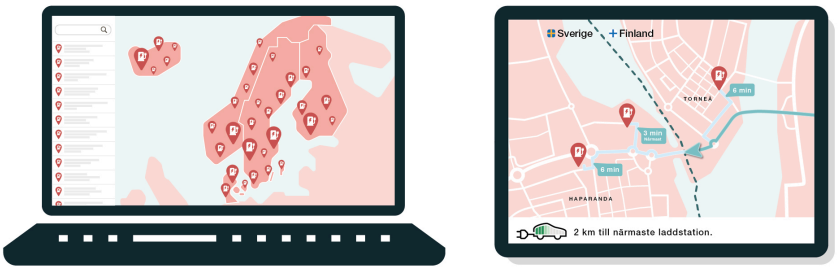
The recommendation and example presented here are based on the meetings and workshop held with stakeholders in the Nordic countries within the subproject on developing a database for charging stations.

Policy recommendation: Appoint a national authority to take responsibility for data of charging infrastructure in every Nordic country

The policy recommendation on ensuring public charging stations in reasonable networks is to appoint a national authority responsible for national data and data quality on the country's public charging infrastructure in all Nordic countries.

Why is this recommended?
Assigning a responsible authority in each country, assisting in the maintenance of a database of charging stations in the Nordic countries would generate an equal administrative party in each country. This would guarantee free access to trustworthy data on charging points in all the Nordic countries for maps and navigation systems. The overall aim is to get as comprehensive information as possible about public charging in the Nordic region. This is a prerequisite for an increased share of electric vehicles and easier travels for electric vehicles across the Nordic borders.

How to achieve this?
Each government appoints a national contact point with responsibility to maintain and support a database of the charging stations for electric vehicles in the Nordic countries. This is already the case in Norway, and during the project the Swedish Energy Agency has been appointed to be responsible in Sweden. However, authorities have not been appointed in Iceland, Denmark and Finland. The respective government or national authority responsible for financial support for charging infrastructure (if there is any), could also decide on a requirement for registration of the infrastructure in an established database.



The Nobil database contains information on public charging stations in the Nordics. The data can be used to build different map services and is already used today in for example Google maps.

Examples of establishing database of charging infrastructure

To be able to plan your trip with a plug-in electric vehicle it is important to have information on where to charge. It is also important to know where your local charging points are if you cannot charge where you usually do. The NOBIL database is a database for plug-in electric vehicle charging infrastructure, established in Norway in year 2010 (NOBIL, 2020). It was initiated with the aim to facilitate for users of electric vehicles who wishes to gather information and locate charging stations, independent of who is the owner and operator of it. It is owned by Norwegian Enova, meanwhile the Norwegian EV Association is developing and maintaining the data, based on information from charging station owners and operators as well as users of electric vehicles. Hence, it is an open database that allows everyone to build services using standardised data free of charge. The database includes, by the time of writing, mainly public charging point in Norway and Sweden but also some charging points in Finland, Denmark and Island. However, this could be a useful database for all Nordic countries.

During the project on the development of, the NOBIL database, some lessons learnt on Nordic collaboration between industry and authorities have been gained.

First, the preparation of a priority list for the development of NOBIL was done together with the charge point operators in the Nordic countries. This was done to make sure that the development was relevant, to engage the market actors in this work and to ensure a good collaboration also in the long run. The agreed development is currently carried out and the ones with the highest priority is expected to be completed during this project, meanwhile some developments are needed over a longer range of time.

Second, this project has generated co-benefits by strengthening the cooperation between mainly Norway and Sweden also in other matters, for example, exchange of experience regarding policy measures for supporting the expansion of charging infrastructure.

"New solutions for the low emission society must also be financially viable"

Marie Tranaas Skjaervik, Enova, Norway

How does your work contribute to climate-smart transports in a sustainable city?

To achieve climate-smart transports we must invest more in innovation and technology development. We need new solutions for the low emission society, but they cannot be just sustainable – they must also be financially viable. It can be costly and risky for individual businesses to start using the newest and most climate-friendly technologies. Enova can make a financial contribution so projects can be implemented. Each year, Enova invests more than NOK 2 Billion of public resources in solutions that help build a green Norway for tomorrow.

What benefits do you see with a Nordic co-operation?

On the road to emission-free transportation, we must develop smart solutions for sharing data to facilitate the use of electric vehicles. By co-operating in the development of the NOBIL database we ensure that the owners of electric vehicles receive information on charging stations across all the Nordic countries. This co-operation has also given valuable information and experiences on working with electrification from different perspectives.



What can other Nordic regions learn from your experiences?

I believe co-operating on sharing and developing data initiated by government agencies across the Nordic countries will benefit the users of the data. Developing data is expensive. Therefore, researching existing data and exploring the possibilities to build on this could be very profitable. We have initiated a database for electric passenger car charging stations. In the future, it would be relevant to share similar data for charging infrastructures for heavy-duty vehicles and vessels.



Man cycling in Aarhus. ***Photo:*** *Mostphotos.com*

5. Discussion and conclusions

Many Nordic cities have implemented ambitious measures and far-reaching policies to promote sustainable and climate-smart mobility. This project has compiled some of the most interesting examples. The Nordic cities and municipalities are leading the way. However, policy measures are not yet widely implemented in the scale necessary in order to reach national climate goals, or to align with the Paris agreement. To achieve this, major behavioural changes are needed. Decision-makers need to seek acceptance for these changes, both at national and local level.

There are several possibilities for local public actors to accelerate the transition. Measures to promote biking and walking, and deployment of charging infrastructure are good examples of this. Urban planning to enhance transport-efficiency and innovative city logistics are key examples too. This project wants to emphasis three important general findings that applies to all Nordic cites and municipalities in order to accelerate the transition.

National governments need to ensure that the cities have the prerequisites to be frontrunners

Nordic cities want to be frontrunners. This project has engaged with numerous local public servants and decision-makers, enthused to understand how they can contribute to the national climate goals. Nordic local public authorities already have many instruments to facilitate a transition of the transport system including traffic regulation and how urban zones are to be used. Through urban planning, it is possible to promote transport-efficient mobility such as biking, walking and public transport. Today, cities already manage their public fleet vehicles in order to enforce national targets.

However, the Nordic national governments need to ensure the overreaching policy support for the ambitious local measures implemented. Both regarding creating favorable market development for plug-in electric vehicles, but also in terms of creating the national legal framework for example data-sharing and market conditions for shared mobility. There is also a discrepancy between local costs and global benefits, associated with measures for reducing greenhouse gases. The local costs of certain measures, such as imposing a zero-emission environmental zone, is difficult for local authorities to motivate for the citizens and seek acceptance for. If

the national climate goals require certain local measures in order reach fulfilment, governments need to understand how to support cities to compensate for lost mobility.

Invest in capacity building of local and regional public authorities

Capacity building refers to the process of improving an organisation or an individual's ability to govern a relevant issue. In this case it is the local and regional civil servants and decision-makers who are governing the development of sustainable transport policy. It implies a greater understanding of the influential factors, obstacles and possibilities.

This project has engaged with local public authorities that want to contribute but are uncertain regarding how to achieve this. In order to interpret new knowledge and to implement good examples and best practices, requires capacity building of local and regional civil servants and policy makers. This project has identified several areas where we must emphasise the need for capacity building; i.e. that of electric mobility, urban logistics, gender equality and perspectives of the young and elderly. As mentioned in this report, there are numerous established practices, methods, and guidelines to support the Nordic local public authorities in their work.

In addition to national and international peers, collaboration of other public and private actors and academia are contributing to the capacity building of an organisation. Inviting demonstration projects onto the city streets, is another contribution to the capacity building of the city and advancing the state of the art. Several representatives interviewed in this project state that Nordic co-operation is essential for exchanging ideas and experiences. The many similarities between our policies and societies makes it easier to copy innovative solutions from one city to another. Our common culture and supportive relationship also make it very easy for us to cooperate. Hence, in the Nordics we can, and are, learning from each other's experiences.

Use transport planning to support other societal goals

Transport policy aims to facilitate mobility of people and goods. However, transport policies must ensure that the transport use, which the framework enables, brings value to the local society. Through alignment, policies which together govern the development towards greater sustainability have the potential to enhance each other.

Throughout the project, the importance of introducing the climate perspective early in the transport planning processes and strategic documents relevant to mobility has been emphasised. To be able to collaborate both between organisations as well as between different departments within a city such as spatial planning, traffic planning, exploitation and environmental management. For this both, human as well as financial resources are needed.

It is important to understand and include the perspectives and needs of different groups in society in the transport planning processes. This can be done through engagement of the citizens and by representation of employees with, for example, different socioeconomic backgrounds among policy makers and civil servants can also be crucial to achieve this. Within this project a focus has been on how to capture and integrate the gender equality as well as the needs of the young and the

elderly. In urban planning there are many goals, needs and perspectives that must be considered and municipalities and other authorities often struggle to prioritise between them. This can lead to conflicts of goals. By integrating different perspectives and needs early in planning processes there can be more possibilities to find solutions and compromises for a way forward.

In conclusion, this project wants to emphasise the potential to learn between the Nordic countries. These countries are often at different levels of change the advantage of which provides good opportunities to learn by comparison. There has been great interest in what is being done in other Nordic countries and the participants have expressed hopes of continuing to exchange experiences for knowledge of what is going on each other's nations. Sometimes similar work takes place at the same time, for example both Sweden and Norway produced guidelines for urban logistics in 2020. Measures for more sustainable mobility requires cross-border collaboration. These boundaries can be national but there is also lineation between academia with business and public activities, which provides many benefits to cooperate.

State support with funding, regulation or other roles in enabling new solutions, for example by providing data can have a major impact on how to manage to make a difference. In order to reduce car traffic and truck traffic, more alternatives and new solutions are needed.

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Appendix A: Overview of activities

Table 1 *Sub-project 2: Zero-emission vehicles in cities*

What	Where	When
Presentation of the preliminary results at Transport-forum	Linköping, Sweden	9th January 2019
Study visit to learn more about Uppsala's work and experience on zero emission vehicles and zones.	Municipality of Uppsala, Sweden	5th June 2019
Study visit to learn more about Aarhus's work and experience on zero emission vehicles and zones.	Municipality of Aarhus, Denmark	17 of June 2019
Study visit to learn more about Uppsala's work and experience on zero emission vehicles and zones	City of Oslo, Norway	8th of August 2019
Workshop with invited experts, project associates and municipality officials. Purpose: learn more about attitudes to different policy instruments for sustainable introduction of zero emission vehicles in Nordic cities	Swedish Transport Admin-istration Stockholm, Swe-den	18th of October 2019
Webinar: Zero emission vehicles and zones in Nordic cities – results from a Nordic study	Online	12th of December 2019

Table 2 *Sub-project 3: Attractive and climate-smart transportation in cities*

What	Where	When
Seminar on Mobility as a Service. Experiences from the Nordic countries.	Conference Persontrafik 2018, Stockholm	24th of October 2018
Seminar and workshop. A Nordic exchange of experiences about support and instruments for the development of sustainable cities.	Lund	11th of April 2019
Online meeting about the collaboration between Haparanda and Tornio on climate smart mobility.	Online	16th of May 2019
Seminar on Nordic exchange on bicycle highways.	Cykelkonferens, Helsingborg	22nd of May 2019
A master thesis about three Nordic cities: Managing freight as a city – decreasing climate change impact and reaching sustainable mobility	Royal Institute of Technology (KTH), Stockholm	23th of May 2019
Workshop on autonomous busses and public transport	Lund, K2	24th of May 2019
Webinar on Shared Mobility	Online	12th of June 2019
Webinar on Nordic exchange of experience on custom infrastructure in cities.	Online	15th of October 2019
Webinar on Nordic exchange of experience of virtual meetings.	Online	23rd of October 2019
Conference on climate friendly city logistics in the Nordics.	CLOSER, Gothenburg and online	29th – 30th of October 2019
Report and presentation on Young people's mobility in the Nordics.	Conference "Energirelate-rad transportforskning 2020", Online	27th October 2020

Table 3 *Sub-project 4: Charging infrastructure of plug-in electric vehicles in cities*

What	Where	When
Seminar on electric mobility and charging infrastructure in Nordic cities	Nordic Clean Energy Week, Malmö	22nd of May 2018
Utrullning av laddinfrastruktur och miljözoner - kan det samverka för ett jämlikt och tillgängligt transportsystem?	Transportforum, Linköping	9th of January 2019
Nordic local policy roundtable on charging infrastructure	Nordic EV Summit, Oslo	21st of March 2019
Deployment of charging infrastructure – the case of the Nordic countries and the role of public actors	Trafikdage, Aalborg Universitet	27th of August 2019
Off-street charging for plug-in electric vehicles in Nordic cities	Webinar	2nd of April 2020

Table 4 *Sub-project 5: Nordic database for charging stations*

What	Where	When
First meeting between the Swedish Energy Agency and Enova	Eskilstuna + Online	16th of May 2018
First meeting between the Swedish Energy Agency and the Norwegian EV Association	København	18th of November 2018
First meeting on potential development of NOBIL database	Stockholm + Online	29th of January 2019
Meeting between the Swedish Energy Agency, Enova and the Norwegian EV Association	Oslo	14th of March 2019
Second meeting regarding Nordic database for public charging stations	Oslo + Online	3rd of September 2019
Second meeting between the Swedish Energy Agency and Enova	Oslo	3rd of September 2019

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Anna Mellin, Alice Dahlstrand, Anders Lewald, David Mowitz, Sara Sköld, Hanna Sundqvist, Erik Svahn and Martina Wikström

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