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Fossil Fuel Free Municipalities in Sweden

Analysing Modes of Governing

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REPORT f3 2017:05B

FOSSIL FUEL FREE MUNICIPALITIES IN SWEDEN. ANALYSING MODES OF GOVERNING.

Report from a project within the collaborative research program *Renewable transportation fuels and systems*

October 2017

Authors:

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THE SWEDISH KNOWLEDGE CENTRE
FOR RENEWABLE TRANSPORTATION FUELS

PREFACE

This report is a sub-deliverable from the project *From visions to smart ICT – local transitions to renewable transportation* that has been carried out within the collaborative research program *Renewable transportation fuels and systems* (Förnybara drivmedel och system), Project no. 40769-1. The project has been financed by the Swedish Energy Agency and f3 – Swedish Knowledge Centre for Renewable Transportation Fuels.

f3 Swedish Knowledge Centre for Renewable Transportation Fuels is a networking organization which focuses on development of environmentally, economically and socially sustainable renewable fuels, and

- Provides a broad, scientifically based and trustworthy source of knowledge for industry, governments and public authorities
- Carries through system oriented research related to the entire renewable fuels value chain
- Acts as national platform stimulating interaction nationally and internationally.

f3 partners include Sweden's most active universities and research institutes within the field, as well as a broad range of industry companies with high relevance. f3 has no political agenda and does not conduct lobbying activities for specific fuels or systems, nor for the f3 partners' respective areas of interest.

The f3 centre is financed jointly by the centre partners and the region of Västra Götaland. f3 also receives funding from Vinnova (Sweden's innovation agency) as a Swedish advocacy platform towards Horizon 2020. Chalmers Industriteknik (CIT) functions as the host of the f3 organization (see www.f3centre.se).

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EXECUTIVE SUMMARY

Based on national legislations, Swedish municipal authorities have the responsibility as well as the means to shape their own transport and energy systems (Olofsson et al. 2015) and lead the transformation towards fossil fuel free cities. In this report we explore how sixteen Swedish municipalities work toward fossil fuel free visions and goals with a particular emphasis on the urban transport and energy systems. We derive our findings from a broad review of municipal policy, strategy and program documents as well as from structured interviews with civil servants working within these issues.

The report presents a summary of the visions and goals adopted by municipalities in Sweden as well as the translation of these visions and goals into key targets and strategies. It also provides a summary of general patterns derived from document analysis and interviews of how municipal authorities work with and use various governing modes (Bulkeley & Kern 2006) to facilitate the transformation towards less dependence on fossil fuels, using transport and energy as a focus area.

The main conclusions and lessons that can be derived from this analysis are as follows:

- Swedish cities generally have explicit visions and goals towards fossil fuel free scenarios by or before 2050. Sometimes these goals and visions are expressed as reducing greenhouse gas emissions and climate neutrality or a combination. These visions are anchored in various documents including political visions, but more often in the climate and/or energy plans. The levels of ambition and target years are not necessarily conditioned by the size or economic specialization of the municipalities. Goals and visions are often broken down to two sets of target years for the municipal organization and for the municipality as a whole.

- In terms of translating these visions and goals into targets there are considerable variations in approach among the studied municipalities, reflecting - among other things – different stages of development work with climate planning and different human and economic resources available to municipal authorities to translate visions into actionable strategies and be able to follow up on these strategies. However, key messages identified by the informants specific to target setting include: 1) the goals are long term making it challenging to set measurable targets across all activities contributing to the vision; 2) targets are often non-binding, and difficult to measure the impacts or outcomes from all the activities municipalities promote; and 3) political consensus across political cycles is important to maintaining continuity of work on the visions.

- In terms of strategies, the most common approaches include a focus on municipal organization activities and procurement, infrastructure investments and planning, followed by strategies aimed at behavioral change. There is little experimentation to link citizen consumption patterns to the visions for the city. The transport system clearly represents the most important and equally the most challenging sector to work with to achieve fossil fuel free visions. Municipalities in the study generally appear more confident about achieving a fossil fuel free energy mix in the power and heating sectors, but not necessarily with transport fuels. Another key message is the link between strategies and outcomes. It is still a challenge for several municipalities to capture and see how the various and sometimes disparate measures in their strategies can lead to the achievement of political visions and goals.

- This report adopts a framework developed by Bulkeley & Kern (2006) focusing on four modes of governance. These modes are distinct in terms of their governing capacities and range from soft forms of governing to traditional forms of state intervention. Although these modes of governing may overlap and individual measures are often based on a combination of several modes, these distinctions provide a framework for the analysis of urban climate governance and the measures preferred by municipalities.

- Governing by example or self-governing is an apparent starting point for all municipal authorities in the transformation toward fossil fuel free municipalities. The common portfolios of action areas include energy savings in municipal owned or managed buildings, energy supply and distribution systems, travel means and behaviors within municipal departments and functions. But even under this mode of governing, not all municipalities are confident about their ability to achieve key targets. Reasons identified include lack of sufficient investments, ineffective coordination mechanism across functions and departments, and sometimes targets are non-binding (i.e. up to the functions to act on them).

- Governing through enabling is equally important in the portfolio of municipal strategies, for two apparent reasons: mobilizing resources and encouraging behavior change. Particularly for the smaller municipalities, partnerships with business actors are seen as important in order to make bigger investments. In a small number of municipalities, new types and forms of partnerships go beyond just helping business actors improve their decisions, but also toward identifying and co-creating new innovations and ideas for deployment in the city context. For most municipalities there seems to be a strong awareness and recognition of this mode of governing in triggering and enabling behavior changes (e.g. nudging citizens towards life style changes). At the same time, there is also skepticism among some municipalities on the effect of some of these measures such as energy advice services and citizen information campaigns, suggesting that municipal authorities still find it difficult to gauge and radically influence the modal choice or the fuel choice of its inhabitants.

- Governing through provision in the transport sector is found in all of the municipalities shift strategies. In particular, municipalities are working to provide infrastructure for modal shifts to biking and walking. This is followed by efforts to improve the efficiency and reach of the public transport infrastructure. Given recent trends in the privatization of operators, the commercialization and tendering of transport services, it is not often clear who is making the investments and how these efficiency improvements are carried through. More interesting is the growing interest among municipalities in the provision of infrastructure for alternative fuels and/or charging stations for electric vehicles. In this context, Swedish municipalities are making changes in favor of cleaner transport modes and the promotion of alternative transport fuels alongside incremental approaches such as car speed enforcement, parking restrictions or route signing.

- Finally, the common theme in governing through authority is the use of physical planning and permitting authorities. Very few municipalities are looking at or considering binding requirements on businesses with regard to energy use or fuel types. There is an apparent tension here with regard to balancing economic interest and environmental visions, particularly among municipalities with energy intensive industries. On the one hand, some municipalities feel constrained by national regulations in implementing more demanding requirements in the transport and building sectors to meet their visions.

Note: The research for this report was out carried under the project *From visions to smart ICT – local transitions to renewable transportation* within the f3 and Swedish Energy Agency collaborative research program Renewable transportation fuels and systems, project no. 40769-1. This report is one of two deliverables from the project.

SAMMANFATTNING

Med utgångspunkt i nationell lagstiftning har de svenska kommunerna ansvaret men också möjligheten att styra sina egna transport- och energisystem (Olofsson et al., 2015) och därmed möjligheten att påverka omställningen till fossilfria städer. Det här projektet utforskar hur sexton svenska kommuner arbetar mot fossila fria visioner och mål med särskild tonvikt på stadstransporter och energisystem. Projektets resultat bygger på en bredare genomgång av kommunal politik, strategi- och programdokument i kombination med strukturerade intervjuer med tjänstemän verksamma inom dessa områden.

Den här rapporten presenterar en sammanfattning av de visioner och mål som kommunerna i Sverige har anammat samt hur kommunerna översätter till mätbara mål och strategier. Rapporten ger också en sammanfattning av hur kommuner arbetar med och använder olika styrningssätt (Bulkeley & Kern 2006) för att främja omställningen till ett minskat beroende av fossila bränslen.

De viktigaste slutsatserna och lektionerna från projektet är följande:

- Svenska städer har generellt sett tydliga visioner och mål mot fossila fria scenarier för 2050 eller tidigare. Målen och visionerna beskrivs ibland som minskade växthusgaser eller ökad klimatneutralitet och är förankrade i olika dokument, till exempel politiska visioner, men ännu oftare i klimat- och energiplaner. Angivna ambitionsnivåer och målår är inte nödvändigtvis kopplade till kommunernas storlek eller ekonomiska aktiviteter. Det händer att mål och visioner bryts ner i två olika målår: ett för kommunens organisation och ett för kommunen som helhet.

- De studerade kommunerna översätter visionerna till mätbara mål på många olika sätt vilket antas spegla dels hur långt kommunen har kommit i klimatplaneringsarbetet och dels vilka resurser de har tillhands. Även uppföljningen av satta målsättningar och strategier varierar. Överlag visar studien på att 1) målen är långsiktiga och därmed inte enkla att översätta i mätbara mål för kommunerna att kunna tillämpa i olika berörda aktiviteter; 2) målen är sällan bindande och det är svårt att mäta effekterna eller resultaten från de aktiviteter som kommunerna prioriterar; och 3) att politisk enighet över tid är avgörande för att upprätthålla kontinuitet i arbetet med de visionerna som är tänkta att fungera långsiktigt.

- Projektet visar att kommuner ofta fokuserar sitt strategiska arbete på den egna organisationen inklusive upphandling, infrastrukturinvesteringar och planering, följt av strategier som syftar till beteendeförändringar. Enstaka initiativ handlar också om att länka medborgarnas konsumtionsmönster till visionerna för staden. Transportsystemet representerar den klart viktigaste men också mest utmanande sektorn för att uppnå fossila fria visioner. Kommunerna i studien tror mer på att uppnå en fossilfri energimix inom elförsörjning och uppvärmning och i mindre utsträckning på transporter. Ett annat viktigt budskap är länken mellan strategier och resultat. Det är utmaning för flera kommuner att uppskatta och beskriva hur deras strategier och åtgärder hjälper dem att uppnå satta visioner och mål.

- Studien som ligger till grund för rapporten bygger på ett ramverk från Bulkeley & Kern (2006) i vilket fyra styrningssätt framhävs. Dessa styrningssätt skiljer sig vad gäller omfattningen på det som ska styra samt att de spänner från ”mjukare” former för styrning till

mer traditionella former av statligt ingripande. Även om styrningssätten kan vara överlappande och individuella åtgärder ofta bygger på en kombination av flera olika former, utgör dessa skillnader en grund för en analys av stadsstyrning och de åtgärder som kommunerna föredrar.

- En tydlig utgångspunkt i arbetet bland alla studerade kommuner är att styra genom att föregå med eget exempel. Återkommande aktiviteter under det här styrningssättet handlar om energibesparingar i kommunalt ägda eller förvaltade byggnader, energiförsörjning och distributionssystem, resemedel och beteenden inom kommunala avdelningar och funktioner. Dock är inte alla kommuner övertygade om att kunna uppnå viktiga mål på det här sättet och förklaringarna pekar på otillräckliga investeringar, ineffektiva samordningsmekanismer mellan funktioner och avdelningar, och i viss mån även avsaknaden av bindande mål (vilket ofta lämnar det till enheterna att omsätta målen i handling).

- Också vanligt är det andra styrningssättet, att styra genom möjliggörande, vilket i stora drag ofta används i syfte att mobilisera resurser men också till att uppmuntra till beteendeförändring. Mindre kommunerna vänder sig ofta till andra marknadsaktörer för att kunna göra större investeringar. Några få kommuner har även initierat nya former av partnerskap för att möjliggöra nya innovationer och idéer i ett stadssammanhang. För de flesta kommuner förefaller det finnas en stark medvetenhet och erkännande av detta styrningssätt för att åstadkomma beteendeförändringar, exempelvis förändringar i livsstil. Samtidigt finns det också skepsis bland vissa kommuner om effekten av vissa åtgärder, såsom energirådgivning och informationskampanjer riktade mot medborgare, vilket tyder på att kommunerna fortfarande har svårt att mäta och radikalt påverka det invånarnas vanor i valet av exempelvis bränsle.

- Styrning genom tillhandahållande är det tredje sättet och detta återfinns i alla kommunerna och då speciellt för transportsektorn. Kommunerna arbetar ofta med att tillhandahålla infrastruktur för förbättrade möjligheter till cykling och promenader men även för att förbättra kollektivtrafiken i fråga om omfattning och effektivitet. Privatiseringen av operatörer, kommersialisering och upphandling av transporttjänster komplicerar dock målgruppsbilden vad gäller effektivitetsförbättringar. Vidare visar kommunerna på ett växande intresse för att tillhandahålla infrastruktur för alternativa bränslen såsom laddningsstationer för elbilar. Här kan man säga att svenska kommuner gör radikala förändringar till förmån för renare transportsätt genom alternativa transportbränslen. De arbetar också med begränsningar och förbättringar vad gäller hastigheter, parkeringsplatser eller skyltning.

- Det sista styrningssättet, styrande med auktoritet, riktas ofta mot fysisk planering, regelefterlevnad och tillståndsgivning. Få kommuner vänder sig till bindande krav på företag när det gäller energianvändning eller bränsletyper. Kommunerna, särskilt de med energiintensiva industrier, brottas här med att balansera ekonomiska intressen med miljövisioner. Vissa kommuner upplever att de begränsas av nationella bestämmelser för att genomföra mer hårdare krav inom transport- och byggsektorn för att uppfylla sina mål.

Obs! Forskningen för denna rapport genomfördes inom projektet *From visions to smart ICT – local transitions to renewable transportation*, projektnummer 40769-1. Projektet är del av samverkansprogrammet Förnybara drivmedel och system som finansieras gemensamt av f3 och Energimyndigheten. Denna rapport utgör en av två leveranser från projektet.

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1 INTRODUCTION

Municipalities around the world are taking a leading role on responding to climate change and reducing dependence on fossil fuels (McCormick et al. 2013; Busch & McCormick 2014). In this project we explore how sixteen Swedish municipalities are working towards fossil fuel free visions and goals with a particular emphasis on the urban transport and energy systems. The report presents a summary of the visions and goals adopted by municipalities in Sweden as well as the translation of these visions and goals into key targets and strategies. It also provides a summary of general patterns derived from document analysis and interviews of how municipal authorities work with and use various governing modes to facilitate the transformation towards less dependence on fossil fuels.

The report is based on qualitative analysis of data and information from primary and secondary sources. The data collection was conducted in 2015 and 2016. Sixteen Masters students from Lund University (supported by researchers) participated in the data collection and in interviewing persons in charge of environmental, climate and/or energy work at each of the municipalities using a standard interview protocol (see Appendix 1). The interviews were conducted in Swedish, and in most cases, they took place over the telephone. The researchers also consulted official documents (mainly policy reports, municipal plans and strategy documents) as well as online data retrieved from the official websites of the municipalities.

The analysis is structured in a way to uncover what is happening in these municipalities in terms of visions, goals, targets and strategies for leading the transformation toward fossil fuel free municipalities. Within strategies, this research investigated the role of infrastructure investments, behavior change programs, city planning, ICT (like virtual meetings, online resources etc.), financing and important collaborations across sectors (with industry, academia etc.) in the municipality as an organisation and the community as a whole. Another objective of the analysis is to examine and distil patterns and common challenges with translating visions into actions and how the various modes of governing available to municipal authorities are used in practice.

Regarding modes of governing, this report adopts a framework developed by Bulkeley & Kern (2006) that distinguishes four types. These include self-governing, governing through enabling, governing by provision and governing by authority. These four governing modes emerge as significant in the analysis of the dynamics of urban climate governance and are distinct in terms of their governing capacities, ranging from soft forms of governing to traditional forms of state intervention (Smedby & Quitzau 2016). Although these modes of governing may overlap and individual measures are often based on a combination of several modes, these distinctions provide a framework for the analysis of urban climate governance and the measures preferred by municipalities.

2 BACKGROUND

This section provides a brief overview of how Sweden's efforts to become fossil fuel free compare within the EU and internationally. It also provides background on the Swedish municipalities included in the study.

2.1 SWEDISH CLIMATE POLICY IN CONTEXT

In 2011, the European Union's 2050 low-carbon economy roadmap set a target of reducing GHG emissions to 80% below 1990 levels by 2050 through domestic reductions (European Commission, 2011). In 2017, Sweden adopted a climate policy framework that adjusted Sweden's previous target of being climate neutral by 2050 and changed it to being climate neutral by 2045 and reducing emissions by 85% lower than in 1990 (Government of Sweden, 2017). Sweden's new target of climate neutrality by 2045 reads more ambitious than other EU countries that have set targets of climate neutrality by 2050 (Denmark, France, Germany) but still less ambitious than Norway's goal of becoming climate neutral by 2030.

The European Environmental Agency's 2016 report on trends and projections for EU members efforts meeting climate and energy targets states that the EU is on course to meet its 20-20-20 climate and energy targets of: 20% reduction in GHG emissions (from 1990 levels); 20% share of renewable production; and 20% improvement in energy efficiency by 2020 (EEA, 2016). The EEA report is based on data from 2014 and found that Sweden was one of eight countries to surpass their national effort sharing decision (ESD) greenhouse gas emission target by more than 10%. In terms of meeting renewable energy source targets outlined in the Renewable Energy Directive (RED), Sweden placed second behind Croatia for their progress on increasing their national share of renewable energy in gross final consumption but leads all EU countries in actual overall share of renewable energy being produced nationally. However, Sweden was one of three countries to be struggling with targets for primary energy consumption and energy efficiency though preliminary data from 2015 suggests that Sweden's performance has since improved.

Internationally, recent publications from NGOs have given positive assessments of Sweden's work in transitioning to a fossil fuel free society. The World Economic Forum's 2017 Energy Architecture Performance Indicator placed Sweden in third globally for environmental sustainability citing Sweden's investment in renewables. The report singles out Sweden as a good example of managing energy transition highlighting its approach to creating adaptable, co-designed policies and stewarding investment to the most impactful areas.

The 2017 Climate Change Performance Index published by Climate Action Network Europe and German Watch also evaluated Sweden's climate efforts favorably. The index uses weighted indicators on a range of areas including emission levels, efficiency and renewable energy as well as a score based on national and international climate policy assessments completed by 280 experts from different countries. A total of 58 countries that account for 90% of global emissions are ranked using the weighted indicators. The Climate Action Network does not award anyone in the top 3 positions citing that no country is doing enough however in 2017 Sweden took the fifth spot for having relatively low emission levels and low carbon intensity of its energy supply. However, the report warns that Sweden's leadership on climate action could be threatened due to a slowdown in investments in renewable energy.

2.2 SWEDISH MUNICIPALITIES IN THE STUDY

In this project, we did not attempt to comprehensively compare the performance of Swedish municipalities with municipalities of other countries. However, it can be assumed that any country's overall performance is in part an aggregate reflection of the performance of its municipalities. In this report, we investigate sixteen Swedish municipalities (see Appendix 2) that are geographically distributed in most regions of Sweden (see Figure 1). The municipalities range from approximately 27 000 inhabitants to nearly 1 million inhabitants in population size. Common among them is that they are all members of the *Klimatkommunerna* (Climate Municipalities), which is a network of Swedish municipalities with proactive climate work (Klimatkommurerna, n.d.).

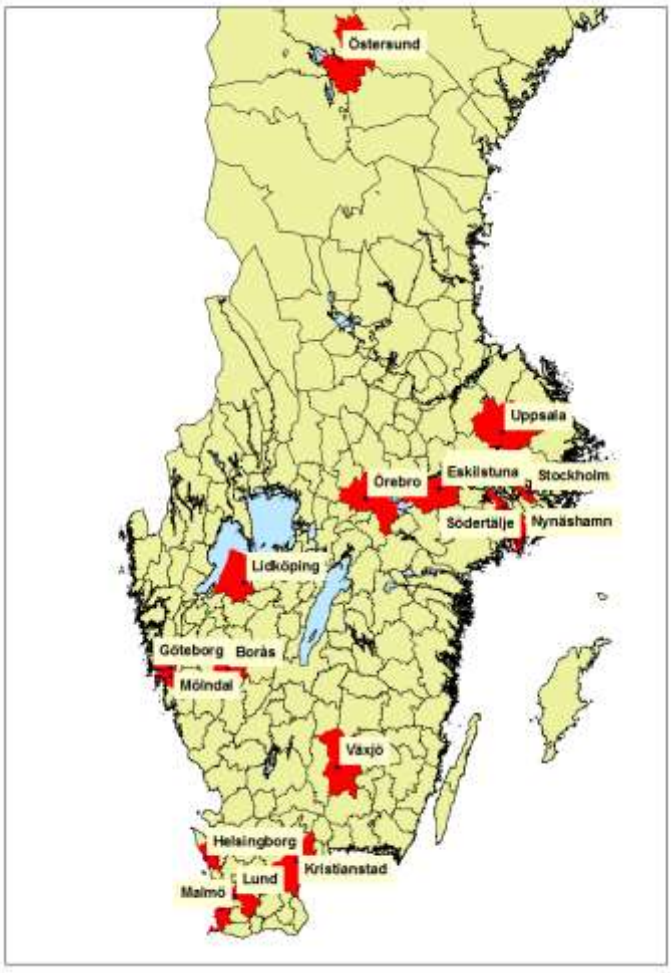

Figure 1. Selection of municipalities in Sweden.

The municipalities vary regarding characteristics such as size, demographics, urban form and economy (see Table 1). The country's three largest municipalities are all represented, including the capital Stockholm, but also a number of mid-sized and small municipalities. Although most of the municipalities are economically quite diversified, many of them have historically been dominated by industry, often of one particular kind. Two of the municipalities (Lund and Uppsala) are pronounced university cities, while others, such as Södertälje and Borås, are still quite specialized within certain industries. These differences lead to different preconditions between municipalities to reduce carbon emissions and fossil fuels.

Table 1. Municipalities in the study.

	Municipality	Region	Population (000)[1]	Environmental Rank[2]
1	Nynäshamn	Stockholm	27	122
2	Vellinge	Skåne	35	86
3	Lidköping	Västra götaland	39	38
4	Östersund	Jämtland	61	51
5	Kristianstad	Skåne	83	30
6	Växjö	Kronoberg	89	13
7	Södertälje	Stockholm	94	68
8	Eskilstuna	Södermanland	103	35
9	Borås	Västra götaland	109	17
10	Lund	Skåne	118	4
11	Helsingborg	Skåne	140	1
12	Örebro	Örebro	146	6
13	Uppsala	Uppsala	214	5
14	Malmö	Skåne	328	21
15	Gothenburg	Västra götaland	566	12
16	Stockholm	Stockholm	935	10

Another factor of importance for the potential to reduce carbon emissions and fossil fuels is the size, spatial distribution and density of the population in the different municipalities. Higher population densities are needed to make public transport viable (Newman & Kenworthy, 2006), and long distances can make walking and bicycling unattractive alternatives to the car. Some municipalities, such as Gothenburg, are sprawling despite being highly urbanised, while other municipalities have a large share of their population living in rural or peri-urban areas. In these municipalities, there is less possibility to shift from cars to other modes of transport. Other municipalities, such as Malmö, have their populations concentrated to more densely populated areas, implying that it is easier to reduce car use.

[1] Population statistics (2016) accessed from Statistics Sweden. See: www.scb.se/hitta-statistik/sverige-i-siffror/kommuner-i-siffror/

[2] Environmental ranking that measures the activities and ambitions in the environmental field in all Swedish municipalities (2017). See: http://kommunrankning.miljobarometern.se/hela-listan/

3 FINDINGS

The section is structured to present what is happening in the municipalities investigated in this research in terms of visions, goals, targets and strategies for leading the transformation toward fossil free municipalities.

3.1 VISION AND GOALS

The uptake of carbon neutral and fossil free visions and goals feature strongly in the climate and energy plans of Swedish municipalities. Within the study sample, almost all municipalities explicitly state ambitions of carbon neutrality or fossil fuel free energy systems in their climate strategies and/or energy plans. Such ambitions are distributed across all sizes of municipalities from the small ones to the large one (see Figure 2).

The municipalities vary in the way they articulate visions and goals in terms of scope and target years. In the described scope for this study we refer to 1) distinctions in the ambition levels for the city as a whole and/or for municipal organization, 2) separate goals for fossil fuel free and for climate neutral objectives, 3) boundary setting between direct and indirect emissions. We elaborate on these three points below.

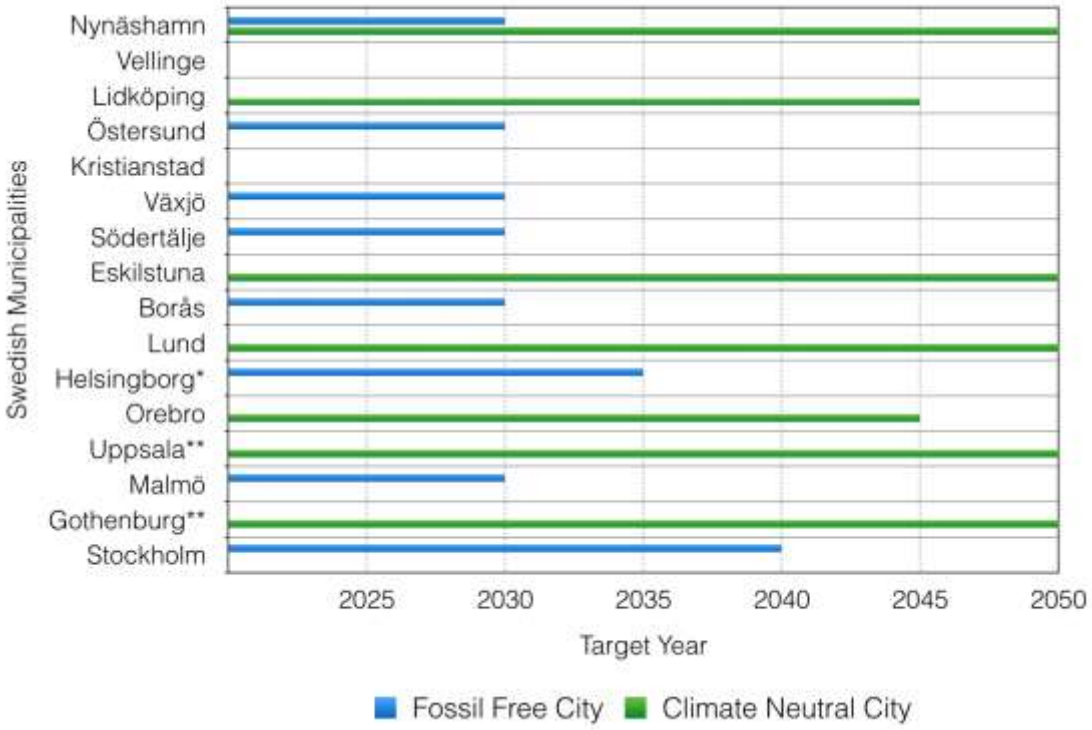

Figure 2. Climate goals for Swedish municipalities. * Helsingborg aims to be "energy neutral" by 2035. **Uppsala and Gothenburg have per capita consumption targets (0.5 tonnes and 1.9 tonnes of CO2 respectively).

In five municipalities, the vision of becoming climate neutral or close to climate neutral at the city level is set for the year 2050. Örebro and Lidköping stand out as the most ambitious with the year 2045.

Cities that chose to use *fossil fuel free* as a vision have set target years are set closer to 2030. One reading of this could be the perception that *fossil fuel free* is more attainable than *climate neutral*. The planning traditions within Swedish municipalities, specifically related to energy planning as a nationally mandated requirement, might have led to the development of better institutional knowledge to explore alternative energy options within the municipal energy mix.

Furthermore, some cities are struggling to set boundaries around climate neutrality as well as the extent indirect emission related to consumption within the municipal boundaries should be included in these boundaries. On that front, cities that have done some work around consumption impacts are more cautious to articulate a vision of climate neutrality. An example is the Municipality of Gothenburg, where the climate goal for 2050 is expressed in terms of 75% reduction of emission per inhabitant. On the other hand, Stockholm strategy document specifically state that the zero emission targets for 2040 apply only to direct emissions and does not include indirect emissions from consumption.

Seven municipalities have an explicit goal of becoming *fossil fuel free* within the municipal organization by 2020 (see Figure 3). The communications from Eskilstuna and Malmö explicitly state goals for climate neutral municipal organizations within 2020 whereas Nynäshamn and Örebro want to become *climate neutral* within the municipal organization by 2030. However, these documents are not always explicit about describing the boundary setting and to what extent indirect emissions from municipal procurement are included.

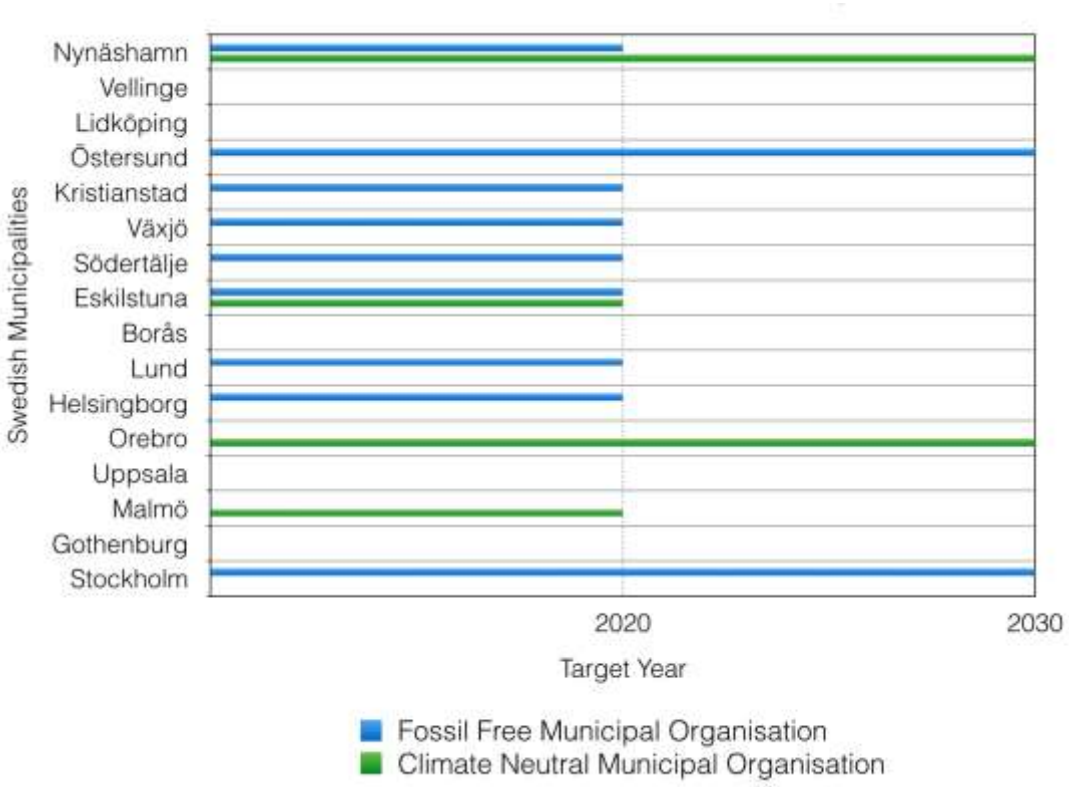

Figure 3. Climate goals for Swedish municipal organisations.

3.2 KEY TARGETS

Analysis of the targets found in municipal documents and their approach to target setting is slightly more complicated. This is due to the diversity of targets, the varying approaches in establishing relationships and connections between visions/goals and operational targets across municipal functions and other strategic and planning documents and the temporal and sectoral scope of these targets. Thus the objective here is not to establish any discernable pattern in target setting as much as to highlight broad observations from reading the documents and interviewees reflections on the subject. To illustrate, we focus the observations on specific interpretations and translation of *fossil fuel free* vision/goals in target setting within the mobility sector.

The most visible scope for target setting towards *fossil fuel free* vision is at the level of the municipal organization. These targets cover a broad range of areas including energy supply and production for heating and electricity, switching to bio-fuel production, energy use reductions in municipal-owned buildings, targets related to the municipal owned car fleet and staff travel patterns. Even in these areas where the municipal authorities have more direct control over achieving targets, since they relate to their own operations, targets are often directional rather than quantifiable. When targets are quantifiable, there is a level of ambiguity or flexibility observed in some municipalities. To illustrate the contrast, *Table 2* shows two contrasting examples of target setting, where in one case it is more about prioritizing actions while in the other case, quantitative targets are clearly set.

Table 2. Mobility related target setting for two municipalities

Municipality	Target	Measurements
Nynäshamn	Energy efficient transports will be prioritized (Nynäshamn, 2012, p.23). Transports free from fossil fuels will be prioritized (Nynäshamn, 2012, p.23).	The number of environmental cars in the municipal's car pool and the number of employees educated in eco driving will be measured (Nynäshamn, 2012, p.37). The number of charging points for electrical cars and for bio fuel cars will be measured every year (Nynäshamn, 2012, p.39).
Uppsala	The vehicles of the municipality are fossil fuel free 2020, (Uppsala kommun, 2014, p.10). The mechanical fleet and procured transports are fossil fuel free or climate neutral in 2023 latest (Uppsala kommun, 2014, p.10).	Number and share of fossil fuel-free vehicles and procurement, as well as climate neutrality Procured transportation. (Uppsala kommun, 2014, p.10). Own / leased passenger vehicles and light trucks are also followed up in respect of: Energy efficiency: kWh / vehicle mileage and total MWh, Low environmental impact: kg CO 2 e / vehicle km and total tonnes CO 2 e. (Uppsala kommun, 2014, p.10).

Extending the targets beyond the municipal organization, again we observe a variety of approaches to defining city-wide targets. A good starting point for understanding the differences is to ask about the processes of target setting including the internal coordination and negotiation processes across functions and departments for ownership of targets. Other factors include the political and budgetary considerations, the baseline used and the perceived endowment of power and resources to influence the urban context in order to achieve these targets. Unfortunately, our data set does not allow for us to probe deeply into these questions. However, our observations based on this study points to some critical factors in relation to these questions and could be explored further in comparative case studies.

One observation is the inconsistent use of output targets as opposed to outcome targets. For example, with regard to achieving change in citizens and/or business mobility patterns, the targets are framed in relation to what the city can do in terms of provision of infrastructure, resources, service or knowledge. In other cases, few municipalities frame targets as outcome targets (e.g. Gothenburg: CO_2 emission reduction targets per inhabitant). Is one approach better than the other? And what makes some municipalities frame targets as outcome targets? This can be partially explained by the internal capabilities within the city's 'civil' administration as opposed to the political orientation of the governing coalition at the time. As one informant noted when formulating their targets: *[there is] surprisingly little resistance from politicians to think from a consumption perspective*.

A second observation relates to baseline year and baseline setting. In cases where the targets are not absolute but relative to the baseline year, there are often inconsistencies across municipalities or even among target areas within the same municipality (e.g. Södertälje: *compared to 2009, reduce fossil fuel emissions from transports with 2% per year and habitant by 2016*; Vellinge: *the municipality will reduce its energy consumption with 20% by 2020 compared to 2010 levels*). This can be explained to some extent by the fact that a variety of strategic planning processes and documents inform target setting and guide the anchoring of 'political' visions into the functional areas. Different functions seem to rely on established routines for target setting. For example, the environmental program (Miljöprogrammet) for reframing existing targets under the new vision. This in itself should not be interpreted negatively. One take away from this is to consider how various strategic planning processes across municipal functions are coordinated and used to frame and/or reframe newly inspired targets in coherent ways.

A third observation concerns achievability and measurability. A starting point is to quote directly from some of the informants with regards to these concerns:

> *…we want to make a clear distinction between targets and means of implementation/ measures. We only want to specify the measures with the [actors we can influence]. Other than that we work more qualitative than quantitative ways.*
>
> *…sometimes we don't understand how small we are and we are aiming for a bit too much.*
>
> *…the goals set for 2020 will be tough to reach but are anyway realistic. Therefore, they will not be reconsidered. What will be reconsidered are the strategies to reach the goals.*
>
> *…It should also be noted that many of the goals are considered long-term goals and it´s in a way easy to set targets regarding all possible areas, but considering the fact that they are not legally binding, it´s not a given matter that these targets is going to be considered accomplished.*

In light of these comments and other observations, we can point to several common challenges in the framing of targets. One is a recurrent concern with regard to political and financial commitment to achieve these targets. Not all interviewees were optimistic towards achieving the targets but also emphasized the need to keep on motivating politicians; quoting one of the informants: *it all depends on the budget of the technical departments*. The second aspect is the burden of monitoring and reporting on targets. Several of the informants see challenges in finding appropriate metrics and continuously developing the relevant set of key performance indicators in order to have a coherent overview on the achievement of the vision. The burden of tracking and reporting on these targets across departments and functions within the municipalities will continue to pose a challenge

given the limited resources given within the environmental units that typically coordinate these plans/visions. Another consideration is the frequency with which targets are updated and reported on as well as the number and variety of governing documents a municipality is working with. In addition to the overall climate plans and strategies, some municipalities are creating medium term action plans as well as providing annual reporting on the progress being made. Additionally, some cities have multiple sub-strategies that are focused on specific objectives (e.g. traffic plans, energy programs, cycling strategies). More analysis would be required to understand the impact of multiple strategies, frequency of reporting and the use of climate plans with shorter time horizons.

3.3 MAIN STRATEGIES

We use two ways to discern the pattern of strategy choices among the municipalities for implementing fossil fuel free visions. The first is to look into the type of instruments used. The second is to look at the sectoral priorities. Both of these perspectives are also linked with the governance mechanism used by municipalities. We present these aspects here briefly and further illustrate with examples in the following section under *modes of governing*.

3.3.1 Instrument Focus

Investments and Procurement

Nearly all municipalities start with the municipal organization as the focus of action. The two key instruments used here are municipal investments and procurement. Examples here include prioritizing investments in fossil fuel free energy supply, integration of climate targets into procurement of transport services or other types of services for municipal schools and hospitals. These are often seen as short-to-medium term strategies with quick pay-offs.

City Planning

The second level is often articulated through the planning role of the city. Several informants were keen to highlight the planning function and how it can be utilized to steer the overall urban environment - both the newly built and supporting infrastructure - to facilitate transitions toward fossil fuel free municipalities or *make it easy for inhabitants to choose sustainable alternatives,* in the words of one informant. To quote another: *…city planning is an important part of Borås strategies […] The municipality considers this being one of the most important tools of changing the energy use and transportation systems*. Some informants echoed the view that at this level, the change is slow and they need to be in it for the long run. Fewer municipalities made linkages to land use & rural areas, e.g. energy consumption in agricultural areas within municipal boundaries (Lund, Uppsala).

Cooperation and Engagement

The third category of strategies covers aspects of collaborating, engaging and motivating stakeholders in the change processes. These strategies can be applied across departmental functions, or externally with inhabitants and companies or with knowledge institutions. One could say that this is the anchoring strategy to get the necessary buy-in across societal actors. The significance of this strategy was highlighted by some of the municipality informants:

> *…In the energy and climate plan a few possibilities that the municipality have in reaching the goals and targets are described. Firstly, the importance of a dialog with the citizens is highlighted. Secondly, the municipality should make it easy for its citizens to choose sustainable alternatives (Lidköping).*

> *…we now have named a contact person from unit/department, so now there is a network and we already got positive responses, which is great! It is extra difficult in such a large municipality, and cooperation (across departments) is not a given on such questions (Gothenburg).*

> *…our strength is that we have a broad approach, with action plan and dialogue involving all units in the municipality. We believe in this (Malmö).*

Related to the same category of interventions are the use of informative instruments, citizens' engagement and dialogues with companies. However, some informants are not fully convinced of their potential to contribute to target achievement. One informant voiced disappointment with informative instruments as they seem not to have the effect the municipality wanted.

Similarly, within the same category, collaboration with universities and knowledge partners was profiled in several conversations on the strategy choices. Examples include enabling a center of excellence on consumption (Växjö) or strengthening cooperation with university actors (Helsingborg, Lund and Malmö).

3.3.2 Sectoral Focus

Energy Supply and Infrastructure

From the perspective of sectoral priorities, energy supply and fuel infrastructure seems to be an obvious choice for most municipalities, particularly the larger ones. These options however are not equally available to all municipalities due to many factors related to regional endowment, size of investments and municipal participation in ownership of the utility companies. Investments in biogas, wind and solar energy were among the options. Others include expansion or upgrading of district heating and technical infrastructure.

Transport and Mobility

Public transport and mobility strategies are cross cutting themes for nearly all municipalities. Most of them see this as an area where they can gain most in terms of realizing fossil fuel free visions. However, the perceived degree of influence on this sector is not equally shared among municipalities, especially municipalities situated in rural settings and with less density where private car is the main means of transport. To illustrate with one quote: *One of the most challenging things to become fossil fuel free is the car use in the city, since it requires change of laws and higher regulations from the government and cooperation together with the car-producer and the fuel-enterprises according (Växjö).*

There are also variations in the types of mobility interventions used, where larger municipalities seem to experiment with all three intervention modes: **avoid** (avoid the use of motorized modes), **shift** (to low carbon modes) and **improve** (technological aspects of private motorized modes by use

of cleaner fuels, e.g. el vehicles). The smaller municipalities tend to focus on either the *shift* or *improve* strategies.

Among the intervention strategies, *transport of goods and logistics* did not profile strongly in the conversations, perhaps due to perceived influence of municipalities on this sector. In one case (Eskilstuna), addressing emissions from heavier traffic was raised as a necessary aspect for achieving their vision because of the industrial base in the city. In another case (Östersund), cooperation with other municipalities was brought up as a necessary condition to address this aspect to enable what is called the *green highway* for the transport of goods. Still, the topic features directly or indirectly in the strategy/vision documents of larger cities such as Stockholm and Gothenburg (i.e. under trade and consumption).

Built Environment

This is an area where extensive examples were provided by the informants and found in the strategy documents for nearly all municipalities in the sample. The range of proposed interventions cover both existing and new buildings, municipal and privately owned as well as integrated approaches through the planning function for more efficient built environment combined with other aspects of mobility and sustainable life style choices (e.g. Lund). Other illustrative examples include: *experimentation with passive houses (Nynäshamn), a focus on small houses (Vellinge), energy efficiency renovation of old buildings (Växjö), densification of the urban center (Lund, Malmö).*

Business and Industry

As expected in municipalities with some industrial base, as expected, we could find direct reference to this sector in the strategy discussion, e.g. (Borås, Södertälje, and Eskilstuna). However, little was discussed during the conversations in terms of the role of businesses. The informant from Lidköping provided the following motivation to engage businesses in the strategy: *To work together with business actors is really important in order to be able to make bigger investment especially for small municipalities (Lidköping).*

We anticipated that with the increasing attention paid to the circular economy and the sharing economy and their promise in the urban context that this might prompt a focus on these concepts in the articulation of fossil fuel free strategies. This was not visible in the conversation or in the documents. In one case, *industrial symbiosis* was mentioned in the city of Malmö as part of their strategy for the industry. One explanation is that the operationalization of these concepts and their promise in contributing to the targets are yet to mature.

Information Communication Technology

The use of ICT is increasingly seen an opportunity to catalyze and enable urban transitions toward fossil fuel free transport. For instance, several municipalities refer to strategies based on increased use of ICT in mobility management (Eskilstuna, Helsingborg). Others talked of promoting *virtual meeting* (Örebro, Växjö) and reducing business and commuter traffic.

> *Växjö wants video meetings to become a natural thing for every one (Växjö).*

Consumption

Tackling *consumption* is an emergent theme for problematizing and framing of interventions toward fossil fuel free visions. This is discussed and presented not without challenges in terms of target setting, influence and achievability. However, there is an explicit recognition of the necessity of steering and influencing consumption in the overall framing of fossil fuel free visions. To amplify this with two quotes from the informants:

> *It is easier for the government to steer the population towards the wanted behavior by making structural changes rather than leaving it up to the individual (Östersund)*.

> *Surprisingly little resistance from politicians to think from a consumption perspective (Gothenburg*).

4 ANALYSIS – MODES OF GOVERNING

This section examines patterns and common challenges with translating visions into actions and how the various modes of governing (see Table 3) available to municipal authorities are used in practice.

Table 3. Modes of governing[3].

Governing by example	• It can be defined as the capacity of local government to govern its own activities, for example by improving energy efficiency in government offices and other municipality-owned buildings. • It relies on reorganisation, institutional innovation and strategic investments.
Governing by enabling	• It refers to the role of local government in co-ordinating and facilitating partnerships with private entities and encouraging community engagement. • Tools such as persuasion and (positive) incentives are most important for this mode of governing.
Governing by provision	• It implies shaping practice through the delivery of particular forms of services and resources. • This is accomplished through infrastructure and financial policy.
Governing by authority	• It can be characterised as the use of traditional forms of authority, such as control and the use of sanctions.

4.1 GOVERNING BY EXAMPLE

Governing by example (or self-governing) is an apparent starting point for all municipal authorities in the transformation toward fossil fuel free municipalities. The common portfolios of action areas include energy savings in municipal owned and managed buildings, energy supply and distribution systems, travel means and behaviors within municipal departments and functions. A detailed list of examples can be found in Table 4.

The municipal energy plans and strategy documents remain the anchor place for most of these actions. Additional and complementing actions can be found in climate strategies and/or environmental programs. Several municipalities use the environmental management system (i.e. Lidköping, Östersund, Lund) to identify, scope and act on some of these opportunities.

Additional new experimentations are found in some municipalities. The Gothenburg municipality, as an example, is looking into enhancing knowledge about smart grids for power steering and more research into storage of heat and cold. A few other municipalities are considering their own procurement criteria to meet emission reduction targets and contribute to fossil fuel free visions. Gothenburg documents read as the most ambitious in this regard with bringing attention and actions to the role of consumption and finding ways to reduce direct and indirect climate related emissions. Örebro stands out with a strong normative position through divestment of municipal assets from fossil based industries.

Behavior changing measures aimed at municipal staff are increasingly popular. Such as information campaigns, online tools and trainings aimed at staff for influencing modes of commuting or business travel. The use of ICT to reduce the need for commuter and business travel is explicitly

[3] Adapted from Bulkeley & Kern (2006)

mentioned in several of the municipal documents to facilitate transformation toward fossil fuel free transportation within the municipal organizations.

Several of the interviewees voiced concerns about the achievability of municipal organization goals and targets and obstacles to action at the departmental level to create the desired change. This relates back to the challenges of coordination and monitoring across departmental functions in order to arrive at a coherent overview on how the sub-targets are adding up. Another concern is the non-binding nature of these targets and availability of resources to achieve them, even for the municipal organization units.

Box 1. Quotes from municipalities about governing by example

> *"The consumption issue is very important here, both for public procurement but also for society, to nudge in the right direction is tougher, actually. But I think it is good that we first focused on the municipality's part to become a role model… how credible would we have been if we were to become the lagers?" (Nynäshamn)*

Table 4. Examples of Governing by Example in Selected Swedish Municipalities.

Self Governing	
Energy Supply	• Purchasing or exploring options to increase RE electricity for MO properties • Developing district heating and cooling system • Installing small scale solar on public buildings • Exploring smart grid development
Energy Efficiency	• Improve EE of MO properties • Setting higher criteria for new construction in MO properties • Creating and managing energy saving programs • Devoting annual budgeting to energy saving measures • Pursue EE in MO renovations and maintenance of existing projects
Transport	• Increasing production of biofuels for fuel in MO • Eco-driving staff training or behavioural programs for staff • Encouraging use of virtual meetings instead of travel
Procurement	• Guidelines on purchase of new vehicles so they are fossil free or climate friendly • EE requirements in procurement of goods

4.2 GOVERNING BY ENABLING

The portfolio of measures municipal authorities engage with to enable transformation appears large and diverse (see Table 5) but in fact there seems to be a tendency to converge toward a common set of actions. The most common are partnerships with societal actors, such as businesses and academia, and information tools and campaigns aimed at citizens.

In addition, few informants point out explicitly to the provision of *energy advisory* and *consulting services* offered by the municipality to enable better energy decisions in industry and/or new construction plans. An even smaller number explicitly stated the provision of incentives and incentive schemes for industry and citizens to enable switching to energy saving measures.

The low emphasis on the provision of incentives might not actually reflect the reality as there are more of these programs than what transpired through the conversations. One reason is that financial incentive-based programs can also be interpreted within the role of provisioning.

Several types of partnership stand out in the conversations where the informants felt worth mentioning. Two examples are the *Klimatprotokollet* partnership in Uppsala and the *Klimatallians Skåne Nordost* in Kristianstad. Both are cooperation platforms with business partners to identify and promote innovations toward low carbon solutions.

Specific to municipalities where there is a strong research environment (e.g. Gothenburg, Lund and Uppsala), the informants emphasized the value and potential of university cooperation to identify new solutions, test ideas and develop new knowledge for the municipalities. They also highlighted the role of external funding in facilitating these projects, such as that from European Commission cooperation programs and Swedish Energy Agency (*Energimyndigheten*).

An interesting observation about the enabling role was voiced by informants from Lidköping and Kristianstad municipalities. It is related to the work they do with children and day care centers. For them, a focus on children is necessary to enable long-term social changes in lifestyles towards climate aware societies. Related to this, the informants from Gothenburg and Stockholm municipalities mentioned the potential use of ICT and gamification to trigger or enable lifestyle changes among citizens in general. Examples mentioned in Gothenburg are the *GreenhacksGBG* and *Future Happiness* game. Though there is a clear awareness that the effects are not clear yet, the need for experimentation with new methods is acknowledged. In contrast to this, the informant from Borås pointed out the important role of the city to facilitate and provide physical meeting spaces for citizens to discuss and explore climate issues.

In summary, the current level of analysis does not discern the patterns and differences among the municipalities in how they assume their enabling role specifically in relation to their size, contextual environments and economic specialization. However, from the perspective of municipal civil servants engaged with strategies and programs for fossil fuel free visions, the enabling role permeates through the various implementation strategies. There seems to be no conscious efforts to distill out this mode of governing into deliberate strategy action.

On the other hand, there seems to be a strong awareness and recognition of this mode of governing in triggering and enabling behavior changes (e.g. nudging citizens towards life style changes). Additionally, two trends can be read liberally from these conversations. One relates to modes of partnering with businesses. We increasingly see new forms of partnerships that go beyond just helping business actors improve their energy decisions, but also toward identifying and co-creating new innovations and ideas for deployment in city context with business partners. The second relates to improvements and more experimentation over the traditional tools and channels of informing and raising awareness. Some informants were already skeptical of their traditional information campaigns to citizens questioning weather these are making impacts at all. What we see now are new possibilities of leveraging the potential of a highly networked society in combinations with strong ICT infrastructure to enable low carbon lifestyle choices.

Box 2. Quotes from municipalities about governing by enabling

> *"The municipality should not go as far as to influence physically how companies and citizens should drive cars. Instead they should give the possibilities, be role models and give additional possibilities to drive cars running on gas, for example." (Kristianstad)*

Table 5. Examples of Governing by Enabling in Selected Swedish Municipalities

Governing by Enabling	
Businesses	• Partnerships and encourage innovation with energy companies • Energy and climate advice • EE programs / partnerships with business community • Targeted partnerships with largest local industries • Educational campaigns on employee travel, developing action plans, etc. • Engage property owners and housing associations on small scale RE production • Promote us and adoption of EE and environmentally friendly • Cooperation with construction companies on EE building programs for building and renovation sector • Encourage and support investment in small scale RE
Citizens	• Energy and climate advice • Solar maps for citizens • Energy and transit educational campaigns • Energy education in schools for children • Supporting development of grants and installation of small scale RE • Communicate to citizens opportunities for them to produce small scale RE • Outreach through gaming and ICT (green hacks)
Academia	• Research projects on energy/transport solutions • Partnerships on educating businesses and citizens on energy/transport solutions

4.3 GOVERNING BY PROVISION

Swedish municipalities, because of planning legislations and local tax revenues, have a relatively broad space to influence sustainability within the transport and energy sector through investment decisions and policies. Table 6 shows the broad spectrum of actions carried by the municipalities in this mode. In the conversations about provisioning, the informants mostly highlight the possibilities and potential investments in infrastructure elements within the transport sector. Provision of specialized advisory services such as energy-saving and mobility planning came up as well in the conversations as it did in the enabling role.

Within the transport infrastructure, the most common element referred to by the informants about their plans for fossil fuel free visions is the expansion and/or improvement of the cycling and walking pathways, discussed in terms of both, expanding the pathways and networks as well as encouraging a shift to cycling and walking. This points to a tendency and perhaps recognition of the importance of *avoid strategies*; avoiding motorized transport as a means to achieving visions.

Table 6. Examples of Governing by Provision in Selected Swedish Municipalities

Governing by Provision	
New Infrastructure	• Expand connection to district heating/cooling • Invest in expanded cycling infrastructure • Developing pedestrian friendly pathways • Charging stations for electric vehicles • Increase production and improve accessibility of biofuels • Digital infrastructure (smart metering)
Public Transportation	• Improve connections between different modes of transportation (rail, buses, cycling) • Free PT for children and seniors • Increase use by improving service (punctuality and exchangeability) • Transition to electrified/fossil free/climate friendly fuelled PT • Increase use of waterways
Freight	• Invest in green freight infrastructure • Increase use of waterways and rail • Organize city logistics around freight • Coordinate and improve efficiency of freight traffic
Services	• Energy and climate advice • Trip planning phone applications • Online solar maps • Environmental construction programmes • Priority to FF modes with snow removal • Offering electric bikes
Financial	• Incentives / grants for installing small scale RE, connecting to district heating, purchasing climate-friendly private vehicles

Similarly, over 50% of the respondents refer to improvement opportunities within the public transport infrastructure. These are highlighted in various terms such as expansion of the public transport network, provision of new modes (e.g. tram lines in Lund and Malmö) and soft measures to enhance efficiency of public transport and inter-modalities (better public transport information, dedicated lanes, more bus stops). Planning tools are also mentioned on several occasions as tools to enhance public transport options. In Nynäshamn and Östersund, reference is made to requirements that the nearest bus stop should be within three hundred meters of any new residential development.

An emerging focus is on charging infrastructure for electric cars. Most municipalities have plans to expand the provision of charging stations independently or in cooperation with businesses.

A focus on urban freight transport is found in municipalities with strong industrial-base such as Eskilstuna, where in their strategy documents they highlight that *achieving a carbon neutral vision will be difficult without taking into consideration heavy traffic and trucks*. The Östersund municipality refers to investing in green freight infrastructure projects in cooperation with few other municipalities.

Financial instruments and financing strategies are key enablers for the provisioning role. Little however is discussed or mentioned in this area. A few of the larger municipalities do offer access to grant opportunities for energy efficiency investments in real estate. The mechanisms and scope

were not discussed. On the other hand, several others highlighted the way investments are prioritized in the transport sector in favor of avoid strategies first.

Box 3. Quotes from municipalities about governing by provision

> *"The aim has been to reach a fossil fuel free vehicle fleet, but the road there has been a bit zigzag because until now we have had an organization that has not really been there with the vehicle fleet at all. Now the work can proceed, we have purchased our first three electrical cars and now we are mapping the charging infrastructure in the whole region." (Nynäshamn)*

Some other examples highlighted by various municipalities include: energy investments in wind installations (Helsingborg), public private partnerships in renewable power production (Örebro), expanding connection to district heating (Stockholm), and increasing bio-gas production (Växjö). These are all case of governing by provision.

4.4 GOVERNING BY AUTHORITY

Swedish cities have scope for exercising authority in most aspects of transport planning, energy efficient built environment and sustainable energy supply. However, the feedback from interviewees is counter intuitive to this notion and to what is actually being exercised. In this analysis, we cannot establish nor confirm the divergence between available scope and practiced authority in these domains (transport, buildings, power and heat). Our data on the other hand provides some pointers to common themes of practiced authority and points of tension (see Table 7).

Planning tools are clearly recognized among the key instruments for municipal authorities to shape the transformations toward fossil fuel free visions. Some are more specific than others on how planning is used. Östersund and Nynäsham refer to how they use physical planning for new residential districts and minimum distances from public transport nodes. Gothenburg on the other hand emphasizes the role of physical planning to create dense and mixed neighborhoods thus reducing the demand for motorized transport. Related to this is the allocation of spaces for parking. Several of the municipalities have or are in the process of reducing and/or limiting available parking spaces according to informants (e.g. Lidköping, Uppsala, and Stockholm). This trend however needs to be validated against existing and changing rates of parking spaces in cities and city centers.

Related also to the strategy of discouraging motorized transport in city centers, there is a trend of increasing parking fees and/or increasing charging times. Gothenburg uses differentiated charges based on environmental considerations in the port facilities for marine transport. Only one municipality, Stockholm, uses fiscal instruments, such as congestion fees to limit motorized transports during peak hours. To promote clean-fuel cars, some municipalities have attempted free parking fees. Green zones and restrictions on freight transports were also mentioned by some municipalities for exercising authority.

Some cities would like to take a step further with more stringent energy efficiency requirements on buildings through building guidelines and permitting procedures (e.g. Nynäshamn, Lund). The informants also highlighted the limitations they have to enforce these guidelines, beyond municipal owned buildings. According to the Swedish law, the guidelines can only be seen as recommendations when granting planning permission.

There seems to be better scope for imposing energy efficiency and carbon emission reduction requirements on industry. Examples here include energy reduction targets for energy intensive industries and in Östersund where inspectors are empowered to impose on companies to provide energy declarations and perform energy audits. However, an apparent tension in these conversations is the reluctance of cities to impose stringent requirements on businesses and the desire to work collaboratively with industry on low carbon pathways.

Box 4. Quotes from municipalities about governing by authority

"Some municipalities pose requirements on companies based on the Swedish energy law (miljöbalken). We do not pose any requirements on the companies because we are concerned with keeping them in the municipality." (Vellinge)

Table 7. Examples of Governing by Authority in Selected Swedish Municipalities

Governing by Authority	
Planning Tools	• Focus urban planning on increasing density • Climate-smart regional expansion • Prioritize pedestrian, bicycle and PT in front of car traffic (transport-saving planning) • Land development agreements including climate and energy aspects
Energy Efficiency	• EE requirements for developers in sales municipally owned properties
Traffic	• Lower speed limits • Differentiated congestion tax • Establishing environmental zones / limits on heavy cargo • Studded tyre tax or ban • Rules on delivery patterns for goods • Rules on construction traffic
Parking	• Parking fees • Provide parking for car pooling • Reduce number of parking spaces • Lower parking quotas for new buildings • Adjust parking standards to encourage use of PT

5 CONCLUSIONS AND REFLECTIONS

In this study we explore how sixteen Swedish municipalities are working towards fossil fuel free visions and goals with a particular emphasis on the urban transport and energy systems. The report presents a summary of the visions and goals adopted by municipalities in Sweden as well as their efforts to cascade the visions and goals into key targets and strategies. It also provides a summary of the general patterns derived from document analysis and interviews of how municipal authorities work with and use various governing modes to facilitate the transformation towards less dependence on fossil fuels. This section provides a summary of key findings and reflections for further research.

5.1 KEY FINDINGS

Swedish cities generally have explicit visions and goals toward fossil fuel free scenarios by or before 2050. Sometimes these goals and visions are expressed as reducing greenhouse gas emissions and climate neutrality or a combination. These visions are anchored in various documents including political visions, but more often in the climate and/or energy plans. The levels of ambition and target years are not necessarily conditioned by the size or economic specialization of the municipalities. Goals and visions are often broken down to two sets of target years. Target years for the municipal organization and target years for the municipality as a whole.

In terms of translating these visions and goals into targets there are considerable variations in approach among the studied municipalities, reflecting – among other things – different stages of development work with climate planning and different human and economic resources available to municipal authorities to translate visions into actionable strategies and be able to follow up on these strategies. However, key messages identified by the informants specific to target setting include: 1) the goals are long term making it challenging to set measurable targets across all activities contributing to the vision; 2) targets are often non-binding, and difficult to measure the impacts or outcomes from all the activities municipalities promote; and 3) political consensus across political cycles is important to maintaining continuity of work on the visions.

In terms of strategies, the most common approaches include a focus on municipal organization activities and procurement, infrastructure investments and planning, followed by strategies aimed at behavioral change. There is little experimentation to link citizen consumption patterns to the visions for the city. The transport system clearly represents the most important and equally the most challenging sector to work with to achieve fossil fuel free visions. Generally, municipalities in the study are more optimistic about achieving a fossil fuel free energy mix in the power and heating sectors, but not necessarily as confident meeting their targets for transport fuels. Another key message echoed here is the link between strategies and outcomes. It is still a challenge for several municipalities to capture and see how the various and sometimes disparate measures in their strategies can lead to the achievement of political visions and goals.

5.2 GOVERNING BY EXPERIMENTATING

The modes of governance framework applied in this research helped to navigate the many activities being undertaken by municipalities to shift away from fossil fuels. In addition to the four modes of governing defined by Bulkeley and Kern (2006), this research suggests a cross-cutting activity that

could be called governing by experimenting (see Figure 4). It is apparent in many of the municipalities studied in this research that experimentation with new and different approaches is taking place to achieve ambitious goals and visions. For example, new types and forms of partnerships that goes beyond just helping business actors, but also toward identifying and co-creating new innovations and ideas for deployment in city contexts with business actors. Another trend is that the traditional tools and channels of informing and raising awareness are opening up to more experimentation and co-production with citizens.

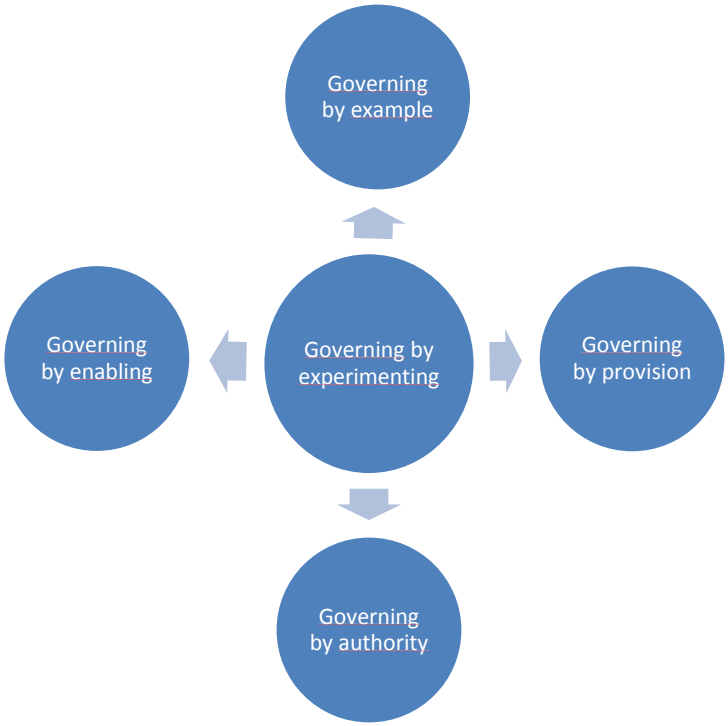

Figure 4. Modes of governing through experimenting.[4]

5.3 OPPORTUNITIES FOR FURTHER RESEARCH

Further research is needed to better understand how municipalities can take effective steps to realising their visions. Three key discussion points have been revealed in this research. First, there is a delicate balance between attracting and keeping industry and meeting fossil fuel free visions. Keeping existing industries and/or attracting new industries can hinder the ability of municipalities to pursue aggressive authority roles on becoming fossil fuel free. Second, where to find investment? Many visions are very ambitions but contingent on budgets. Some of these visions are formulated without due consideration of the financing implications. Third, there are tensions between national and municipal authority, and working with energy and transport systems requires support and coordination from national agencies and organisations.

A deeper reading of the visions and strategy documents of municipalities in Sweden might give a more detailed overview of all the types of actions and measures taken through different forms of governing. In this analysis, our understanding of how municipal authorities work with various

[4] Source: Adapted from Bulkeley & Kern (2006)

modes of governing is derived from the conversations with civil servants rather than from a thorough analysis of the official documents. The purpose of this research was to better understand how the possibilities for governing are understood in municipalities rather than to provide an inventory of measures. However, further research could take a more systematic evaluation of official documents to compare with the interview findings from this report.

REFERENCES

Bulkeley, H. & Kern, C. (2006). Local Government and the Governing of Climate Change in Germany and the UK. *Urban Studies*, 43(12), 2237-2259.

Busch, H. & McCormick, K. (2014). Local power: Exploring the motivations of mayors and key success factors for local municipalities to go 100% renewable energy. *Energy, Sustainability and Society*, *4*(5), 1-15.

European Commission (2011). Communication from the European Commission: A Roadmap for moving to a competitive low carbon economy in 2050. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0112&from=EN

European Environmental Agency (EEA) (2016). Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. Retrieved from https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe

German Watch and Climate Action Network (CAN) Europe (2016). Climate Change Performance Index 2017. Retrieved from http://www.caneurope.org/publications/press-releases/1268-climate-change-performance-index-2017

Government of Sweden (2017). The climate policy framework. Retrieved from http://www.government.se/articles/2017/06/the-climate-policy-framework/

Klimatkommunerna (n.d.). *About Klimatkommunerna*. Reterieved from http://www.klimatkommunerna.se/sv/Om-klimatkommunerna/

McCormick, K., Neij, L., Anderberg, S. & Coenen, L. (2013). Advancing sustainable urban transformation. *Journal of Cleaner Production, 50*, 1-11.

Newman, P. & Kenworthy J. (2006). Urban Density to Reduce Automobile Dependence. *Opolis, 2(1), 35-52.*

Nynäshamn (2012): Klimatstrategi och energiplan Nynäshamns kommun Kf §153, 2012-06-13 p. 4-45.

Olofsson, Z., Hiselius, L. & Varhelyi, A. (2015). Development of a Tool to Assess Urban Transport Sustainability – the Case of Swedish Cities. *International Journal of Sustainable Transportation*, DOI: 10.1080/15568318.2015.1055535

Smedby, N. & Quitzau, M. (2016). Municipal Governance and Sustainability: The Role of Local Governments in Promoting Transitions. *Environmental Policy and Governance*, 26(5), 323-336.

Uppsala kommun (2015). Miljö- och klimatprogram 2014-2034.

World Economic Forum (2017). Global Energy Architecture Performance Index Report 2017. Retrieved from https://www.weforum.org/reports/global-energy-architecture-performance-index-report-2017

APPENDIX A: INTERVIEW QUESTIONS

Here is the interview protocol used to structure all the interviews with municipalities carried out by Masters students from Lund University.

- What are the key visions and goals for your municipality on climate change, energy and the environment?
- What are the key (measurable) targets for your municipality on climate change, energy and the environment?
- What are the key strategies employed by your municipality to achieve the visions and goals, and meet the targets?
    - Is there a focus on both energy and transport in the strategies? Or other sectors (like agriculture, forestry etc.)?
    - Are there infrastructure investments? Are there behavior change programs?
    - What role does city planning play in the strategies?
    - What role does ICT (information communication technology, like virtual meetings, social media, online resources, google maps etc.) play in the strategies?
    - Is there a focus on both the municipality as an organization and the community as a whole in the strategies?
    - What financing is available to pursue the strategies?
    - Are there important collaborations (with industry, academia etc.) that underpin the strategies?
- What are the main challenges and opportunities in your municipality in the next 5-10 years in regards to climate change, energy and the environment?
- What are the key lessons from your municipality for other places or organisations?

APPENDIX B: LIST OF MUNICIPALITIES INCLUDED IN THE STUDY

Municipality	Region	Interviewes
Borås	Västra götaland	Energy coordinator
Eskilstuna	Södermanland	Environmental strategist
Gothenburg	Västra götaland	Environmental analyst
Helsingborg	Skåne	Environmental strategist
Kristianstad	Skåne	1. Climate advisor 2. Climate Strategist
Lidköping	Västra götaland	Environmental strategiest
Lund	Skåne	1.Environmental construction strategist 2. Environmental Strategist
Malmö	Skåne	Climate strategist
Nynäshamn	Stockholm	Environmental coordinator
Örebro	Örebro	Energi strategist
Östersund	Jämtland	Climate advisor
Södertälje	Stockholm	Samhällsbyggnadskontoret
Stockholm	Stockholm	1.Environmental strategist 2.Head of Climate Unit
Uppsala	Uppsala	Climate and environment strategist
Växjö	Kronoberg	1.Climate and energi advisor 2. Environmental Coordinator
Vellinge	Skåne	Climate strategist