Sustainable energy and sustainable transport – what can Swedish towns learn from municipalities in Denmark, Germany and Switzerland?

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Summary

This report explores the varying ways in which three European cities attempt to increase levels of sustainable mobility, and the extent to which renewable fuels or alternative forms of propulsion are integrated within the cities’ strategic work for sustainable transportation. The report presents findings from document and interview studies in the three cities – Basel, Switzerland; Göttingen, Germany; and Odense, Denmark – in order to highlight approaches, experiences or lessons that may be of value to Swedish municipalities addressing these topics.

The report indicates that there is a demonstrable need for municipalities across Europe to more explicitly and deliberately integrate strategies aiming for sustainable mobility with the use of renewable fuels and alternative forms of propulsion. Such integration will enable municipalities to increase levels of walking, cycling and public transport whilst reducing use of vehicles operating on fossil fuels. Where and when journeys by motor vehicles are unavoidable, municipalities should strive to ensure that such vehicles are electric or using high blends of renewable fuels. From a Swedish perspective, there is a need to recognize the important role of sustainable mobility in urban sustainable development and develop bolder and more coherent strategies and policies to reduce levels of vehicle use.

Hållbar energi och hållbara transporter – vad kan svenska städer lära från kommuner i Danmark, Schweiz och Tyskland?

Sammanfattning


Resultaten visar på hur de europeiska städerna har arbetat för att kunna minska bilism och utöka resandet med hållbara färdmedel. Däremot konstateras att en svag integrering av alternativa drivmedel finns. Därför bör kommuner i Europa anstränga sig för att kunna uppnå en integrerad politik som gynnar hållbara transporter. Svenska kommuner behöver lägga ännu mer vikt på hållbar mobilitet i hållbar stadsutveckling och utvecklar mer ambitiös och proaktiv strategier för att kunna minska bilism.

De tre mest värdefulla effekterna med projektet anses vara (1) identifikationen av städer med hög prestation inom hållbara mobilitet och olika tillvägagångssätt när det gäller t.ex. deltagande; (2) bekräftelse att svenska kommuner ligger före när det gäller biogas och även exemplifiering av målkonflikter avseende biogasproduktion och användning i transportsektorn; och (3) identifikationen av innovative exempel i el-mobilitet som kan vara en inspirationskälla till svenska kommuner. Dessutom understryks vikten av engagerad, ambitiös och orädd politik och tjänstemän.
1. Introduction

An extensive range of policy initiatives and literature has identified urban sustainability as a critical challenge for humanity (UN, 2015). However, urban sustainability is a contested and seemingly paradoxical concept (McManus, 2012; West, 2010). Rydin (2010: 10-11) states urban sustainability is shaped by:

(1) “the extent to which activities within urban areas contribute to unsustainable outcomes”;
(2) “the possibilities of using urban areas to render economic development more sustainable”;
(3) “using the urban level of governance to pursue action for sustainability and to demonstrate commitment to the sustainable development agenda”.

The pursuit of urban sustainability thus implies the avoidance in planning and practice of known unsustainable outcomes and commitment to consistent action favouring sustainable development. Given their profound impacts – in terms of e.g. accidents, air and noise pollution, greenhouse gas emissions, physical and spatial effects – urban transport systems must undergo a profound transition to contribute to urban sustainability and improve quality of life for residents and other users of urban space (European Commission, 2011).

However, although there is substantial knowledge about the range of policy options available to decision-makers, planners and other stakeholders, when seeking to pursue sustainable transportation, much of the research on sustainable transportation has focussed on form, function and users, rather than the practical organisation and implementation of policies aiming for sustainable mobility.

In this report, the experiences of three European cities with low shares of vehicle use are explored to assess varying approaches to sustainable mobility and the integration of renewable fuels in sustainable transportation. These results inform conclusions which identify opportunities or contrasts between the approaches of these cities and contemporary practice in Sweden, and aim to provide insights for Swedish policy and practice.

1.1. Swedish municipalities and sustainable transportation

In recent decades, Swedish municipalities have gained international recognition for their work on urban sustainability (Gustavsson and Elander, 2012; Hult, 2015) and sustainable transportation, including their systematic efforts to introduce new vehicle types, renewable fuels and alternative forms of propulsion (Johnson and Silveira, 2014; Raboni and Urbini, 2014; Silveira and Johnson, 2016). However, although the use of such alternatives and general improvements in vehicle technologies have led to a stabilization of greenhouse gas emissions from vehicle transportation, Sweden has struggled to reduce the number or length of car journeys and national incentives have also supported non-renewable pathways, for example through the classification of many diesel vehicles as “environmental” despite concerns regarding local air emissions (Trafikverket, 2016abc). Moreover, transport planning at the national level not only appears to conflict with the fulfilment of various national environmental targets, including those concerning climate change, but also the Swedish Transport
Administration’s own goals concerning safety, environment and health (TRAFA, 2015; Trafikverket, 2016c).

At the national level, the use of the “four-step principle” in planning is encouraged (SKL, 2010). In theory, this means all possible alternatives to avoid infrastructure investments should be explored before infrastructure investments are improved. In practice, Sweden appears to have, based on assumptions regarding consumer demand, generally prioritized infrastructure provision for road transport, ahead of measures aimed at promoting alternatives and ensuring existing infrastructure is used efficiently. The Swedish Transport Administration has been accused of willful negligence and obfuscation concerning both its prognoses concerning future vehicle demand, and its own role in inducing demand and generating adverse path dependencies in planning (SvD, 3 March 2016).

Against this background, many municipalities have attempted to increase levels of sustainable mobility, and there are reports of increased cycling across the country. There is near unanimity among the larger cities in Sweden that sustainable modes of transport should be prioritized, and use of motorized transport reduced. However, when it comes to practice, increases in one sustainable mode (e.g. cycling) often occur at the expense of others (e.g. walking and public transport), with limited impacts on levels of car usage. For example, Malmö is often cited as a good example with regard to sustainable mobility, yet between 2008 and 2013, the use of cars fell by only 1% and an increase in use of public transport was largely accounted for by a decline in walking and cycling (TEMS Database). Seen over a ten-year period (2003-2013), however, Malmö experienced a 11% decline in use of cars and 8% increase in public transport, with marginal increases in walking and cycling.

This example illustrates the dangers of emphasizing short-term changes in transport behavior, or making assumptions based on modal split data. In their latest transport behavior surveys, municipalities such as Gothenburg, Umeå and Uppsala have also reported a shift towards sustainable modes of transport at the expense of vehicles (TEMS Database). Nevertheless, local efforts appear stymied by national planning processes that are strongly influenced by assumptions and prognoses concerning transport demand. Moreover, settlement patterns have in some locations increased the need for rural services, whilst changes to the organisation and financing of public transport have limited the ability of transport operators to provide services, thereby consolidating the role of motor vehicles. This is a particular challenge for municipalities with single or few urban centres and large geographic zones (Hermelin et al, 2015). Swedish municipalities thus face significant challenges when seeking to promote sustainable mobility.

1.2. Sustainable mobility in European cities

Many European cities face similar challenges to Swedish cities, albeit (usually) without a large rural hinterland as in Swedish municipalities. Partly for this reason, many European cities of a comparable size to Swedish cities report higher modal splits for walking, cycling and public transport; and this trend is still pronounced when taking into account the different between

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1 This is a preliminary finding from Phase II of the project, which has received co-financing from ÅForsk and J. Gust. Richert stiftelsen.
mobility norms in the urban conurbation and the whole municipality. Reporting to the TEMS database indicates that some medium-sized cities have particularly strong performance with regard to specific modes of transport, e.g. cycling in Münster, Germany, or Dutch cities such as Eindhoven, Gröningen and Houten. However, only a few medium-sized cities report a low number of journeys by car and balanced mix of alternatives. These include the three cities studied in this report, along with others such as the German cities of Freiburg, Karlsruhe and Heidelberg (all in the State Baden-Württemberg). Uppsala and Lund are the foremost Swedish examples, with Uppsala rapidly approaching the level of Göttingen or Freiburg.

Holzapfel (2015) writes that there is a need for European cities to maximize an opportunity to demonstrate global leadership on sustainable mobility and urban sustainability. The aforementioned cities appear to examples of good practice, yet the question remains – good practice in what? Is the data a consequence of historic coincidences or conservative mindsets that have preserved urban forms favouring sustainable transport modes? Or have these cities actively sought to promote sustainable forms of transport and reduce journeys by car? Are levels of car use declining? And, even if the levels of car usage are low, are vehicle emissions being reduced through use of alternative fuels or propulsion? Whilst there may not necessarily be clear answers to such questions, they are worthy of consideration and exploration.

1.3. Aims of the study

The project idea was developed during the Sustainable Norrköping project (Fenton and Gustafsson, 2015; McGuiness, 2014: 139-141), which suggested that more proactive approaches to achieving sustainable mobility were required in Norrköping and similarly-sized towns and cities in Sweden. Using modal split data, three European cities – Basel, Switzerland; Göttingen, Germany; and Odense, Denmark – were identified as interesting study objects with a low share of journeys by car and balanced mix of transport modes. However, time and budgetary constraints meant it was not possible to thoroughly investigate the factors shaping, and implications of, this strong performance.

This project aimed to address this knowledge gap and increase understanding of the policy processes in the three cities, in order to relate these to the Swedish context. Specifically, the project aimed to investigate the ways in which three European cities organize processes to develop strategies and plans facilitating sustainable mobility, and the extent to which renewable fuels and alternative forms of propulsion are integrated into such strategies. In doing so, the project aimed to consider how targets and measures are selected and the forms of collaboration with stakeholders used before, during or after strategy development processes.

In sum, the project aimed to explore the extent to which sustainable mobility is a catalyst or impediment to the uptake of renewable transport fuels and highlight potential for integrating apparently divergent perspectives, consumption (fuel) and avoidance (modal shift). The project aimed to identify possible topics for mutually-beneficial city-to-city exchanges and provide qualitative insights and recommendations concerning strategy, policy and organisation of strategies and policies for sustainable mobility and transportation.
2. State of the art
The Introduction contained a brief discussion of the state of sustainable mobility in theory and practice. In this Chapter, the current state of renewable fuels and alternative forms of propulsion (i.e. electromobility) in Europe will be discussed, providing a background for the presentation of the project, its methods, results and conclusions in subsequent chapters.

2.1. Renewable fuels in Europe
The European Union has stipulated that by 2020 the share of renewable energy in transport should account for at least 10% energy consumed in transport, and that fuel suppliers must reduce the greenhouse gas intensity of the fuel mix by 6% from 2010-2020. Biofuels are subject to sustainability requirements and, since 2015, must also address issues related to indirect land use change (EU Energy, 2015).

A wide range of user groups – including private consumers, company fleets, public transport operators, logistics companies – are exploring and adopting vehicles using renewable fuels or alternative forms of propulsion. These include cars, buses, trucks, cycles and ships using different combinations of engine and fuel (Carlsson and Fenton, 2010; City of Stockholm, 2014; Merkisz and Gis, 2012; Inköpsrådet, 2016). However, the trend towards an increased share of renewable transport fuels in Europe has provoked debates and controversies, for example concerning the use of specific feedstocks in biofuel production or indirect land use change (Royal Society, 2008), the efficiency of legal instruments or incentive schemes (Skogstad, 2016), the use of low blend biofuels in fossil fuels or the selection of particular biofuel types or technologies over others in specific contexts (Månsson et al., 2014; Silveira and Johnson, 2016). A comprehensive assessment of such issues lies outside the scope of this report. However, some general trends will be briefly discussed in order to inform the subsequent chapters.

For example, the number of biogas upgrading facilities producing biomethane for transport increased by 23% to 367 from 2013-2014, with Germany, Sweden and the UK experiencing significant growth (European Biogas Association, 2015). Indeed, almost half of Europe’s biogas upgrading facilities are located in Germany2. Similar growth has been observed in the installed capacity for biogas energy production. Almost 11,000 of Europe’s 17,240 biogas plants at the end of 2014 were located in Germany3. According to the EBA:

Despite its small size in terms of gas consumption, Sweden has placed itself as the European front runner in biomethane production and especially, the use of biomethane in transport: the country dedicated 78% of its 1,303 GWh production to fuel almost 50,000 vehicles. (European Biogas Association, 2015)

The Swedish case shows that the use of biogas for transport is possible in a country lacking extensive infrastructure for provision of (fossil) natural gas (see e.g. Fallde and Eklund, 2015). In other European countries, biogas is upgraded to biomethane, and then usually injected into

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2 For the countries in this report – 178 in Germany; 59 in Sweden (#2 in Europe); 24 in Switzerland (#4); and 6 in Denmark (#9).

3 For the other countries in this report – 633 in Switzerland (#5 in Europe); 279 in Sweden (#8); and 155 in Denmark (#12).
the natural gas grid. This has important implications as, for instance, low blending may provide a marginal gain whilst having little impact on overall demand for natural gas vehicles or fuels. Another issue is that, when biogas production occurs in one land yet is consumed in another, producers or purchasers may find that its product classification varies, e.g. depending on national standards or regulations. This creates obstacles both within the EU, and for neighbouring countries.

For example, Fenton and Kanda (2016) explores specific issues related to import tolls and environmental taxation in Switzerland, a country that – like Sweden – was an early adopter of biogas for transportation (Lienen et al., 2005). Nevertheless, despite achieving a relatively high blend of biogas in the natural gas mix for transportation, and having a reasonably large distribution network, there are significant barriers to further increases in the use of biogas for transportation in Switzerland (Fenton and Kanda, 2016). Similarly, Denmark, a country which significant agricultural production, has only in recent years begun to increase its production of biogas and installed upgrading facilities for transport fuel; barriers to market development and the experiences of two producers of biogas for transport in Denmark and Switzerland are explored in Fenton and Kanda (2016).

2.2. Electromobility

A shift to forms of mobility using electrical propulsion may offer potential to significantly reduce air and noise pollution, or greenhouse gas emissions. However, the achievement of such potential depends partly on the source of electricity used, and partly also on the extent to which electromobility challenges existing behavior, norms and adverse path dependencies. With regard to the former, Directive (EU)2015/1513 encourages accelerated introduction of renewable electricity for use in transport. The latter concern points to a more complex transition towards sustainable mobility and reduction of the overall level of motorized transport in tandem with increases in the share of electric forms of mobility. In other words, electromobility is not a panacea, but rather may contribute to integrated policy packages that facilitate a wider transformation of transport systems in favour of sustainability (Bruun and Givoni, 2015).

Electromobility is a relatively old concept, and until recently, many cities in Europe had extensive tramway or trolleybus systems. In Sweden, cities such as Gothenburg and Norrköping maintained historic tram networks, whereas other cities, such as Stockholm, withdrew, and then reintroduced trams. Other cities, such as Gävle, decommissioned trams and now concentrate on high-frequency bus services (a la Bus Rapid Transit), and some without a history of trams, such as Lund, are commissioning new tram systems. For modern travelers, trams are predominantly associated with electricity, just as motor vehicles are typically associated with fossil fuels, yet it is worth remembering that trams have utilized various forms of propulsion, including horses, steam and gasoline.

Nonetheless, the electric tramway is currently enjoying a renaissance and is central to urban development projects across Europe (e.g. Barcelona, Freiburg, Nottingham, Sheffield, Strasbourg). Of the three cities studied in this project, Basel has an extensive tramway network; Odense operated an electric tramway from 1911-1952 and is currently constructing a new
tramway; whereas Göttingen has – after construction of an electric system was halted due to World War I – never had a tramway. Basel also operated an electric trolleybus network from 1941-2008 (Fenton and Kanda, 2016).

The electrification of railways is another example of electromobility, as is the electric bicycle, a mode of transport that is increasing in popularity across Europe (Fishman and Cherry, 2016). Electric propulsion is also viable for other mobility services, such as ferries (Dauncey, 2015) as well as for logistics (City of Stockholm, 2014). Despite this, the overwhelming focus of most discussions of electromobility is on the motor vehicle and the possibility to replace existing vehicles with electric vehicles (including autonomous vehicles) and thereby avoid consumption of fossil fuels. The prominence of such debates have risen and fallen as electric vehicle development has been seen to accelerate or stagnate. For example, the first national joint procurement of electric vehicles in Sweden was carried out in 1995, yet resulted in limited market impacts. In recent years, a new national procurement initiative was launched (see Sunnerstedt and Hedenquist, 2015). Similar initiatives have been launched in other parts of Europe at both the national and European levels (e.g. the German national programme “Schaufenster Elektromobilität”).
3. Methods

The main methods used to conduct this qualitative study were document and interview studies.

**Document study**: For each municipality, the document study broadly addressed the topics of sustainable urban development, sustainable mobility, and renewable energy in transportation. Although the focus was on the local context of each city, the document study also considered related regional or national initiatives, such as projects or associations. Documents studied included relevant scientific literature, along with documents concerning public policy, projects, and other information, e.g. reports produced by company information, civil society, media, etc. The majority of this information was identified using web searches, the websites of municipal organisations or other local actors, and databases such as Scopus. The document study had three main objectives – first, to provide a general background on each case and inform the development of an interview guide for the three cities; second, to help identify potential interviewees; and third, to provide references and quality control after the interviews had taken place.

**Interviews**: Interviewees were contacted on an ongoing basis from January 2015 until the interviews, which were held in Odense on 23-25 March 2015; Basel on 23-24 April 2015; and Göttingen on 18-19 May 2015. The interviewees typically included several civil servants working on the aforementioned themes; politicians; civil society representatives (e.g. NGO, research, etc) and companies. These individuals were selected as they worked closely with strategy, policy or implementation on issues related to mobility, transport and urban planning, including renewable energy, biogas or public transport. In total, 18 individuals were interviewed, representing 13 different organisations or entities. In addition, three written responses were received. All interviewees were granted anonymity and are referred to in this report by type/function (see Table 1).

In most cases, interviewees were available and able to participate. However, there were some exceptions. In Odense, a meeting of legal importance was scheduled at short notice, meaning two interviews (with a municipal politician and the manager of the city’s tram project) were cancelled a few hours in advance. It was not possible to reschedule these interviews. Written questions were sent and a response was received from the politician. In Basel, scheduling conflicts meant it proved difficult to secure interviews with individuals working in the biogas sector at the national level. In Göttingen, a series of email discussions with local politicians from various parties (mainly concerning scheduling conflicts) resulted in a limited written response from one political party.

Time constraints – both my own, and those of the individuals contacted – were more significant in determining the composition of interviewees than language. All interviews except one were conducted in English. A native German speaker (Fanny Paschek) led one interview in Göttingen and provided transcripts that interview in English and German; I participated in that interview, asking follow-up questions in German when possible. Another person in Göttingen was unavailable for an interview and sent written responses in German.
**Analysis:** The interviews addressed a wide range of themes. Subsequently, each interview was transcribed. Results were then sorted by theme and logged in excel sheets, enabling categorization of different themes and trends and comparison between cities. Single case studies were then prepared, providing the basis for the structured analysis of interviews presented in project publications.
Table 1. Overview of interviews by type and respondent in the three cities.

<table>
<thead>
<tr>
<th></th>
<th>Basel</th>
<th>Göttingen</th>
<th>Odense</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Organisations / entities</td>
<td>Individual or Group</td>
<td>Total persons</td>
</tr>
<tr>
<td>City administration</td>
<td>Two cantonal departments</td>
<td>1 Ind.; 1 group A (2 persons)</td>
<td>3</td>
</tr>
<tr>
<td>(civil servants)</td>
<td></td>
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<td></td>
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<tr>
<td>Political party</td>
<td>Social Democratic Party; Green Party</td>
<td>1 Ind.; 1 in group B</td>
<td>2</td>
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<tr>
<td>Civil society</td>
<td>Transport NGOs</td>
<td>2 in group B</td>
<td>2</td>
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<tr>
<td>Business</td>
<td>Energy company</td>
<td>Ind.</td>
<td>1</td>
</tr>
<tr>
<td>Written</td>
<td>Written – County civil servant (ind.); Green Party (group)</td>
<td>1 Ind.; 1 Group response</td>
<td>2+</td>
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</table>
4. Results

This Chapter presents the results from the three cities, including a longer presentation of findings from Göttingen and abridged versions of the results from Basel and Odense (see Fenton, 2016; Fenton, forthcoming; Fenton and Kanda, 2016). A synthesis of key results in then presented, informing the conclusions of this report.

4.1. Basel

In Basel, the number of interviews and composition of the interviewees was the greatest and most diverse of the three cities studied. This is reflected in the results, which address an extensive range of issues ranging from constitutional arrangements to tri-national cooperation and local actions for renewable energy, energy efficiency and sustainable mobility.

Fenton (2016) focuses on the development and implementation of strategies and policies for sustainable mobility in Basel. The paper highlights the importance of constitutional arrangements and the role of Basel’s direct democracy in conditioning strategy and policy both within Basel and its surrounding region. The results emphasise the importance of sustained efforts by committed individuals within the political and administrative spheres, as well as the possibility to consolidate sustainable mobility through incremental radicalism, i.e. systematic, strategic steps resulting in a variety of marginal gains, whose cumulative impact is large. Moreover, the study offers important insights for cities when conducting referenda on topics related to sustainable mobility, by indicating that whilst broad objectives may be supported, votes on the measures required for implementation are likely to be contested (cf. Hysing et al., 2015).

Concerning renewable energy and alternative forms of propulsion to fossil fuels, a significant share of journeys in Basel and its agglomeration occur using electrified railways or electric tramways. Interviewees also noted an increase in the use of electric bicycles, which – due to the city’s topography – have helped facilitate cycling among new user groups or in new areas. With regard to public transport, electric trolley buses were phased out in favour of buses running on CNG/CBG. As Fenton and Kanda (2016) shows, this decision was controversial and has had mixed impacts. On the one hand, the decision prompted investments in new production and upgrading facilities, yet on the other, a subsequent decision has led to a new shift in favour of diesel hybrid buses, ostensibly as part of an electric bus pathway.

The shift away from electric (trolleybuses) to biogas and CNG, and then to fossil diesel indicates uncertainty concerning the viability of different vehicle and fuel alternatives. This uncertainty is reflected both at the national level, with regard to passenger vehicles, and at the local level, in terms of energy and district heating. Across Switzerland, biogas production is increasing and the country has the fifth highest number of production facilities (633) and fourth highest number of upgrading facilities (24) in Europe at the end of 2015 (European Biogas Association, 2015).

Biogas is included as a low blend in the CNG supplied to vehicles to a minimum of 10% and an average of 20% (blending is subject to regional variations). In Basel, biogas is also, since 2015, included as a low blend in natural gas supplied to houses for heating, cooking, etc. In addition,
energy companies such as IWB own production facilities in other countries enabling local emissions to be “offset”. Nonetheless, Basel continues to incinerate a significant fraction of organic waste and interviewees suggested there is potential to improve sorting and collection, and thereby increase biogas production.

This may increase the overall flexibility and performance of the district heating system, yet is likely to prove expensive. At the national level, the market for natural gas vehicles has stagnated and consumers appear to favour electric or fossil-fuel vehicles. There thus appears to be potential for Basel to exchange experiences with Swedish municipalities, e.g. with regard to sorting of organic waste and development of business models for production of biogas for district heating and transport. Similarly, experiences with direct democracy and with urban and regional planning for sustainable mobility in Basel may provide insights for Swedish municipalities aiming to reduce use of motor vehicles and increase the share of sustainable modes of transport.

4.2. Göttingen

The results from Göttingen broadly address three themes – (1) municipal and county energy, climate and mobility strategies; (2) electromobility; and (3) biofuels.

With regard to theme (1), the development of municipal and county energy and climate strategies in Göttingen has been closely linked to national financing programmes, raising questions about the extent to which energy and climate strategies are integrated into municipal operations. Previous studies of energy and climate strategies have shown that project financing offers both opportunities and challenges for municipal organisations, with risks including person-dependency, symbolic adoption of outcomes or uncertainty concerning financing of implementation (see Fenton et al, 2015; 2016).

These risks were acknowledged by interviewees, yet several of the approaches used by Göttingen may help mitigate them. For example, the City of Göttingen has made extensive use of thematic workshops when developing its energy and climate strategy. Such workshops were open to the public and included representatives from a wide range of interest groups and associations. Outputs from workshops have fed directly into municipal strategy and policy, yet also been used to develop and implement projects run by participants, such as small businesses producing ecological or recycled products, or a voluntary initiative for restauranters promoting vegetarianism. In this way, the municipality has been able to delegate some tasks to committed individuals and groups, and achieve a wider impact than had otherwise been the case.

A similar approach has been used to develop the city’s sustainable mobility strategy, which strongly emphasizes climate change. The strategy is also based on analysis by consultants outlining various pathways to achieve low carbon transportation, including plans to introduce hybrid buses and the use of (current) biogas and (planned) electric vehicles in the municipal car-sharing fleets. The city’s historic plan together with a large student population and short distances make cycling extremely attractive and a core component of mobility strategy. However, commuter traffic into the city from the surrounding region is a major challenge, with many journeys taking place by car.
Moreover, there is limited integration between the urban and regional public transport systems and between public transport and other modes. Implementation of the strategy is thus partly contingent on market-level transformations (i.e. shift to alternative fuels or propulsion for private vehicles) and is also subject to uncertainties concerning project financing or political priorities. For example, the link between sustainable mobility and climate change has resulted in changes to planned developments, including the cessation of two large road projects. At the same time, the introduction of speed limits in the urban area has been contested by one political party, despite their adoption of the climate targets.

With regard to theme (2) electromobility, infrastructure is being installed to encourage adoption – in the form of e.g. an electric-cycle highway, public charging stations for electric vehicles and secure lockers for electric cycles (with chargers) in the municipal building – along with information campaigns and events. The County of Göttingen is the lead partner of a demonstration project funded by “Schaufenster Elektromobilität”, a national electromobility programme, in which business models for electric car-sharing in urban and rural areas, along with other electromobility services promoting intermodality, are being developed through iterative innovation with local communities.

For rural car-sharing, this involves the development and demonstration of business models for electric vehicles in the “bioenergy village” of Jühnde. Families in this village have participated in workshops to identify their service needs and subsequently tested e-car-sharing services during during free and commercial phases. Again, the participatory work form has resulted in identification of services such as ride-sharing for e-car-sharing in rural areas that may not have otherwise been considered by the project organisation.

With regard to theme (3), Jühnde is a village located in the County of Göttingen that has aimed for self-sufficiency in energy. This village was the first in Germany to – as a community initiative – construct a heat and power biogas plant and district heating grid, and has become a template for similar initiatives in many other German and international communities. Jühnde is looking into biogas storage facilities and increasing its capacity for wind electricity production, in order to make more efficient use of its biogas and supply neighbouring villages.

However, although biogas is widely produced and used in rural areas (particularly in the north of Lower Saxony), its use for energy and transportation in the City of Göttingen is less widespread. The city has a target of achieving 10% biogas in heating supply, yet interviews suggested the actual level is closer to 1%, partly because household food waste is normally used for composting. One interviewee suggested that it is more cost-effective to burn biogas and produce electricity than use it for heating or transportation. Moreover, the national Renewable Energy Law (EEG) has been subject to repeated changes, first introducing incentives encouraging biogas production and upgrading, and then since 2014, removing such incentives and limiting growth in the sector. As such, although the climate strategy of Göttingen suggests increasing the amount of agricultural land used to provide feedstocks for biodiesel and biogas, it is unclear to what extent this will take place.

Concerning transport, the climate and mobility strategies of Göttingen – in line with national policies – emphasise electromobility to a greater extent than biogas. Nevertheless, as noted
above, the extent to which strategic objectives are realizable is unclear. For example, the purchasing and operating costs of diesel buses are much lower than hybrid or electric buses. For biofuels, low blends of biodiesel and bioethanol have been introduced, yet – as in many EU countries – high blends have had limited market impact.

Despite its widespread production, biogas is primarily used for electricity and heating and not for transport, despite isolated initiatives by car manufacturers to offset users’ gas usage by injecting equivalent volumes of biogas into the grid. One interviewee said that many municipalities are using CNG vehicles, yet biogas is often too expensive for use in municipal fleets and public transport. Uncertainties about the regulatory environment, production costs and the market for consumption are thus major hinders to the increased use of biogas for transportation in Göttingen and Germany.

4.3. Odense

The results from Odense share many similarities with Basel and Göttingen, with one notable exception. Whereas Basel and Göttingen have historic city plans that were spared from bombing in World War Two and left relatively unchanged since then, providing good conditions for public transport (Basel) and pedestrians and cyclists (Göttingen) respectively, Odense’s historic town centre was divided in the post-war period with the construction of a four-lane highway, Thomas B. Thrigdes Gade. Odense is currently in the process of removing this highway and, in its place, constructing a new tramway as part of an urban regeneration strategy (see Fenton, forthcoming).

Odense has thus chosen to place an electric tramway, cycling and pedestrianism at the heart of its urban vision. The municipality has adopted a diverse range of measures in its mobility plan, which aims to improve conditions for non-motorised road users and promote behavioural change. Moreover, the municipality has decided to convert its car fleet to electric vehicles, and has commissioned hybrid buses for use in public transport, even though the municipality co-owns a company producing biogas for transport fuel (see Fenton and Kanda, 2016). This indicates a willingness among politicians to address local air pollution, rather than global climate change. Interviewees suggested other large cities in Denmark do the same, with rural municipalities preferring biogas.

This implies that – if not used in bus fleets – there is potential to increase use of biogas for private passenger vehicles or heavy goods vehicles. This would require new initiatives to coordinate interested stakeholders and changes to national regulations, e.g. fuel and CO₂ taxes. Indeed, national regulations also appear to counteract sustainable mobility, with low tax on second cars and increasing numbers of young people driving. Investments in cycle highways are occurring in various Danish cities, and some interviewees criticized Odense for being slow or unambitious in this regard. The impacts of the new tramway system on use of cars, levels of cycling and intermodality will be interesting to explore in the coming years.

As in Basel, there is potential to envisage exchange between Swedish municipalities or energy companies and NGF Nature Energy concerning the development of markets for biogas vehicles, particularly with regard to private passenger cars and heavy goods vehicles.
4.4. Synthesis of results

The findings indicate that Basel, Göttingen and Odense have struggled to integrate renewable fuels into wider strategies for sustainable mobility and sustainable transport, and that any such integration is largely confined to municipal fleets, public transport fleets and compulsory low blends aimed at private consumers. The three cities lack clear strategies to achieve such integration, although in the case of Basel this is currently subject to political debate. In Göttingen, renewable fuels are included in the city’s strategy for climate change and sustainable mobility, although the degree to which implementation will be possible is unclear. The contrast between the experiences of these three cities and many comparable cities in Sweden is thus stark, confirming the basic assumption informing the project.

As Fenton and Kanda (2016) suggest, the reasons for this appear complex and relate in part to system-level challenges such as market structures and institutional challenges, yet also to actor-level challenges. For example, interviewees note a skepticism towards biogas vehicles among consumers. Indeed, although both Basel and Odense own stakes in companies producing biogas for transportation, the cities have chosen to emphasise electromobility in recent strategies and procurements. Similarly, Göttingen is currently demonstrating a variety of electromobility alternatives. Electromobility is thus seen to offer potential to support sustainable intermodal transit (i.e. electric cycle to electric public transport) or is the preferred alternative to fossil fuels for vehicle propulsion in urban areas, due to concerns about e.g. air and noise pollution. The experiences of the three cities with regard to electric bicycles and, in the case of Göttingen, e-car-sharing in urban and rural areas, may be interesting to Swedish municipalities attempting to develop such services.

With regard to strategy and policy for sustainable mobility, the three cities offer interesting, yet contrasting examples. Basel has long had a mixed modal split with a low share of vehicle use in the Canton of Basel-Stadt. Moreover, Basel has a large tri-national agglomeration and significant transport flows within and across its territory. Fenton, 2016 shows how the city makes creative use of instruments aimed at promoting sustainable mobility both within the Canton and the wider agglomeration. Basel also offers an interesting example of how strategies and policies aiming for sustainable mobility are conditioned by forms of direct democracy, an issue that may be of interest to Swedish cities such as Gothenburg and Stockholm. Odense’s experiences with cycling, together with its current attempts at tramway-focused urban regeneration, also offer instructive examples for Swedish cities, particularly those currently constructing or planning new tram networks. Göttingen demonstrates that it is possible to have a thriving city centre that is relatively car-free, and also offers insights from experiments concerning electromobility and participatory planning that may be interesting for Swedish municipalities to consider.

Each of the three cities face a continual struggle to contain or reduce levels of vehicle use. Just as system-level challenges inhibit widespread use of renewable fuels, these also induce use of motor vehicles or create disincentives to sustainable mobility. This means that, at the actor-level, local politicians, civil servants, and other stakeholders must be prepared to tackle challenging debates in order to accomplish strategic objectives. The three cities offer varying approaches as to how this may occur – in Basel, direct democracy conditions a form of
bargaining or incremental radicalism in urban planning, whereas in Odense, interviewees emphasized the importance of multi-party consensus and mutual understanding. In Göttingen, national project financing created vertical leverage for local action that was characterized by participatory approaches.

Each of these approaches offers advantages and disadvantages, and no particular approach can be recommended, as the suitability of any approach is context-dependent. Nevertheless, it is possible to say that in broad terms, the three cities demonstrate approaches that indicate strong awareness, among diverse groups of stakeholders, that sustainable mobility is a prerequisite for urban sustainability and the competitiveness of each city, and that use of motor vehicles should be reduced both within and around urban areas. Moreover, each city demonstrates an obligation or undertaking to involve stakeholders in strategy and policy development on an ongoing basis. Finally, there was specific interest for exchange with Swedish partners on the topic of biogas from two organisations, one in Denmark and one in Switzerland.
5. Conclusions

This report indicates that there is a demonstrable need for municipalities across Europe to more explicitly and deliberately integrate strategies aiming for sustainable mobility with the use of renewable fuels and alternative forms of propulsion. Such integration will enable municipalities to increase levels of walking, cycling and public transport whilst reducing use of vehicles operating on fossil fuels. Where and when journeys by motor vehicles are unavoidable, municipalities should strive to ensure that such vehicles are electric or using high blends of renewable fuels.

Swedish municipalities have demonstrated a wide range of practical approaches to facilitate the latter (e.g. infrastructure investments and historic incentives offered to clean vehicles such as free or discounted parking), yet there was little evidence of such approaches being implemented in the three studied cities. This implies that Sweden’s experiences with renewable fuels are somewhat unique and conditioned by an absence of system-level or actor-level challenges as noted in the three cities. On the other hand, the three European cities studied in this report illustrate a variety of approaches and measures aimed at promoting sustainable mobility and electromobility that may be of value to Swedish municipalities.

From a Swedish perspective, it is clear that political and administrative cultures should recognize the important role of sustainable mobility in urban sustainable development and develop bolder and more coherent strategies and policies to reduce levels of vehicle use. As the cases studied in this report show, the achievement of such a transition will not occur without conflicts, yet it would be wrong to assume that, in its current form, urban planning is conflict-free. Moreover, different forms of mobility have different user groups. The seeming tendency to avoid conflict with one user group (vehicle owners or users) at the expense of others is thus profoundly problematic.

The achievement of a relatively even distribution between different modes of transport has, as observed in the three cities, led to a nuanced understanding of mobility and the need for compromises favouring all or most user groups. In the three cities, it remains difficult to reduce levels of car use, yet equally, other transport modes flourish. These experiences appear informative to Swedish municipalities with high modal splits for motor vehicles and aspirations to promote sustainable modes of transport.

An overall reduction in vehicle use in Swedish cities would inevitably have consequences for renewable fuels, either by freeing up capacity to raise the level of low blends in fossil fuels, or by offering scope to more precisely target the optimal use of different fuels or propulsion for different vehicle types and functions. Cities such as Gothenburg and Stockholm have been pioneers in experimenting with new vehicle and fuel types in sectors such diverse as public transport and (in collaboration with industry) commercial freight distribution.

The adoption and achievement of a bolder vision for sustainable mobility at the national and local levels may – by reducing and increasing the efficiency of transportation – help to clarify the extent to which renewable fuels and alternative forms of propulsion may contribute to reducing use of fossil fuels to a minimal level. In this regard, the three cities studied in this report offer important insights that are likely to be of utility to Swedish policy and practice.
6. References


