



City of Gothenburg



Gothenburg's learning network – State of sustainable city planning, implementation and key issues



City of Gothenburg

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1 Summary

Gothenburg City Council interviewed three out of the four companion cities that Gothenburg has. They are Bergen (Norway), Borås and Malmö (Sweden), and Aarhus (Denmark) will probably follow later.

As with the other networks the concerned cities have populations of typically between 70.000 and 300.000 people. All of the companion cities have signed the Covenant of Mayors (CoM) and have either submitted their Sustainable Energy Action Plan (SEAP) or are preparing them. These cities first had climate plans upon which the current SEAPs are based. Apart from Climate Plans and SEAPs the cities have many other related plans and strategies available on transport and mobility, urban development, environment, water, the building sector etc. All of these plans or strategies are related in some way to the SEAP as it has been integrated strongly with all other policy. Owing to the existing comprehensive plans and strategies all cities have a wide range of exemplary projects in many sectors from passive house buildings, light rail systems, bike policies and plans, urban development plans with ambitious targets for energy efficiency and sustainable energy solutions, smart energy solutions and many more projects giving proof of a broad view on sustainability which goes beyond just energy and climate targets to incorporate elements like water, waste and recycling.

While Scandinavian communities are at the forefront of these developments, still many issues and needs exist. The following key issues were raised during the interviews:

- The lack of business models that encourage long term investments
- Collection and use of correct data for planning and monitoring
- Knowledge about sustainable solutions in the building sector
- Need for a good transportation system and space for other-than-motorized vehicle road transport and the car as 'the measure and reference' for all things
- Different actors within the city sub-optimizes solutions
- Cooperation around complex issues such as transport is hard to achieve

2 Context

Gothenburg is working with four companion cities: Borås, Bergen, Aarhus and Malmö. Bergen and Aarhus are “sister cities”, a form of cooperation that goes far back in time. Both Bergen and Aarhus are also, like Gothenburg, the second largest city in their respective countries. Borås is the closest large town to Gothenburg, only 60 km away and with great commuting interchange. Malmö is the third city in Sweden in one of the fastest growing regions. However, only three companion cities are reported here: Bergen, Borås and Malmö. Aarhus will catch up later.

2.1 City introduction

2.1.1 Bergen

Bergen is the second largest city in Norway and is situated on the west coast facing the Norwegian sea. The distance to Oslo is 478 km and 2.368 km to Nordkapp. The location between the seven mountains and the sea makes it the rainiest city in Europe with 269 days of rainfall in 2012. In many areas the municipality has been pro-active in facing climate challenges. The municipality has very good knowledge of the risk of flooding, high winds, high water levels, large waves, extreme precipitation and landslide dangers as a result of extreme weather and climate change.

Bergen was founded in 1070 AD and was held as the capital city until 1299 when Oslo was designated the capital city of Norway. The city has always been a natural node for trade with foreign countries and the Norwegian northern coast.

Since the Second World War, Norway has mostly been led by the social democrats, Arbeiderpartiet, but Bergen is ruled by a coalition of the conservative party (Høyre), the Christian Democrats (Kristlig folkeparti) and The Progress Party (Fremskrittspartiet).

Bergen is one of Northern Europe’s largest cruise ports and a gateway to the fjords. In 2013 340 cruise ships have stayed in the Port of Bergen. The oil and gas industry, together with fish and maritime industry, are the most important economic sectors within the city. Bergen also has a good science environment with a high tech industry and has access to some of the world’s greatest energy sources: oil, gas and hydroelectric power. The region has received several science- and development programs which will have a positive impact on the region for the future.

2.1.2 Borås

The city of Borås is located 60 km west of Gothenburg and has around 66.000 inhabitants. Borås is home to 11.500 large and small companies in a wide range of different businesses. As the second largest municipality in western Sweden, Borås offers a rich choice of public services, trade and commerce, cultural events, recreation and education, as well as a highly specialized labour market. Proximity to both Gothenburg and Landvetter International Airport is a major asset. No less than 1.5 million people live within a 100-kilometre radius of the city, itself a centre for the 220.000 inhabitants of the Sjuhärads area. Nearly 105.000 of them live in the municipality.

The University of Borås accommodates around 15.000 students and offers courses and research in fields such as computer science, economics, textiles and engineering. Borås is the Swedish centre for textiles and clothing with several famous companies, and a city of

commerce with its 1.500 import and export companies. A lot of well-known mail order and e-commerce companies are located in Borås. Supporting this booming commerce is a large number of companies working with logistics, distribution and marketing.

Nature is always nearby in Borås. The city is surrounded by parks and green areas, stretching into the built-up areas. The beautiful countryside is always within easy reach, for pleasure and for exercise.

The City of Borås has recently adopted the vision of a "Sustainable Borås in 2025". According to this vision only renewable energy sources will be used within the municipality from 2025. Borås is also in the process of adopting new environmental goals regarding, for instance, energy efficiency and the use of renewable energy. During 2013 the municipality will make an energy and climate plan that will be incorporated in an upcoming comprehensive plan.

2.1.3 Malmö

Malmö is the commercial centre of southern Sweden (Skåne region) and an international city. This is expressed, not in the least, by the fact that Malmö has 300.000 residents from approximately 170 different nationalities.

Malmö is also undergoing a transition from being an industrial city to a city of knowledge. Older industries have been replaced by investments in new technology and training programmes of high calibre. Malmö University, which opened in 1998, is Sweden's latest venture in the field of higher education, accommodating some 15.000 students.

The strongest sectors in Malmö are logistics, retail and wholesale trade, construction, and real estate. There are also a number of well-known companies within biotechnology and medical technology, environmental technology, IT, and digital media fields. Co-operation between colleges, science parks, and companies provides a sound basis for entrepreneurs and creative development in Malmö.

An exceptionally well-developed infrastructure makes Malmö very easy to reach, whatever means of transport you use: boat, plane, train or car.

Over the last years the City of Malmö has received many international awards for its focus on sustainable city development and pilot projects such as Augustenborg and the Western Harbour. Malmö was also appointed as the first Fair Trade City of Sweden. Malmö aims to be a world-leading climate city and the broad-based efforts cover traffic, energy and city planning, and also consumption, education and lifestyles. But cutting emissions isn't enough. Malmö also has to adapt to climate changes like extreme precipitation and drought.

2.2 City background

The companion cities to the city of Gothenburg for the STEP-UP project are a bit different in size, location, climate, and density for example; see Figure 1 and Table 1. There are also differences in governance structures between Sweden and Norway which are seen in variable planning conditions. However, all cities work hard to address the challenges of sustainability, climate and energy, and living standards at the city and local neighbourhood level, as well as working to reduce social segregation.



Figure 1 The 3 companion cities of Gothenburg; Bergen (Norway), Borås (Sweden) and Malmö (Sweden). Aarhus (Denmark) is also shown since the work with companion cities will include them. (Source: Eniro maps).

To European standards these are rather small cities, with the size of the cities varying from about 66 000 up to more than 270 000 residents (Table 1). With the bridge over Öresund, Malmö and Copenhagen are well connected and can easily share the same market for economic growth, competence, work opportunities and culture among other things. Borås is close to Gothenburg and is located in West Sweden, a region of great growth potential. Bergen is, like many cities in Norway, more isolated from cities of similar size. The most effective means of transportation in Norway is flying. All companion cities are industrial cities, with a background of transitioning from heavy industry to more knowledge based services. All companion cities also have universities.

Table 1 Size of Gothenburg and the STEP-UP companion cities (source: Wikipedia)

City	Inhabitants	Area (km ²)	Density
Gothenburg	549 839	204	2 700/km ²
Bergen	268 950	465	578/km ²
Borås	66 273 (105 000)	32	2 111/km ²
Malmö	280 415	77	3 651/km ²

Note how the population density varies in the different cities. Malmö has the highest density and Bergen by far the lowest. This might be explained by how population density is calculated; for example, whether the area is defined as the whole area of the municipality or the area of the city and its surroundings.

2.3 Population and growth in municipalities

All major cities in Sweden show a trend of increasing urbanisation; however, this hasn't always been the case. The dip in population growth in the 1970s occurred for the same reason in both Malmö and Gothenburg – crisis in the shipyard industry. Borås, on the other hand,

experienced population growth trends more similar to the rest of the country. Borås has had a long tradition of textile and clothing industries and during the late 1980s almost all these manufacturers moved abroad, a trend which affected population growth, as shown in Figure 2.

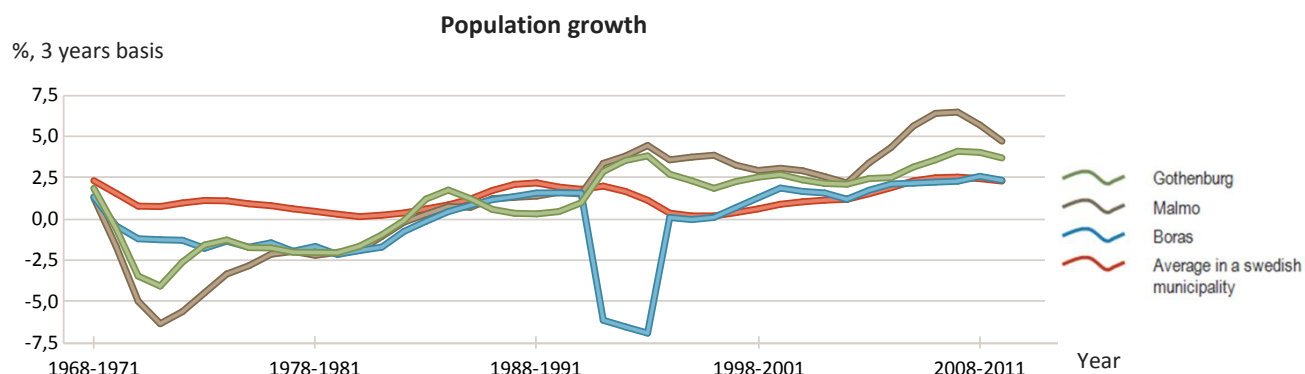


Figure 2 Population growth in municipalities in question. "Sverige medel" means average population growth in Swedish municipalities. (Source: www.ekonimifakta.se)

Looking at estimated population growth (Table 2) Malmö shows the highest figures with around 1.6 % growth per year. The whole Skåne region (southern Sweden) is a hot spot for both living and working, which can at least be partly explained by the connection to Copenhagen. Borås is a part of the West Sweden region, usually mentioned as a region with great potential for upcoming development. There is also a growing trend emerging of building knowledge and industry clusters around cities and large industries, which makes it even more important to maintain easy transport linkages with surrounding regions.

Table 2 Estimated population growth for 2014-2018 in Malmö and Gothenburg.

Malmö	2013	2014	2015	2016	2017	2018	2012-2018
Inhabitants	307 758	312 710	317 870	323 030	328 190	333 300	
Est. pop. growth	1,58%	1,62%	1,60%	1,57%	1,53%	1,49%	9,04%
Borås							2013-2017
inhabitants	105 711	106 584	107 488	108 420	109 381		
Est. pop. growth		0,83%	0,85%	0,87%	0,89%		3,47%
Gothenburg							2012-2016
Inhabitants	532 791	539 106	545 032	551 049			
Est. pop. growth	1,19%	1,19%	1,10%	1,10%			4,65%

More graphs illustrating interesting statistics in population, population growth, average age, educational level and business climate from Borås and Malmö and also Gothenburg as comparison, are shown in Appendix 5.1.

Around the beginning of the 17th century Bergen had about 15 000 inhabitants and was the largest city in the Nordic countries. Today 267 950 people live in municipality of Bergen and the municipality is predicted to have 319 000 inhabitants by 2030. Most of the population (102.742 people) is between 20- 44 years old. The population growth was 1.6 % in 2012.

2.4 Long term challenges

Impacts of changing climate, such as flooding and increasing precipitation, and the need to adapt to renewable energy sources are major challenges for all cities. Other problems to be addressed include restoration, energy efficiency and environmental problems such as air quality, noise, contaminated ground and water.

Knowledge of technical solutions exists, especially when it comes to energy efficiency and renewable energy, but these will not take us all the way. A big challenge is implementation, how do we go from words to action? It's about having strategies and goals and action plans but also courage, money to invest and the knowledge to how implement all plans and strategies. It is a great challenge which all cities are aware of.

Other challenges for the sustainable city are segregation and large gaps in income and social standards. Several cities show a growing number of children living in poor conditions and young people needing social benefits. Aging populations also require additional healthcare and social service resources, an issue requiring attention in numerous cities. In Sweden there is also a big debate over school standards, especially in light of the increasing number of young people who fail primary school.

3 Sustainable Planning

3.1 In general

One way to explain sustainability is in terms of the three dimensions of ecology, economy and society aspects. This means that sustainable planning addresses all three dimensions. Here sustainable planning mostly comes down to energy rather than other social or economic issues. That doesn't mean there are no targets, strategies or action plans for the social dimension, but other parts of the municipality are more engaged with these issues. The city planning offices are engaged in all three sustainable dimensions, especially when it comes to making comprehensive plans etc.; however, the main focus is on energy plans and environmental and social programmes. Also sustainable projects tend to address only one of the three dimensions, even if some of the projects impact on a lot of different city targets. Sustainable planning in this document therefore can be taken mean energy/climate planning and exploring how this connects with comprehensive planning.

3.2 SEAP

All of the companion cities have signed the Covenant of Mayors (CoM) and have either submitted their Sustainable Energy Action Plan (SEAP) or are preparing it (Table 3). As such the Covenant of Mayors might well be the first long-term commitment these cities make, with commitments going beyond the six year political term. Some are even already looking further ahead with long-term goals towards 2050. Most of the SEAPs have been based upon climate plans which were developed or under development at the time of the CoM signature (Table 3). Climate plans are focused on greenhouse gas emissions, energy production and energy consumption, encompassing sectors like traffic and mobility, housing and waste.

Table 3. SEAP and targets for the companion cities

City	SEAP	2020 target (baseline)	Long term goal
Gothenburg	SEAP - The energy efficient city (2010) Energy plan (2005)	By 2020 emission levels of CO ₂ will be reduced by at least 30 % compared to the levels in 1990.	By 2050 the city will have a sustainable and fair level of carbon dioxide (CO ₂) emissions (around 2 ton/capita).
Bergen	SEAP – Climate and energy action plan (20 September 2010)	Around 80 % reduction of oil consumption and 30 % reduction of gas consumption in 2020. The general energy consumption per inhabitant is lowered in step with the expected population growth of 1.3 %t per annum	By 2030 there will be a 50 % reduction in CO ₂ emissions compared to 1991. Long term goal of becoming a greenhouse gas neutral city.
Borås	Environmental action plan 2013-2016	By 2016 there will be a reduction of energy use by 15 % compared to 2009	By 2020 there will be a 20 % reduction of energy use and CO ₂ emissions, compared to 1990.
Malmö	SEAP – energy strategy Malmö (2009)	20 % energy reduction per capita (compared with the period 2001-2005)	Climate neutral by 2020. Only renewable sources in the energy system by 2030

3.3 Monitoring and data availability

It is obvious that collecting data, knowing what to collect and how, and to get the right data quality is a major problem.

The Norwegian Statistics Bureau (SSB) used to collect data and produce statistics for different kinds of emissions, including CO₂. This data runs up to 2009. For the municipality level the quality of this data was relatively poor and they were stopped. Various work continues in different organisations to obtain data for emissions and energy use at the municipality level but has yet to conclude. For the county level there will be data from 2014. This is a problem experienced by all cities in Norway at the moment.

In Sweden measuring and reporting energy use and emissions follow different procedures in different cities, with many cities struggling to find accurate and reliable data across different sectors. Many cities, e.g. Malmö and Borås, use “Miljöbarometern” (www.miljobarometern.se).

It is difficult to compare cities directly due to variations in what is measured, how it is measured and what is included in different categories.

3.4 Long term visions

Climate change has stimulated city stakeholders to think further ahead than usual. All cities have targets set for 2020, 2030 or even 2050. Even if the targets are formulated in different ways, all of them centre around becoming CO₂ neutral by 2050 or even 2030. This can, of course, be fulfilled in different ways.

3.5 Integrated sustainability

Although a climate plan is framed by the challenge of combating and coping with the effects of climate change, and a SEAP by the challenge of reducing energy consumption and increasing energy efficiency and renewable energy production by 2020, all cities stress the need to take into account all other aspects of sustainability. It also means there is a need for breaking the drainpipe organization structure, which is pointed out by all cities.

3.6 Bergen

3.6.1 Sustainable planning

Bergen was the first municipality in the country to prepare its own climate plan. In 2008 a Climate Section was established, which coordinates the work on climate, environment and energy.

Bergen Municipality's first Climate Action Plan was adopted by the City Council as early as 28 February 2000 with the aim of reducing greenhouse gas emissions by 30 % and CO₂ emissions by 20 %, from 1991 to 2005. This goal was not reached. In 2002 a report was prepared about the greenhouse gas emissions status in Bergen for the period 1991-2001. The report was based on the most recent official figures from The Norwegian Statistics Bureau. The result showed that the total greenhouse gas emissions in Bergen had increased by 7 % from 1991 to 1999.

Climate, energy and the environmental issues have been incorporated into the land-use part of the municipal master plan adopted on 25 June 2007. The reduction of greenhouse gas emissions and a good urban environment thus form an integral part of the municipal land-use and transport policies. The Climate and Energy Action Plan (2010) has set concrete targets for greenhouse gas emissions and energy consumption in different areas. The overall target for reducing greenhouse gas emissions is set to 50 % CO₂-equivalents in the period 1991-2030.

The land-use part of the municipal plan therefore sets out a requirement for a new and comprehensive discussion about which energy strategies shall be developed for the future. The plan emphasises that the municipality ought to have a more central role in this area than it has today and the work should culminate in a new energy plan where the strategies for energy, urban development and transport are closely connected.

Land-use policy is a municipal area of responsibility and the municipality has legislation and policy instruments on its side to direct land-use development. In a regional context, where the requirement is to view urban development across the municipal boundaries, there is no mutual coordination of land-use and transport policy. The most important policy instruments for evolving land-use and urban development with lower greenhouse gas emissions from transport are:

- Concentration of transport hubs where there is good public transport cover and good access to local services
- Location policies where firms with large volumes of visitors are channelled towards public transport hubs located centrally within the urban structure
- Delay or abandon house building plans in the outer city that lead to urban sprawl
- Coordination of land-use policy and regional housing policy in respect of public transport cover and local services

The Energy and Climate Plan shall contain an action programme. The plan will also illustrate how greenhouse gases from mobile sources may be reduced and how the use of environmentally-friendly energy solutions can be promoted in new and existing buildings. It will also explain the relationship between land-use policy and development patterns on the one hand, and emissions, energy use and the influence on climate on the other. In addition, Bergen municipality wants the climate and energy action plan (SEAP) to outline what has to be done for Bergen to be climate-neutral in 2030.

Some of the ongoing plans and reports that are important for ensuring the sustainable planning and undertaking of the SEAP are shown below.

Cities of the Future

Bergen municipality is a participant in the collaborative project "Cities of the Future – towns and cities with the lowest possible greenhouse gas emissions and a good urban environment". It is a cooperative project between the Ministry of the Environment, the Ministry of Petroleum and Energy, the Ministry of Local Government and Regional Development and the Ministry of Transport and Communications and it includes the 13 largest urban municipalities in Norway. The four priority areas in Cities of the Future are: land-use and transport; stationary energy; consumption patterns and waste; and adaptation to climate change. The project period is from 2009 to 2014.

The land-use part of the municipal plan

The land-use part of the municipal plan is the municipality's top-level control document for land-use and transport policy. The period of the plan is 12 years, but its lasting impacts take a longer perspective than this. Bergen municipality's environmental plan was integrated with the land-use part of the municipal plan in 2007, with the environmental policy strategies also being incorporated. When the plan is next rolled over, this principle will be continued.

The Bergen Programme for Transportation, Urban Development and the Environment ('the Bergen Programme')

The Bergen Programme is a collaborative project between the Norwegian Public Roads Administration, Bergen municipality and Hordaland County Authority. Nearly NOK 5.3 billion is to be invested in new public transport and communications projects in Bergen in the period 2002-2015. The Bergen Programme includes new road projects, the Light Railway, public transport measures, pedestrian and cycle routes, environmental projects, improvements in the street network in the city centre and traffic safety measures. Without new measures, the increased traffic volume will lead to more accidents, a longer rush hour and aggravated environmental problems. The objective of the programme is to reverse this trend.

Cycle Strategy 2010-2019

Cycle Strategy for Bergen 2010-2019 is a roll-over of the previous "Plan for Cycle Strategy 2002-2011" and it gives guidance as to how the arrangements for cycling in Bergen are to be improved in the next 10 years. The City Council has adopted the objectives and measures in Cycle Strategy for Bergen 2010-2019. A fully developed network of main cycle routes and a cycling share of at least 10 % are among the objectives.

Energy management in municipal buildings

In collaboration with Enova, Bergen municipality has initiated energy efficiency improvements in municipal buildings. The activities are included in the municipality's work on environmental management and balanced scorecard. The principles of energy management in municipal buildings correspond with the measures proposed in the climate and energy action plan (SEAP).

Sustainability control in the municipal sector

Activity management for the sustainability field and a standard for climate and sustainability accounting are to be developed. The preliminary study report is complete and Bergen municipality is the pilot city.

3.6.2 SEAP

Bergen is working in a program "Cities for the Future" including four priority areas 1) Land Use and Transport, 2) Stationary Energy, 3) Consumption Pattern and Waste, and 4) Adaptation to Climate Change. The city is satisfied with the current climate and energy action plan. The short term action plan is the "City of the Future" program and when this finishes in 2014 the short term program will be updated.

In the SEAP there are 50 measures that address energy saving. These are prioritised in the short term program, "City of the Future". The stakeholders have been identified but not always involved. The short term measures have funding but the long term aspects mostly lack funding at present. The plan is divided into three main chapters, according to the sector to which the greenhouse gas emissions originate from. The classification is in line with the system used in official Norwegian statistics for greenhouse gas emissions. This means that the discussion is divided into the following emission sources:

Mobile emissions These include all transport activity on roads, in the air and by ship. For aircraft and ships, limits are set for how much of this traffic shall be attributed to municipal emissions. This emissions group also includes building and construction machinery and a wide range of mechanical equipment.

Stationary emissions These are emissions from energy use associated with fixed installations such as dwellings, construction sites, installations etc. Stationary energy use also includes energy supplies to the Light Railway, airports and quays, but not the energy used by the actual means of transport such as cars, planes and ships, even if electric cars, for example, are in the "grey zone".

Consumption, waste and process emissions In the context of Statistics Norway these include gas emissions from waste disposal sites, process emissions from industry, natural emissions from agriculture and greenhouse gas emissions from waste handling. In the climate plan these are drawn together under the concept of waste and consumption patterns, waste minimisation, private and public waste treatment, and waste disposal site upgrading and better solutions for industrial waste.

Total emissions of greenhouse gases in Bergen Municipality were 755 900 tonnes of CO₂ equivalents and were thus around 1.4 % of Norway's total emissions. In 2007, Bergen's population was 5.2 % of the total population of Norway. **Emissions per person in Bergen were 3.1 tonnes of CO₂ equivalents per annum.** In percentage terms, Bergen has much lower emissions from industry and agriculture in comparison with the emission figures for Norway as a whole. The contribution from mobile sources is thus larger in Bergen than on a national level. To a great extent this reflects the structure of Bergen's economy. The total emissions of greenhouse gases in Bergen municipality have grown by a little over 17 % from 1991 to 2007. The population increased by slightly more than 14 % in the same period.

Stationary energy consumption in Bergen has been increasing steadily, on average by 1.7 % per annum, during the period 1996 - 2006. In 2005 total consumption was 4 845 GWH, of which around 2 235 GWH (46 %) was household use. This has happened at the same time as the introduction of district heating has had a restraining effect on the growth of electricity consumption. District heating production has been through a period of extensive growth and expansion. The energy report for Bergen is based on annual growth in energy consumption for 2006 - 2016 of 1.2 % . In Appendix 5.2 (Table 5.2.1) there are main figures for energy use in Bergen in 2006.

In the period from 1991 – 2007, the total annual greenhouse gas emissions in Bergen increased from 645 400 tonnes to 755 900 tonnes of CO₂ equivalents. Process emissions, including emissions from waste disposal sites, went down by 45 % in this period, while emissions from stationary energy use increased by just over 6 %. Emissions from mobile sources, mainly road transport, have increased sharply by nearly 50 % and now account for 68% of Bergen's total greenhouse gas emissions. The greatest challenges are therefore to reduce emissions from mobile sources.

Figures for energy use and greenhouse gas emissions in Bergen are shown in Appendix 5.2. There is also a table showing the reduced greenhouse gas emissions necessary to reach climate policy objectives for Bergen. Graphs show stationary energy consumption by consumer groups and projected stationary energy use in Bergen distributed by energy carrier.

If all suggested measures are carried out as planned and the assumed technological development in the transport sector takes place, greenhouse gas emissions in Bergen in 2030 can be reduced by a total of 72 % compared with 1991. In that case, the target will have been exceeded by 50 %. However, it must be stressed that it presupposes comprehensive measures and some optimistic assumptions about technology and climate-neutral fuel. With a somewhat lower proportion of rechargeable vehicles, more moderate technological development and

continuance of some stationary emissions, the 50 % reduction by 2030 will still be an ambitious target.

Figure 4 shows the historical growth in greenhouse gas emissions and projections with and without measures. Without measures an increase in mobile and stationary emissions is anticipated because of population growth, increased income levels and increased energy use. A reduction in emissions from waste disposal sites is expected, due to measures already introduced and reduced methane emissions from closed landfill sites.

The total emissions level is expected to be about 916 000 tonnes of CO₂ equivalents in 2030 if no measures are initiated and there are no reductions in the form of technology developments. This is 42 % higher than the emissions in 1991.

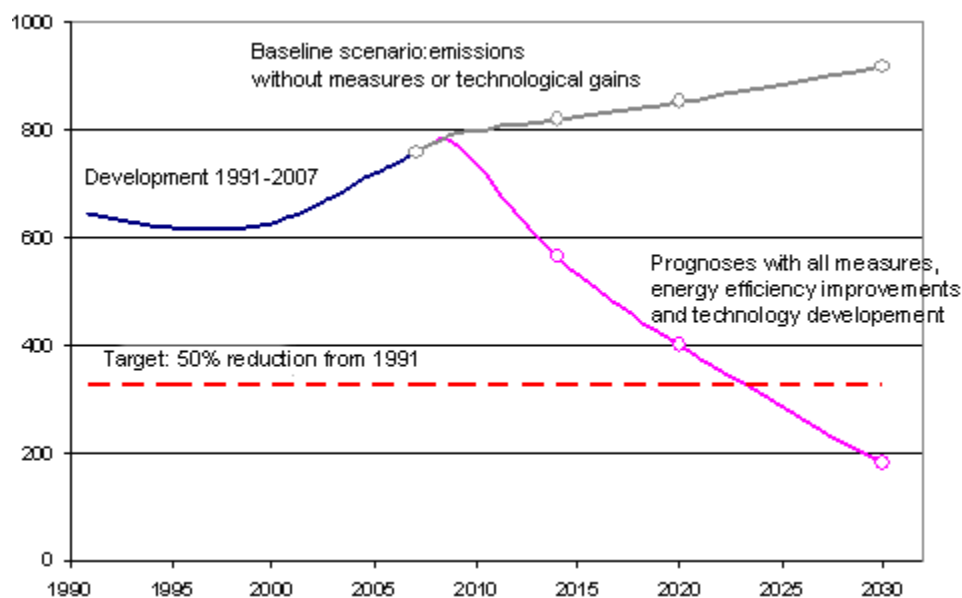


Figure 4 Historical development and extrapolation of greenhouse gas emissions, excluding and including measures and development trends stated in the action plan.

Implementation

Energy and greenhouse gas emissions are cross-sector themes involving many participants, where climate objectives both partly coincide with and oppose targets set for other communal spheres. To achieve results from this Action Plan it is important that the agencies and organisations involved take responsibility for, and ownership of, the various measures and that the climate effect becomes the main theme of activities and measures at all levels. Some of the proposed measures that have the greatest energy and climate effects will require long-term planning. To achieve the goals of the SEAP, monitoring and follow up measures are required.

Work on follow-up measures has been initiated in the areas below:

- Implementation in the land-use part of the municipal plan
- Clear allocation of responsibilities. Energy and greenhouse gas emissions are cross-sector themes involving many participants.
- Annual follow-up and monitoring. There are inadequate statistics for municipal emissions of greenhouse gases. The figures published by Statistics Norway are calculations based on a range of data sources, partly municipal figures and partly statistics at a regional and national level broken down to municipal level. This means

that some local circumstances and municipality-specific variations are not captured. Therefore it is necessary to develop a set of local indicators to monitor development closely. Work on this is in progress in Bergen municipality, through the project “Sustainable Control in the Municipal Sector”. This management tool, being piloted by Bergen municipality, is a systems solution to underpin the municipalities’ work on climate among other things. Plans and measures implemented will be documented and the effect of the various measures will be analysed and reported upon.

3.7 Borås

3.7.1 Sustainable planning

The city of Borås is planning for a sustainable city and municipality with residents having a healthy environment in both urban and rural areas. New constructions are mainly carried out in areas where public transportation is provided and through the densification of urban areas. Gardens and quiet environments are measured, as well as energy-efficient solutions. Sustainable urban planning includes objectives and targets that primarily aim to reach the national goal of “Good urban environment”, and the environmental objective “Reduced Climate Impact” is of particular significance. In the city of Borås several policy documents relate to the area of sustainable urban planning. Comprehensive Plan (ÖP06), Environmental program, Vision 2025 and Borås Agenda 21.

Comprehensive plan, ÖP06

The Borås Comprehensive Plan presents visions, targets and guidelines for the use of land and water. Work on a new comprehensive plan has just started, which will more clearly show how the city plans to achieve a sustainable society. The following are objectives and guidelines for the city administration to use to assist in sustainable decision-making for the municipality and the neighboring municipalities.

- A resource-efficient building structure
- Attractive homes of different sizes and types of tenure for all citizens
- Good architecture, aesthetic quality and safe, accessible and beautiful outdoor environments in interaction with identity and history
- A diverse economy with a focus on textiles, trade, logistics and design
- Confident, safe and sustainable transportations
- The use of land and water is done in such a way that the long-term production capacity, biodiversity, and natural, cultural and recreational assets are maintained

Environmental program,

The program presents four priority areas: sustainable perspectives, sustainable urban planning, a fossil fuel-free and energy-efficient Borås, and nature. Each area includes several targets, together it makes, in total for the program, 12 environmental objectives. These objectives are monitored in an environmental report each year.

Vision 2025

The general vision is developed further in seven strategic target areas. The vision can become reality by continuously working on all seven target areas. The City of Borås is the driving force behind the work, which involves residents, industry and other organizations. Each target area includes a number of strategies that embody how to work to achieve the desired ideal state. Over time, more strategies may be added, while others may cease to be relevant and need to

be removed. These are the targets that best respond to sustainable planning: good travel habits and attractive transport links and ecological sustainability, both locally and globally.

Borås Agenda 21

In Borås Agenda 21, adopted by City Council in February 2000, there is a vision of Borås as a sustainable city where quality of life, good health, security, confidence and responsible use of the earth's resources is more important than a standard that requires a lot of energy and high consumption. The resources are distributed fairly, not only in generations but also between them. Different stakeholders come together in an active dialogue. Residents' requests and initiatives are taken care of by responsive politicians.

3.7.2 SEAP

The city of Borås signed the Covenant of Mayors in 2009. The work with the SEAP has started and will be ongoing for the rest of 2013, to be finalised during 2014. There is a collaboration process of officials from different parts of the city joining the work, with broad representation. Politicians are also involved in the work. The work is top-down, and starts out by defining the city's vision. One interesting thing is that the SEAP is made in a mutual process with the creation of a new comprehensive plan for the city. From the ongoing SEAP work, there will also be a new environmental objective about climate.

The city has developed local targets in line with the CoM and the national targets in Sweden (at least 49 % renewables by 2020, and reduced CO₂ emissions by at least 27 % compared with 1990). All of them are presented in the environmental program, since the city doesn't have a real SEAP yet. For energy and city planning these are the most relevant goals for the near future, 2013-2016:

- The city of Borås is a fossil fuel-free organisation
- Energy use is more efficient
- Reduce environmental impacts from traffic
- Increased share of renewable energy

Since the SEAP is a rather new document for the city, there are not reported figures for energy use and CO₂ emissions other than the statistics from the national statistics Sweden. The figures are reported in "Miljöbaometern" through a variety of indicators. It is a tool to describe the environmental situation and how environmental objectives are reached.

CO₂ emissions per person in Borås were 2.8 tonnes of CO₂ equivalents per person (2011). This is a reduction by 47 % compared to 1990. The energy use within Borås geographical area was in total 294 080 MWh in 2011. While energy use in Borås, including heating, has decreased, transportation between 1990 and 2010 remained almost constant. Energy consumption has increased in 2009 and 2010. Probably due to an increased need for heating during extra cold winters. The highest energy use is found in the sectors of household and transportation. The goal is to reduce the energy use with 15 % to 2016 compared with 2009. The goal for energy use for heating is 130 kWh/m². The energy use for heating was during 2011 in average 155 kWh/m².

In Appendix 5.3, there are graphs of total energy use (MWh) in Borås from 2000 - 2008, total energy use (MWh) per sector from 2000 - 2008 and CO₂ emissions per person divided in sources from 1990 - 2011.

Implementation

Targets and milestones

For each priority area a number of goals and milestones are established. The goals specify what the city wants to achieve and milestones defining the necessary steps to reach the goals. Milestones are to be reached during the period 2013-2016. For each milestone there is a department or municipal company that has primary responsibility for leading the efforts to achieve the goal.

Implementation and monitoring

For each one of the milestones, measures are set how to achieve the goal and how it can be monitored. To reach the milestone, it is important that the responsible departments and companies will make a more detailed action plan. Three times a year, at four-month follow-ups and in the annual report, the data is checked and updated. It should then be clear in the budget projection if more resources or investments are needed to achieve the milestones. The Environmental and Consumer board is responsible for coordinating the reporting of the work.

3.8 Malmö

3.8.1 Sustainable planning

Sustainable planning in Malmö can be identified in eight areas:

- **Sustainable Consumption in Malmö**
Organic food and Fair Trade products are on the rise in Malmö. Already today over 50% of the food served in schools is organic and the consumption of ethically labelled products increases year by year in Malmö.
- **Sustainable Recycling**
All household waste in Malmö is collected and 98 % of the waste is reused or recycled into new material or energy. Energy production from waste is primarily biogas or incinerated in the waste-to-energy facility.
- **Climate Change and Energy in Malmö**
Malmö aims to be a world-leading climate city, and are on the way already with broad-based efforts cover everything from traffic to consumption. But the city also has to adapt society to climate changes like extreme precipitation and drought.
- **Mobility in Malmö**
The City of Malmö is growing and urban density is increasing. The overarching goal of the mobility policies in Malmö is that walking, cycling and public transport are the first choices for transport of people and goods in the city.
- **Sustainable Urban Planning in Malmö**
Malmö is a compact city, facilitating the provision of collective services, including transport and bicycle pathways whilst simultaneously incorporating mixed use planning and green space; creating favourable conditions for sustainable urban development.
- **New Sustainable Housing and Offices**
Malmö's journey from a grey industrial city to a young city striving for sustainability is more visible in the Western Harbour than anywhere else. And Hyllie, in the south of Malmö, is the latest expansion area with smart energy systems from the beginning.
- **Refurbishing for Sustainability**
The City of Malmö has not only built new housing areas with sustainability in focus, but has also stressed the importance of transforming existing areas. Augustenborg is a striking example of this transformation and Rosengård is a good runner-up.

- **Green and Blue in Malmö**
Malmö is a compact and dense city, but values urban green space. Parks and the city's close proximity to the sea are complemented by green roofs, landscaping in city squares and bike and walking paths lined by trees.

Comprehensive planning

The principal goal for Malmö's current comprehensive plan is to maintain and develop Malmö as an attractive and sustainable city in the short and the long term, and above all to establish the broad outlines for building in the future. At the same time, Malmö is growing as it has probably never grown before. During the last three years, 5 000 more people have come to Malmö every year. That is a growth rate twice as fast as in the previous ten-year period. At this rate Malmö will have 350 000 inhabitants by 2020 and 400 000 by 2040. It is clear that such a strong rate of growth is going to place great demands on future town planning. One prioritisation is to build a compact city where work and home are in close proximity, and where everyone is within walking or cycling distance of public transport. It is a priority to prevent "urban sprawl", an unstructured expansion of outlying areas which is neither town nor country and where you can't manage without a car.

The new comprehensive plan, issued in spring 2013, defines the direction for the city's long-term development. The vision is that the city shall be developed in a socially, economically and ecologically sustainable way. The plan covers the period until 2030, by which time Malmö shall have sufficient reserves for expansion to deal with a population of 400 000 inhabitants. In brief, the strategies for making Malmö an even more attractive, sustainable city are:

- Malmö shall be a compact, diverse city.
- Socio-economical development shall be enhanced.
- The environmental impact shall be reduced. Malmö shall be the most climate-smart city in Sweden.
- Malmö shall be a driver of growth in the region.
- Traffic strategies shall focus on people.
- Malmö shall be a dense, green city – the urban environment of the future is created here.
- Malmö shall interweave the rural and coastal environment with urban environments.

Traffic programme

The new traffic environment programme in Malmö states that the proportion of car journeys within the city shall be reduced from 41 per cent in 2008 to 30 per cent in 2030. With regard to inbound commuting by car, the aim is that only half of the journeys into Malmö will be made by car, compared with 67% in 2008.

Cycling programme

The aim of the new cycling programme is to increase the proportion of bike journeys in Malmö from 23 % in 2008 to 30 % in 2018. The new cycling programme takes a joint approach to cycle planning in order to make it even easier for cyclists and to encourage even more Malmö residents to choose the bike.

Environmental programme

City of Malmö's Environmental Programme, adopted in 2009, has four main goals:

- Sweden's most climate friendly city
- Malmö — the city of the future
- Sustainable use of natural resources
- It's easy to do the right thing in Malmö

3.8.2 SEAP

The Energy Strategy (SEAP) is an important planning element of the comprehensive plan and Environmental Programme and has connections with Traffic Programme. Current energy strategy will have a strong impact at the urban planning. The energy strategy is divided into three areas, with specific goals in each.

More Effective Energy Use

More effective energy use provides big possibilities to decrease the environmental impact and energy costs. There is a great potential for improving the effectiveness of both the housing and industry sectors as well as transport. In the Energy Strategy, several guidelines and principles for achieving this in different areas are presented. Using energy mapping as the basis it is possible, for instance, to establish efficiency programs for buildings and structures. By developing and strengthening energy counselling the motivation for putting efficiency measures in place is increased. For new developments it is suggested that the energy demands established in the Miljöbyggprogram SYD (Environmental Building Program SYD) are followed. Regarding transport, it is important to promote pedestrian, bicycle and public transportation but also to strive for more energy efficient vehicles and ECO-driving.

A Switch to Renewable Energy Sources

Switching to renewable energy sources is an important strategy for decreasing the environmental impact and securing future energy provision. There are great possibilities for replacing fossil fuels with renewable energy sources. When it comes to electricity and heat production, bio-fuels, hydro-power, wind-power and solar-energy are the solutions being discussed. In regards to fuels there are many interesting possibilities, such as biogas, hydrogen gas, electricity and various hybrids of these. In Malmö, district heating is prioritised because it is effective, safe and has good fuel flexibility. For electricity production, continued investments in wind and solar energy are suggested. The municipality's official cars should consist of environmental vehicles which are driven by biogas, electricity or electrical-hybrids. For public transportation biogas is suggested in the short term, later to be replaced by renewable energy.

Better Planning, Economy, Safety and Knowledge

These strategies can contribute to decreasing environmental impacts and energy costs and create safer energy systems and deliveries. It is important to plan compact, mixed-use cities which offer opportunities for good public transportation and efficient electricity and heat provision. An improved collaboration between neighbouring municipalities with inter-linked energy systems, for instance, could provide better efficiency and safer deliveries. Increased competition within the energy sector and coordinated tendering procedures could contribute to decreasing energy costs. In order for important societal functions to keep running even during breaks in supply, it is important to have done risk and vulnerability analyses in order to quickly be able to put in place replacement systems and minimize the consequences. The public sector has a responsibility to serve as a good example regarding energy use. It is therefore important to support research and development and spread knowledge in schools and networks.

Some of the most important goals:

- By 2020, the City of Malmö will be climate neutral and by 2030 the whole municipality will run on 100% renewable energy.
- Energy consumption in Malmö will decrease by at least 20% per person by 2020, and by a further 20% by 2030.

- Solar, wind, water and biogas will be phased in and fossil fuels phased out. The proportion of renewable energy will be 100% in the City of Malmö by 2020. The ambition is for as large a proportion of this energy as possible to be produced locally.
- Greenhouse gas emissions will decrease by at least 40%, calculated from 1990 levels.
- The significant development of rail traffic and other electrically (green electricity) driven public transport, as well as an extended network of cycle lanes, will create new possibilities for local and regional travel.
- The capacity for transporting goods by ferry and train will be improved.
- Malmö will prepare for temperature changes, rising sea levels, and increased precipitation. Foresight can provide for lower costs and an improved environment.

Malmö is reporting all the energy data and CO₂ emissions by structures and definitions in Miljöbarometern. The action plans for the Environmental program and the Energy Plan is being revised every four years.

During the eighties and nineties, emissions of CO₂ decreased greatly mostly due to changed industry structure and improvements in district heating systems. Emissions per capita have declined significantly after 1990, even when the population by 2008 had increased by more than 40 000 people. The industrial and energy sector accounts for just over half of emissions and the transport sector accounts for approximately one-third.

CO₂ emissions were 6.3 tonnes/person during 2011, which is slightly higher than the baseline year of 1990 with emissions of 6.2 tonnes /person (see Appendix 5.4.5). The goal for 2020 is 3.7 tonnes/person. Until Öresundsverket (power plant with fossil fuel) was commissioned in 2009, statistics show that emissions have fallen slightly since 1990. In 2009 and 2010, CO₂ emissions per capita in Malmö increased largely due to Öresundsverket emissions. In 2011 emissions fell again, most of which was due to the fact that Öresundsverket was not in operation as much as in 2010. Öresundsverket has complicated the goal of reducing greenhouse gas emissions by 40 % compared to 1990 significantly.

Total energy consumption for the city of Malmö was 24.7 MWh/person (2010). During the baseline year (2004) the consumption was 26.5 MWh/person, which shows an improvement. The energy consumption has been rather stable for the last 10 years. To reach the goal of 21.7 MWh/person in 2020 further improvements are necessary (see Appendix 5.4.4 for more details).

In Appendix 5.4, there are graphs of total energy consumption (MWh) in Malmö from year 1990 to 2005, total energy use (MWh) per sector from year 1990 to 2005 and total CO₂ emissions per sector 1980 to 2008.

Implementation

The City of Malmö as a whole has a shared responsibility to realise the goals and objectives outlined in the environmental programme. Cooperation between committees, steering boards, government agencies and companies will be expanded so that the working system is simple and coherent. For work on the environment to be successful, the citizens of Malmö have to participate, and collaboration with the citizens has to be enhanced.

Every committee and steering board bears responsibility for achieving the objectives set out for their particular sector. Committees and steering boards will break down the general objectives into manageable targets and measures appropriate for each area of responsibility, and incorporate these targets and measures into their agendas. Every committee and steering

board will work on every general objective. A follow-up of the environmental work will be included in the annual accounts of each committee and steering board, and will therefore be integrated into the accounting system. This will lay the foundation for a simple environmental leadership structure. Furthermore, each government agency and municipal company can also work with standardised environmental leadership structures.

To ensure that the work carried out achieves the general environmental objectives, the development will be monitored by quantitative and qualitative indicators set by the committees. The Environment Committee will coordinate this work and set the indicators for the whole municipality. Committees and steering boards are responsible for producing documentation and reporting on the indicators that are relevant to their particular area of competence. The Environment Committee is also responsible for the checking, reporting and communication of the state of the environment in Malmö. A comparison and links can even be made to the regional and national environment quality objectives.

The Environment Committee will play a leading, supporting and coordinating role in the work involved in implementing the Environmental programme. Conflicting objectives in implementation of the environmental programme should be avoided as much as possible by improved cooperation between all relevant partners. There will be an ongoing dialogue on the critical subject areas with long-term sustainable development as our shared aspiration. The Environmental Programme's content will be publicised throughout the duration of the programme. All committees and steering boards are responsible for publicizing their own environmental work.

4 Good examples

4.1 Bergen

In Bergen passive houses in wood are being built and very much promoted, for example social housing, Rådalslia, finished in 2011. A new passive house school built in wood, Søreide skole, was also finished 2013. Bergen is building "Bybanen" - a light rail system and one of the largest infrastructure investments in the city. Together with more cycle paths and pedestrian routes, which have been ongoing for several years, the city can offer very good alternatives for transportation. Damsgårdssundet is a practice area for sustainable development. A plant to make biogas from sewage sludge is being built and there are some small hydropower plants in the water treatment system to access the potential energy reserves in the system. The city will increase its use of biogas from sewage sludge in buses for public transportation, to be finished in 2014. Below are short descriptions of some of the projects.

Bergen light rail

Bybanen Bergen Light Rail is a public transport system operating since 22nd June 2010 in Bergen. It builds on the positive experiences of many similar systems which have been built during the past three decades in Europe, Africa, Asia and North America. The decision to build a light-rail system was made by the Bergen City Council in 2000. The entire line will directly serve about 25% of the region's population and will be integrated with existing bus services throughout the corridor of operation. Stations will be integrated with local transportation facilities for pedestrians and cyclists; many stations will also include parking spaces for commuters.

Topographically, Bergen is ideal for public transit. Because of the mountains, the population is concentrated in valleys which are less than 2 kilometres wide and radiate out from the city centre. A light-rail transit line will help improve the efficiency of the existing transit system, offer substantial capacity along the busiest corridor in the region, provide an attractive alternative to the private automobile with a frequent and reliable service, and will stimulate higher density development within the served corridor. Estimates of ridership show that between 40 000 and 50 000 passengers on a normal weekday are expected to use the system when it is completed with a connection to the airport.

The first section with a length of 9.8 kilometres and 15 stops now operates from the Bergen city centre (Byparken) to the town centre of Nesttun. The first phase to Nesttun will transport 26 000 passengers per day or about 6.5 million passengers annually. Construction started in 2011 on a second section to the major shopping area at Lagunen. This section is approximately 3.6 kilometres and will add 5 stops to the line. It is expected that this section will open in 2013. A third section is now under planning and will complete the line from the city centre to the Bergen airport at Flesland. This 7 kilometre section will add 7 new stations and a new workshop to the system. Additional extensions to the northern and western areas of the city are also being planned. The reasons for building the light rail:

- Bergen will become a better city to live in. Citizens will experience less noise from cars and the air will be fresher
- Bergen will be a city that is easy and fast to travel around. There will be less traffic during rush hour and faster handling of the traffic with more departures for bus and rail.
- Bergen will get more comfortable and accessible public transportation options. As a passenger, you will have to worry less about timetables or stepping on your co-passengers toes and it will be easier for those who use wheelchairs or strollers.

- Bergen will get a new and dynamic attraction. The light rail will be a mobile part of the soul and cityscape of Bergen. We will get a modern and future oriented rail where it's needed the most.

Cycling in Bergen

The City Government plans a threefold increase in investments in better conditions for cyclists in the coming years. The matter is being processed in ongoing cases concerning the national transport plan and the continuing of the Bergen Programme 2010- 2019. Through the Bergen Programme, the City of Bergen, the Public Roads Administration and Hordaland County Council made an updated strategy for increased investment in the construction of cycle paths/ tracks and other facilities for cyclists. This work will focus on five aspects:

1. Cycle parking
2. Main routes into the city centre
3. Increased investment in local centres, public transport hubs and concentrations of workplaces
4. Cycle and light rail – the good way to travel
5. Cycling in and through the city centre

Main principles for the measures:

- Cycle parking must ensure that the cycles remain intact and are not stolen
- Cyclists and pedestrians must be separated where the groups have a high annual average daily traffic
- There should be as few points of crossing, conflict and changes of system as possible
- There should be as many continuous networks as possible, preferably of the same type.

Damsgårdssundet

This is a project involving six of the Bergen City Government departments, the State Housing Bank and the largest private developers in the area. A run-down area with a high proportion of council housing along Løvstakksiden will be given a physical boost. Social, cultural and commercial/industrial measures will help to merge the new urban areas along the waterfront and existing areas into a new identity area in the centre of Bergen with forward-looking solutions and a good urban environment. Forward-looking energy solutions in new buildings and the rehabilitation of older buildings have high priority in both private and municipal development projects. Priority is also being given to good pedestrian, cycling and public transport solutions in order to reduce the use of cars.

The project's action plan will be implemented in a number of different thematic areas:

- Democracy, involvement and responsibility
Two meetings a year with all business-unit managers and other players in the area. One annual information meeting/event targeting the whole population. Exhibitions and thematic seminars.
- Infrastructure
Prioritised pedestrian and cycle network. New pedestrian/cycle bridge over the sound Markusplassen – new local urban space. Light rail stop and free bus. Traffic reduction and two housing zone car parks.
- Housing programme, housing and area management
BOB (housing association for the Bergen area) is the main developer for a residential area with approximately 1,500 housing units. New energy solutions. Large proportion of municipal and private rental housing. Measures are being evaluated.

- Ny Krohnborg urban district centre – the beating heart of the local community
Ny Krohnborg school is to be renovated, and the additions of a new multipurpose hall, culture centre, kindergarten and urban district local market square will give the area a new and vital social and cultural hub. New energy and new solutions.
- Commercial, industrial and cultural development
The High Technology Centre, the University and Solheimsviken industrial park will be further developed in the area. Approximately 4-5 000 jobs. New energy and energy solutions. Strategy plan for the creation of jobs in the culture sector – in collaboration with the National Academy of the Arts, the Norwegian Labour and Welfare Organisation and Fretex (redesign).
- Task solving in health and welfare
The action programme prioritises measures targeting children and young people, immigrants and the elderly.
- Expertise development
Study trips and updating of expertise for project participants is given priority. Work seminars and thematic seminars form part of the action programme linked to Bergen University College, and several students are working on assignments in this field.

4.2 Borås

The City of Borås participates with 37 other municipalities in the program Sustainable Municipality. Municipalities should, through monitoring, research and collaboration, implement measures in the energy and climate sector to reduce and improve energy efficiency. The city has just started an ambitious project with a combined energy and comprehensive plan. A new traffic strategy began in 2012. An infrastructure for lending, borrowing and sharing, as well as maintaining, bicycles is under construction. Wind power plant has been established.

The city is working to improve the city's transportation system by participating in the EU project QUEST; 45 cities will participate in the project. The project aims to help cities become more systematic in their work for sustainable mobility. The municipality is also working on the project "New travel habits in the labour market region". Below are short descriptions of some of the projects.

A new and combined energy and comprehensive plan.

This is a new approach when it comes to comprehensive planning, to include energy planning in the process. The projects aims to combine two different and usually separate processes by developing a comprehensive plan and energy plan. First the city will make a mutual analysis of the current situation and key issues for Borås. Out of this, the city will then develop future scenarios and assessments. The outcome will be one energy plan and one comprehensive plan, but with the same targets. It will also include action plans and responsibilities. The work will focus on possibilities instead of problems, highlight current resources and provide inspiration for local initiatives.

Cycling on the embankment

The old railway embankment to the east is paved for cycling and walking. For horse riders there is also a trail with gravel surface. You reach the area from the cycle path network in Borås and can cycle to several towns in a distance of at most 40 km. "Kindbanan" is another disused old railway line suitable for cyclists. The parts that are still gravel will be paved. A special bicycle map shows bike routes in the city of Borås. Rural roads with low traffic flows which are suitable for cycling are also shown. The Bicycle map is available at the Tourist Office, City Library or at City Hall, but it can also be downloaded from the municipality's website.

Energy

Borås Energy and Environment shall secure infrastructure for the municipality regarding waste and energy. The company shall also promote good and sustainable energy supplies. Borås Energy and Environment will also produce energy in a sustainable way with minimal environmental impact and promote renewable energy sources. This is the foundation for Borås Energy and Environment to build two wind farms - Rångedala and Borgstena. Total annual electricity production in Rångedala and Borgstena is about 63 million kWh (63 GWh) from the four turbines in Rångedala and the five wind turbines in Borgstena. This represents about 7 % of total electricity supply Borås City, which is about 917 GWh.

During 2008 a new accumulator tank was built for the storage of hot water. Building the tank was a big step to achieving the target of a fossil fuel-free city. The project aims to reduce the fossil fuel heat production, increase power generation, reduce impact of production disruptions and create a better working environment

4.3 Malmö

Malmö has accomplished a lot of projects in terms of sustainable buildings, energy efficiency, mobility and renewable energy production. Below are some examples of energy projects and a description of two major urban development projects, Hyllie and Bo01.

Lillgrund

Lillgrund Wind Park is located approximately 10 kilometres off the south coast of Malmö, in the Öresund (the sound between Sweden and Denmark). Lillgrund is Sweden's largest investment in wind and to date, the third largest installation of off-shore wind energy in the world. The park produces 0.33 TWh of electricity per year, equivalent to the household electricity consumption of 60 000 homes.

Solar cells in Sege Park

Sege Park in Malmö, completed in summer 2007, features the largest photovoltaic plant in Sweden, consisting of 1250 square meters of solar cells with a peak power of 166 kW. It is also planned that this neighbourhood, featuring a former hospital, will also become an environmentally sustainable city district. The City of Malmö, together with Skåne Energy Agency, Lund's University of Technology and Solar Region plans to develop the region into the leading Nordic region in terms of production of solar energy.

Climate smart Hyllie

Hyllie, Malmö's largest development area, will lead the way towards Malmö becoming a sustainable city. By as early as 2020, Hyllie will be 100 % sustained by renewable or recycled energy. To reach the high sustainability ambitions for Hyllie, the City of Malmö, VA SYD and E.ON, in February of 2011, signed a climate contract for Hyllie. Under this contract, the City of Malmö, VA SYD and E.ON, jointly undertake to lay the foundation for Hyllie to become the most climate smart city district in the Öresund region.

Hyllie is at the forefront of the development of a sustainable energy system. The area will integrate, for electricity, heating and cooling, the smart grids and other intelligent energy solutions that will hallmark the future. A sustainable approach to transportation, waste management and recycling are other key cornerstones in Hyllie. The food waste will be used to make biogas for purposes such as fueling buses and garbage trucks. For transportation, Hyllie aims to make it easy to walk, cycle or use public transportation instead of taking your car. If

you still need a car, there will be access to carpooling in Hyllie. It will also be easy to charge your electric car or fill up using biogas.

Smart grids and smart energy solutions

Hyllie is at the forefront of the development of a sustainable energy system. The area will integrate electricity, heating and cooling, the smart networks and other intelligent energy solutions that will hallmark the future. Smart grids and smart energy solutions will also enable people to actively be able to measure, monitor, control and influence their own energy consumption using smart energy solutions, and be able to independently produce energy.

To enhance the efficiency of energy consumption, building contractors that are interested can install flow meters for the individual metering of hot tap water and heating. When combined with Hyllie's energy efficient properties and the use of electric and biogas-fueled vehicles, this will result in enhanced energy consumption efficiency and less of an impact on the climate.

Eco city of Augustenborg

Augustenborg is a residential area and one of the key aims of the project is to enable residents to take a leading role in the ideas, design and implementation of the project. The project also includes the school, industrial area and other local businesses in the area. The project was launched in 1998 and the results so far indicate that Augustenborg has become an attractive, multicultural neighbourhood in which the turnover of tenancies has decreased by almost 20% and the environmental impact has decreased to a similar degree.

Eco-building

The 1950s character of some of the buildings was damaged in the 1970s by covering the facades with external insulation and steel sheeting. This has also had a negative effect on the internal environment in certain houses causing problems with damp, ventilation and temperature control. The appearance of the houses is now more like the original and the energy efficiency has increased by about 10 % compared with the 1998 status of the buildings or approximately 35 % more efficient than the original status of the building.

A new school building has been built using natural materials, a high level of natural lighting, ground source heat pumps, solar thermal panels, composting toilets and a number of other finesses to create pleasant classrooms in the school. The building is a factory made by modular construction which can be removed and relocated in another school in the future if pupil numbers in Augustenborg decrease.

Improved accessibility has also been behind the conversion of one high rise block and the construction of a new two storey building, both earmarked for senior residents. The lack of lifts in the area was one of the driving forces behind this. The new building is a lightweight concrete structure built with prefabricated units on the roof of an underground garage. The building has an interesting design, good general environmental performance and green roofs.

Energy efficiency and production

A number of initiatives have been undertaken throughout Augustenborg to increase resource efficiency by up to 20% compared to 1995 levels. Measures to increase energy efficiency have been undertaken throughout the neighbourhood, optimising heating and hot water systems and cutting electricity use.

The apartments are prepared for individual measuring of hot water when the old plumbing is replaced. The possible energy saving effect is large since the residents then will be able to regulate their use of water completely and hence also control their environmental impact. A

third of all heat is used for hot water. A pilot project for individual measuring has been carried out, but the conclusion was that presently there are greater gains from a central control system. Some residents have taken part in a programme to weigh in their CO₂ and then work together to find ways of decreasing their carbon footprint.

Ideas from residents are behind the large solar energy project in Augustenborg with 450 m² solar panels in the industrial area connected to the central heating system and solar panels on the new school building, and a number of demonstration photovoltaic systems in the industrial area. The Augustenborg solar project was the starting point for Solar City Malmö which operates all over Malmö. In spring 2009, a wind power plant was installed at the local school.

Mobility

A local survey indicated a difficult traffic situation in the area. The survey, carried out by the residents themselves, eventually resulted in an overview of the traffic situation. Restructuring of the street Augustenborgsgatan has diminished through traffic substantially and a number of measures have been taken to increase safety by the school. A new exit to the industrial area is the next step, so that heavy vehicles will no longer be passing the school entrance.

Residents have started a car pool in 2001, which now is a part of the regional not-for profit Skånes car pool. The car, fuelled by ethanol or biogas, is parked close to the square and is used by members in the area and from other parts of Malmö.

The Green City

Residents, pupils and people working in the area have been involved in the design of the outdoor environment to create new habitats whilst increasing amenity. Flowering perennials, native trees, fruit trees and wetlands are key features whilst bat and bird boxes provide additional accommodation on the housing estate. All the 30 gardens in Augustenborg have been renewed within the project.

The storm water system has gone through a major change. Green roofs and open storm water channels leading into ponds have stopped the flooding in the area and have created a beautiful environment and a richer biodiversity. The houses have 2 100 m² of green roofs, apart from the large facility at the Botanical Roof Garden covering 9 000 m². There are a total of 6 km canals and water channels in Augustenborg. 90 % of the storm water from roofs and hard surfaces is led into the open storm-water system in the housing area. The aim the project was that 70 % of all storm water should be taken care of for the whole of Augustenborg.

Waste management

Today there are 15 recycling houses with full recycling and composting facilities for the 1 800 inhabitants of Augustenborg. The aim is that 90 % of the waste from Augustenborg will be collected and recycled, re-used etc. Today that number is around 70 %. The houses were based on design ideas from some of the residents who had been involved in the initial recycling pilot project. In the recycling houses there are containers for paper, cardboard, coloured glass, uncoloured glass, metal, plastic and batteries.

Composting food waste started early on in the 13 recycling houses. More than a third of the waste was turned into fertile compost in less than eight weeks. In 2008 Augustenborg was chosen as a pilot area for separating food waste to make biogas. Within the pilot programme all of the waste flows in the neighbourhood will be analysed and a new information campaign will take place. There is also collection of hazardous waste, electronics and fluorescent tubes. The collection of electronic waste has generated 3 250 kg in six months.

5 Needs and priorities

All cities have developed action plans for implementing measures and specifying the actions needed to reach the targets. All cities work with planning for more compact cities to avoid urban sprawl, increased and improved public transportation and biking roads, converting from fossil fuel to fossil fuel-free in heating systems. Many things are done but there are also some difficulties, for examples.

- A lack of business models that encourage long term investments
- Collect and use correct data
- Knowledge in the building sector
- Large needs for good transportation system and a long tradition for cars and road vehicles
- Enough space for traffic other than cars
- Different actors within the city sub-optimizes solutions
- Cooperation around complex issues such as transport is hard to achieve

5.1 Bergen

Clear division of responsibilities and active involvement

Energy and greenhouse gas emissions are cross-sector themes involving many participants, where climate objectives partly coincide with, and in part stand in opposition to, targets for other communal spheres. To achieve results from this Action Plan it is important that the agencies and organisations involved take responsibility for, and ownership of, the various measures and that the climate effect becomes the main theme of activities and measures at all levels. Some of the proposed measures that have the greatest energy and climate effects will require long-term planning.

Annual audit and monitoring

The plan requires monitoring. Therefore an annual audit of the Action Plan is proposed, where the status of emissions and the packages of measures are monitored. Monitoring and necessary revisions need to have firm foundations among those responsible for the measures. In addition to annual reporting to political superiors, it may be useful to establish specialist groups that correspond with the procedural methodology of this plan. The organisation of these groups and their mandates need clarification and the groups should consist of central specialist agencies with participation by partner organisations and business and commerce. "Sustainability Management in the Municipal Sector", where Bergen Municipality is the pilot, is a systems solution for supporting the municipality's work on climate amongst other things. The purpose of this systems solution is that plans and measures implemented are documented, and the effects of the various measures are analysed. This applies, inter alia, to climate accounting being used to document the status of, and changes to, the Municipality's contribution to the national consolidated climate accounts. It may be crucial to have this in place if, for example, the introduction of further incentive mechanisms for municipalities in connection with emission reductions is considered.

Monitor development trends

There are no adequate statistics for municipal emissions of greenhouse gases. The figures published by Statistics Norway are calculations based on a range of data sources, partly municipal figures and partly statistics at a regional and national level broken down to municipal level. This means that some local circumstances and municipality-specific variations are not captured. Therefore it is necessary to develop a set of local indicators to monitor

development closely. Work on this is in progress in Bergen Municipality, through the project “Sustainability Management in the Municipal Sector”.

Implementation requires resources

The direct budget costs of climate measures vary widely. Moreover it is not correct to allocate all the costs of a measure to “climate policy” when the justification is also associated with other needs. This applies to a great extent within land-use and transport policy where climate considerations coincide with targets for better local environmental conditions and efficient transport development. Even if there are objectives that coincide and the costs cannot be linked exclusively to climate considerations, an ambitious climate policy must be followed up by freeing-up budgets and by administrative resources being provided to enable the measures to be implemented and monitored. Use of national subsidy schemes such as Enova and Transnova, among others, will be important resources for implementing local measures.

5.2 Borås

A lack of business models that encourages long-term investments in energy friendly housing is a particularly big barrier for the City of Borås. There are no measures in the Borås City Environmental Objectives 2013-2016 that respond to this challenge; however, there are other actors in the city that work with the issue.

When it comes to the transport and mobility issues, in-depth knowledge is needed on how we as individuals transport ourselves around the city and how we motivate our choices of transport. The mobility patterns and the barriers that prevent us from using public transportation are also important to gain deeper knowledge about.

There are also needs for a visualised energy model that allows for understanding energy usage over time and place. Knowledge is critically needed on how this can be achieved.

A major barrier is a lack of knowledge on how cross-sector cooperation around these issues is to be achieved as well as the fact that different actors operate on a suboptimal level. The transport and mobility measures respond to the challenge through involving different stakeholders in the city. However, cooperation around complex issues such as these is hard to achieve.

It is interesting to discuss the relevance of different targets, and the level of ambition. It is also important to discuss how much work it will take to reach the targets. Can this be done within the mandate of the city or are other measures needed, like national legislation.

Another important issue to discuss is stakeholder involvement. There is a strong support from the politicians in Borås to increase stakeholder involvement in planning processes. However, there is a lack of knowledge around this issue. How to work with this, methods and implementation and overall capacity building, is highly requested.

5.3 Malmö

Biogas

A number of measures at national, regional and local level are proposed to meet the energy and climate targets. Measures include an energy efficient construction and powerful counselling interventions for both households and businesses and a significant shift to public transport. Particularly urgent in Malmö and the region of Skåne is to emphasise the

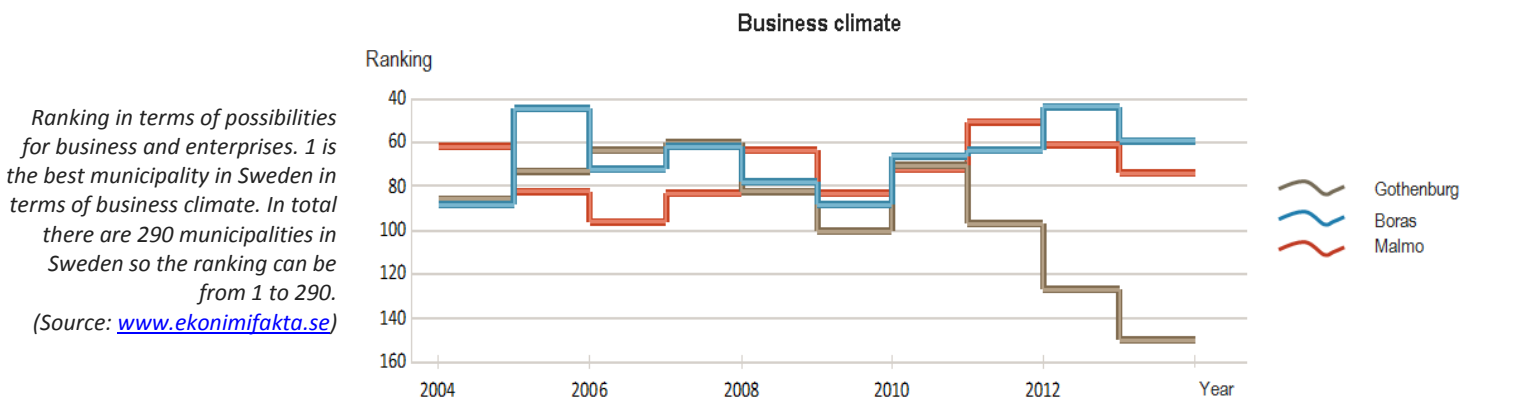
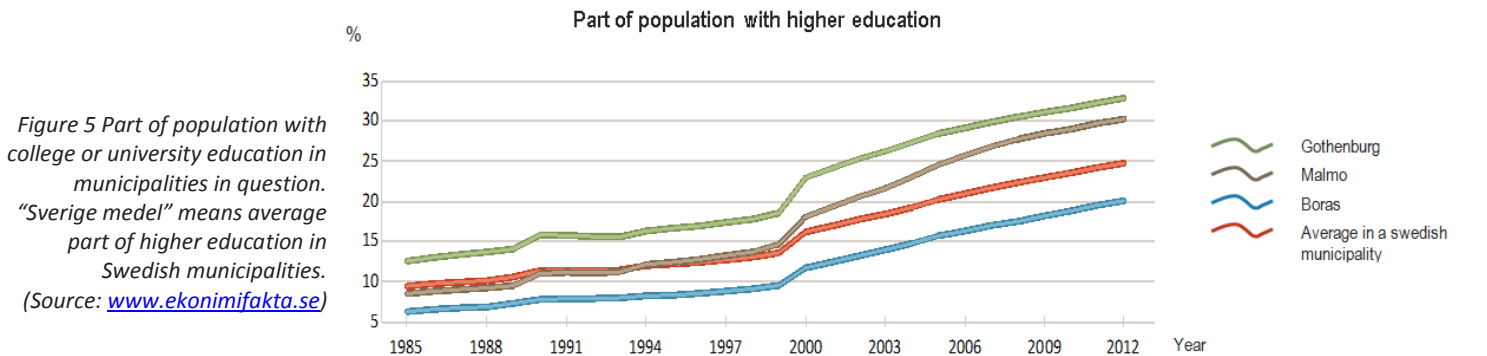
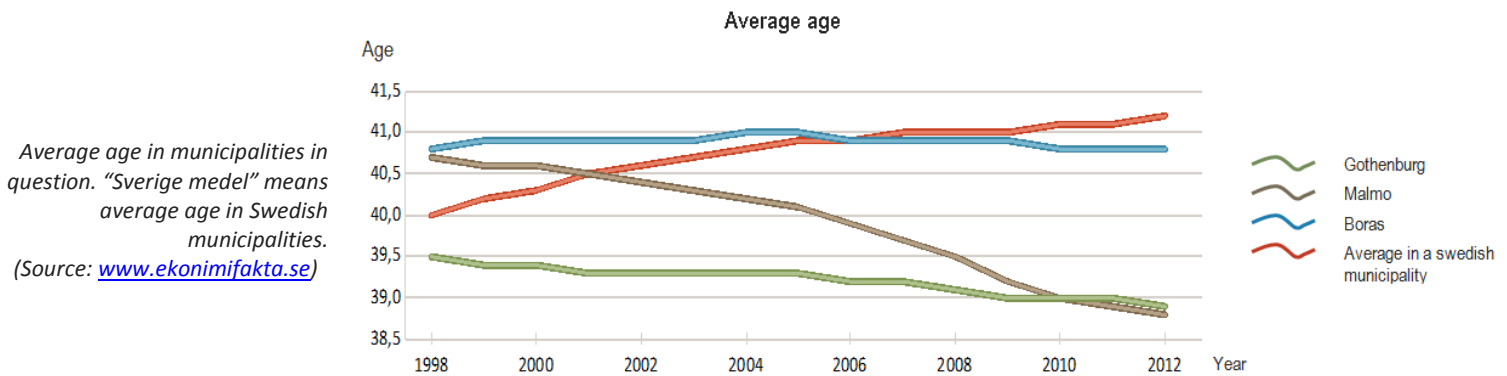
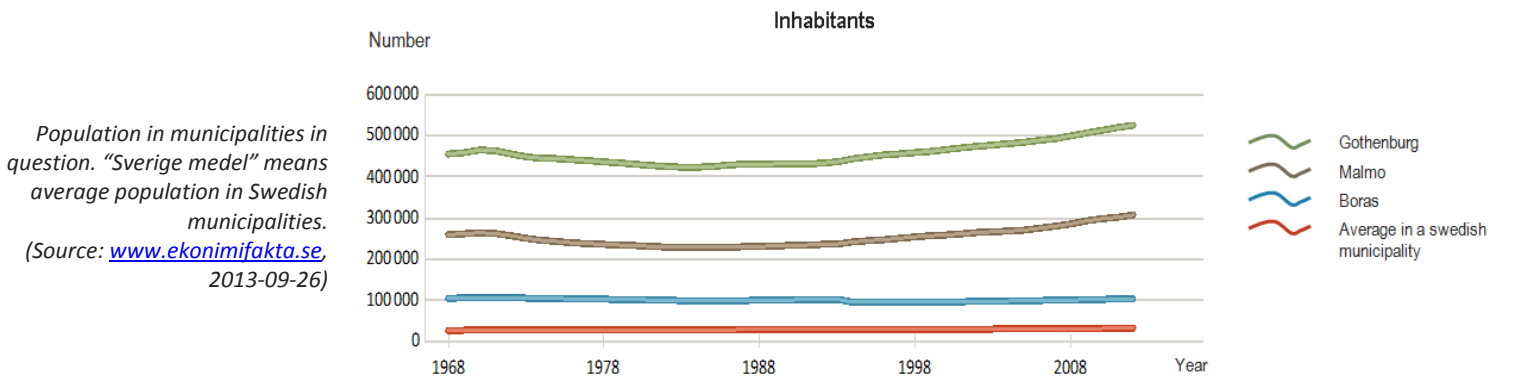
possibilities to produce and utilize biogas, for example by utilizing biological waste from households and businesses. A further consideration is the importance of investment in research and business development within the energy sector.

Global - local

The greenhouse effect clearly shows the connection between global and local. Local emissions of carbon dioxide have a global impact. Malmö has, in recent decades, reduced energy use and emissions among other things through improvements in district heating systems but also because of a change in industry structure, where heavy industry has been phased out. A large part of Malmö's former industrial products is now manufactured elsewhere in the world, with continued high energy impact. This means that energy use and emissions globally is unlikely to be smaller. This points out the difficulties in defining the appropriate measure for comparing the energy output and emissions between different times and places. It also raises the need for international cooperation.

6 Appendix

Appendix 5.1 – Graphs and figures, Swedish municipalities



Appendix 5.2 – Bergen, Norway, June-September 2013

Table 5.2.1 Main figures for energy use in Bergen in 2006. (Source: Climate and energy plan Bergen, 2010)

	Electricity [GWH]	Oil/paraffin [GWH]	Gas [GWH]	Bio-fuels [GWH]	Waste, coke [GWH]	Total [GWH]
Households	1,815.4	181.3	60.8	126.0	2.2	2,185.7
Public service provision	587.2	75.1	54.4	0.0	0.0	716.7
Private service provision	907.7	139.2	4.6	1.7	0.0	1,053.3
Industry	390.8	72.4	23.7	0.0	0.0	486.9
District heating	0,0	22.2	30.9	0.0	309.0	362.2
Other	14.2	5.9	0.0	0.0	0.0	20.0
Total	3,715.3	496.1	174.5	127.8	311.3	4,824.9
KWH per household in the Municipality	16,287	1,626	546	1,131	20	19,609
KWH per household in the County	18,102	911	386	2,130	13	21,541
KWH per household nationally	18,738	1,173	80	3,751	1	23,743

Table 5.2.2 Emissions of greenhouse gases in Bergen Municipality, tonnes CO₂ equivalents. (Source: Climate and energy plan Bergen, 2010)

	1991	1995	2000	2007	2007 %
Stationary combustion	151,816	128,785	136,999	161,578	21.4 %
Industry	31,806	32,742	21,622	36,042	4.8 %
Other commercial	54,572	56,676	51,401	55,653	7.4 %
Households	65,424	39,345	43,040	43,599	5.8 %
Other stationary combustion	15	23	20,936	26,285	3.5 %
Process emissions	148,963	126,147	100,306	81,336	10.8 %
Industry	1,499	1,734	2,562	2,934	0.4 %
Waste disposal sites	114,789	90,731	66,125	54,904	7.3 %
Agriculture	16,015	14,018	11,992	7,844	1.0 %
Other process emissions	16,659	19,665	19,626	15,654	2.1 %
Mobile sources	344,620	363,432	390,851	512,938	67.9 %
Road traffic	295,480	299,413	322,151	419,374	55.5 %
Passenger cars	234,550	228,597	245,581	320,801	42.4 %
Trucks and buses	60,929	70,817	76,570	98,573	13.0 %
Ships and fishing	9,435	9,766	10,944	12,243	1.6 %
Other mobile sources	39,705	54,253	57,756	81,320	10.8 %
Total emissions	645,399	618,364	628,155	755,851	100.0 %

Table 5.2.3. Reduced greenhouse gas emissions to reach climate policy objectives for Bergen, consolidated and divided by emission sectors if the same targets are to apply to all emissions. Tonnes CO₂-equivalents (source: Climate and energy plan Bergen, 2010)

Emission source:	Emissions 1991	Emissions 2030 Rel to 50% tgt	Emissions 2030 Rel to 100% tgt	Emissions 2007	Reduction required for 50% target	Reduction required for 100% target
Stationary combustion	151,816	75,908	0	161,578	85,670	161,578
Process emissions	148,963	74,481	0	81,336	6,854	81,336
Mobile sources	344,620	172,310	0	512,938	340,628	512,938
Total emissions	645,399	322,699	0	755,851	433,152	755,851

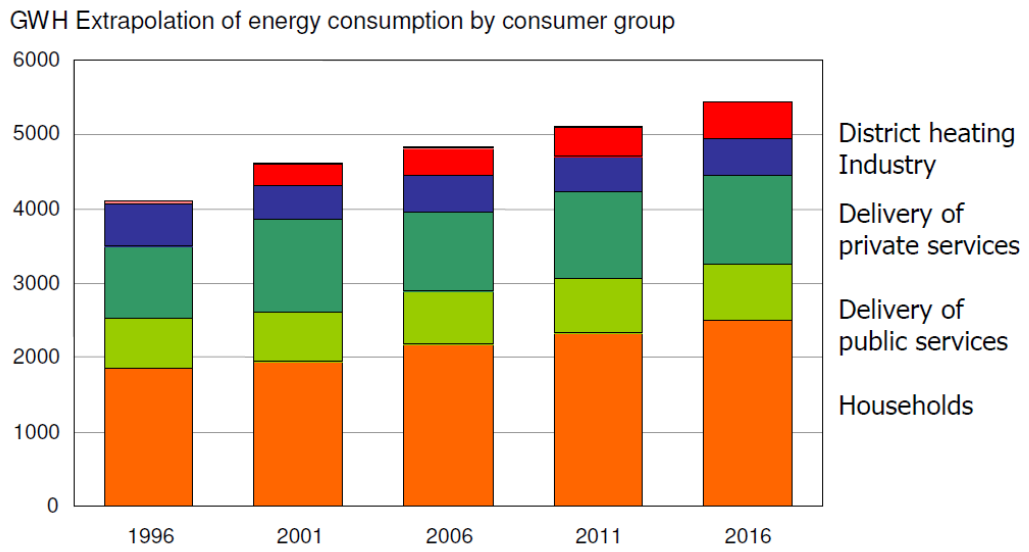


Figure 5.2.1 Stationary energy consumption by consumer group (Source: Bergen climate and energy action plan, 2010)

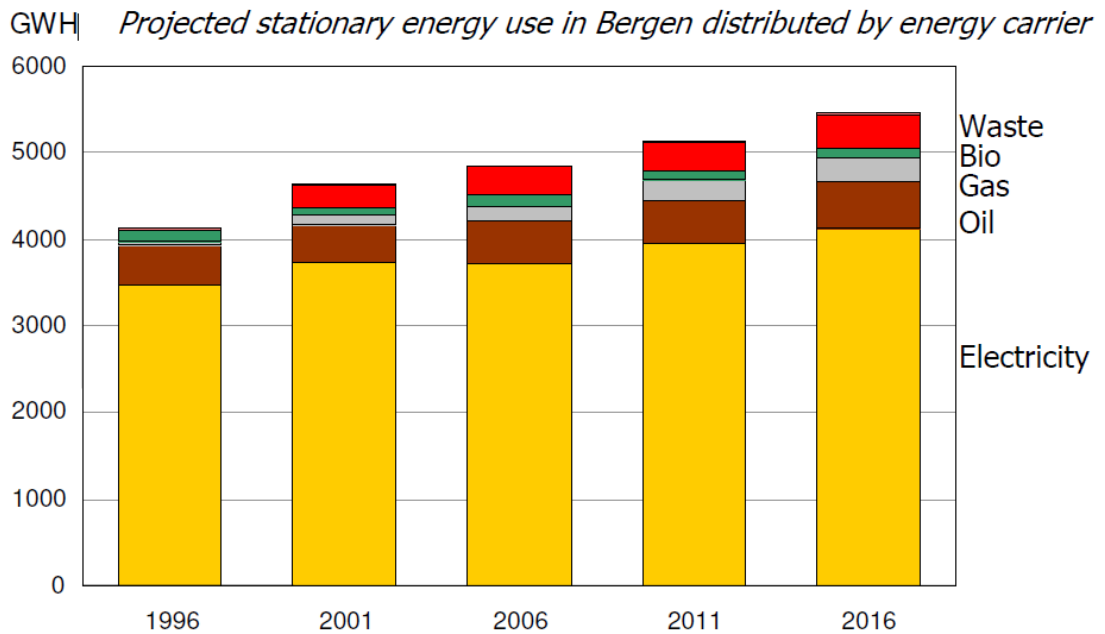


Figure 5.2.2 Projected stationary energy use in Bergen distributed by energy carrier (Source: Bergen climate and energy action plan, 2010)

Interview

Interview with Elisabeth Sorheim. Climate department at the City Council in Bergen. Department sustainable city at the Service Energy and Environment. A meeting and the first part of the interview was carried out in June 2013, by Anna Svensson, City of Gothenburg. The rest was done by Elisabeth during September 2013.

Title of the document	City	Date	Language	Short explanation
Cities of the future	Bergen	No info	ENG	
Climate and Energy action plan	Bergen	No info	ENG	Climate Plan on which the SEAP is based
Bergen aims for carbon neutrality	Bergen	No info	ENG	Information about some of the attractions of the Bergen of the future. We are working on: Land use and transport, Heating consumption, Patterns and waste, Adaptation to climate change.
The city is Bergen	Bergen	No info	ENG	Overall information on Bergen
Water and life of the city	Bergen	2010	ENG	Water resources and management and adapting to the climate.
Energy efficiency	Bergen	No info	ENG	
Kommuneplanens arealdel	Bergen	2010	NOR	Comprehensive plan for Bergen

Appendix 5.3 - Borås, Sweden August-September 2013

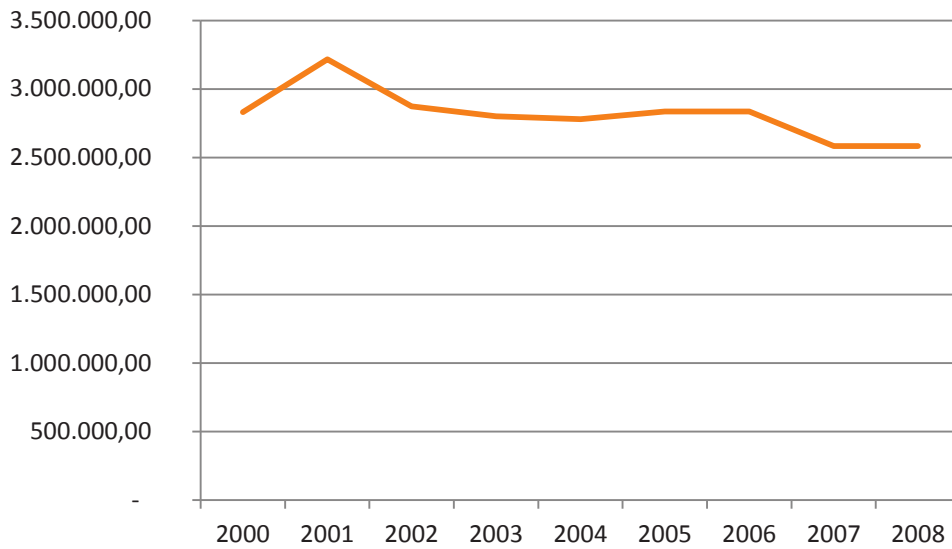


Figure 5.3.1 Total energy use (MWh) in Borås from year 2000 to 2008. (Source Statistics Sweden, SCB; www.scb.se)

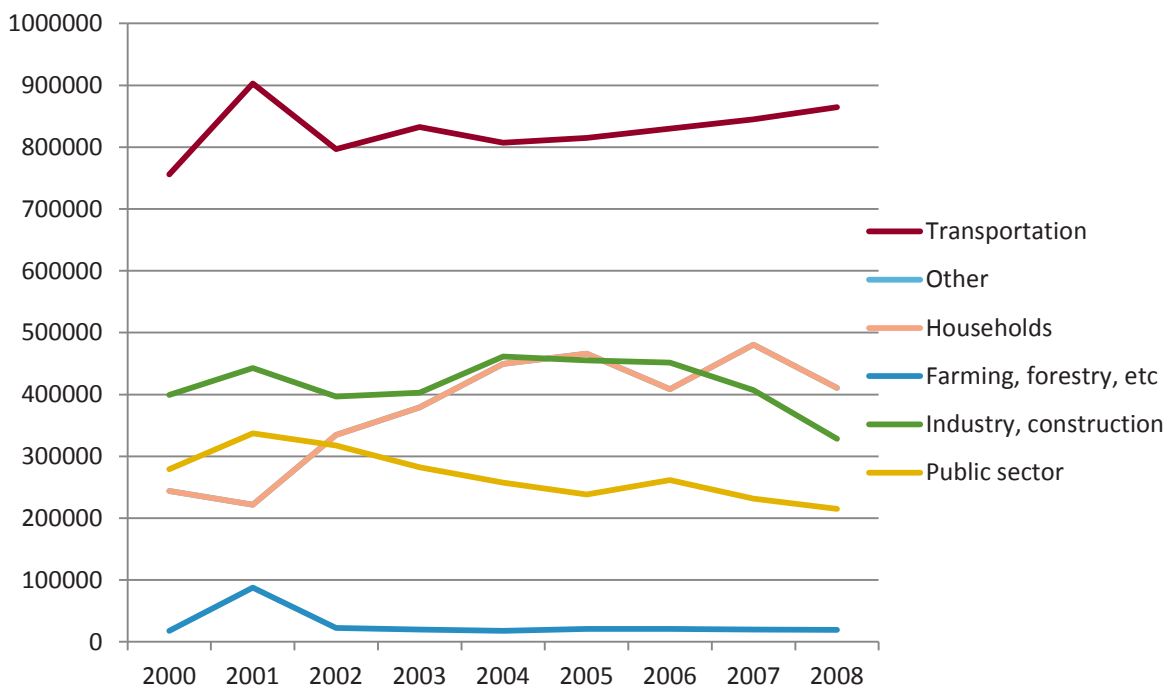


Figure 5.3.2 Total energy use (MWh) per sector in Borås from year 2000 to 2008. (Source Statistics Sweden, SCB; www.scb.se)

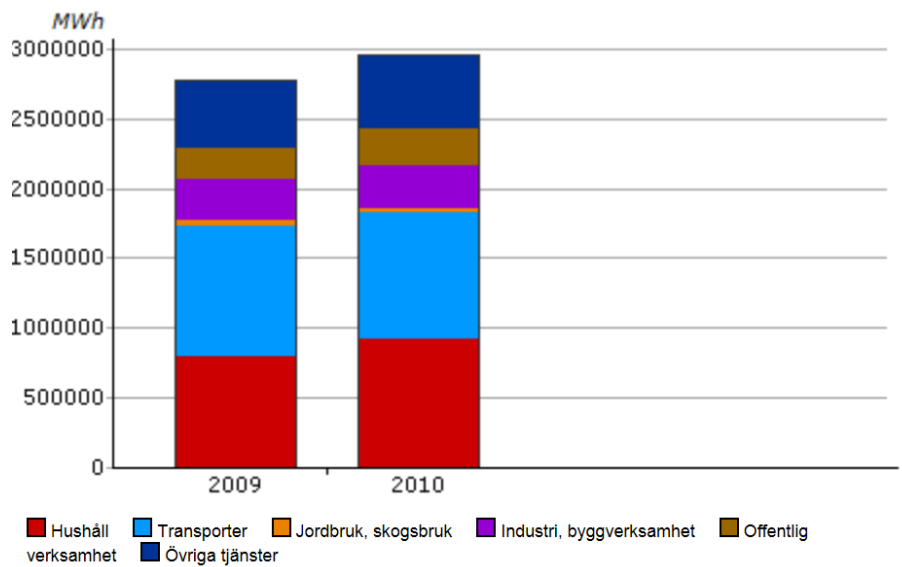


Figure 5.3.3 Energy use per sector in Borås (Source City of Borås).

CO₂-emissions from energy use in the geographical area of Borås per inhabitant

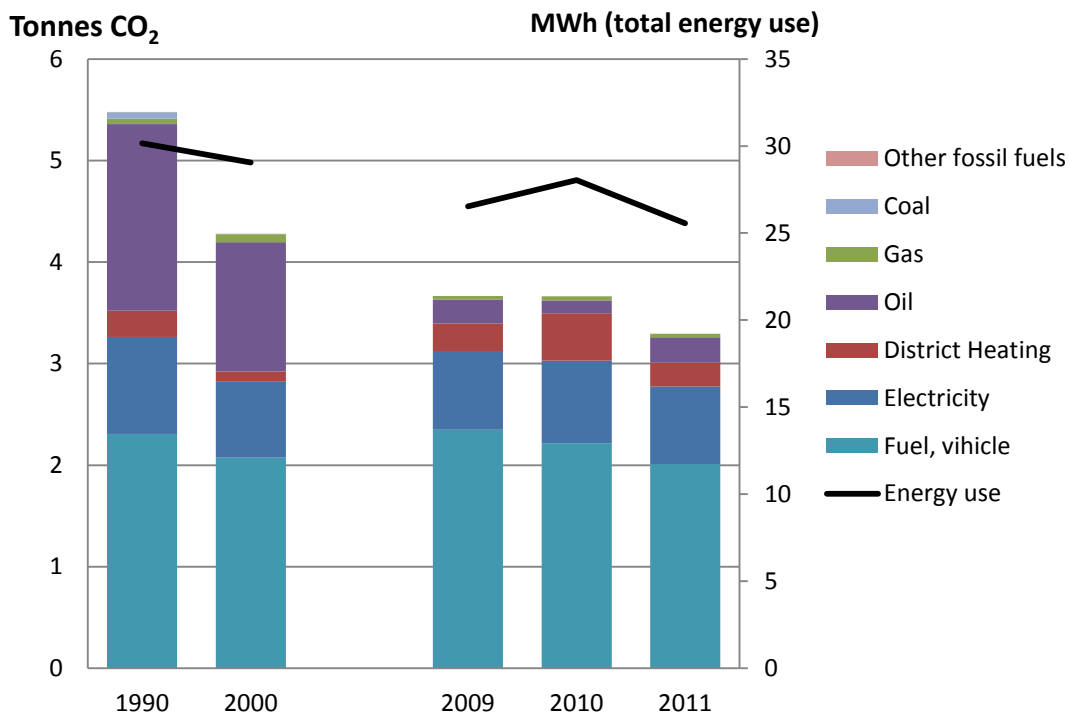


Figure 5.3.4 CO₂-emissions per capita, from energy use in the geographical area of Borås (Source City of Borås).

Interview

Interview with Heiti Ernits, chairman of the Environment and consumer committee in Borås, by Erica Eneqvist, SP, August 2013. Completed by Stefan Molnar, SP, in September 2013.

Title of the document	City	Date	Language	Short explanation
Vision Borås 2025	Borås	2012	SWE (English summary)	A vision for Borås until 2025.
Borås stad miljömål 2013-2016	Borås	2013	SWE (English summary)	An updated version of the environmental goals for Borås.
Miljörapport 2011	Borås	2012	SWE	Environmental annual report A report of the environmental state in the city. All indicators and measurements for sustainability are reported and compared to targets.
Miljörapport 2012	Borås	2013	SWE	Environmental annual report A report of the environmental state in the city. All indicators and measurements for sustainability are reported and compared to targets.
Cykelbokslut	Borås	2011	SWE	Annual report of cycling in Borås, which measures are in place and which have been started during the year.
Översiktsplan Borås	Borås	2006	SWE	Comprehensive plan Borås
Miljöåret 2012	Borås		SWE	Annual Environmental report from "Borås Miljö och Energi" the municipality owned energy company

Appendix 5.4 – Malmö, September 2013

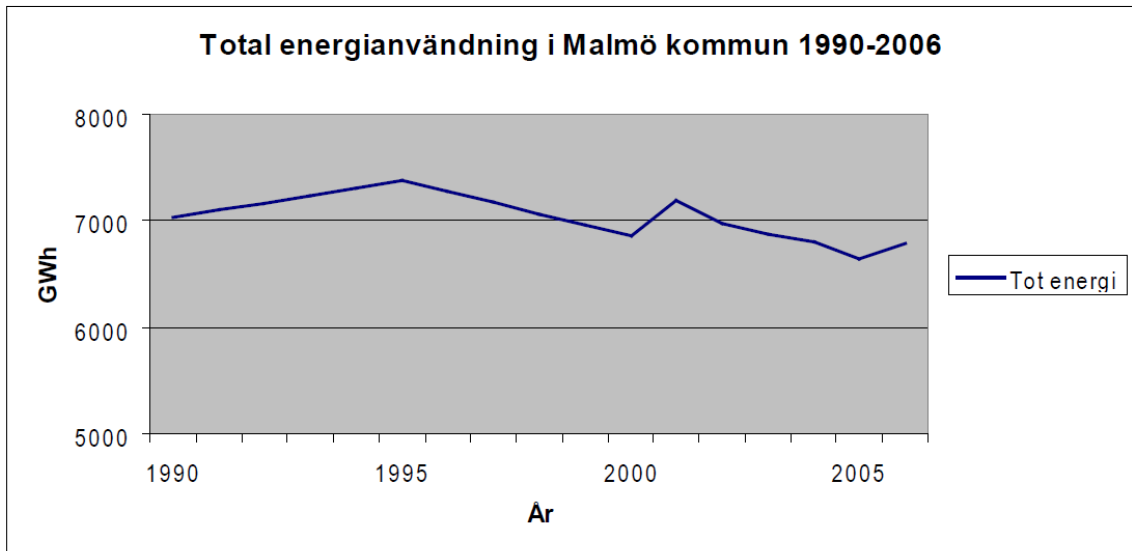


Figure 5.4.1 Total energy consumption in the city of Malmö from 1990 to 2005. (Source Energy strategy for Malmö, 2009)

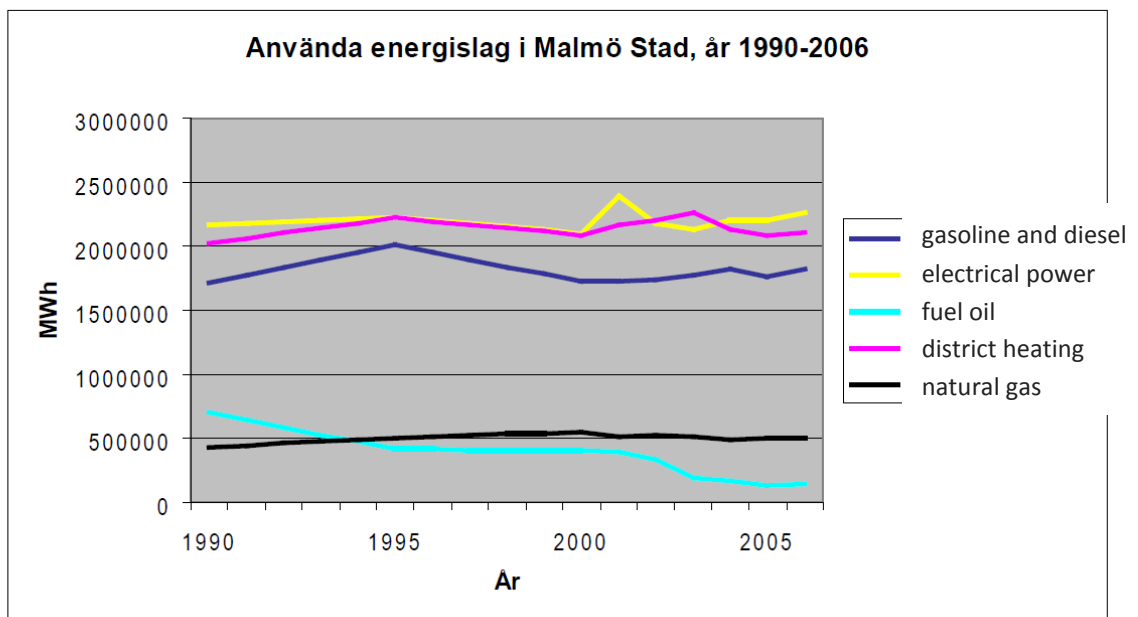


Figure 5.4.2 Total energy consumption per sector in the city of Malmö from 1990 to 2005. (Source Energy strategy for Malmö, 2009)

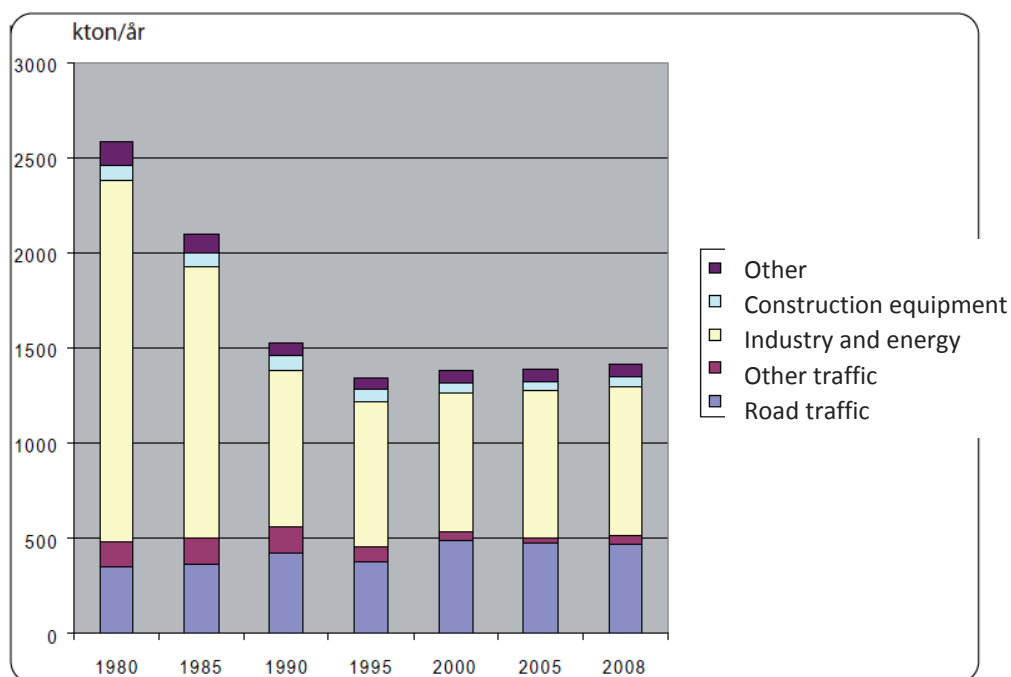


Figure 5.4.3 Total CO₂ emissions per sector in the city of Malmö from 1980 to 2008, kiloton per year. (Source Energy strategy for Malmö, 2009)

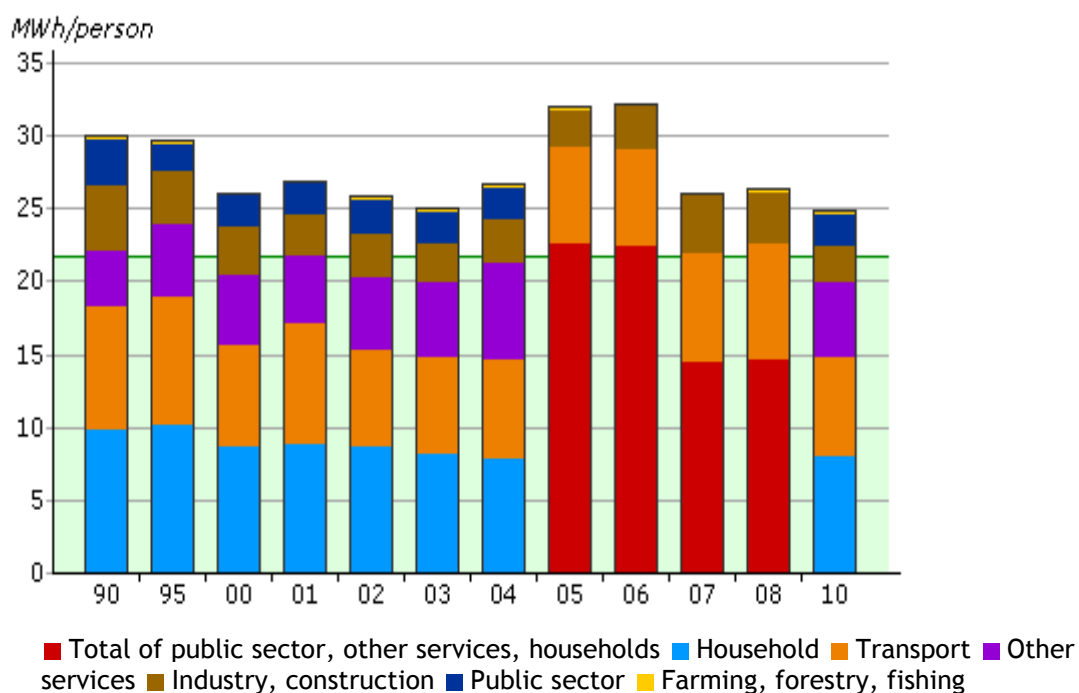


Figure 5.4.4 Total energy consumption for the city of Malmö per sector, MWh/capita (2010). The statistics are from Miljöbarometern (Environment Survey). (Source: www.miljobarometern.se, SCB)

The green field shows Malmö's target – energy reduction with 20 % per person until 2020. There is no explanation of the high energy use in 2005 and 2006, but there are statistical uncertainties. Apart from that the energy consumption has been rather stable the latest 10 years

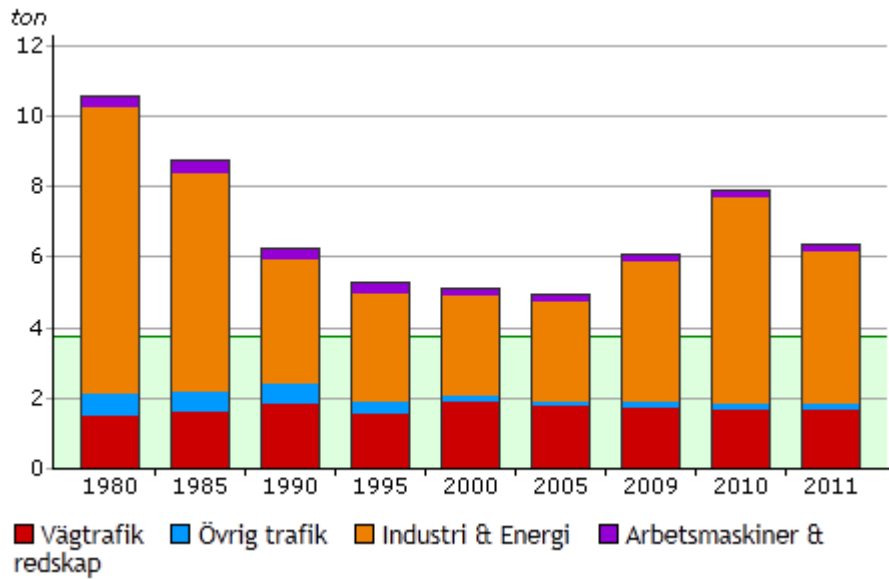


Figure 5.4.5 Total CO₂ emissions per person in the city of Malmö from 1980 to 2011. (Source Energy strategy for Malmö, 2009)

The green field shows Malmö's target – reduced emissions by 40 % until 2020 compared to 1990, which means an emission of 3,73 tonnes CO₂ person

Interview

Interview with Malin Norling at the environmental department in the city of Malmö.

By Anna Wenstedt, City of Gothenburg

Title of the document	City	Date	Language	Short explanation
Energistrategi för Malmö	Malmö	2009	SWE	Energy strategy (SEAP) for Malmö.
Sustainable city Malmö	Malmö	2013	ENG	Sustainable City is a magazine about sustainable development in Malmö
Integrating Ambitious Renewable Energy Targets in City Planning	Malmö (by ICLEI WS)	No info	ENG	About Malmö's work with reducing greenhouse gas (GHG) emissions and increasing the share of renewable energy (RE)
Climate-smart Malmö - Making sustainability reality	Malmö	2009	ENG	About climate challenges in terms of transportation, energy and consumption.
Översiktsplan för Malmö Planstrategi Utställningsförslag	Malmö	2012	SWE	Comprehensive plan for Malmö