

# Fossil Fuel Free Växjö

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## 1. City Profile

### 1.1 Location, geographic situation

Växjö is located in the south of Sweden. The area is 1,925 km<sup>2</sup> and consists mostly of forests and lakes, with a small proportion of agriculture.

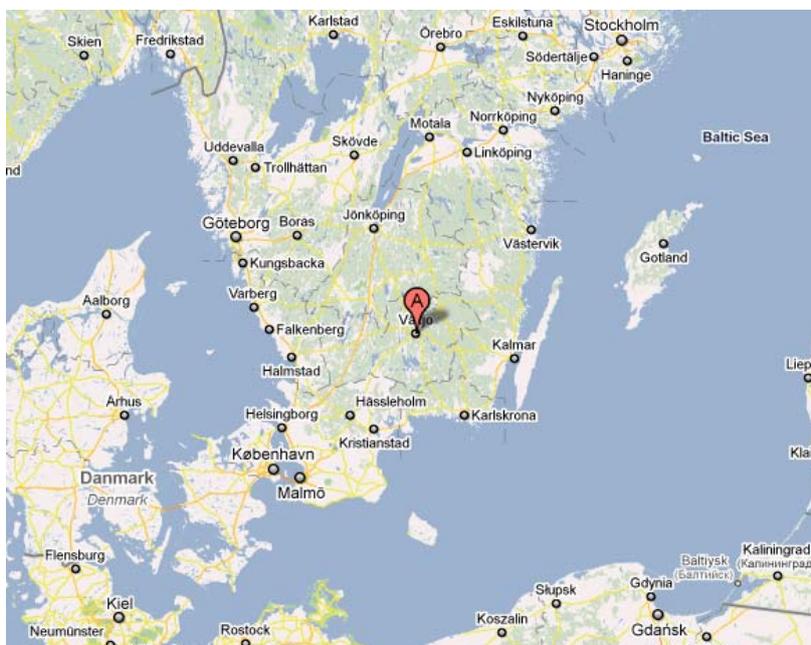


Figure 1. The geographical localization of Växjö.

### 1.2 Size, population

Växjö has 82,000 inhabitants, of which nearly 60,000 live in the city. The rest live in the countryside or in the smaller urban areas.

### 1.3 Demographics, business and industry

When comparing the demographics in Växjö with the one for Sweden, one can see that the older part of the population is lower in Växjö than for the whole country. Växjö has a larger amount of people in the age between 20 and 30 years, compared to Sweden. At the same time, the number of births has increased slowly the last years.

Växjö is the central city of the county of Kronoberg, with a university and around 8 000 companies. The service sector as well as commercial and educational sectors is the basis for the local businesses. Access to the many forests is the basis for the climate politics of Växjö. Växjö is actually lying in the middle of the woodshed – the source of bioenergy. Trade and industry contains a great variety.

### 1.4 Other relevant information to the cities work on sustainability and climate change

The active environmental work in Växjö started already in the 70s. Then, the water quality of the lakes was the main issue. Växjö has been called "the greenest city of Europe" by many

journalists, a recognition which also is a leading star in the work towards a sustainable city. The municipality has a vision to be fossil fuel free and has already carried out a number of climate and energy saving measures. The CO<sub>2</sub> emissions per capita have decreased by 34 % between 1993 and 2009.

## **2. Current climate impact and measures**

### **2.1 Current energy system?**

The energy supply (including energy for transport) to Växjö is about 2400 GWh/year, of which 56 % comes from renewable energy sources, mostly biomass. Fossil fuels are mostly used within the transport sector. The municipality owned energy company, VEAB, produces both district heating and electricity. All district heating and 25-30% of all the electricity needed by VEAB's customers is produced in the Sandvik plant. From 1997 onwards the share of biomass fuels being used is over 90%. There are also local district heating plants in the villages Lammhult, Ingelstad, Rottne and Braås. The benefits are the same as for large-scale district heating, although the technology has been modified to operate at lower pressure and temperature. VEAB has recently started its work to also supply large customers with district cooling – cooling based on district heating instead of electricity.

In Växjö there is also production of electricity from other renewable energy sources (wind, hydro, biogas, solar) but not at all to the same extent.

### **2.2 What is the level of CO<sub>2</sub> emissions today? From which activities or sectors?**

In 2009, the total emissions from all activities within the geographical area were approximately 247 000 tonnes, equivalent to 3 tonnes per capita. Roughly, 68 % of the emissions come from transport, 10 % from machinery, 10 % from households and 12 % from business, industry and public sector.

### **2.3 Climate mitigation and adaptation – achievements so far**

#### **2.3.1 What has been done? Results?**

##### *Taking the first steps*

The first steps towards a biomass-based energy supply were taken already in 1980. After the oil crises in the 70s, the municipality owned energy company, Växjö Energy Ltd (VEAB), wanted to find a way to be less vulnerable and less dependent on what was going on in the world. Alternatives to oil were to be found – alternatives that would guarantee a secure supply, and with more stable price. The answer turned out to be biomass. Växjö is surrounded by forests, and the forestry industry could provide VEAB with lots of wood chips and saw dust, that they had no use for themselves. This material was also cheaper than using oil. In 1980, Växjö was the first city in Sweden to start using biomass in the production of district heating, even though the majority of the energy still came from oil. However, during the decades, the share of oil has been minimized to around one percent.

So, the reason for starting to use biomass for heating in Växjö was to be more self-dependent on energy. There were some positive side effects though; it was more environmental friendly

(even if almost nobody talked about climate change in those days), it could generate more local jobs – which would also generate more tax income to the city. And in the beginning of the 90s, when the national CO<sub>2</sub> tax was introduced, the use of biomass turned out to be a really good solution from a financial point of view. This also meant cheaper energy to the citizens connected to the district heating system, compared to if oil would be used in a larger extent.

#### *Time to make a decision*

In 1995, the City of Växjö started a cooperation with Sweden's biggest environmental NGO, the Swedish Society for Nature Conservation (SSNC). Växjö wanted to start lots of environmental projects, but we wanted someone to verify that we were doing the right things. The cooperation was to last in three years to start with. During the cooperation, lots of seminars and educations were arranged. There was an intense dialogue between the SSNC, the city staff and the politicians, but also, lots of roundtable meetings were arranged where companies, other NGOs and citizens could attend and contribute with their ideas. This was the true start of the local Agenda 21 work.

During this cooperation, the SSNC wanted to see if Växjö could be unique and outstanding in some way. Together with the staff and politicians they saw the potential when it comes to local work on a global problem – the climate change caused by emissions of greenhouse gases. This was in 1996, the year before the Kyoto protocol was written. The climate debate started to become intense in the international arena. Locally, Växjö had already had good experience with the use of biomass for production of heat and power, Växjö University was well-known for its biomass research, and also some companies were working actively within the bioenergy or forestry sectors. In Växjö, there was a potential to achieve good results, if everyone participated.

A seminar was arranged, in which experts talked about the importance of reducing the CO<sub>2</sub> emissions and companies and other actors explained their views on a fossil fuel free Växjö. In the end of the day, the Mayor said that it is not possible to continue using fossil fuels. And very soon, a unanimous political decision was taken:

- Växjö shall be a fossil fuel free city (in its own organisation and in the total geographical area)
- The fossil CO<sub>2</sub> emissions shall be reduced by 50 percent per capita until 2010 compared to the level of 1993.

There was no decision defining when Växjö should be totally free from fossil fuels, however, there is a regional target saying that the County of Kronoberg, shall be more or less fossil fuel free in 2050, which mean that by then, also Växjö should have achieved its vision. In 2010, when revising the Environmental Programme, the CO<sub>2</sub> reduction target was revised to minus 55 percent per capita until 2015 and minus 100 percent until 2030.

After the Fossil Fuel Free Växjö decision, the national and international media coverage of Växjö started, and when it was time for the Kyoto conference, several reports were made from Växjö. People wanted to find out why a small city decides to stop using fossil fuels, since it will clearly not have any big impact on the global emissions. But since the global emissions of greenhouse gases are the sum of all local emissions, it means that every effort made at local level is important.

It became obvious that some kind of action plan was needed. In 1997, the Government of Sweden announced that they would allocate around 600 million € to local environmental investments. A municipality could apply for financial contribution to a wide range of projects in a Local Investment Program (LIP) for ecological development. The program could consist of projects owned by the city administration, companies or NGOs. This turned out to be a good opportunity to gather local actors to different thematic dialogues to discuss; a) what kind of projects could be part of Växjö's LIP, and b) what actions would be implemented in a local Agenda 21 strategy. This was the start of the drafting of a local action plan for a Fossil Fuel Free Växjö. Many of the climate related projects in Växjö have been financed partly, either by the Government or by the European Commission.

In the struggle to reduce the CO<sub>2</sub> emissions, it is necessary to work with many different actions. Växjö's strategy for a change to a fossil fuel free community comprises a combination of changed behaviour, energy efficiency, and transition to renewable energy in heating, power and transport.

One important thing to mention is that when the decision was taken, nobody really knew neither if it is possible to achieve the goal for 2010, nor what kind of actions that needed to be carried out. Also, since the baseline for the goal was 1993, it meant that we were already at quite a low level, due to the introduction of biomass in the heating and power production in the 80s. In 1993, the CO<sub>2</sub> emissions were only 4 576 kg per capita – and that include emissions from heating, power and transport. The goal to achieve in 2015 is therefore 2 059 kg per capita – a very ambitious goal.

#### *Actions for renewable heating and cooling*

It is in the heating sector we can see the main achievements so far. In 2009, 84 percent of the energy for heating came from renewable energy sources, mainly from biomass. Some of the actions that have been carried out or are planned are mentioned below.

The municipal energy company VEAB, has been providing the city with district heating since early 70s. Since then, the connections to the district heating have increased steadily, and nowadays, almost the entire city gets its heat from district heating. At the same time, the share of oil in the system has been reduced from 100 to one percent. A big reduction of oil came in 1997, when the new biomass boiler was taken into operation.

While the energy plant in Växjö is a combined heat and power plant, the four smaller district heating plants in Braås, Ingelstad, Rottne and Lammhult only produce heat. Also here, over 90 percent of the energy supply comes from biomass. The district heating plant in Lammhult is owned by a private energy company, E.ON. These plants were built between 1997 and 2000.

Even though district heating originally was an option for buildings that needed a lot of heat, such as offices, schools, apartment blocks and industries, it has been seen that it can also be feasible to connect single family houses. And district heating is popular in Växjö, so many house owners have connected their homes to district heating, even the ones who used to have electric heating and had higher conversion costs.

In Växjö, many households are situated in the countryside, where it is not possible to have district heating. In order to make them a part of Fossil Fuel Free Växjö, the city managed to receive money within LIP from the Government, and use that for a 25 percent subsidy to households who removed their oil boilers and installed a pellets or wood boiler instead. There was also a 35 percent subsidy to households who installed solar panels. Around 275 households were given the pellets and wood subsidy, while around 60 households were given the solar subsidy.

Even though Växjö is famous for not having much sunshine, solar energy is used for heating. In the 80s, a research project started in Ingelstad, in order to have a solar heated district heating system. However, the project failed, and since then it has been very hard to introduce solar energy in Växjö. Except for some households, the biggest solar heating site is on the roof of the public swimming hall, where it heats up the water to the showers.

At the sewage treatment plant in Växjö, biogas is produced in the process. This biogas is among others used for heating in the plant, and has made it possible to reduce the oil use in the plant substantially. A substantial oil reduction will also be performed in 2011, when the industry Lantmännen Reppe Ltd goes in for grain waste as a heating source instead of oil.

Global warming, lighting and electrical equipments have increased the need for cooling, especially in summertime. District cooling based on absorption cooling is one way of reducing the needs for electricity for air conditioning equipments. The absorption technique is driven by district heating, which means that VEAB can produce cooling out of biomass. Already, a demonstration installation is located at the CHP plant, but larger chillers are planned in other parts of the city, such as the university and the hospital.

#### *Action for renewable power production*

The majority, 67 percent, of all power used in Växjö is imported from other parts of Sweden (Northern Europe). Roughly half of it is nuclear power and half of it hydro power. The power that is produced locally is mainly produced from biomass and peat in the combined heat and power plant. VEAB was the first company in Sweden to produce power from biomass when it started in 1983.

In the end of 2008, the first PV plant was started in Växjö, on top of a roof of a school. Now it gives about one eighth of the school's power need. The PV plant is also used in the education of the school. This PV plant showed the way for further installations and currently there are PV plants on two more schools. In 2010, a small scale urban wind mill will be put on the roof of an apartment house.

#### *Action for efficient use of energy*

Even when Växjö manages to get rid of fossil fuels, we need to use energy efficiently, in order to have as little impact as possible on the environment. Many energy efficiency actions are very simple and actually only mean better awareness among people. Others cost a little, but are often feasible.

Almost 20 percent of the city administration's power use is used for street lighting. In Växjö we have systematically replaced the old light bulbs with more energy efficient and more environmental friendly alternatives, which reduce the power use by 50 percent.

One way of reducing the use of power is to make everyone aware of what they are paying for. In the apartments and the student lodgings, individual metering systems are installed, instead of collective metering systems, which were used before. Some projects show that this reduces the power use by roughly 20 percent. In one of the newest built areas, the individual metering system has been connected with a display, installed in every apartment. By that, the residents can follow their energy use immediately which gives yet an incentive to reduce energy use. Compared to similar households in Sweden, the energy use is 34 percent lower in these houses.

In the SAMS project (2007-2010), the City of Växjö, VEAB and the public housing companies have been working together to try to reduce the households' power use by five percent in a few years. This was done through awareness raising campaigns and competitions. Through the web based program Energikollen (Energy Check), people can follow their energy use, and compare it with other time periods – or with their neighbourhood.

When we sell land owned by the city to contractors who want to build houses there, we have declared demands on maximum use of energy per m<sup>2</sup>. This means that the contractors need to think carefully about insulation, ventilation etc. It might lead to higher costs in the building process and a higher renting cost for the resident. However, the residents will have lower energy bills.

Many energy efficient buildings are erected in Växjö within the framework of the EU project SESAC within the CONCERTO initiative. In this project, the buildings must have an energy use that is between 30 and 40 percent lower than national regulations. In the Välle Broar area, the houses are not only energy efficient; they are also made of wood. Four eight-storey high wooden buildings now are Europe's highest buildings made of wood. During 2008, the municipal housing company Hyresbostäder, started to build Växjö's first passive houses. They are really unique, since they are also eight-storey high and made in wooden construction. When building houses in wood, less energy is used compared to concrete and steel; also, the houses have a function as a carbon sink.

The Energy Agency for Southeast Sweden is working on a project in order to reduce the use of energy in the shops in Växjö City. If it works out well, the experiences can be spread to other commercial sites.

#### *Actions for renewable fuels for transport*

For a long time, the transport sector has been dominated by the use of petroleum products such as gasoline and diesel. Most of the work to obtain a higher share of renewable fuels depends upon what happens on national and international level. Someone must produce the other fuels, someone must produce vehicles that can use the fuels, and someone must deliver the fuels. In Växjö, five percent of all energy for transport comes from renewable energy.

In 1999 the first fuel station for ethanol was established in Växjö. A company in Växjö had rebuilt a car to be able to use ethanol, and therefore there was also a need for a fuel station.

The number of cars and fuel stations for ethanol continued to be quite low in Växjö for some years, but since 2002, the sold amount of ethanol has doubled for nearly every year.

The interest in using biogas is very high in Växjö, but there is only enough biogas to provide fuel for about 80 cars. Within a few years though, collecting of biological household waste may help realise a production of biogas, enough for the city buses and many more cars.

Since the end of the 90s, Växjö has also been involved in different projects together with Växjö University, Volvo and others to develop 2nd generation's biofuel. The idea is to use wood as a resource for this. However, it is still a long way to go before the final decision when, where, how and if a gasification plant should be built in Växjö, and what kind of fuel would be the output.

#### *Actions for reduced climate impact of transport*

The transport and machinery sector stands for about 80 percent of the CO<sub>2</sub> emissions in Växjö. In a short time-scale, it is not possible to replace all the fuels with biofuels, and in the longer run, even that would not be the solution. Therefore, we also have to consider if transport systems can be more efficient or if the modal split can change. In 2004, a travel survey was performed in Växjö, showing that about 60 percent of all travels are made by car, and that half of the car travels are shorter than 5 km. many of these travels should be possible to replace with bicycle, walking or bus instead. In the period 2002-2004, there was a Mobility Office, with the task to try to change peoples' behaviour and attitudes.

In Växjö, we have over 150 km of cycle paths, which makes it easier for people to use bicycle. However, many things must be done to make it even easier and safer to go by bicycle. In the city planning, more focus is needed on the bicycles. Bicycle highways are being discussed, which would allow people to go by bike from residential areas to the city centre without crossing any streets. Sign posts by the cycle paths are showing the cyclists which way to go. Also, Växjö produces a very popular map for cyclists.

Public transport (buses) is frequently used by the citizens, but there is a potential for increasing the number of passengers. During the coming years, actions to make public transport more attractive have high priority. According to the national statistical agency, 45 percent of the families in the City of Växjö do not have a car, which makes it very important to develop and improve public transport as well as bicycle facilities.

During the last decades, the community is more and more based upon consumption, which also means more transport of goods. In Växjö we want to optimize the transport of goods to the city centre by building a reloading central where the forwarding companies can deliver their goods, which will then be reloaded and delivered by other vehicles to the centre. The same kind of system is planned for the goods that are used by the municipal organisation. Some of the forwarding companies in Växjö have started to use positioning systems in order to be more efficient. The same has been done by a taxi company which managed to reduce its use of fuel by 20 percent.

When it comes to car travels, the City of Växjö has tried to encourage citizens and companies to use environmental friendlier cars. In 2002, free parking for environmental friendlier cars

was introduced, and it is a very popular incentive. To speed up the development, Växjö introduced a subsidy to everyone who bought an environmental friendlier car. The result? In 2004, Växjö had the highest sale of ethanol-driven Ford Focus per capita in Sweden, and the highest sale of the hybrid car Toyota Prius in Europe! In the end of 2009, about 5 percent of all private cars in Växjö were environmental friendly; most of them using ethanol. The subsidy is no longer in use since it was replaced by a national subsidy.

### **2.3.2 Lessons learned?**

The background to the climate strategy of Växjö is a wide knowledge about climate change and the ability to see solutions instead of problems. This has led to a common understanding from politicians, companies, inhabitants and organisations. We have to stop using fossil fuels.

However, there are three aspects that we generally mention. The first, and probably the most important one, is the political commitment and political unity. All political parties agree that environmental issues, not at least the ones concerning climate change, are very important. They manage to agree upon clear and long-term goals, which make it easier for the municipal staff to implement the goals into action. Unlike many other cities, the environmental policies are not depending on who wins the elections.

The second aspect is the broad cooperation. The Fossil Fuel Free Växjö programme was worked out through intensive dialogue with local NGOs, companies, the university and citizens. In 2007, a local climate commission was started, in order to identify actions that needed to be carried out to reach the goal. The commission consisted of representatives from politicians, city administration, Växjö University, Växjö Energy Ltd, Energy Agency for Southeast Sweden, and three companies. The climate commission found out that it will be hard to reach the goal by 2010, though it is possible. It also identified lots of actions that needed to be carried out, and in some way pointing out who should do it. But cooperation can also be sharing ideas and experiences with other cities, for example within the Swedish climate network Klimatkommunerna or the international networks ICLEI, Energy Cities and Union of Baltic Cities.

The third aspect is financing. Växjö has managed to receive funds for many of the actions carried out here. Some of it has come from the national Government, some of it from European Union. One should remember that the national and international financial contribution would probably be much less if Växjö didn't already have the political commitment and the broad support from others. Also, Växjö has always been able to show concrete results when it comes to CO<sub>2</sub> emissions reductions.

#### *CO<sub>2</sub> and Energy results*

The goals for Fossil Fuel Free Växjö are that the CO<sub>2</sub> emissions per capita shall decrease by 55 percent until 2015 and by 100 percent until 2030 compared to the levels of 1993. Thanks to all the actions mentioned above, and many more that are impossible to keeping track of, the result is so far a reduction of 34 percent until 2009. However, one should remember that 34 percent wouldn't be so much if Växjö wouldn't have done anything before 1993; but the CO<sub>2</sub> levels were low already in 1993. In 2009, the emissions were 3 011 kg per capita in Växjö,

compared to 4 576 kg per capita in 1993. This means that already in 1993, Växjö had less emission level per capita than Sweden has today.

Taking a closer look on the emissions, we can see that 78 percent comes from transport and machinery, 18 percent from heating and four percent from power etc. Compared to the levels of 1993, the CO<sub>2</sub> emissions per capita from transport is three percent higher. However, the highest level was in 2001, and since then, the emissions have been reduced. The reason for this can be explained by higher share of biofuel blended into gasoline and diesel, more environmental friendlier cars, and hopefully a changed behaviour.

The emissions from heating have decreased by 74 percent and the emissions from power use have decreased by 51 percent compared to 1993. The reasons have mainly been described above, but in general, it has been quite easy and feasible to for example convert heating systems, and to use energy more efficiently.

Taking a look at the energy balance, we see that Växjö is supplied by about 2 430 GWh in 2009. Of all the energy, 56 percent comes from renewable energy sources, 36 percent comes from fossil fuels and the rest is non-renewable power, mainly nuclear power imported from other parts of Sweden.

We have also tried to estimate the level of self-dependence when it comes to energy security. It is not very easy, but if we suggest that all biomass and peat comes from local or regional sites (within a radius of 80 km from Växjö), it means that the level of energy independence is 45 percent. Then, biomass, peat, local wind and hydro power, heat pumps, solar energy and biogas are included.

#### *Socio-economic results*

It is impossible to quantify the savings of money due to the Fossil Fuel Free Växjö programme. The reason for this is that our goals and the statistical information we have is based on the overall energy consumption, which means that we cannot for sure say who has managed to be more efficient or why they have been doing that. Also, one way of being more energy efficient is to change from old systems to new systems (boilers, cars or whatever) and the same time there might be a change of fuel. The economic savings could then be a combined result of less energy and new fuel.

But one thing is interesting – we can see that in Växjö, the economic growth and CO<sub>2</sub> emissions have decoupled from each other (figure 2, further down). We can see that the economic development did in no way suffer from our shift to biomass-based energy. This is important to show to anyone in the world claiming that you first have to get economic growth, and then start with CO<sub>2</sub> emissions cuts. But since the CO<sub>2</sub> cut in no way means less production for us (the companies that used to have district heating based upon oil, now gets district heating based upon biomass – it doesn't mean any new investments for them). The big investments have been in the energy production facilities where new biomass boilers needed to be installed instead of oil boilers.

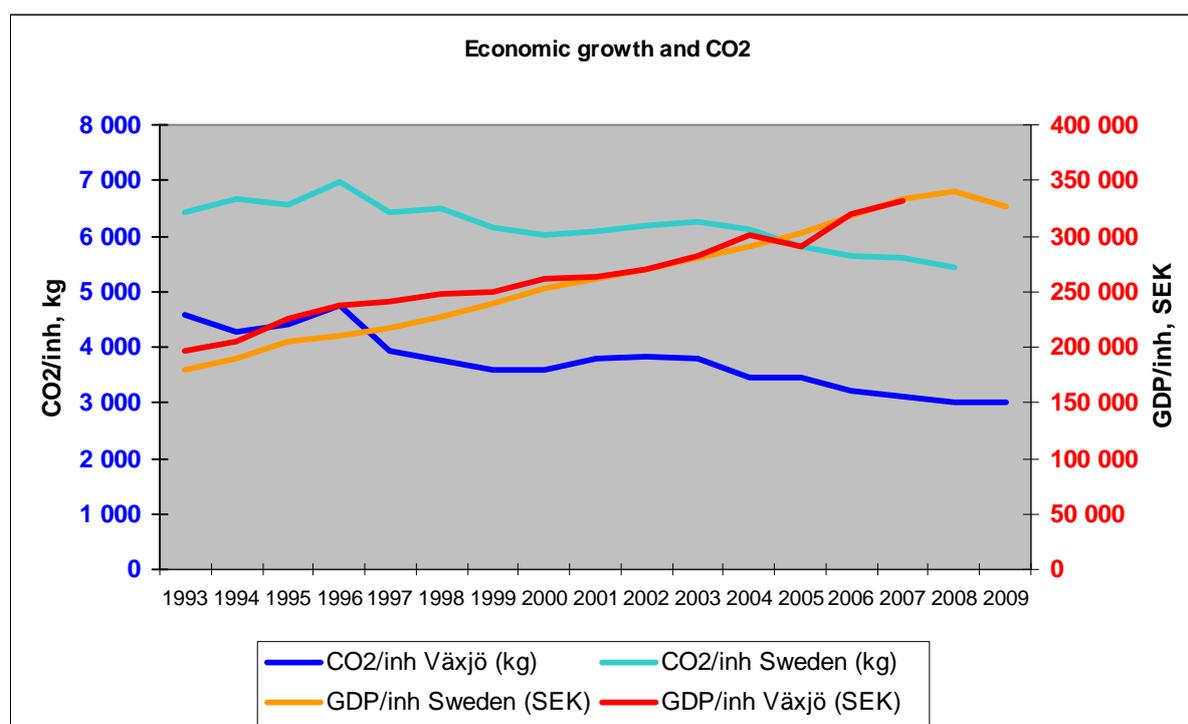


Figure 2. The Economic growth and CO<sub>2</sub> in City of Växjö, between 1993 and 2009.

### 3. Plan for reaching zero carbon emissions within the next few decades

In this section, we describe what measures we have planned to take towards zero emissions and to contribute to a climate positive development in the world through the development and dissemination of sustainable solutions. Dimensions to be covered are the following:

#### Renewable energy, energy efficiency solutions, awareness raising among citizens, etc.

- The web tool Energikollen is a service by the energy company VEAB. Through this tool the citizens have the possibility to monitor their energy use and energy costs. By comparing the daily, weekly or monthly results with previous periods (and with the average user in Växjö), the citizens have a good incentive for reducing their energy use. Its hard to estimate any net reduction in CO<sub>2</sub>, but still the measure is important to work with to change behaviour of citizens.
- During the last five years, lots of experience has been retrieved in Växjö about constructing energy efficient houses and passive houses. Many buildings are using 60-90 kWh/m<sup>2</sup> and year, compared to the national buildings legislation of 110 kWh/m<sup>2</sup> and year. The experience that the municipal housing companies have will be used in

upcoming constructions of new buildings. In the areas, where the City of Växjö is the land-owner, hard limits on energy use can be set before selling the land to a construction company. Right now we are working on a new strategy, quality program for energy efficiency, for building in new areas where the municipality own the land.

- In 2013, a new boiler will be in operation at the Sandvik CHP plant. It will produce district heating and electricity from biomass. Thanks to the investment, the local electricity production from biomass will be increased by 90 GWh (about 40 %), and the investment alone will contribute to a reduction of the local CO<sub>2</sub> emissions by 24,000 tonnes. However, considering the fact that locally produced electricity from biomass is replacing inefficient electricity production in European coal power plants, it means that the reduction is 90,000 tonnes of CO<sub>2</sub>.
- The production of electricity from other renewable energy sources is quite small in Växjö. There are some PV plants and a windmill. In the beginning of December 2010, the small scale urban windmill, previously mentioned in another part of the text, will be installed and in operation. It will be put on the roof of an apartment house, and will produce about 20 MWh of electricity annually. In the nearest future a PV plant will be installed at the City Hall.
- A distribution of district cooling is currently being developed in Växjö. Pipelines are already connecting the CHP plant with the hospital and the university. The idea is that a cooling machine using absorption technology, will transform district heating into district cooling, and the cold water will be delivered to the customers through the pipelines. There are a wide range of buildings and areas (industries, shopping centres) waiting for connection to the district cooling within the closest years. The reason for choosing district cooling is that we can reduce the use of electricity, but in fact, since biomass based district heating is used for the cooling, the system forms a basis for production of biomass based electricity at the CHP plant also in summertime.

### **City planning, environmental vehicles, public transport systems etc.**

- Mobility management: There are plans to offer all employees at the city and the hospital to use the bike instead of the car. Then they could get some equipment to the bike and health test before and after this project. We also have a bicycle campaign every spring and autumn during six week were you measure the amount of bicycle kilometres and have the possibility to win nice prizes and se how much CO<sub>2</sub>, money and calories you save personally and in total. The city is planning to offer interested car drivers in special areas of the city to test public transportation for free during a month to change behaviour.
- In 2013, biogas will be introduced as a vehicle fuel in Växjö in a larger scale. By then the sewage water treatment plant will be expanded by units that can treat and digest biological household waste. The waste will be sorted and collected by the houses and transported to the plant, where it will be used as a source to produce about 15 GWh biogas annually. This is enough to supply the city buses and 500-1000 cars with fuel

per year. It will reduce Växjö's CO<sub>2</sub> emissions from transport sector by approximately 2 %.

- The energy company VEAB has pre-booked 40 electric cars to them self, the municipality organisations and private companies within the region. Växjö will participate in a national tendering process in hope to make a break-through for the electric cars on the market. During the coming year, several chargers for electric hybrid cars will be installed in strategic places Växjö.
- An Urban freight consolidation centre (UCC) serving the 360 units of the City of Växjö means increased traffic safety and the opportunity for environmental adaption and greater efficiency. All freight deliveries to municipal units will go through an UCC. From the UCC the goods will be delivered to the units in a predetermined route. A baseline review, conducted in 2009, shows that the 360 units get approximately 1900 deliveries per week without the use of an UCC. With an UCC the number of deliveries is reduced by approximately 50%. This means that transport work and emissions can be reduced by at least 40 % each using an UCC with rout optimization. In oktober 2010 the new system with an UCC is being implemented. The aim is also, within a couple of years, that all transport will be done by biogas vehicles.

#### **Green public procurement, promoting city's awareness etc.**

- City of Växjö is a target concerning food in the environmental programme: Ecological agriculture shall constitute at least 30% of agricultural acreage by 2015. Current situation in 2009 was 13%. Locally produced and/or ecological foodstuffs purchased shall, together, make up at least 45% of total purchased foodstuffs by 2015, of which at least 20% shall be locally produced. Current situation in 2009 was 13% share of ecological foodstuffs in the municipal organisation.
- Since 2006 there is a group to support efforts to achieve the target. We have had study visits, information and discussions. One department also has cooperation with the owner of a private restaurant involved with education and inspiration to the employees in school kitchen. We are members and supporters of a regional network "Miljöresurs Linné" whose aim is to work for sustainable development, mainly organic food and environmental education. Through the on going work with the urban consolidation centre we want to facilitate for small suppliers and also the procurement unit work to facilitate for small suppliers to be suppliers for the municipal organisation (possibility to smaller contracts).

#### **Solutions to help citizens to live a sustainable life, promote recycling and reuse, support sharing/pooling of goods etc.**

- In Europe, current on November 20 to 28, 2010, an international campaign, "European Week for Waste Reduction", is taking place to address the problem of large amounts of waste. City of Växjö supports the campaign since 2009. We inform about the project on our website and encourage companies and citizens to take part and join the

campaign in November. For more info about the campaign:  
<http://www.minskaavfallet.se/>

- Within the municipality there are exchange-days. Municipality employees can leave things they don't use (books, clothes etc) and other employees can take these articles. In this way we reduce the waste and work with behaviour among our employees, that in turn can spread it to there surroundings.

### **Export of solutions for net production of zero-carbon energy etc.**

- Environment and Climat Centre: Due to the long experience with strategic climate work, actual measures taken, and fantastic results in the reduction of CO<sub>2</sub> emissions, Växjö receives lots of so called Technical visits. These are journalists and representatives from other cities, companies, universities, governments etc from all over the world, coming here with the purpose of learning more about Växjö's work, in order to see what they can implement in their own place. The result of this is that the City of Växjö has taken the initiative to form a "Environment and Climate Centre", through which the city together with other local and regional actors (university, companies) can sell and export the energy and climate knowledge. Under the initiative "Environmental and Environment and Climate Centre" and commencing from 2011 the city of Växjö intends to start an economic association, Sustainable Småland, based on a triple helix model (city, industry and academy). The idea is to promote and jointly sell environmental know-how on the international market. The members of the association can be Swedish and foreign companies, from the public or private sector, and being cleantech companies or companies with strong environmental ambitions. The latter are seen as users/buyers of cleantech and at the same time promoters of cleantech, pulling smaller cleantech companies into new international markets. Jointly the members of Sustainable Småland also can provide a wider range of offers to potential customers, all the way from technical visit, on site training programs, pre-studies, technical feasibility studies, products, after sale management and services. All offers combining the environmental know-how in public, industry and academic sector.
- Sustainable Energy Systems in Advanced Cities, SESAC, is part of EU's Concerto initiative, within the sixth framework programme for research and development. In the project, which runs from 2005 to 2010, Växjö, the Dutch city of Delft and the French city of Grenoble, are demonstrating different projects that contribute to a more sustainable consumption and production of energy. In Växjö the project includes the building of the energy efficient houses, individual metering systems, increased biogas production, PV plant on a school and absorption cooling. Dissemination of experiences, improvement of energy management policies, monitoring and technical visits are also important parts of the project.

### **Export solutions for trendsetting – expanding low carbon solutions in society etc.**

- City of Växjö is working with a project called “Climate Idols”: During spring 2010 seven Climate Idols (local well known persons) were coached to cut their CO<sub>2</sub> emissions in five different challenges, energy, ecodriving, consumption, short trips with bike, public transport etc and food). The climate idols manage to cut in general -29% of their CO<sub>2</sub> emissions. Now two of the idols, the County governor and the Regional manager, are challenge five different organization and business to also cut their emissions. 1200 people are now challenging in more sustainable transportation and to cut the use of electricity. It’s called the climate challenge. The plan is to continue the climate challenge to more organizations and business and reach more citizens. See the website of the climate idols:  
<http://www.vaxjo.se/VaxjoTemplates/Public/Pages/Page.aspx?id=57519>
- Internal climate account: In the municipal organisation, every department and company reports their CO<sub>2</sub> emissions annually. Based on this, an internal CO<sub>2</sub> emission trade has been established. The departments and companies have to pay a small fee for each ton of CO<sub>2</sub> that they have emitted. The paid amounts form the climate account. Then all of them can apply for contribution from the climate account in order to take measures that contribute to reduced CO<sub>2</sub> emissions in the community.
- ENGAGE – local authorities’ communication to engage stakeholders and citizen. Local actions is crucial for the successful implementation of EU energy & climate policies. But how can cities mobilise their different municipal departments, stakeholders and citizens to jointly act towards the common EU “3x20” objectives and build a sustainable energy future? The ENGAGE project aim to provide an efficient participative PR campaign strategy and an innovative, ready to use online tool in order to render the participation of the civil society not only feasible but also desirable. This will be done via a bottom up process involving a core group of 12 pioneer cities from 12 different countries. Furthermore, the project will support collaborative work among local administration, stakeholders and citizens facing similar challenges in different European countries. It is not easy to estimate any net CO<sub>2</sub> reductions of the engage project, but still this is an important measure to establish new trends and work with citizens behaviour.

**Promote export of business models and communication tools that promote more climate friendly food habits etc.**

- "Växjös lilla gröna" guide to sustainable consumption in Växjö, is a brochure initiated by the municipality but developed together with local NGOs. You get information which restaurants can offer you ecological, locally produced and/or Fairtrade food, where to buy second hand etc.
- Within the climate idol project there are challenges concerning energy efficient food choice. This is a way to promote more climate friendly food habits to citizens. For more information, see homepage:  
<http://www.vaxjo.se/VaxjoTemplates/Public/Pages/Page.aspx?id=58159>

**Help citizens live a low carbon life, support development and export of social/private green entrepreneurship and support a low carbon development among businesses etc.**

- The network dynamic Växjö interacts industry, universities, organizations, associations and municipalities to develop Växjö and increase its attractiveness. By joining forces we are working to develop Växjö against future vision. Collaboration is based on everyone's active participation. All have the same responsibility for the development of networking, to be good ambassadors of Växjö, bringing out the intentions of the development plan and work to achieve our common goals, the concept "Greenest city of Europe".
- Växjö City collaboration includes 150 companies working with commerce or restaurant in the town and strives for common goals. There is an ongoing project concerning reduced energy use in shops, where some stores are working with energy effective measures.
- The "Environment and Climate Centre" will also work in this direction and focus on spreading knowledge about energy efficient and climate friendly technique.