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Analysis of selected strategies for sustainable improvement of energy efficiency of municipalities in southeast Sweden

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Foreword

The initial point for the preparation of this thesis was the EnercitEE sub-project PraTLA (Practical training in local authorities) which enabled me to complete an internship in the Energy Agency of Southeast Sweden (Energikontor Sydost) in Oskarshamn.

PraTLA is initiated to identify specific needs to improve energy efficiency in cities by connecting students as energy experts and local authorities within practical trainings to generate a benefit for both target groups.

Thus, the project offered me the opportunity to take a look at energy work from another perspective. I received Swedish energy-efficiency knowledge in several project fields by working in the Energy Agency's every-day business and participate, for instance, in excursions, project kick-starts, meetings and public energy consulting services.

I would like to acknowledge the support of my colleagues of Energikontor Sydost in Oskarshamn, Roger Gunnarsson, Lena Eckerberg, Kerstin Eriksson and Mia Stavert as well as of Tommy Lindström from the city administration Borgholm and Henrik Johansson from the city administration of Växjö and many more.

This thesis will provide an overview of experiences and knowledge gained from energy efficiency work in Sweden.

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1 Introduction

Within the recent years, the importance of the topics climate and energy was emphasized: Climate change is one of the greatest challenges of mankind. The effects of the changing climate are immediately tangible for everyone. Of the last twelve years, eleven were the hottest years since weather records began. At the same time, the shortage of fossil energy resources raises energy prices, which can also be observed by each consumer considering petrol prices or the last electricity bill.

In order to counter this, answers must be found that enable a sustainable development and that take technical, economic, environmental and social issues into consideration.

In 1992, United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro creates the foundation for the integration of environmental and development efforts. Environmental protection has since then been regarded by the United Nations as an integral part of the process for sustainable development. [1]

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) from 2007 emphasizes the role of humans in the currently observable change of climate, which is mainly influenced by changes in the concentration of greenhouse gases and aerosols in the atmosphere. The emissions of greenhouse gases between 1970 and 2004 increased by 70 %, the emissions of the main greenhouse gas, carbon dioxide, by about 80 %. The highest proportion of this increase was caused by the energy sector (+145 %) and transport sector (+120 %).[2]

According to the European Council, human activities that result from the energy sector, account for approximately 78 % of greenhouse gas emissions in the European Community. In order to achieve the long-term goal of the United Nations, to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, emission reductions are required. [3]

Thus, increased energy efficiency could contribute to environmental protection by reducing greenhouse gas emissions through appropriate actions. Energy efficiency is a central element in the EU-Europe 2020 strategy for smart, sustainable and inclusive growth and the transition to a more resource efficient economy. Therefore it will be analyzed, why energy efficiency plays such an important role in EU policy.

Projects for sustainable energy use in the public sector, such as the Covenant of Mayors and the initiative "Intelligent cities and municipalities", are sponsored by the EU. Therefore it will be analyzed, why energy efficiency on local level plays such an important

[1] Cf. Report of United Nations Conference on Environment and Development: Rio Declaration on Environment and Development
[2] www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml as of 09.08.2011
[3] Cf. unfccc.int/resource/docs/convkp/conveng.pdf as of 10.11.2011

role in EU policy and what role a local government can play concerning the improvement of local energy efficiency.

Sweden is considered as one of the most ambitious countries in the international climate negotiations. Sweden's European Union's Presidency in 2009 was focused on climate and energy efficiency as one of the main challenges of the presidency period. The vision of the Swedish climate and energy policy is to have a sustainable and resource effective energy supply and no net emissions of greenhouse gases in the atmosphere. This shall be achieved by improving energy efficiency which is a means of reducing greenhouse gas emissions in a forward-looking and cost-effective manner. Furthermore, Sweden is a good example regarding integrated sustainable welfare which is indicated by high sustainable growth, high sustainable employment, social welfare and economic stability. Therefore, Sweden and Sweden's municipalities should serve as area of the thesis' investigation.

This thesis presents an analysis of selected strategies and projects for a sustainable improvement of energy efficiency on regional and local level in Sweden. The purpose is to provide other ambitious municipalities with a working basis to improve their energy efficiency, to disseminate best-practices of energy efficiency handling and to offer local authorities with inspiration and guidance.

The document comprises three main sections:

The first section clarifies the terms of energy efficiency and sustainable development and explains how energy efficiency as a tool can contribute to sustainable development. For this purpose the importance of energy efficiency and the role of the public sector influencing energy efficiency at municipal level are considered. Then, the framework conditions for energy efficiency in Sweden are outlined. Here, the political motivation for energy efficiency is addressed and a measure is regarded that supports local governments leading by example in terms of efficient use of energy.

In the second section, two strategies of local authorities in south-eastern Sweden are analyzed, which support sustainable development by more efficiently use of energy and resources. It comprises the structure of the strategies, organization of work, objectives, selected measures and key factors for success.

The third section is the analysis of selected projects aiming to contribute to increased energy efficiency in buildings, transport, learning and lifestyle as well as networking.

Finally, the observations are summarized and conclusions as well as important information for other municipalities are deduced.

The annex includes the translated handbook "Support for energy efficiency in local governments - a guide to a successful strategy" from the Swedish Energy Agency which supports local governments in establishing their own energy efficiency strategy. Furthermore, it includes an overview about EU institutions, EU initiatives and EU campaigns, international regular events, international associations, networks and initiatives of local authorities concerning energy efficiency.

2 Sweden and energy efficiency

2.1 Disambiguation

Energy Efficiency

In general, efficiency is the ratio between benefits and efforts. Thus, energy efficiency is the ratio between an obtained benefit („output of performance, service, goods or energy”[4]), and an input of energy.[5]

In economic terms, energy efficiency is expressed as the opposite of energy intensity or energy productivity, with energy values that are opposed to monetary values, for example GDP per primary energy consumption.

In terms of energy conversion, energy efficiency corresponds to the degree of effect respectively the degree of utilization of the conversion, for example ratio of used or final energy and deployed primary energy.

On the demand side, end-use energy efficiency is the ratio of input energy and mostly physical benefit which is achieved from the use of energy. "An improvement of end-use efficiency, therefore, means to use less final energy for the same level of mobility respectively energy use, thus an energy saving for the same energy or mobility benefit."[6] It is important to note that the increase of energy efficiency can also mean a greater expenditure of time.

Sustainability and Sustainable Development

Sustainability or future viability is the concept of using a system in a way that no more is removed from a system, than is reproduced within the duration of the extraction. The World Commission for Environment and Development defines Sustainable Development in the Brundtland Report from 1987 as the "development that meets present needs without compromising the ability of future generations to meet their own needs." Sustainable development means that environmental, social and economic aspects are given equal consideration. To act in sustainable way means therefore to leave behind an intact ecological, social and economic structure for our children and grandchildren. It could be said: "The future is not ours: we have only borrowed it from future generations".

[4] European Council: Directive 2006/32/EC, 2006
[5] Cf. European Council: Directive 2006/32/EC, 2006
[6] www.wupperinst.org/uploads/tx_wibeitrag/energieeffizienz_definition.pdf, as of 15.07.2011

2.2 Importance of energy efficiency improvement

2.2.1 Improvement of energy efficiency

Improvement of energy efficiency in a wider sense is the reduction of energy consumption compared with the previous consumption, but with having at least the same benefit. Regarding benefits, it is necessary to include in consideration that energy efficiency improvements might cause higher expenditures of time.

The improvement of energy efficiency can be caused on basis of technical, organizational (structural) as well as behavioural changes. Technical change means improved energy efficiency of the used device. Organizational respectively structural change can be caused through changes in the control of usage regarding the way of usage of a device, for instance a changed manual or automatic control respectively steering. Behavioural change can be translated into change of habits and behaviour. Often this is caused by raised awareness concerning energy consumption matters. Behavioural changes are necessary to achieve a sustainable improvement of energy efficiency (see section 2.2.3 Rebound Effect). According to the EC, negative environmental impact caused by energy efficiency measures has to be avoided and social priorities have to be respected.[7]

Energy intensity is a common and often used value to indicate overall energy efficiency of an economy. The energy intensity is the ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a given calendar year. The ratio is measured in kgoe (kilogram of oil equivalent) per 1 000 Euro.

Energy intensity as an indicator not necessarily refers to the entire economy but can also be calculated for a sectoral analysis, a product group or a single product.

2.2.2 Importance of energy efficiency improvement in general

According to the European Commission, "energy efficiency is the most cost-effective way to reduce emissions, to improve energy security and competitiveness, to make energy consumption more affordable for consumers as well as to create employment, including in export industries."[8]

The implementation of measures for more efficient use of energy provides tangible benefits to citizens: according the EC, the average savings can amount to 1 000 Euro per household and year. It can improve economical competitiveness due to creation of two million jobs and reduced greenhouse gas emissions of around 740 million tonnes.[9]

Energy efficiency is a key factor within the Energy 2020 Strategy paper to achieve the central objectives for 2020 as well as a the long-term energy and climate goals. According

[7] Cf. European Council: Directive 2006/32/EC, 2006
[8] European Commission Directorate-General for Energy: EU Energy 2020 Strategy, 2011
[9] Cf. European Council: Directive 2006/32/EC, 2006

to the European Commission energy efficiency can be seen as Europe's biggest energy resource.[10]

The International Energy Agency (IEA) considers energy efficiency as a "powerful and cost-effective tool for achieving a sustainable energy future" from the overall economic view: "Improvements in energy efficiency can reduce the need for investment in energy infrastructure, cut fuel costs, increase competitiveness and improve consumer welfare. Environmental benefits can also be achieved by the reduction of greenhouse gases emissions and local air pollution. Energy security can also profit from improved energy efficiency by decreasing the reliance on imported fossil fuels."[11]

In summary, energy efficiency can be seen as an effective instrument that is mainly capable to reduce fossil primary energy consumption that leads to reduced greenhouse gas emissions and thereby helps to prevent climate change. Additionally, it is able to reduce the intensity of deployed final energy per net product and thus reduce dependency on imported fossil fuels as well as improve competitiveness. By realizing energy saving potentials, security of energy supply is improved. Furthermore, the introduction of energy efficient technologies promotes innovative capability.

"Energy efficiency should be seen in a system perspective. This means that primary energy efficiency should be taken into account and to be evaluated rather than a one-sided focus on energy end-use efficiency. It is the use of primary energy that determines the consumption of the earth's resources and thereby the amount of emissions affecting the environment." [12] Renewable energy sources can be seen as almost emission-neutral. Therefore, replacing fossil energy sources by renewable sources improves the primary energy efficiency.

It is important to coordinate energy efficiency measures within a long-term strategic guidance and to ensure further development of this strategy in the future. Furthermore, it is advisable to use energy efficiency within an integrated energy and climate strategy, among other approaches (use of renewable, locally produced energy resources, improve resource efficiency, etc.), to achieve a common objective and vision. The objective should be achievable within a specified period and may, as can be seen in the following chapters, for example, be a city or region that is independent of fossil fuels, or a region, which causes no net greenhouse gas emissions. The vision of the strategy can be for example the sustainable development of the society.

2.2.3 Energy efficiency and energy saving – the Rebound Effect

Understanding of the term improvement of energy efficiency is often only confined to the use of more efficient technology. But an improvement of technological energy efficiency not always leads into energy savings. In the case of computers, televisions and car engines

[10] European Commission: Energy Efficiency Plan 2011, 2011
[11] www.iea.org, as of 21.08.2011
[12] Swedish Energy Agency: Energy Efficiency Policies and Measures in Sweden 2007, 2009

the techniques became more efficient, but the energy consumption was stable or rises. This effect is called Rebound Effect which is based on Jevon's Paradox.

The paradox of W. S. Jevon describes the fact that technological progress that enables the more efficient use of a resource finally increases the utilization of this resource. This dilemma can be explained on the one hand with economic effects that an improvement in efficiency leads essentially to a discount of the product which contains the resource. This leads from increased demand to more consumption of the resource (direct rebound). On the other hand, the dilemma can be justified also by the human's own behaviour. People tend to consume technical efficiency winnings not in the form of savings, but in the form of additional power.

In the energy economy, this circumstance is described as Rebound Effect or efficiency paradox. Technical efficiency improvements therefore do not necessarily lead to a realization of saving potentials. The impact of the efficiency paradox varies and is difficult to determine. Experts estimate that the rebound from energy efficiency improvements is between 0 and 30 %, whereby one can in general assume around 10 %. Often, also a time-rebound is observed if efficiency increases.

It is important to realize that energy savings can be achieved not only by using more efficient technology. Only if technical changes are connected with organizational respectively structural and behavioural changes, saving potentials from efficiency improvements can be particularly effective realized and the impact of the rebound effect can be minimized.

2.2.4 The role of the municipality – the municipality administration's ability to influence[13]

The expenses of public authorities in the EU amount to 17 % of the EU's gross domestic product (GDP). Around 12 % of all buildings located in the EU are owned or used by the public sector.[14]

Municipality administrations are responsible for physical planning, energy planning, supervision and operation of technical facilities. Thus, the local administration has an important role to play concerning energy and climate change. Additionally, the municipality has opportunities to influence developments through their responsibility for information, education and counselling.

"Urban Planning plays an important role if we are to achieve energy and climate goals and reduce climate change. General and detailed plans are an important function in terms of energy use such as locations of new buildings and how it is placed in the terrain as well as

[13] Cf. Borgholm Municipality: Energi- och klimatstrategi 2010-2014 Borgholms kommun, 2011
[14] Cf. European Council: Directive 2006/32/EC, 2006

the possibilities for walking, cycling and public transport that is created and the heating and cooling systems that can be used."[15]

Transport is responsible for a large proportion of greenhouse emissions of many municipalities. Purchasing and consumption costs play a decisive role in the choice of fuels and transportation. The municipality has little ability to influence legislation, fuel prices and taxes, which are some of the factors that control our fuel usage and therefore our carbon emissions.

The municipality may, however, in its various roles and close contact with citizens and businesses work towards more environmentally friendly transport and minimize transportation operations within the municipality as well as develop other effective policy instruments such as the introduction of energy efficiency criteria in procurement.

By being a mediator of knowledge and information the municipality can inform and communicate possible contributions that citizens, associations and businesses can contribute, in order to use energy more efficiently or to perform other actions concerning energy and climate improvements. An example in the field of energy is the conversion from direct electric heating to, for instance, district heating, mountain-, sea- or ground-sourced heat pumps or heating from biomass.

Furthermore, the municipality can use its environmental administration authority to reduce companies' carbon footprint. This can be done through informing businesses about energy efficiency as well as verify environmental code compliance, in the context of review, and requirements concerning for instance low greenhouse gas emissions as well as through active monitoring work to reduce emissions.

2.2.5 Importance of energy efficiency improvement on municipal level

Municipalities account for a big amount of the energy consumption of a country. The residential and services sector consumes around 39 % of Sweden's total energy use[16], primarily for space and domestic hot water heating but also for cooling, lighting and domestic equipment, for travel and for the production and distribution of goods and services. The municipality as an organization is also contributing a relatively large part of the municipality's total energy consumption.

The responsibilities and possibilities of a municipal organization to influence public authorities, citizens, associations and businesses (see previous section) create a huge obligation to lead the municipality in an economically and ecologically sustainable way. By acting as a good example concerning energy efficiency handling and by operating focused and systematic, a municipality's administration can achieve great effects in economic, ecologic and social matters.

[15] Borgholm Municipality: Energi- och klimatstrategi 2010-2014 Borgholms kommun, 2011
[16] Swedish Energy Agency: Energy in Sweden 2010, 2010

By investing in energy efficiency, energy consumption and therefore the running costs of the municipal organization can be reduced. Furthermore, the use of local energy resources creates local jobs and reduces the dependence on imported fuels for heating and transportation.

In addition, positive effects on the local environment and quality of life could be achieved if the local government manages to reduce its relatively large contribution to municipal greenhouse gas emissions.

Thanks to cost reductions, municipalities can increase their competitiveness and attractiveness by investing saved money in the improvement of public services such as education, public transport, transport infrastructure, public relations and transparency of urban planning, preservation of tradition and an attractive town- and landscape and thus contributing to raise the general social welfare.

2.3 Framework conditions for energy efficiency improvements in Sweden

2.3.1 Energy and climate policy of the EU and Sweden

In June 2010, the European Council (EC) adopted the Europe 2020 Strategy for smart, sustainable and inclusive growth in the EU. EC set five ambitious objectives - on employment, innovation, education, social inclusion and climate/energy – that should be achieved by 2020.[17]

To achieve the objectives of the Europe 2020 Strategy in the field of energy, the Directorate-General for Energy introduced the EU Energy Strategy 2020 paper in November 2010. The vision is to have a competitive, sustainable and secure energy supply which simultaneously ensures that consumers are treated as a priority. The strategy forms a framework for "Member States and regional and local authorities [...] to intensify their work to implement adequate policies and to make full use of the available tools, objectives and indicators, with comprehensive National Energy Efficiency Action Plans."[18] Energy efficiency is the first of five pillars of the strategy.

"Energy efficiency is at the heart of the EU's Europe 2020 Strategy for smart, sustainable and inclusive growth and of the transition to a resource efficient economy. Energy efficiency is one of the most cost effective ways to enhance security of energy supply, and to reduce emissions of greenhouse gases and other pollutants. In many ways, energy efficiency can be seen as Europe's biggest energy resource. This is why the European Union has set itself a target for 2020 of saving 20 % of its primary energy consumption compared to projections, and why this objective was identified in the Commission's Communication on Energy 2020 as a key step towards achieving our long-term energy and

[17] ec.europa.eu/europe2020/, as of 10.10.2011
[18] European Commission Directorate-General for Energy: EU Energy 2020 Strategy, 2011

climate goals."[19] The term energy efficiency in the sense of the EC does only refer to the efficiency of final energy use.

Early in 2011, the EU Energy Efficiency Plan was presented. It can be seen as an overall action plan which comprises "determined action to tap the considerable potential for higher energy savings of buildings, transport and products and processes"[20] in this order of potentials. Processes mean especially target development and target revising processes on EU and national levels.

The Efficiency Plan points out the importance of public authorities that should lead by example. This comprises especially energy efficiency in public spending (procurement requirements for vehicles, office equipment, new buildings, goods, services etc.), renovation of public buildings (higher renovation rates, high energy performance class of buildings), energy performance contracting and implementing energy efficiency on the ground (cities participating in Covenant of Mayors benefit from energy saving, building retrofitting, urban mobility and urban renovation which are employment-intensive economic activities, creating skilled, stable jobs that are not subject to delocalisation).[21]

The implementation of the EU Energy Efficiency Plans 2011 is supported by the new European Energy Efficiency Fund (EEE-F) which provides 146 million Euro to efficiency measures. Public authorities on local and regional level that initiate investments in sustainable energy projects and energy efficiency can apply for the support. Eligible project types are energy-saving measures in public and private buildings; investment in cogeneration of heat and power (CHP) with high energy efficiency including micro-CHP and district heating and cooling systems; investments in decentralized renewable energy, including small-scale production from renewable energy sources and cleaner transport in urban areas; modernization of infrastructure such as street lighting and smart grids; investment in sustainable energy with the potential for innovation and growth.

Sweden's policy concerning energy efficiency is largely based on the EU Energy 2020 Strategy but exceeds the European 20/20/20 objectives by far: The vision of Sweden is to have a sustainable and resource effective energy supply by 2050, without net emissions of greenhouse gases in the atmosphere. Sweden is leading the ongoing international climate negotiations due to its high ambitions and forward-looking policy. The Swedish government adopted the Swedish National Reform Programme 2011 to implement the European guidelines in national policy. Within the field of climate and energy, the government adopted the following national targets for 2020[22] [23]:

- by 2020 one half of Sweden's energy consumption shall come from renewable energy sources,

[19] European Commission: Energy Efficiency Plan 2011, 2011
[20] European Council: Conclusions 4/2/2011 Nr: EUCO 2/11, 2011
[21] Cf. European Commission: Energy Efficiency Plan 2011, 2011
[22] Miljödepartementet och Näringsdepartementet: En sammanhållen klimat- och energipolitik, 2009
[23] Regeringskansliet: Swedish national reform programme 2011, 2011

- the share of renewables shall be at least 10 % of the transport sector energy by 2020 and the vehicle fleet shall be independent of fossil fuels by 2030,
- economy wide reduction of energy intensity by 20 % between 2008 and 2020, concerning primary energy relative to GDP,
- emissions in Sweden shall be 40 % lower in 2020 than in 1990 referring to those activities not covered by the emissions trading scheme in the EU (EU ETS) and by 2050 the net greenhouse gas emissions shall be zero.

It should be noted that targets committed to the EU and Swedish national targets are different. The latter are more ambitious.

Swedish energy and environmental policy is traditionally connected due to the generational goal of Swedish policy. The generational goal is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders. To mitigate climate change is the Government's highest priority among environmental issues.[24] This can be achieved by appropriate energy policy: Since 1997 the Swedish energy system is restructured towards an ecologically and economically sustainable energy system.[25] Because of this dependency of energy and environmental issues, Sweden pursues an integrated climate and energy policy.

To meet the target of 20 % energy intensity reduction, Sweden uses mostly general economic policy instruments (for example energy taxes, carbon dioxide taxes and emissions trading) as well as measures that firstly support municipal energy and climate advisory services for households and small businesses, secondly work to encourage the market introduction of systems solutions for making the housing and service sectors more energy efficient and thirdly aim to close significant information and knowledge gaps.[26]

For the period 2010 - 2012, the Government allocated SEK 575 million to support energy efficiency initiatives at the local and regional levels and initiatives for sustainable energy use. Furthermore, an amount of SEK 300 million is annually allocated to finance a five-year programme for energy efficiency between 2010 and 2014. This programme strengthens the regional and local energy and climate efforts, supports initiatives for information and consultation, and strengthens efforts for technology procurement and the market introduction of energy efficient technology, with particular focus on small and medium-sized companies (SME).[27] Public authorities should lead by example in energy efficiency work. The municipalities that actively work with energy and climate issues can seek for state support (see chapter: "Government subsidy for energy efficiency in local governments").

[24] Cf. Regeringskansliet: Swedish national reform programme 2011, 2011
[25] Cf. Swedish Energy Agency: Energy in Sweden 2010, 2010, page 125
[26] Cf. Regeringskansliet: Swedish national reform programme 2011, 2011
[27] Cf. Regeringskansliet: Swedish national reform programme 2011, 2011

The following table provides a comparison of national and international energy and climate targets.

EU Climate and energy targets for 2020[28]	Sweden's national energy and climate targets for 2020[29]	Germany's energy concept targets for 2020[30]
20 % reduction of CO2 emission compared to 1990 levels	40 % reduction of greenhouse gas emissions (base year 1990)	40 % reduction of greenhouse gas emissions (base year 1990)
20 % of energy from renewables	50 % of total consumption from renewable sources	18 % of total final energy consumption from renewables; 35 % of electricity consumption from renewables
	10 % renewable energy in the transport sector	10 % reduction of energy consumption in transport sector (compared to 2008 level)
20 % increase in efficiency of energy use (equalling 368 Mtoe reduction of energy consumption by 2020)	20 % more efficient energy use indicated by reduced energy intensity (12.8 Mtoe that have to be saved by 2020)	Improvement of energy productivity based on final energy of 50 % by 2020 (compared to 1990 level)

Tab. 1: Comparison of energy and climate targets of EU, Sweden and Germany for 2020

2.3.2 Excursion – Structure of the Swedish energy system

On national level, the Swedish Energy Agency (STEM - Statens energimyndighet) is the central public authority that is responsible for the implementation of energy policies decided by the Swedish government. The Agency is funded by the State and aims at developing Sweden's energy system in an ecologically (energy supply with the lowest possible impact on people and the environment) and economically (competitive energy prices) sustainable way. "Its work includes responsibility for Sweden's part in the emissions trading system, the Green Electricity certificate system, climate research in connection with energy policy, and international climate projects. Energy-related work carried out at regional, county and local authority levels has a key part to play in the strategic programme of converting Sweden's energy system to a more sustainable basis. The Agency operates, finance and participates in many activities in the sector, which are

[28] European Commission Directorate-General for Energy: EU Energy 2020 Strategy, 2011
[29] Regeringskansliet: Swedish national reform programme 2011, 2011
[30] www.bmu.bund.de/energiewende/beschluesse_und_massnahmen/doc/47892.php, as of 21.10.2011

carried out in conjunction with other public authorities, with industry, energy utilities, local authorities and the scientific community."[31]

There are also 13 regional energy agencies as well as 290 local advisory services in the 290 municipalities. All authorities are funded by state support, although, in particular at regional level, a large share of the financing is gathered through project-linked funds from EU or national energy-related projects.

The following section describes the current situation of the Swedish energy system.

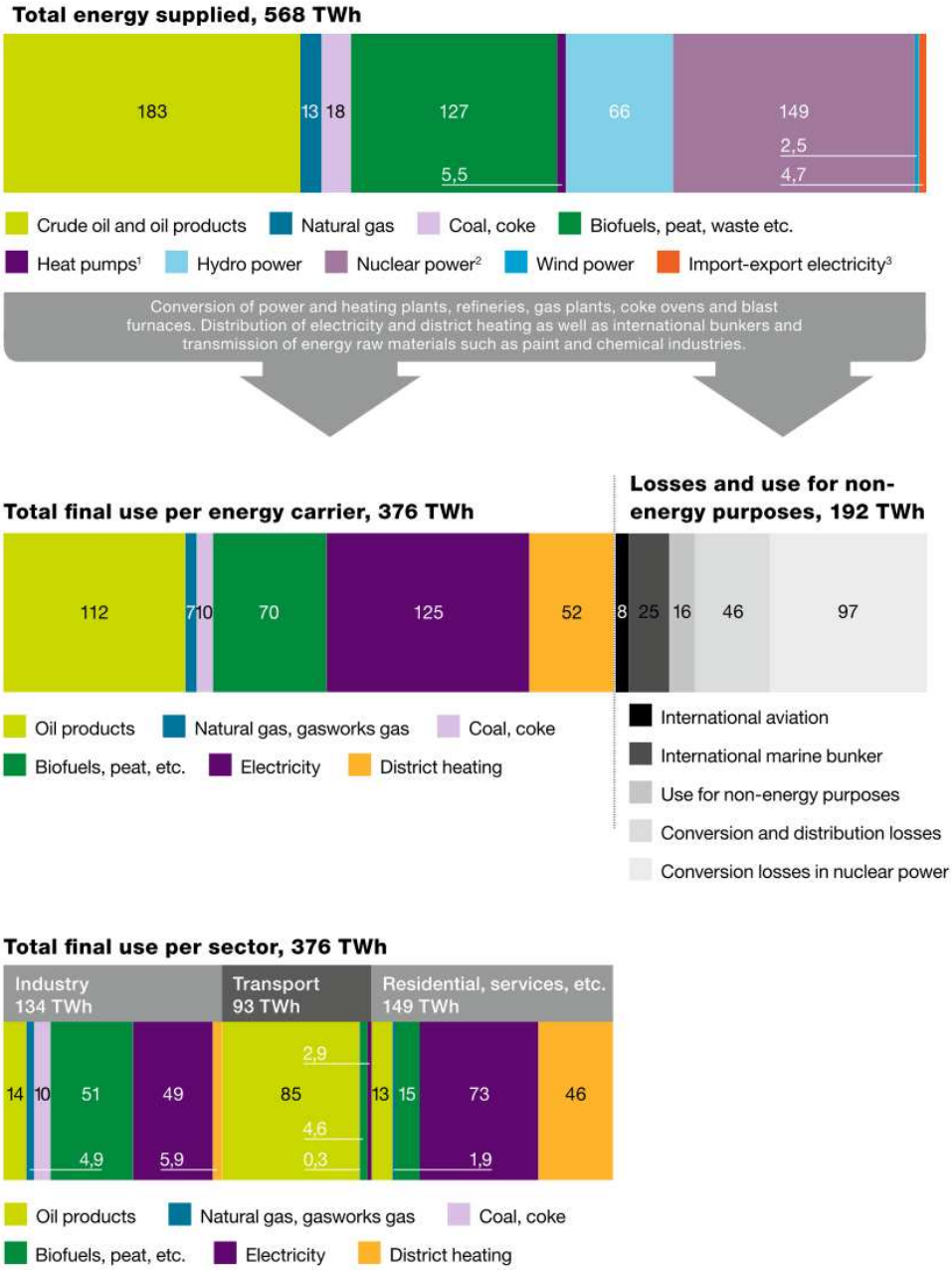

Fig. 1: Energy supply and use in Sweden 2009[32]

[31] Swedish Energy Agency: Energy in Sweden 2010, 2010
[32] Swedish Energy Agency: Energy in Sweden 2010, 2010

The figure shows that the main final energy carriers in Sweden are electricity, oil products, bio-fuels and district heating. Natural gas, coal, heat pumps and wind power play a subordinate role as energy carriers. Nuclear power is shown as gross power, this means as the nuclear fuel energy input, in accordance with the UN/ECE guidelines. The net import of electricity is treated as supply.

Electricity is mainly produced from hydro power with a share of 49 % (2009) and nuclear power with 37 % (2009). The remainder is mostly produced from bio-fuels and wind power. Only a small amount is produced from fossil fuels. In 2009, the proportion of renewable energy sources (bio fuels, hydro power and wind power) in the country's total energy supply amounted to over 34 %. Solar energy is hardly used.

Sweden's total energy use is declining. The share of oil products is decreasing continuously, while the share of biomass is increasing steadily. Since the oil crisis in the 70s oil products were replaced by biomass to produce heat and electricity for households and industry, and 'green' fuel. Oil is of course still used in industry and housing sectors, but more than three-quarters of oil products are used in the transport sector.

Sweden has relatively low carbon dioxide emissions in per-capita and per-GDP (gross domestic product) terms compared to most other industrialised countries. In 2009, Sweden's emissions amounts to 41.7 million tonnes of carbon dioxide, equivalent to 4.5 tonnes of carbon dioxide per capita, which is 20.9 % lower compared to 1990 level. The EU-27 average carbon dioxide emissions were around 8.8 tonnes in 2008.

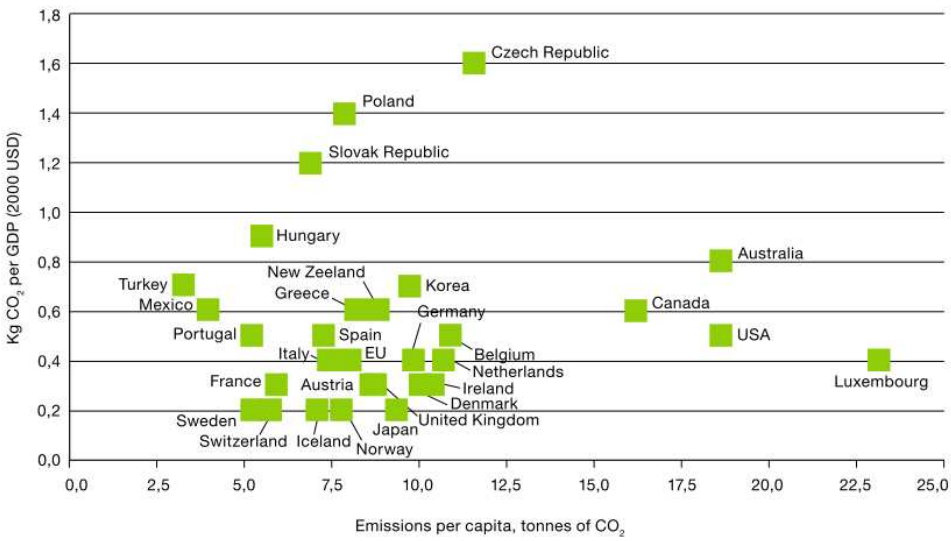

Fig. 2: Emissions of carbon dioxide in total, per capita and per GDP in EU and OECD countries, 2007[33]

The energy intensity of Sweden is relatively low compared to the average energy intensity of the EU-27 countries. Sweden managed to reduce its energy intensity during the last years. Figure 3 presents the development of final and primary energy intensity per unit of

[33] OECD: OECD in figures - 2009 edition, 2009

GDP during the period 1995 to 2007 using data from the MURE Odyssee project. GDP is converted into Euro 2005 using purchasing power instead of exchange rates.

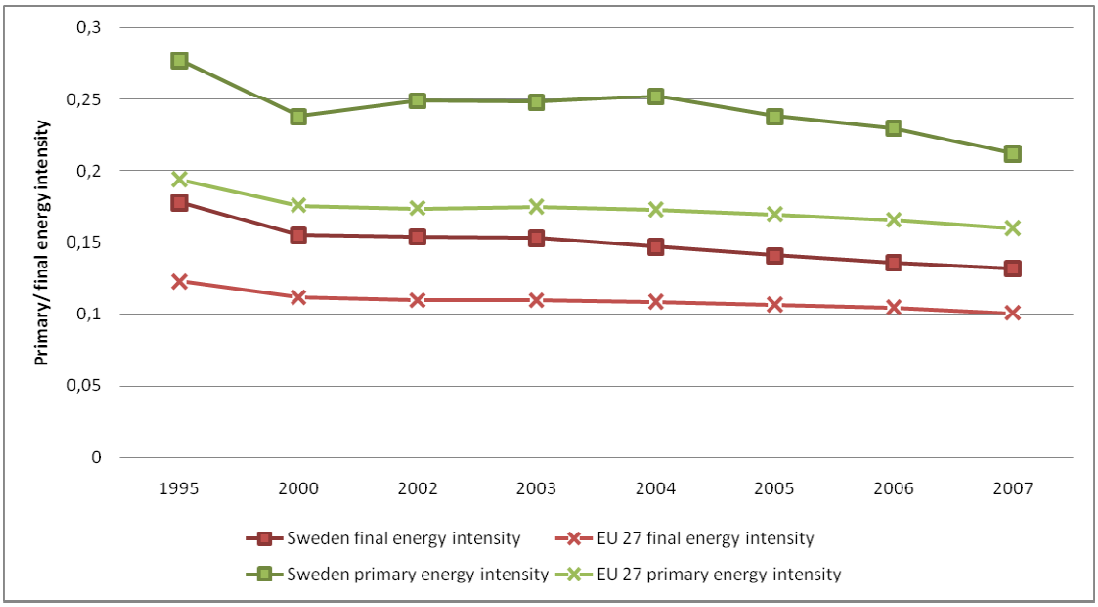

Fig. 3: Primary and Final Energy Intensity in Sweden and EU 27[34]

During the period 1995 to 2007, energy intensity of final energy has been reduced by 26 % in Sweden compared to 18 % in the EU-27. During the same period, primary energy intensity has been reduced by 23 % in Sweden whereas only by 18 % in the EU-27.

2.3.3 Government subsidy for energy efficiency in local governments

To strengthen the local and regional energy and climate work in the country, the Government decided 2009 to support municipalities and county councils working strategically with energy efficiency in their operations and public transportation with a state aid. SEK 99 million will be allocated per year to municipalities and county councils. The initiative is part of the national five-year energy efficiency program (2010 - 2014) and is administrated by the Swedish Energy Agency. The aim is that the public sector should lead by example with efficient usage of energy as well as to contribute to and adopt the goals set by the government concerning energy efficiency.

The municipalities that agree to establish a strategy for energy efficiency and then actively work to implement it, will receive annual financial as well as decision support. The strategy shall include a situation analysis (inventory), objectives and action plan and the election of at least two of the six following eligible measures described in Annex VI of the EU Energy Services Directive 2006/32/EC [35]: (a) use of financial instruments for energy savings including energy performance contracting; (b) purchase energy- and cost-effective equipment and vehicles; (c) purchase efficient equipment also in standby-mode for

[34] Own illustration. Data from Swedish Energy Agency: Energy Efficiency Policies and Measures in Sweden 2007, 2009

[35] European Council: Directive 2006/32/EC, 2006

minimised life-cycle cost; (d) replace or retrofit existing equipment; (e) use energy audits and implement cost-effective recommendations; (f) rent or purchase energy-efficient buildings or replace/retrofit them[36]. Effects of the work and the work processes itself shall be followed-up and reported annually to the Swedish Energy Agency.

To enable participating local governments to achieve the committed goals of the aid, the Swedish Energy Agency developed the guidance handbook "Support for energy efficiency in municipalities and counties"[37] (see Annex I), as well as an extensive frequently asked question area on their homepage[38]. In addition, the local authorities receive support and guidance regarding road network, education and individual support on current questions as well as seminars concerning energy efficiency and climate smart city planning organized by the Energy Agency.

The association of municipalities, counties and regions "Klimatkommunerna" provides good guidelines and materials to support municipalities, for example, how to develop the data for the current situation analysis[39] or how to make an emissions inventory for the climate strategy[40] etc.

[36] Cf. European Council: Directive 2006/32/EC, 2006
[37] Cf. Energimyndigheten: Stöd för energieffektivisering i kommuner och landsting, 2010
[38] www.energimyndigheten.se/eestod, as of 07.08.2011
[39] www.klimatkommunerna.se/?page=page4c064c2a48169, as of 08.10.2011
[40] www.klimatkommunerna.se/?page=page4912ada79a1c2, as of 08.10.2011

3 Analysis of energy efficiency strategies of selected successful municipalities in southeast Sweden

In this section, strategies for improving energy efficiency at local level are analyzed. Successful municipalities are selected, that can serve as a good example for other municipalities that are willing to improve energy efficiency.

The aim of the analysis is to give examples of approaches to realize a sustainable improvement of energy efficiency in a municipality and to get an idea of costs and opportunities for realization.

For developing and implementing energy efficiency strategies and projects, small communities have other financial and personnel conditions than larger municipalities. Therefore, the selection of the sample municipalities considers differences of the population numbers and municipalities' experience with energy and environmental issues. This will contribute to increase the universal validity and applicability of the analysis for potential applying municipalities.

Based on these considerations, the municipalities of Växjö and Borgholm are selected as objects of the analysis.

Växjö, the "Greenest city of Europe", with its population of about 83 000 inhabitants is not the only Swedish municipality which has much experience in the field of energy and environmental policy. However, in Växjö the knowledge and progress of environmental protection and energy efficiency is by far the best communicated and marketed.

For this reason, Växjö has a concentrated amount of easily accessible and well-prepared information materials about the local climate and energy strategy and on appropriate actions. Therefore, the municipality is a very good analysis object.

Borgholm is a small Swedish municipality with almost 11 000 inhabitants which covers the northern part of the island Öland. Despite limited human resources and little experience in the field of energy efficiency the municipal organization developed an exemplary environmental and energy strategy. Particularly in the areas of building and transport, energy efficiency measures are an active instrument for achieving the created goals.

3.1 Municipality and City of Växjö

3.1.1 Introduction

Växjö is internationally known and renowned for many years for its efforts for a better environment and against climate change. The local administration has developed an integrated concept for sustainable urban development that relies on a broad participation of the stake holders to ensure wide acceptance and long-term political support and commitment for achieving the goals.

The sustainable strategy package "Fossil Fuel Free Växjö", which has the vision of a fossil fuels independent Växjö, was honoured in 2007 by European Commission initiated "Sustainable Energy for Europe" award. Växjö is a good example for both an integrative and cooperative approach to achieving the goals as well as for a diversity of projects that focus on more renewable energy sources and technologies that improve energy efficiency and a sustainable mobility structure.[41]

The city also received the "Best Environmental Practice in Baltic Cities" Award from the Union of Baltic Cities (UBC). In the work on small and large-scale projects, many stake holders were involved, such as the city administration, energy companies, property and transport companies, the university, private individuals and some other non-governmental organizations (NGO).

BBC London gave Växjö the epithet "Greenest City in Europe" which leads to big international media attraction. Since then the city sees the title as an honour as well as a commitment for the future at the same time.

„Individuals and groups from all over the world visit Växjö to learn about Fossil Fuel Free Växjö and how the city manages sustainable development, bioenergy, forestry, elderly care and gender issues. A technical visits menu has been produced where seminars and study visits in a great variety are presented.”[42]

3.1.2 Municipal profile[43] [44]

The municipality of Växjö is located in the South of Sweden within the County of Kronoberg. The municipality has an increasing population of around 83 000 inhabitants (2010). With a land area of 1 925 km² this corresponds to approx. 43 inhabitants per km². The City of Växjö itself has around 61 000 inhabitants. The average municipal income per capita in 2008 was SEK 252 900 (approximately EUR 28 000).

[41] Cf. City of Växjö: Welcome to Växjö - The Greenest City in Europe, 2007
[42] City of Växjö: Welcome to Växjö - The Greenest City in Europe, 2007
[43] Cf. www.vaxjo.se/sv/Kommunen/Statistik-undersokningar-och-kvalitet/Statistik, as of 07.07.2011
[44] www.scb.se/Pages/TableAndChart____308468.aspx, as of 27.07.2011

The surrounding landscape consists mostly of forests, only little agriculture and around 200 lakes. Due to the surrounding forests, wood is the main source for bioenergy.

The Linnaeus University has around 15 575 students (2010) in both locations in Växjö and Kalmar. About 8 000 companies are located in Växjö. The main economic key areas are the service sector as well as the commercial and educational sectors.

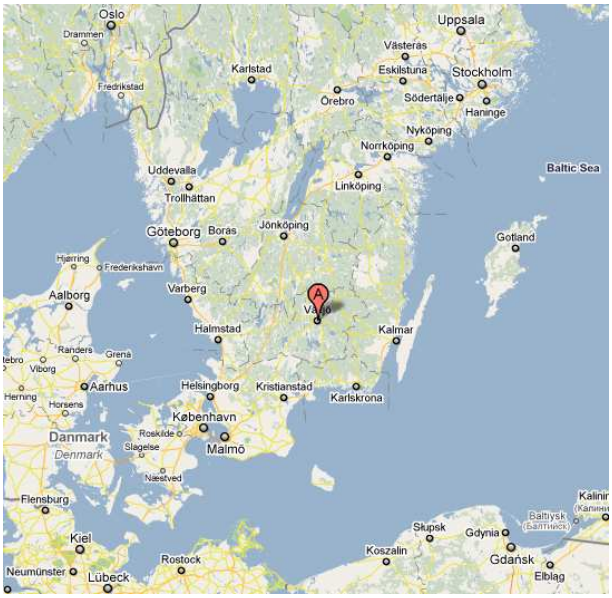

Fig. 4: City of Växjö in southern Sweden, Reference: www.googlemaps.com

Energy profile[45] [46]

The average energy supplied to the municipality is stable above 2.4 TWh per year (2009: 2 447 GWh). 56 % of the energy is generated from renewable sources. The CO_2 emission amounts to 247 000 tonnes per year, which is equivalent to 3.0 tonnes per capita. The municipality managed 34 % reduction of CO_2 emissions per capita between 1993 and 2009. During the period 1993 to 2008, the economical growth increased by around 83 %. Roughly 80 % of CO_2 emissions are caused by the transport sector due to the high share of fossil fuels compared to other sectors.

Electricity

One third of the electricity is produced locally, mainly from wood in the combined heat, power and cooling (CHPC) plant – the basis for almost CO_2 neutral heat production, but also through small scale hydro power, wind power, photovoltaic plants and biogas engines. Around two thirds of electricity demand is covered by the Swedish energy mix, which normally consists of above 50 % renewable sources[47]. Swedish electricity mix in 2009 was produced from 47 % hydro power, 42 % nuclear power, 1.5 % wind power and approximately 9.5 % other thermal power.

Heat

About 90 % of the heat demand in the city centre of Växjö is supplied by district heating. The heat is produced in a municipality owned CHPC plant from more than 95 % of biomass fuel from wood and the rest from peat and oil for peak load supply. Nearby district heating, with lower pressure and temperature, provides heating to many houses

[45] Cf. Concerto Initiative, SESAC: D21h – City report on energy performance in Växjö, 2011
[46] Cf. Svensk Energi: The Electricity Year 2009, 2009
[47] Concerto Initiative, SESAC: D21h – City report on energy performance in Växjö, 2011

outside of the city area. Bioenergy from wood is procured of a radius of 70 km around the city. Other heat sources are individual heat and pellet boilers, heat pumps and a few thermal solar panels. The use of oil for heating is generally uncommon.

Transport

95 % of transportation energy comes from fossil energy sources, mostly gasoline and diesel. The trend is increasing diesel share and a decreasing gasoline share. Ethanol (3.1 %), FAME (1.7 %) and biogas are the renewable sources within this sector, which have a quite high share, compared to other European countries.

Cooling

Currently the most cooling is produced by electricity driven compression cooling machines. But recently, since the district cooling grid is developed parallel to the district heating grid, more and more public buildings like shopping malls, the hospital and university etc. are supplied by centrally produced cool water. The cool water is produced either from centrally located absorption cooling machines or directly taken from the surrounding lakes. As heating from the CHPC plant is used to produce the district cooling partly due to absorption cooling machines, the working time efficiency in the summertime is improved drastically for the CHPC plant.

Interesting facts[48]:

81 % of city inhabitants believe themselves to be environmentally aware (2010)

26 % of city inhabitants often purchase locally produced foodstuffs (2010)

20 people per week want to know more about environmental activities in Växjö (2009)

40 different languages are used for technical and other visits to the city hall in Växjö (2009)

3.1.3 The vision of a Fossil Fuel Free Växjö – Tradition of integrated energy and environmental policy in Växjö

In Växjö, energy efficiency is traditionally not regarded as a separate work area, but rather as a powerful tool for achieving goals within the sustainable environmental and energy policy of the city.

Thus, the environmental work has a long tradition in Växjö: beginning in the 1970s, the city surrounding lakes have been restored, after their ecological balance was upset. In 1980, the conversion of district heating production to biomass was managed by the city-owned energy company Växjö Energi AB (VEAB) and formed the basis for today's almost CO_2 neutral heat supply of the city. In those days the reason was not an environmental-

[48] Cf. Municipality of Växjö: Växjö – The Greenest City in Europe, 2010

friendly policy, but rather an economical thinking: after the oil crisis they wanted more stable energy price. This meant turning away from imported oil to locally produced wood fuel.

1995 – two years before the Kyoto Protocol – collaboration began between the municipal administration and the Swedish Society of Nature Conservation (SSNC). The aim was to make the urban development more sustainable, environmentally conscious and more liveable. To develop the right strategies, abroad communication was started between SSNC, municipal staff and politicians with business, other NGOs, the university and the citizens. In seminars and roundtable discussions their ideas were discussed on an equal footing. It quickly became clear that Växjö has great potential due to the already developed forestry; the experience in the field of biomass as well as university's knowledge in the field of biomass research.

In a seminar, experts talked about the importance of CO_2 reduction, and companies and other participants explained their view of things. A vision of a fossil fuel free Växjö emerged, with broad support from the local economy and the politicians: 300 to 400 m^3 of saved oil corresponds to one local job that is created by replacing oil.

In 1996, this resulted in a unanimous political decision: Växjö should be a fossil fuel free city and its fossil CO_2 emissions should be halved by 2010 compared to 1993 level. The decision attracted international media attention: Why does a city like Växjö decides to do so, although it will have little impact on global emissions? But since global emissions are the sum of local emissions, each local effort is important.

To achieve the goal, 1997 the Local Action Plan was elaborated, which includes the necessary measures. In the course of time it was renewed and extended several times. Many of the projects are partly financed by the Government and partly by the European Commission[49].

2006, the Environmental Programme was introduced the first time, which as revised version of 2010 is valid for being the key steering document for sustainable development. This overall strategy provides the framework conditions for the implementation of energy efficiency policies and is to be viewed in detail in the section below.

3.1.4 Framework conditions for improving the energy efficiency in Växjö municipality

Framework strategy on regional level (County Kronoberg/Southern Småland)

As the section 2.3 already dealt with national framework conditions for the improvement of energy efficiency, this section will be dealing briefly with the implementation of

[49] Cf. Municipality of Växjö: Fossil Fuel Free Växjö – the Story, 2010

national strategies at the regional level of Kronoberg County to give an insight on the various influences for the energy efficiency strategies of Växjö.

The Administrative County Board (Lansstyrelsen) is responsible for the implementation of national legislation in the municipalities. Together with the Regional Council (Regionförbundet) the 'Regional Climate and Energy Strategy for the County of Kronoberg and the Region of South Småland' was developed on behalf of the government. This strategy is based on the 16 national environmental goals. The strategy shall "inspire the county administrative boards, regional councils, trade and industry, organizations and inhabitants to work together to reduce climate change"[50].

Using this guideline, the municipality should develop a local strategy for a more climate-friendly lifestyle which is more detailed and sustained by means of specific measures. Unlike many other municipalities that used the regional strategies as a basis for creation of local strategies, Växjö created their own strategies based upon previous local decisions, targets and results. It was though important to make sure that regional and local strategies were in line with each other.

In the field of energy efficiency, the guideline includes the following strategies:[51]

- Build new – build passive houses and energy-plus houses
- Make old houses more energy efficient
- Train more people in eco-driving
- Reduce the share of electricity for heating residential buildings
- Use climate smart electricity in industry and municipalities
- Collaborate to make goods transports more environmentally friendly
- More carpooling and car sharing
- Use surplus heat in industry and agriculture
- Stimulate consumers to save energy with individual metering
- More district cooling

[50] Länsstyrelsen i Kronobergs Län, Energikontor Sydost: Climate and Energy Strategy for Kronoberg County and the Region of Southern Småland, 2010

[51] Cf. Länsstyrelsen i Kronobergs Län, Energikontor Sydost: Climate and Energy Strategy for Kronoberg County and the Region of Southern Småland, 2010

Strategy on local level – the Environmental Programme[52]

Vision and objective

To ensure a sustainable, environmentally responsible, livable and healthy urban development, Växjö is pursuing an integrated environmental and climate strategy. Energy and climate issues are dealt with in the profile area “Fossil Fuel Free Växjö” of the Environmental Programme. The overall objective is to minimize the anthropogenic impact on the climate and environmental damage while increasing the quality of life and wealth for all stake holders. There are four cornerstones of Fossil Fuel Free Växjö: a more efficient use of energy, the transition to renewable sources of energy, lowering greenhouse gas emissions, especially in the transport sector, as well as the change of behavior and consciousness of people.

Development of long-term, trend-setting goals and strategies in Växjö is traditionally done with participation of all stake holders – city government, politicians of all parties, citizens, entrepreneurs and various other organizations – and unanimously adopted to ensure the continuous target orientation and commitment.

The Environmental Programme is, as the central steering document for sustainable development in Växjö, the result of years of local experience (Local Action Plan) and the implementation of national and regional regulations (Climate and Energy Strategy for the County of Kronoberg and the Region of Southern Småland).

Organization and structure

The Environmental Programme’s targets are divided into three prioritized areas: “Living Life”, “Our Nature” and “Fossil Free Växjö".

Fig. 5: The three prioritized areas of Växjös Environmental Programme[53]

The profile areas objectives are dealing with a resource-efficient and non-poisonous consumption and production (“Living Life”), water and natural resources (“Our Nature”) and that energy and transport do not contribute to any climate effect (“Fossil Fuel Free Växjö”). Each prioritized area comprises medium-term (2015) and overall targets for either the geographic area or the Växjö municipal administration.

For all targets at least one appropriate indicator will be assigned, to ensure an effective follow-up of the progress. The indicators are either follow-up indicators, which detect

[52] Cf. Municipality of Växjö: Environmental Programme City of Växjö, 2010
[53] Municipality of Växjö: Environmental Programme City of Växjö, 2010

whether work moves in direction to the overall target, or measurable budget indicators that helps steering towards the targets for year 2015.

In addition, for each target at least one board (a political leadership of a certain municipal area) is assigned. Its tasks include the production of an annual environmental budget for each budget indicator (a specific measurable value that will be determined annually), the development of an appropriate Action Plan, the implementation of these measures, the follow-up as well as to do half year and annual ecological reporting on the achievement level that corresponds to compliance with the environmental budget. Overall responsibility is assumed by the municipal Executive Office. The Environmental Programme is revised each mandatory period and the targets are adapted in line to the achievement level, respectively new targets are developed.

Basically, the targets of the Environmental Programme are based on both the national and regional energy and environmental objectives, but surpass them in most cases. For example, the carbon dioxide emissions per capita shall be reduced by 55 % in 2015 and 2030 to 100 % (compared with 1993) in Växjö municipality. The national objective is 40 % reduction by 2020 (compared to 1990), respectively 100 % in 2050[54].

Especially within the target area Fossil Fuel Free Växjö, energy efficiency has an important role as a tool for achieving the targets.

Prioritized area Fossil Fuel Free Växjö and measures to improve energy efficiency

Fossil Fuel Free Växjö is a very living framework. That implies that specific actions can be entered in the program as time goes by and are removed when they are finished. Some important projects within the Fossil Free Växjö are:

- Establishing coordinated deliveries via coordinated loading centre to reduce municipality's good transport
- Major improvements of public transport and bicycle lanes (cycle highways) to make it simple, attractive, secure and safe to walk, cycle and travel with public transport all year round
- Bio-fuel production from biological household waste and sludge in municipality owned plant and usage in city busses
- Second generation bio fuels (BtL – biomass to liquid) from gasification of biomass waste, dimethyl ether (DME), Fischer-Tropsch (F-T) diesel
- Always test the construction of passive or plus-energy buildings
- Raising awareness among citizens through events and advertisements
- Green public procurement

[54] Swedish Energy Agency: Energy in Sweden 2010, 2010

- Establish networks for spreading knowledge
- Establish a Climate Centre for research and development and to sell energy-efficient and climate smart know-how and services (task completed: called Sustainable Småland)
- Parking fee in relation to CO_2 emission (not a prioritized work area any more)

The Fossil Fuel Free Växjö programme incorporates different types of activities, such as biomass-based district heating and power generation, smaller scale district heating, district cooling, biomass boilers for households, energy efficient street lightning, energy efficient construction, solar panels, cycle paths, environmental friendly cars, biogas production, large scale bio-DME production etc. The Fossil Fuel Free program is developed in cooperation between the city administration and a lot of stake holders, local enterprises, Linnaeus University etc. All these initiatives together with announced national incentives are estimated to give 55 % reduction of CO_2 emissions by 2015 which means that the goal will be met.

Växjö participates on the Covenant of Mayors since 2008. After the signing of the Convention, a Sustainable Energy Action Plan (SEAP) has to be developed within one year and the actions contained shall be implemented until 2020. The SEAP of Växjö corresponds to the final report of the Climate Commission ("Klimatkommissionens Slutrapport"), which was presented early 2008. It presents the measures planned for the future and their persons in charge for the fields of bicycle and pedestrians, public transport, private transport, commuter transport, vehicle fuels, energy usage, increased electricity and other concerns. In addition, the report shows the effects of CO_2 reduction and its potential for regional growth. It also contains a list of the commitments that the participating partners agreed (municipality of Växjö, Växjö Energi AB, Linnaeus University, Energy Agency of Southeast Sweden, Alwex, Växjö Taxi and Volvo) and presents the problem areas of the future for Växjö[55].

The final report of the Climate Commission for Växjö can be downloaded from the Internet on the homepage of the Covenant of Mayors (as of 07.11.2011):

http://www.eumayors.eu

During the autumn, a new Energy Plan for Växjö will be approved. This includes very concrete actions and strategies. This document will also be used as a new SEAP within Covenant of Mayors.

Follow-up

For reviewing the progress and effectiveness of environmental work in Växjö and for controlling the achievement of the Environmental Programme's targets, semi-annual and

[55] Municipality of Växjö: Klimatkommissionens Slutraport, 2008

annual reporting and review of the indicators is carried out. For this Växjö uses the environmental management system ecoBUDGET[56].

The management of natural resources works analogous to conventional management of financial resources by imitating a financial budget system for natural resources. In ecoBUDGET, natural physical variables are quantified in an accounting system, booked and regulative checked. The system takes into account all the environmental objectives both in municipal administration as well as in the geographical area of Växjö.

The system follows the ecoBUDGET cycle, which consists of three phases: "The first is to establish and adopt the environmental budget. Next step is to implement the planned measures to achieve the budget. The final phase is to balance the environmental annual account."[57]

3.1.5 Strategic administrative structure and responsibilities in Växjö[58]

The development of strategies and major project coordination is mostly a responsibility of the highest municipal political organization, the Municipal Executive Board (Växjö's "government") and its department – the Executive Office. One unit of the Executive Office is the Department of Strategic Planning (Planeringskontoret). From here, much of these strategies and action plans are coordinated and developed. However, the actual carrying out of the projects can be done by, for example, the Technical Department, municipal energy companies or municipal property companies. Strategic Planning Department is also responsible to help the organization by, for example, seeking for external funding from EU or the government. It coordinates and gives ideas to actions that are in line with the politically approved strategies etc.

The Strategic Planning Department's responsibilities and duties are described in the plan of responsibilities (verksamhetsplan):

- we create possibilities for a sustainable development of the community for the citizens;
- we think new, on a long term and in a wide range;
- we are in the forefront when it comes to knowledge of technique and development;
- we support municipal departments and municipal companies in the way towards a sustainable municipality;
- we stimulate to dialogue and cooperation in the planning process.

The Executive Office has 165 employees; the Strategic Planning Department has 16 employees.

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[56] Cf. City of Växjö: Welcome to Växjö - The Greenest City in Europe, 2007

[57] www.vaxjo.se/Kommun--politik/Om-Vaxjo-/Internationellt/Other-languages/Engelska--English1/Sustainable-development/ecoBUDGET-/, as of 15.07.2011

[58] Cf. Henrik Johansson, Executive Office Växjö, Department of Strategic Planning

The overall municipal budget for the undertaking climate and energy related work is very difficult to identify. There is a budget of SEK 1 800 000 (approximately EUR 200 000) for climate coordination and a few other climate and energy related issues at the Department of Strategic Planning. However, there are also budgets within the Technical Department (building, cycle paths, running cycle campaigns etc.), the energy company (almost their entire budget), housing companies etc. The amount of EU funding specifically related to energy and climate issues also cannot be identified exactly, since it varies over time and some of the funding are related to climate activities and part of it are related to administration and dissemination that needs to be done because the projects are funded. In most cases it is easier to calculate the funding of environmental projects as such.

The organizational structure of the entire municipal administration can be found in the organization chart, see:

http://www.vaxjo.se/upload/www.vaxjo.se/Kommunledningsf%C3%B6rvaltningen/Kommunkansli/Organization_skiss_v%C3%A4xj%C3%B6_kommun.pdf (as of 8.7.2011)[59]

[59] Municipality of Växjö: Växjö kommuns organization, 2011

3.1.6 Conclusion and Växjö's key factors of success

Växjö has more resources compared to most other municipalities, but still useful conclusions of Växjös success in environmental and energy issues can be drawn for other municipalities.

According to Henrik Johansson from the Executive Office of the City of Växjö, not particularly innovative projects are the reason for success, but the „combination of wide range of activities within changes of behaviour, energy efficiency and transition to renewable energy, supported by a long-term political commitment and political unity". It is important „to start with a clear ambition early and strengthen it throughout the years. "

In detail the three key factors of success in Växjö are[60]:

Political commitment and political unity

Across-party unity regarding the significance of environmental and climate issues allows long-term political commitment according suitable decisions for the benefit of such issues, such as the financing of project administration, the creation of a suitable legal framework and the necessary knowledge dissemination throughout all municipal organizations that translate strategies into action. By making it possible to work continuously to achieve environmental objectives, regardless of mandate periods, the local organization can be perceived as a good example by the citizens: the municipal authority should serve as a forerunner when it comes to implementing energy efficiency measures in municipal buildings, city owned companies, procurement, municipal travel policy, public transport, smart and long-term thinking and rethinking old habits.

Broad cooperation

The elaboration of the strategic guidelines of the City and corresponding activities is carried out in close dialogue with local stake holders in order to carry and disseminate the goals and visions in the municipal organizational structure and to achieve a change in thinking within the municipal administration, which fertilizes an almost self-running implementation. By communicating beyond the boundaries of the municipality ideas and experiences with other communities and international networks can be exchanged.

Financing

To receive as much national and international funding as possible, at first a good financial organization is necessary. Additionally political commitment and unity as well as concrete results and figures of achievements make it easier to collect financial contributions.

[60] Henrik Johansson, Executive Office Växjö, Department of Strategic Planning

3.2 Municipality and City of Borgholm

3.2.1 Introduction

Borgholm is an average small Swedish municipality. Similar to other municipalities Borgholm has only little financial budget and few human resources for energy matters. The number of inhabitants is continuously decreasing due to the better working opportunities in bigger cities such as Kalmar. But in fact, Borgholm has an exemplary energy and climate strategy. This raises two questions:

How the small municipality Borgholm does manage to establish an effective and efficient working strategy, organize and structure the work, collect data, set up indicative goals, carry out and follow-up the actions considering limited financial and personal budget?

How a small municipality like Borgholm can exert influences on energy efficiency of the fields of transport and buildings?

The following analysis of Borgholm's energy and climate strategy will attempt to clarify these questions.

3.2.2 Municipal profile

Borgholm is a municipality within Kalmar County and covers the north of the island Öland. The capital of the municipality is the city of Borgholm. Borgholm's municipality had 10 676 inhabitants on 31th December 2010[61] with a decreasing trend. The municipality's land area is 680 km², making 16.0 inhabitants per square kilometre. The average municipal income per capita in 2008 was SEK 205 000 (approximately EUR 22 800) which is clearly under the average income in Sweden (SEK 252 900[62]).

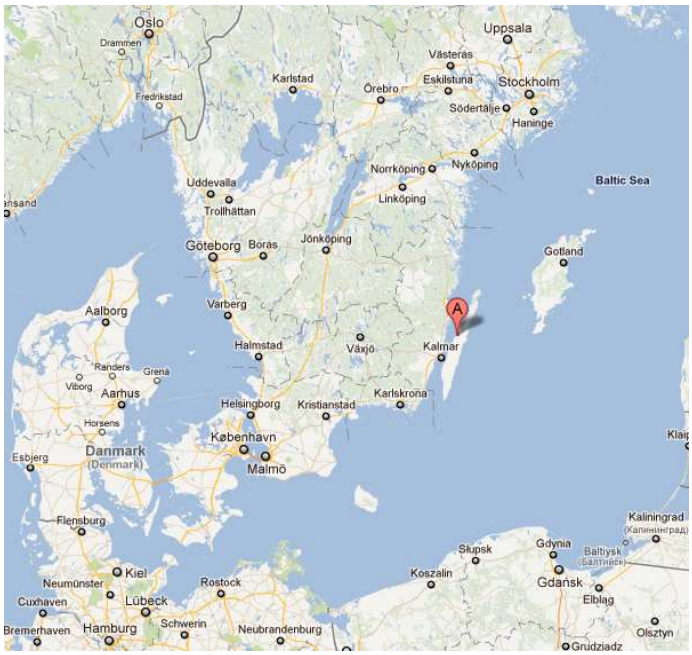


Fig. 6: City of Borgholm in southern Sweden. Source: www.googlemaps.com

The landscape comprises mostly of agricultural used land and forests. Tourism is an important economic as well as ecologic factor in the municipality. The number of people residing in the municipality is 20 times higher over the summertime. Approximately half of the households in the municipality are summer cottages for part-year residents. Agriculture

[61] www.scb.se/Pages/TableAndChart____308468.aspx, as of 08.07.2011
[62] Statistiska centralbyrån: Statistical Yearbook of Sweden 2011, 2011, page 321f

is the second dominant industry in the municipality. The cultivated area is about 21 000 ha and pastured land amounts to about 13 000 ha. Agriculture employs about 900 people in the municipality.

Energy profile

Total energy supplied to Borgholm municipality was around 0.36 TWh in 2007. The total energy use in the municipality generated approximately 47 358 tonnes of fossil carbon dioxide, which is equivalent to 4.3 tonnes per capita. Since 1990, emissions decreased by more than 11 067 tonnes (15 %), while the total energy consumption decreased by 12 % during the corresponding period.

Situation of carbon dioxide emission sources are exemplary for average small cities: Three fourths of the total carbon dioxide emissions come from transport – gasoline and diesel. The other major source of emissions is the energy supply for heating.

The majority of the municipal buildings are already converted from electric and oil heating to district heating in the urban areas and pellets and heat pumps in the smaller towns. Around 70 % of the total heating and hot water consumption for municipal building are covered by district heating. The heat for the district heating grid is produced mainly from wood chips. District heating build-out in Borgholm has reduced oil use for heating by about 3 000 m³ per year. The bio fuel boiler at the heat plant Osten, which is owned by the municipality owned company Borgholm Energy AB, is a steam boiler to enable energy efficient cogeneration of heat and power (CHP) in the future. Borgholm Energy produces around 30 GWh heat per year.

3.2.3 Energy Efficiency Strategy on local level – Energy and Climate Strategy Borgholm, Efficiency Strategy of Borgholm, Transport Strategy of Borgholm

How to establish an effective and efficient working strategy?

Political decisions concerning energy and climate issues in Borgholm's municipality have long been characterized by project thinking and a municipal energy strategy did not exist since the energy savings program in the late 70s.

During the period 2010 to 2014 the municipality of Borgholm seeks for support for energy efficiency (“Stöd för energieffektivisering”) from the Swedish Energy Agency to establish an efficiency strategy for the municipal organization. Energy efficiency measures are an important tool for achieving the regional energy and climate goals. They are therefore integrated into the local energy and climate strategy.

The municipality employs one energy and climate strategist who, at the same time, is the energy advisor of the municipality. The Swedish Energy Agency provides 50 % salary to municipalities for hiring an energy advisor. Often the jobs are combined as one full-time

job to gather knowledge in one person. The energy strategist is responsible to coordinate the climate work of the municipality.

The Executive Committee has overall responsibility of developing an energy and climate strategy and as a first step established an internal organization of a steering committee and a working group. The working group led by the energy and climate change strategist, was composed of various experts, people in areas including buildings, roads, energy, transport and industry. The steering committee had political support and indicated the resource framework for the project.[63]

Vision and objectives of the Energy and Climate Strategy

The vision as described in the former chapters is an ecologically and economically sustainable society whose energy consumption does not cause any climate change through emissions of greenhouse gases. The climate goals of the municipality are adapted from the regional climate goals for the county of Kalmar. The overall target is to become a fossil fuel free region until 2030. To achieve this, three sub-targets were adopted within the NoOil strategy[64] (2009):

- Energy and the environment as growth factors: Energy and environmental-related businesses shall be better than industry averages for each respective sector and energy production shall be increased in the county.
- Becoming a fossil fuel free region by 2030: By 2010, 15 % reduction of greenhouse gas emissions compared to 1990 level, 20 % emission reduction in the transport sector compared to 1995 level and all purchased or leased vehicles by the public sector shall be eco-cars. By 2020, all buildings shall be heated by renewable energy sources. County's renewable electricity production shall be equal or exceed its electricity consumption. All public financed transports shall be eco-cars or using renewable fuel. By 2030, no net carbon dioxide emissions shall come from fossil fuels in Kalmar County.
- Decoupling economic growth from increased fossil fuel usage: Carbon dioxide emissions from combustion of fossil fuels shall decrease in relation to the gross output for the region.

[63] Cf. Borgholm Municipality: Energi- och klimatstrategi 2010-2014 Borgholms kommun, 2011
[64] Cf. www.kalmar.regionforbund.se/nooil-eng, as of 31.09.2011

How to organize and structure the work? - Structure and organization of the Energy and Climate Strategy of Borgholm

The Energy and Climate Strategy of the municipality Borgholm for 2010 to 2014 ("Energi och klimatstrategi 2010 – 2014 Borgholm Kommun") consists mainly of two parts: the first, informative part comprises the background that led to the elaboration of the strategy, the situation analysis of the municipality, including the forecast of important fields of action and impact of the strategy as well as details how the local authorities work with the strategy and follow-up target achievement. The second part presents the strategy's objectives, how the strategy is linked with other policy documents that relate to the impact areas of energy and climate strategy, and the action plan.

The action plan covers six areas of action which are presented in figure 8:

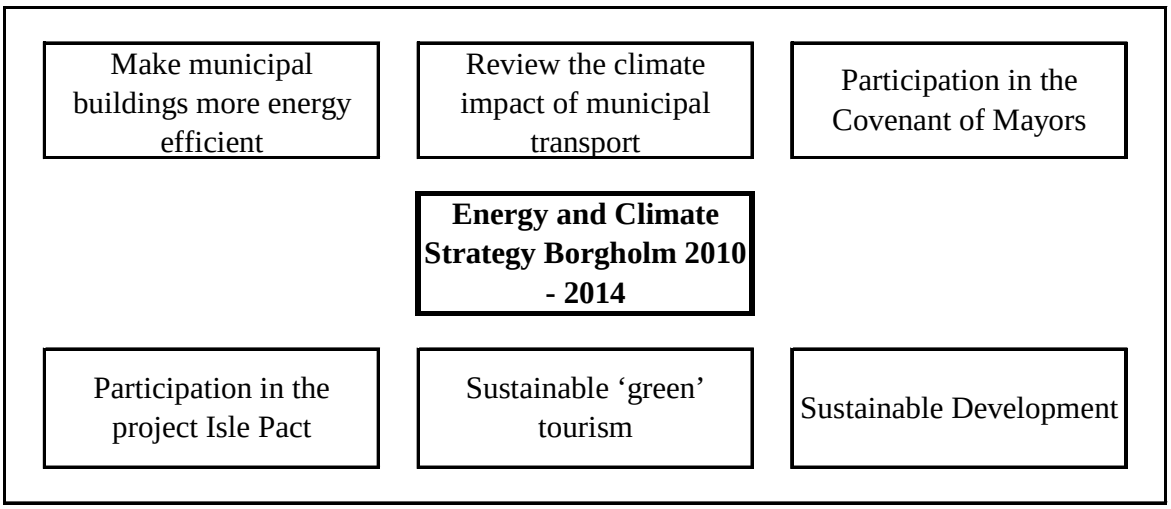


Fig. 7: Energy and Climate Strategy Borgholm consists of six areas of action

By realizing energy efficiency measures that save fossil fuels and reduce energy needs, the two fields of action "Make municipal buildings more energy efficient" and "Review the climate impact of municipal transport" shall contribute an essential part to reduce greenhouse gas emissions.

Extract from the Action Plan of the Energy and Climate Strategy Borgholm[65]:

Action Nr. 1:	Review the climate impact of municipal transport
Description:	Make an inventory and calculate annual CO_2 emissions of own vehicles; Improving policies for the purchase and use of vehicles
Action responsibility:	Energy and Climate Strategist
Cost:	Within the energy agreement; plus route optimization for home care services
Reduction of CO_2 emissions:	Reduction at least 10 % by 2014

[65] Cf. Borgholm Municipality: Energi- och klimatstrategi 2010-2014 Borgholms kommun, 2011

Time Schedule:	Transport Strategy with Action Plan, referral version ready by February 2011
Other environmental benefits:	Reduced fuel costs, optimized driving schedules

Tab. 2: Action Nr. 1 of the Action Plan of the Energy and Climate Strategy Borgholm

Action Nr. 2:	Make municipal buildings more energy efficient
Description:	Energy Analysis of own property; Present the profitable efficiency measures
Action responsibility:	BEAB + Energy and Climate Strategist
Cost:	Within the energy agreement
Reduction of CO_2 emissions:	By reduced energy supply
Time Schedule:	Efficiency Strategy with Action Plan, referral version ready by February 2011
Other environmental benefits:	Fossil fuel free heating in own properties by 2014

Tab. 3: Action Nr. 2 of the Action Plan of the energy and climate strategy Borgholm

In the year 2011 strategies and goals for both areas of action were elaborated ("Effektiviseringsstrategi Borgholm Municipality" and "Transportstrategi").

It is important to elaborate an effective strategic basic structure that gives the framework for a long-term energy efficiency work. The handbook "Support for energy efficiency in local governments - A guide to a successful strategy" provided by the Swedish Energy Agency (translated version see Annex 1) suggests that a strategy should include the following four parts: Situation Analysis, Objectives, Actions and Follow-up to work effectively.

“A project plan can facilitate work by clarifying the objective of the work and set work resources and responsibilities. Likewise, it is important that even in the following climate work, after the project period, have a clear organization of work. It is for example that for every action is clear who is responsible, when it should be done, cost, and who is responsible for following up the objectives and actions in the strategy. This means that the politicians have to set aside enough working time.”[66]

[66] Energimyndigheten: Stöd för energieffektivisering i kommuner och landsting, 2011, Annex I

How to collect data?

To elaborate the situation analysis, at first an inventory for each field of action should be created to have appropriate indicators for determining the current situation and to be able to measure the attainment of the established targets.

Thereby the following questions could be interesting:

How many vehicles does the local authority own or rent? Which kind of fuel do the cars have and how much do they consume? What distances do local government representatives drive and which distances are driven by citizens? Which amounts of CO_2 emissions are caused by the driven distances? How many people use bikes on their way to work? What consumption values of water, electricity, etc. Are caused by public buildings?

Acquiring reliable and accurate data is very difficult at the beginning. Information must be obtained in a creative manner: energy suppliers, water works, gas stations have to be asked for data, surveys have to be made etc. Often, it costs a lot of time to persuade data administrators to release the data. Much information is already available, but often not in the required form (for example written form vs. electronically data). Well-networked city administration databases are a great advantage but no obligation. Over time, the acquisition of information is easier because the data sources are known and data will be less retained after results are visible and it is certain what the data will be used for.

"Regardless of whether the municipality chooses to do the statistics compilation by itself or bring in a consultant, it is important that the methodology used is documented. This means for example, to write down the statistical sources, calorific values and emission factors used when looking at energy consumption and carbon footprint."[67]

In the case of Borgholm the recorded data (for instance statistics on local and residential areas from municipal-owned real estate companies and authorities, information on fuels used for heating of buildings, purchased energy for heating and vehicles, electricity consumption and production, analysis of the municipal fleet of vehicles including the driving statistics and information on fuel, passenger and goods transport) has to be reported to the Swedish Energy Agency. The Agency calculates indicators for the municipality on the basis of the recorded data that are necessary for a follow-up.

How to set up indicative and comprehensive targets?

The next step after gathering data and develop a comprehensive situational analysis of the current situation and future development of the municipality is to define the vision and the targets. Borgholm municipality's energy and climate vision and goals can be found in a former section.

[67] Energimyndigheten: Stöd för energieffektivisering i kommuner och landsting, 2011, Annex I

For achieving these goals, the municipality has to decide on effect and activity objectives. Effect objectives contain specified values on what should be achieved. These objectives should be SMART (see Annex I, goal theory)[68].

In Borgholm, effect objectives are for instance:

- During the period 2010 – 2014, new wind turbines shall be built or upgraded by 50 MW installed capacity.
- At least two biogas plants that use mainly manure or sewage gas to produce vehicle gas respectively district heating or electricity shall be available until 2014.
- At least two filling stations for biogas vehicles shall be available to the public in 2014.
- 50 % of the total amount of private and company cars in Borgholm's municipality shall be eco-friendly cars by 2014. 20 % of the municipality and municipal organizations owned vehicles shall be biogas or electricity driven, 80 % of the vehicles shall have an ethanol or diesel particulate filter.
- Additional 250 hectares of wetlands shall be constructed around the municipality by 2014.

Activity objectives are tangible goals that are comprehensive and cover several measures. The municipality of Borgholm proposed the following activity objectives:

- Establish a travelling policy for the municipality in which environmental and climate requirements are indicative.
- Establish an energy efficiency strategy for municipal buildings.
- Establish a strategy for the purchase / lease of vehicles for the municipality that meets the environmental requirements of public procurement SFS 2009:001.
- Fossil fuels are not used for heating of municipal properties.
- Most of the municipal property that is not connected to district heating has solar collectors for hot water.
- All housing and construction in Borgholm's municipality is characterized by energy efficiency and environmental awareness. Passive houses and other low energy houses are welcome for new construction.

How to carry out and follow-up the actions?

Action Plan

In order to achieve the objectives, the municipality has to develop an action plan. The measures contained in the action plan should be defined clearly and precise to be effective. Within the Action Plan of Borgholm municipality’s efficiency strategy, the actions are

[68] see Annex I, page 5

defined through the intended vision, measurable objective, description of the action, acting authority, responsible authority, allocated resources, time schedule and the type of follow-up method.

For example, two actions in the field of heating in Borgholm municipality owned properties are defined in the Action Plan of Borgholm's Efficiency Strategy as follows:

"The municipal buildings with operations currently have a large part connected to the district heating network. However, there are a number of properties that are still heated with fossil fuels or direct electricity. These contribute too much to the property's carbon footprint. District heating carbon dioxide emissions are only around 7 % of that of oil fuel. It is not only changing the form of heating that is important but also the optimization of indoor temperatures. By adjusting the indoor temperature to correspond to what tenants can expect, it is possible to reduce energy use. An important part of efforts to optimize the operation is that systems and installations are in operation more than necessary. One way is to synchronize the ventilation system operating schedules with utilisation times. It is possible to do this with other systems such as climate cooling, circulation pumps, heaters, etc.

It is important that the flow in the heating, ventilation and, where appropriate, cooling system is properly aligned. An "imbalance" may involve abnormal system temperature to compensate for deficiencies in parts of the system. A decreased heat throughout the heating system reduces heat energy. It's about to get a good effect release of each item by dividing the flow in the heating system. This is a prerequisite for many other energy efficiency measures where the change of form of heating is the last one when you probably can install a lower power.

Vision	Borgholm Energy AB (BEAB) will provide and manage effective and resource efficient buildings and premises.
Objective	By 2020, all properties owned or leased by the municipality and BEAB have fossil fuel free heating.
Action description	Phase out Plan shall report where the conversion is carried out successively. The plan should include situation analysis and after action, both in metrics, but also an analysis of the property's other maintenance and future use so that the coordination of efficiency measures can be made. Life cycle cost and the investment cost must also be included.
Performance	BEAB
Responsibilities	Property Department
Resources	Investments for scheduled maintenance and efficiency measures in municipal buildings are decided by KF on the reported phase out plan from BEAB.
Time schedule	Phase out Plan presented by 2013-06-30 to Municipal Council
Follow up	Methods for controlling and monitoring are presented in relation to phase out plan.

Vision	Borgholm Energy AB will provide and manage effective and resource efficient buildings and premises.
Objective	By 2020, the total energy consumption per building shall not exceed 140 kWh per m²; milestone in 2015 max: 160 kWh per m².
Action description	Energy Analysis of all buildings with proposals of measures. The results will form the basis for continuous monitoring and be part of operating the computer system and done in consultation with users. The analysis will be considerably more extensive than any conducted energy performance.
Performance	Property Department or hired consultant
Responsibilities	BEAB
Resources	Investment for efficiency measures decided by the BEAB board to the reported energy analysis. Resources for energy analysis in BEAB budget.
Time schedule	Energy Analysis is performed continuously, starting in 2012 and by 2014, all business properties to be ready.
Follow up	Results of the performed actions are presented annually to the Municipal Council.”[69]

Another example is given by a defined action in the field of procurement based on energy efficient product specifications in Borgholm’s efficiency strategy:

“Procurement is a effective tool for a sustainable public sector. The Public Procurement Act (LOU) places heavy demands on procurement must be transparent and that it must be stated clearly what requirements and criteria to use in the procurement. LOU providing simultaneously great potential for environmental and energy adapted procurement and purchasing. The public sector can place demands on manufacturers to develop environmentally friendly and energy efficient alternatives. Today it is common for municipalities to purchase /procure support functions such as IT, maintenance and administration. For this, energy criteria should be valid by Environmental Management Council criteria also included for service requirements for the supplier. Procurement of products can also be done with the requirements of other energy or environmental labelling systems if criteria documents are missing. Environmental Management Council (MSR) criteria for the procurement have three levels: basic, advanced and cutting edge.

Vision	The municipality purchased products should be adequate, secure, resource-efficient and have low environmental impact.
Objective	Energy and environmental requirements will be used for purchasing products in selected areas.

[69] Translated from Borgholm Municipality: Effektiviseringsstrategi Borgholms kommun 2011-2014, 2011

Action description	All purchases of products in selected areas shall match at least the lowest MSR's basic requirements.
Performance	All purchasing managers
Responsibilities	The Executive Office
Resources	Resources for education decided by the Municipal Government
Time schedule	Training of all purchasers carried out by 2012-12-31. All purchases announce that from 2013 for the selected product areas must contain not less than MSR's basic requirements.
Follow up	Annual report to Municipal Council on energy and climate benefits and cost effectiveness.”[70]

Follow-Up

Energy in climate work is followed-up annually and a report presents municipality’s efforts. Report provides a basis for monitoring the grade of success of the energy and climate work and to formulate adapted and new objectives and measures. The strategy shall be a living document with realistic and practicable measures considering the annual work budget. It is important to create a continuous work on climate change that leaves room for development and improvement.

It is the goal to establish a permanent Climate Working Group with representatives from Borgholm Energy, Environment and Construction Administration, Agenda 21 Group, municipal leaders, Öland's Economic Development Agency, Education Administration, Social Services Administration. They shall follow, encourage and develop climate work from an overall perspective. The representatives of each authority appoint the group responsible for addressing climate issues in their respective organizations.

3.2.4 A small municipality’s ability to influence – Borgholm as an example

As already noted in the energy profile of Borgholm, transport and heating of buildings cause the largest shares of carbon dioxide emission. Changes in the transport sector would create a major impact on climate change gases in Borgholm’s municipality. Therefore, transport and energy use in buildings are the main points where measures for energy efficiency work should focus on.

Many decisions which affect the overall development of transports are taken at national level or above, but even a small municipality has a lot of own tools. In some areas municipalities have major control over, such as the municipality’s and municipal companies’ own vehicle fleet, employee business travel, access and charging in car parks, car-efficient urban planning and design of public transport. Other areas have less power

[70] Translated from Borgholm Municipality: Effektiviseringsstrategi Borgholms kommun 2011-2014, 2011

over but can still make efforts such as information campaigns, logistic solutions and commuting to work.

Within the field of energy efficiency in buildings, small municipalities are also able to influence the development. By establishing clear visions and objectives of municipal energy strategy, dissemination of best practices, cooperation with interest groups as well as implementation of energy efficiency measures in own properties, the local government can present itself as a good example.

The implementation of energy efficiency measures in municipality owned and municipal companies owned properties (heating, ventilation, water, lightning, climate shell, investments in renewable energy, methods of control and monitoring) as wells as efficiency measures for municipal activities (purchasing energy efficient products, energy requirements for procurement of electronic equipment, street lighting) will reduce operating costs of the municipal organization. In the field of urban planning (building structure and urban planning; requirements for new and re-construction) the municipality also has potential to improve energy and resource efficiency.

3.2.5 Conclusion and Borgholm's key factors of success

It is quite possible that even small municipalities can influence energy efficiency of the municipality in a comprehensive manner. As the analysis of Borgholm's Energy and Climate Strategy shows, this can be achieved on the one hand by establishing the local organization as a good example of establishing and implement energy efficiency measures. On the other hand the municipal organization has to work with energy efficiency in a strategic manner, especially when there is no adequate experience available in this field. By working with a strategy it is possible to reveal potentials and weaknesses of the local energy structure, for instance, to find energy saving potentials.

A strategic energy efficiency development has the effect of reducing operating costs within the municipality's organization and area. Furthermore, is has good effects on the local environment and tourism, it can improve life quality, reduce dependency on fossil fuels and create local jobs, and therefore can lead to an economically and ecologically sustainable development. Of course, many measures improving energy efficiency need investments, but the gathered data can also be used for calculations that provide payback periods. Thereby, projects with short payback periods can be indicated.

In summary, it can be said that there are two key factors of success: the municipality's organization including all municipal authorities and municipal companies has to act as a good example by establishing and implementing appropriate measures and that the municipality should do this in a strategic manner.

The handbook "Support for energy efficiency in local governments. A guide to a successful strategy" provides good guidance and help to develop an effective energy efficiency strategy for a municipality's administration, see Annex I.

4 Analysis of selected best-practice projects for a sustainable improvement of energy efficiency in municipalities

This section comprises the analysis of projects that improve energy efficiency in the municipal area. Projects were selected for the analysis, which are in principle transferable to other municipal organizations. The goal is to disseminate best-practices of energy efficiency handling and to provide local authorities with inspiration and guidance.

The projects are divided into four sectors: buildings, transportation, learning & lifestyle and networking. For an overview about EU institutions, EU initiatives and EU campaigns, international regular events, international associations, networks and initiatives of local authorities, see Annex II.

4.1 Sector buildings: District heating and district cooling

District heating is an effective tool for reducing CO_2 emissions. The use of biomass fuels reduce emissions of CO_2 drastically and rise price stability when using wood or other local produced fuels. Furthermore, local jobs in the forestry industry are created, when wood is used instead of imported fossil fuels.

In combined heat and power (CHP) plants hot water for district heating is produced simultaneously with electricity. While the district heating business is cost-covering, the production of electricity brings in money for the company. Also the overall efficiency of the process is roughly doubled to about 90 %.

In combination with district cooling a higher utilization rate can be established in a CHP plant. These plants are so called CHPC plants – cogeneration of heat, power and cooling plants. Chilled water for district cooling is usually generated by powering the absorption cooling machines with heated water of the combined heat and power process. Alternative cooling sources can also be cold water from surrounding lakes or seas and melting snow, which is stored on a special field and isolated by e. g. wood chips or underground storage.

Fig. 8: Absorption chiller at Sandvik plant with 300 kW; photo by Växjö Energi AB

In Växjö, a district cooling grid is installed parallel to the existing district heating grid. In the first step consumers like hospitals, shopping malls, industry and university buildings are connected due to their year-round cooling demand that is more economically feasible in the initial period of the establishment of a district cooling. After establishing an initial grid, district cooling grid will be developed further with the goal to provide district cooling to smaller consumers without grants in the future.

By replacing conventional electrical driven compression cooling machines with absorption chillers for producing cold water for district cooling, a lot of electrical energy can be saved and peaks of electricity load in the summertime can be reduced. On the contrary, it is possible to produce more electricity also in the summertime. A few big cooling machines are more efficient and produce less noise than many small aggregates.

The heat demand within a week is not constant. The difference between consumption peak and ground level can distinguish up to 40 %. Through the use of hot or cold water accumulators unused heat can be stored and peaks of heat consumption can be covered without using fast variable oil or gas boilers. This contributes to raise the utilization rate of a biomass-fuelled CHP or CHPC plant and reduce costs of the provided district heating energy. When accumulators are open on top, they can also be used to hold pressure and serve as expansion tank.

The Växjö Energi AB owned Sandvik plant consists of two CHP blocks producing together 105 MW of heat and 55 MW of electricity plus 70 MW heat from a hot water boiler without CHP. The Sandvik plant produced around 161 GWh of electricity and 519 MWh of district heating during the year 2003 which corresponds to a use of around 70 000 m^3 of oil if it would have been run solely on oil. The hot water accumulator of Växjö Energi AB at Sandvik plant can store around 2 700 MWh energy. It is 61 metres high with a diameter of 30 metres and stores about 40 000 m^3 water. Further information can be found on VEABs homepage (www.veab.se).

By using biomass from wood for generating heat, ash is produced. This ash is to be stored in a tower silo which is open on top so that the ash can weathered. After approximately one year the ash is distributed back to the forest as a fertilizer, containing nutrients and trace elements.

Concerning information policy, a connection plan of the district heating grid in the city area is available for the public. Thus, citizens can inform themselves about the development of the connection availability in the next years.

4.2 Sector transport: Bicycling as a sustainable way of transportation in Sweden

The avoidance of greenhouse gas emissions by substitution of motor vehicles by bicycles in urban traffic is an important component of the environmental and energy policies of most Swedish municipalities in the field of transport. Many municipalities in Sweden have recognized that the promotion of cycling in urban areas will pay off in many ways and that

cycling correlates excellently with the vision of an economically and ecologically sustainable society. Swedish cities as well as role models such as Copenhagen and Amsterdam are continuously working on improving conditions for cycling and thereby considering the interests of all road users such as car drivers, pedestrians and blind and partially sighted people.

The migration of traffic participants from the motor vehicle to the bike not only reduces energy consumption and greenhouse gas emissions, but also significantly improves the quality of life of the city:

- Health and safety effects: exercise increases health and fitness; time savings by combining daily exercise and commuting to work; improved safety for cyclists, but also pedestrians and motorists by well-developed bicycle path network
- Environmental effects: reduced air pollution and noise pollution, reduced inner-city parking space requirements
- Economic effects: creation of local jobs, longer retention time in the downtown revives shops and restaurants, increased tourist attractiveness by car-free city centre, sales increase in bicycle business, reduced dependence on oil price
- Social effects: since bicycling is cheaper than car and bus, many groups in society benefit from investments in pedestrian and bicycle traffic: small children, older people, disabled people, people with low income, work commuters

Currently some cities such as Växjö realize concepts for bicycle highways on which one can use for instance wooden bridges, tunnels to go unhampered from various districts to the city centre. Other measures that improve bicycle riding are for example:

- Avoidance of curbstones at intersection areas and other potential driving route points;
- zebra crossings for pedestrians and cyclists at many intersections and roads intersected by bike paths;

Fig. 9: Oskarshamn – zebra crossing. Photo by Armin Verch (photo left)

Fig. 10: Oskarshamn – avoided curbstones. Photo by Armin Verch (photo right)

- wide and non-stop asphalt and gravel roads, which offer sufficient space for cyclists and pedestrians at the same time;
- traffic calming measures in parts of the inner city such as speed barriers for cars;


Fig. 11: Photo of a wide asphalt bicycle and walking path in Oskarshamn. Photo by Armin Verch.

Fig. 12: Photo of numerous roofed bicycle stands in Oskarshamn. Photo by Armin Verch. (right side)

- more comfortable, stable, covered and illuminated bicycle stands;
- good and adequate signage at key waypoints, detailed cycling maps, bicycle barometers, provision of air pumps, bicycle repair kit and maps in the shops of city centre;


Fig. 13: Photo of a bicycle and walking path crossing a road in Oskarshamn. Photo by Armin Verch.

Fig. 14: Photo of wide bicycle paths in the city centre of Oskarshamn and appropriate signage. Photo by Armin Verch. (right side)

- secure and roofed luggage storage possibilities (lockers or baggage stations);
- delivery services for larger objects or quantities of goods;
- easy to handle bike rental, especially at central car parks;
- awareness-raising measures for citizens, such as Bicycle Chain (Cykelkedjan – see following section);
- showers at work as well as roofed bike racks and corporate e-bike pools provided by the employer;
- setting up feedback opportunities (for instance a website).

The improvement of infrastructure and safety for cycling is just the first step, but necessary to change people's awareness and behaviour. Only when a certain level of comfort and security still exists, more people will opt for the bike.

The collaboration between politicians, citizens, urban retailers, businesses and other interest groups makes it possible for municipality and entrepreneurs to present themselves as common supporters of bicycle traffic. Moreover, by broad agreement it is easier, to develop a long-term strategy and implement it.

In the following, strategies and actions of some Swedish cities are analyzed regarding their effects and efforts.

Jönköping – Bicycle Plan

The city of Jönköping has worked out a Bicycle Plan, which aims to answer the questions, how to win more people to ride a bike and how to improve safety for cyclists and other road users. It includes proposals on appropriate measures and how to achieve a more frequent use of bicycles as transportation. Above all, a general consideration of cyclists in road and transport planning is important. Planning and design of the Bicycle Plan takes place in the Urban Planning Department and Traffic Department. The technical office is responsible for operations and maintenance.

Jönköping – bicycle map

Jönköping has around 270 km of bicycle paths throughout the city. They are summarized in a detailed bicycle map of Jönköping[71].

Fig. 15: Jönköping bicycle map front

Fig. 16: Bicycle map back

[71] Jönköpings kommun: Cykelkarta – Jönköping och Huskvarna med omnejd, 2011; Reference: http://www.jonkoping.se/download/18.67319cbb12e72e7bb0480008427/Cykelkarta.pdf

Fig. 17: Detail of Jönköping bicycle map

In the city of Jönköping, two bicycle barometers (Cykelinformationstavlor) were installed, which detect and display the transits of bicycles. They show the number of travelled-by riders of the current and previous day. In addition, information can be displayed that can be useful for cyclists, such as: “DO NOT FORGET TO PUT ON A HELMET” or “NOW STARTS CYKELKEDJAN” (see section below: Bicycle Chain). The current trends and movements as well as weather information are available on the Internet:

http://www1.infracontrol.com/cykla/jonkoping_cykeldata.htm (as of 29.07.2011).

Antal registrerade cyklister i Jönköping:

Hittills i år: 334 684 CO2-reduktion ca 127 849 kg info

Plats	Cyklister idag	Samma tid 1 vecka sedan	Aktuell trend
Odengatan:	372	411	→ 9%
Munksjögatan:	590	569	→ 3%
Summa:	**962**	**980**	→ 1%

Uppdatera

Fig. 18: Detail of the bicycle barometer webpage

Jönköping – Awareness rising with the project Bicycle Chain (Cykelkedjan)

The project Bicycle Chain is an initiative of Jönköping's municipality. It is a bike-to-work-campaign which takes place from May to September. The goal of the campaign is to get as many people as possible to cycle to and from work in order to gain health, environment and economy and to generate good habits in the long-term view.

All cyclists have to make a free of charge registration for their team on the campaign website. Each team consists of three to five cyclists. The first ten teams get a prize. Organized by the municipal building authority, it has a budget of around EUR 13 000 (2011) used for advertisement (announcement, folders, e-post, flyers, maps etc.) and consists mainly of sponsoring funds.

Results from the Bicycle Chain in 2010: 613 cyclists in 145 teams participated, of which were 70 % female bikers. 81 % used a bicycle helmet. 65 % abstained from the car which has contributed to a saving of 47 tonnes of carbon dioxide. Together, all teams cycled 268 000 km in 26 400 days, which means that all participants have together burned about 20 000 units of 100 g chocolate.[72]

Linköping – Information on bikes and riding

In Linköping, a proportion of 30 % of cyclists of all traffic has been achieved by appropriate measures. The homepage of Linköping provides all kinds of interesting information related to bikes and riding: www.linkoping.se/sv/Trafik-resor/Cykling (as of 30.07.2011).

Lund

The Lund University examined the impact of traffic zones in the city centre on the economy. It turned out that this leads to more purchases in the city, because many people use the well-developed bike paths and stay longer in the inner city as if they were going by car. In particular, small shops, restaurants and cafes in the city benefit from the traffic-calmed zones, if more cyclists are on the road.

The cyclists impact on trade in Växjö

On behalf of Växjö, the research institute Handelns Utredningsinstitut (HUI) made an investigation about travel and spending habits of cyclists in Växjö city centre. The survey shows, that bicycling is an important mode of transport when visiting the city centre and that cyclists have a great economic influence. In fact, cyclists spend SEK 300 million for shopping in the city centre[73] (83 000 inhabitants) plus SEK 40 million in cafés and restaurants. The average cyclist spends more money in the city compared to those who

[72] www.cykelkedjan.jonkoping.se, as of 21.07.2011

[73] www.mynewsdesk.com/se/view/pressrelease/cyklisterna-viktiga-foer-vaexjoe-centrum-486208, as of 02.10.2011

travel by bus, train or go to the city centre of Växjö.[74] The study also shows a new trend: So far, the planning of shopping centres and shops was very focused on motor vehicles. Many parking spaces for cars emerged, but cycling enthusiasts have to put their bikes on the wall. Cyclists, however, have a large share of sales in the city. Therefore their influence on the trade will be included into consideration of urban planning in the future.

4.3 Sector learning & lifestyle: Earth Week for the Climate project

Earth Week for the Climate is a project of the sector learning and lifestyle. Projects of this sector aim at changing habits and behaviour of people to generate a sustainable energy efficiency improvement. The objective of the Earth Week project is to raise awareness for energy saving and energy efficiency of pupils and teachers. By guiding pupils on several days, the project aims at changing habits and attitudes towards energy use within field of food consumption and sustainable production, shopping, waste separation and disposal, transport issues, standby/switch off, carbon dioxide footprint and how it affects the climate. In addition, the project's goal is to reduce electricity consumption of the schools and save money on the long run.

The project is about saving energy in schools during one week. It is built as a competition of schools within countries around the North Sea, participating each with two rival schools located in one city. The competition between schools is the driving force of the project. This competition takes place every year with registration but it is generally imitable for ambitious schools, local organizations or even companies. Earth Week for the Climate gains publicity in media (television, radio etc.).

Approach:

- Started week by providing the brochure "footprint" with energy saving tips
- Turn lights off, use sunlight
- Switch off instead of stand-by: pupils investigated that 30 % of energy consumed while nobody is at school, made inventory of all rooms and their electrical devices, switched off all unused devices
- Sorting waste is not complicated: only a habit
- Ask yourself the question: "Do I need this?" and "What are the alternatives?"
- Website informed everyone about results and measures
- One day cold food was served for energy reduction
- Comparison of all participating schools: percentage of reduction in several categories

[74] www.vaxjonytt.se/3/cyklisterna_bidrar_mest_till_centrumhandeln.aspx, as of 02.10.2011

The results in Växjö schools were astonishing: Teknikum School saved 11.3 % and Katedralskolan 22.8 % compared to the electricity consumption of the previous week. In total, the Katedralskolan and Teknikum together saved 7 000 kWh during the week which is roughly equivalent to average house annual electricity consumption.

The efforts to achieve such results are manageable: It needs the commitment and time of teachers and the principal, the organization of an opening and final event, equipment for electricity and perhaps heat measurement, the creation of flyers as well as material such as checklists etc. Unfortunately there is no monetary funding. But in fact, energy saving causes cost saving for the schools and furthermore an interesting and teaching project for pupils, teachers and other participants. Contact and further information: www.answerproject.eu.

4.4 Sector networking

Municipal Energy Advisors Network in Småland and Blekinge (Energirådgivning)

The goal is to create a competence network in the region and an effective energy advice system in all municipalities, a resource that local residents should be familiar with and is used frequently. Municipal Energy Advisors represent the operational backbone of the strategy towards more energy efficiency in municipalities in Sweden.

The Energy Agency for Southeast Sweden coordinates the municipal energy advisors in the region, with regular activities, education and new information, particularly from the Energy Agency. Through the organized networking events a skills network was created.

Swedish energy advisors are employed and paid by the municipality instead of being paid by the company (although refunds can be proposed). A municipality paid energy advisory system has big advantages:

- Many businesses are unsure whether energy advisory can meet their expectations. There is an uncertainty if the expected success will cover the occurring costs and bureaucracy of applying for funding. A free kick-off energy advisory circumvents this obstacle and leads to higher utilization rates and thus more energy saved in the municipality area. Furthermore a funding system is unnecessary, what avoids cost, energy and nerves.
- Due to regular and consistent training and encouraged knowledge sharing across the network, the knowledge levels of the public energy advisors are relatively homogeneous.
- Knowledge is available for public and can be used symbiotically by a combined task field of the energy adviser, such as the development of a municipal energy efficiency strategy. The community will benefit from integrated energy strategies by saved energy costs and greater environmental friendliness.
- The exchange of knowledge is not impeded by private interests.

Night wandering (Nattvandring)

The goal is to improve energy efficiency in the industry and trading sector as well as in municipal buildings and schools in the area of southeast Sweden.

The night wandering project is financed by the Swedish Energy Agency with around EUR 100 000 until 2012 and is suited for the existing energy advisors that already carry out municipal energy advisory within the municipal area. At its first stage the project comprises a number of 150 night wanderings in industry, trade, municipal buildings and schools in the 39 municipalities of the Counties Kalmar, Kronoberg, Jönköping and Blekinge. The project includes specific trainings for the energy advisors as well as training material.

A night wandering appointment takes approximately three hours in the company plus one hour for writing a report for the company. It takes place when the organizations production is down or at advantageous moments, such as production revisions in shift work companies. Usually the production is down at nights; therefore, it is called night wandering.

The appointment firstly comprises a meeting, which means to have a first look at the organizations' layout plan, the water, electricity and heating bills respectively proper statistics and to discuss occurring questions. Especially interesting is the comparison of ground and peak energy loads, comparison of production rates and energy demand and other proper statistics.

Secondly, a walk inside the facilities follows. The observant energy advisor has to take a critical view within all rooms of the premises, also in restrooms, corridors, etc.

The night wandering protocol, a checklist for the main points of interest, is a helpful tool for an easy follow up and reporting. It mainly comprises of comments on the different main points of interest, for example: building and building shell, heating system, ventilation system, electricity and light, cooling system, tap water system, compressed air system. It is most important to keep the checklist as clear and easy as possible but simultaneously not to miss important points.

The report shall comprise all questionable points that were detected in the different areas and comments of the energy advisor, how the organization can improve this or to give a kick-start how the issue could be handled more energy efficiently in the future. Generally the report can be seen as a free of cost initial kick-start report which shows current problems and raises questions from which the organizations energy efficiency respectively cost savings can benefit.

5 Conclusion

The first section states that energy efficiency is a tool which is mainly capable to reduce fossil primary energy consumption that leads to reduced greenhouse gas emissions and thereby helps to prevent climate change. Additionally, it is able to reduce the intensity of deployed final energy per net product and thus reduce dependency on imported fossil fuels as well as improve competitiveness. Furthermore, the introduction of energy efficient technologies promotes innovative capability. By realizing energy saving potentials, security of energy supply is improved.

For the prevention of human-induced climate change, the stabilization of the greenhouse gas concentration in the atmosphere is necessary. Energy efficiency measures play a decisive role in order to create an ecologically sustainable energy system by reducing greenhouse gas emissions.

The analysis revealed that the public sector can take an exemplary role by acting energy-conscious regarding investments, maintenance and other expenditures for energy-consuming equipment, energy services and other energy efficiency measures. By disseminating information, exchange of experiences and best practices, some of these measures could be brought to citizens and businesses in an effective way by highlighting the cost benefits. Benefits of energy efficiency measures for the municipality go beyond energy savings: restoration of buildings, adaptation of infrastructure and urban renewal create local qualified and long-term secure jobs. This causes the economic sustainability of energy efficiency measures.

It could be said that public authorities who lead by example in energy efficiency work are a key factor of leading the municipality in an economically and ecologically sustainable way. The handbook “Support for energy efficiency in local governments. A guide to a successful strategy” that can be found in the Annex provides good guidance and help to develop an effective energy efficiency strategy for a municipality’s administration.

The analysis of strategies for increasing energy efficiency of two Swedish municipalities showed that both, large and small municipalities have a significant influence on energy use within the municipal organization itself, but also beyond. With strategic planning and systematic implementation of energy activities, local governments can influence both citizens and businesses within the region as a good example. Due to political commitment and political unity, broad cooperation and good financial organisation, municipalities have good opportunities to implement energy efficiency measures.

Many measures that are based on behavioural changes and appropriately modified organization require no or little investment. Technical changes increasing energy efficiency, such as the use of more efficient equipment or controlling appliances often require high investment, whose payback period can be estimated by means of a life cycle calculation.

It should be emphasised that energy savings can not only be achieved by using more efficient technology. Only if technical changes are connected with organisational respectively structural and behavioural changes, energy saving potentials from efficiency improvements can effectively be realized.

There are many interesting approaches for energy efficiency activities. The Swedish municipalities rely on a mix of measures for all areas. The areas learning & lifestyle and networking, which include behaviour-based and organizational activities are of interest to supplement technical activities.

The example of Swedish municipalities showed that consideration of energy and environment in an integrated strategy contributes to a more sustainable urban development and higher quality of life. Actions and projects for sustainable increase of energy efficiency are cost effective and can significantly contribute to the development of an ecologically and economically sustainable energy system. This forms the basis for sustainable development. Therefore, energy efficiency plays an important role in international and national politics in Europe.

Annex I

Handbook - Support for energy efficiency in local governments. A guide to a successful strategy.

Translated by Armin Verch from original document:

„Stöd för energieffektivisering i kommuner och landsting. Vägledning till en lyckad strategi.”

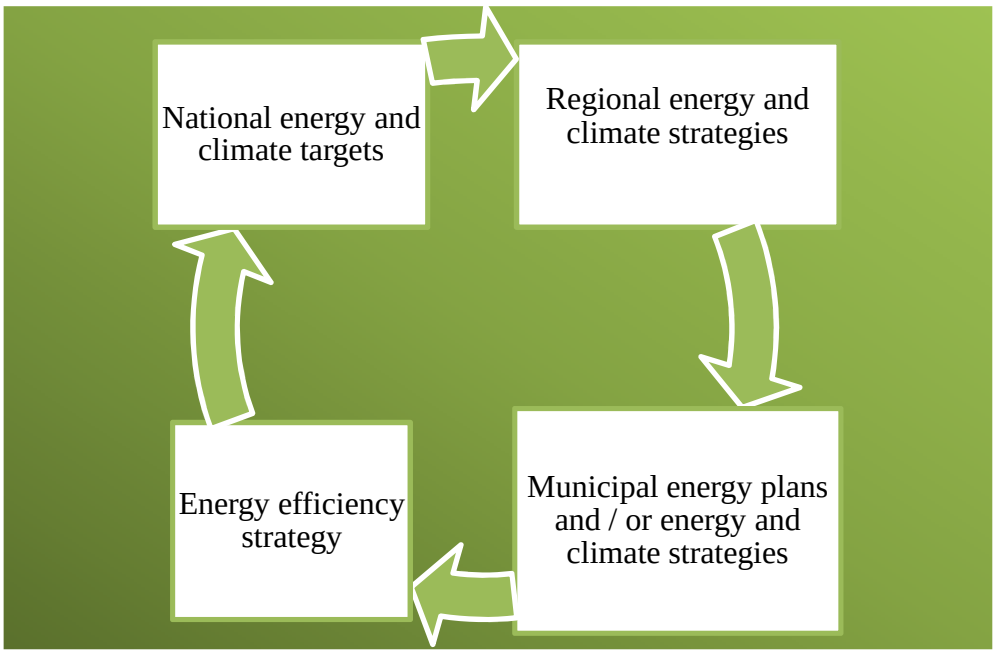
Reference: Energimyndigheten

www.energimyndigheten.se

Introduction

From 2010 local governments can seek general support from the Energy Agency to work with energy efficiency within their organization. The aid will go to developing a strategy and action plan for energy efficiency with targets for 2014 and 2020, and actively work to implement the action plan. This brochure provides tips and advice for work on energy efficiency strategy.

The strategy should include energy efficiency measures for buildings and transport within your organization. Energy efficiency strategy, however, if you wish to be part of a larger energy and climate strategy for the municipality as a geographical unit, therefore we give also some hints for this work. In principle, one could say that energy efficiency strategy is the last, but perhaps the most concrete step in a long chain from national to local level which ambitions at the various levels all affect each other.



Organization and process

A clear work process and organization of climate and energy work is a crucial factor in getting an entrenched and vital approach. At the same time it is important to create participation so that many people become involved in climate work.

For the self-running force of the strategy, it is common to let municipalities set up a working group to develop targets and actions, a steering committee responsible for the scope of work and a coordinator who acts like a spider in the web (sometimes reference groups may be necessary).

In some municipalities thematic groups were established to identify actions (transport, buildings, etc.) combined with an order to administrations and municipal owned companies themselves to identify actions and report these centrally to the main environmental and climate-strategists. It is not uncommon that some of these groups live on after the project period and then serve as a forum for the continued development of climate change work, identifying new actions and projects.

A strategy usually consists of four parts:
• Situation Analysis • Objectives • Actions • Follow-up

A project plan can facilitate work by clarifying the objective of the work and set work resources and responsibilities. Likewise, it is important that even in the following climate work, after the project period, have a clear organization of work. It is for example that for every action is clear who is responsible, when it should be done, cost, and who is responsible for following up the objectives and actions in the strategy. This means that the politicians have to set aside enough working time.

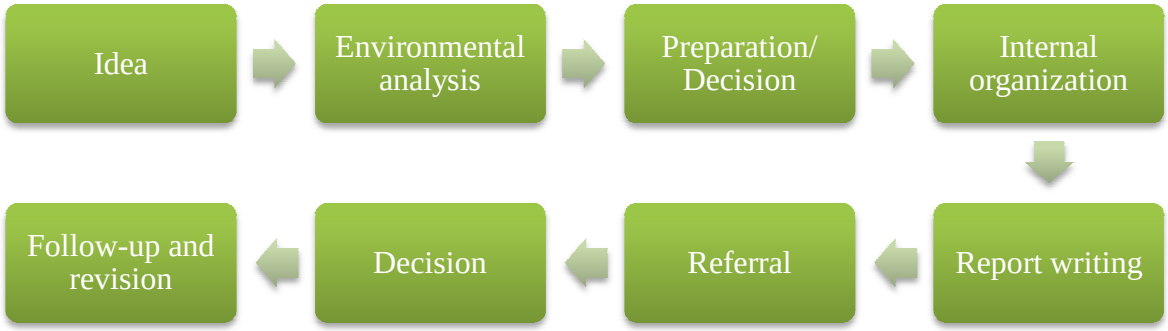
Climate municipalities (Klimatkommunernas) website [www.klimatkommunerna.se] gathered an amount of useful tools, such as a process guide that describes how the work on climate and energy strategies can be set about.

Klimatkommunernas presents on its website specific tools for the work on energy and climate strategies. These process and document guides show examples of how to organize one's energy and climate work and how to work successfully in different municipalities. The guide contains templates, ready-made texts, examples of meeting agendas, project plans, etc. Much of this material is useful even when you develop an internal energy efficiency strategy for your organization. To be used by municipalities of all sizes and levels of climate work the process guide is divided into a basic and an advanced level. For more info see Klimatkommunernas website, www.klimatkommunerna.se

The Energy Agency of Sweden (Energimyndigheten) within the framework of Sustainable Municipality developed a tutorial to make it easier for municipalities to get started and

fulfil their ambitions in the energy and climate field. It includes inter alia defining what you want to achieve, to organize itself effectively, to prioritize appropriate activities, and to implement things in a good way. Guide is available at the energy agency's website, www.energimyndigheten.se/uthalligkommun

Example of a process



Example of a work process for a strategy. For more information on the different steps, see Klimatkommunernas process guide on www.klimatkommunerna.se

Objectives...

Within the framework of the aid you should develop objectives for 2014 and 2020, expressed both in MWh and as percentage reduction compared to base year. Targets should be set by the municipality or the County Council's own conditions and be based on the situation analysis carried out.

In the situation analysis, you will hopefully been answered what are your main areas for action to reduce energy consumption and carbon footprint. Your objectives should harmonize with the objectives contained in the regional energy and climate strategy for your county.

To set a good example for the rest of the society, you should set ambitious and inspiring objectives that call for a high tempo in the transition. Energy Agency will watch that you are actively working to achieve the objectives; however, there is no explicit obligation of that you have to reach the targets that you set for 2014.

SMART objectives:
S ... specific.
M ... measurable.
A ... accepted.
R ... realistic.
T ... time-bound.

The formulation of objectives is an important process - through good objective analysis and goal-setting it becomes easier to develop an effective and realistic action plan. In many contexts so called SMART objectives have to be emphasized.

Overall, inspiring vision objectives can also be set up to work on energy efficiency but it is the more concrete objectives which, in our experience really calling for action.

Short on objectives theory

Vision's objectives
Answers the question "what you want to achieve? ". It's about to paint the picture of what you seek. It can be a sustainable development, a fossil fuel free municipality or how to travel in the future. Do not be afraid to think freely and go the whole hog!

Effect objectives
Responding to the question of "what should be achieved? “. It can be specified emission targets in e.g. tonnes, MWh or percentages. These objectives should be SMART (see previous page).

Activity objectives
Answers the question "what should be done?" This is about concrete goals as the number of completed seminars, training, information measures, physical measures and technical solutions, etc. The difference to measures in the action plan is that the activity objectives are more comprehensive and cover several measures.

Process objectives
Answers the question "how the work should be done? “. It could be that it intends to create involvement, specifying meeting forms, responsibility and influence, etc.

...and actions

As for work with objectives set out in your strategy the starting point for your package of actions should be the current situation analysis. Based on the current situation analysis, areas in which efforts should be prioritized to cost-effectively achieve significantly reduced carbon footprint and energy consumption.

Anchoring is important when the actions worked out to both your energy efficiency strategy and for your energy and climate strategy. The Energy Agency requires that the action plan shows when your actions are to be implemented. In addition, a good action plan should also indicate who should implement the measures and how they are financed. If it is difficult to obtain an accurate funding at an early stage, it should still be made simple cost estimation.

There are practical ways to work out actions:

1. The Action Plan to be developed in a broad and administration-overlapping work group

2. Theme groups working in specific action areas

3. Mission for each administration/company to self-identify actions

4. Each employee has the responsibility to work in accordance with the action plan in close collaboration with administrations (spider in the web)

Reality is often a combination of these methods.

If energy and climate work previously has been slow in your organization you might want to identify the most profitable actions and then "sell" them first. The risk with this is that you will miss future opportunities for smart overall solutions in which the measures with a short payback period can finance longer-term measures with longer payback period.

Life cycle analysis is a good thing to give an accurate picture of the actions profitability. If possible measures in your action plan should be validated by such tests. UFOS has several publications about energy efficiency, including "Calculate for life 'which is about just that. In addition to identifying the "right" action, you may want to consider the actions of mutual relations. Actions in the Action Plan may indeed often influence each other:

• Sometimes activities support each other

• Sometimes activities weakens each other

• Sometimes the one activity benefits of the other while the other has disadvantage of the first

The dependencies that exist can be of different nature. It can be about both resources and the effects or side effects. It is not just about "hard" variables, but also on 'soft', such as commitment and communication. A broad package of measures, involving the entire municipal administration, may be an example of ways to create "soft" synergies.

The Energy Agency requires that you work with at least two of the actions in the box at the top of next page. Many of these actions are broad in character and one reasonable package of actions should include many different actions in different areas. In addition to this requirement, it is relatively free to the municipality or county to prioritize actions for as long as the measures relating to the organization or urban planning issues.

Cooperation across municipal boundaries may sometimes be appropriate to go beyond what a single municipality can do. It could be everything from technology procurement to planning projects. Your contact at the County Board can help you to find joint activities with neighbouring municipalities or the County Council in your county.

Inspiration through good examples can be found in many areas. Uthållig kommun (Sustainable Municipality), for example, produced several good examples that you can use. Also other agencies and organizations have worked on similar types of examples and on the website for energy efficiency aid you will find links to these, www.energimyndigheten.se/eestod

Actions

The municipality or the County Council must implement at least two of the following actions:

1. Take advantage of financial instruments for energy savings, including energy performance contracting, in which measurable and predetermined energy savings are provided as required
2. Purchase equipment on the basis of lists that the National Energy Agency provides and products containing energy-efficient product specifications to different categories of equipment
3. Buy equipment with energy efficiency in all modes, even in idle mode
4. Replace or retrofit existing equipment with the equipment referred to in 2 and 3
5. Use energy audits and implement recommendations of these
6. Purchase or rent energy-efficient buildings or parts thereof, or take measures to make buildings that the authority already owns or leases more energy efficient

See "Guidelines on State aid for energy efficiency for local governments" for more tips and information www.energimyndigheten.se/eestod

Examples of measures that an Action Plan can include:

Buildings	Transport	Other
EPC-projects (Energy Performance Contracting)	Travel and meeting policies	IT measures
Procurement	Procurement (both vehicles and transport services)	Energy knowledge in school
Operating efficiency	Coordination of transport services	Light Measures in the park, street, or similar
Energy demand for new and renovated buildings	Route optimization in transport-intensive activities	Information and awareness projects aimed at staff
Lightning measures	Establishment of local car and bike pools	Energy-efficient, and transport-efficient overall connected planning
Ventilation measures	Telecommuting and IT solutions	Planning for investments in renewable energy
Behavioural issues	Eco-driving for staff	Measures in the VA business

Situation Analysis

The aim of the situation analysis is to provide guidance for further strategy work. **Through a good situation analysis** it **will be easier to formulate objectives**, **to determine what activities need to be implemented to meet the targets and last but not least, to allocate the resources necessary to implement the activities**.

Situation analysis consists of two parts: current situation description (status report) and analysis. The self-analysis can be performed by various methods; a simple and useful tool is the SWOT analysis. The situation description consists of statistical data, and partly by other, more qualitative information. The collection of statistics gives a current picture which is also a natural starting point for follow-ups. It may therefore be appropriate to use indicators that are also used by other municipalities. The Energy Agency of Sweden will calculate a number of indicators based on your reported data. These indicators will hopefully be a good starting point for your situation description. You will find all the indicators at www.energimyndigheten.se/eestod.

Other essential information that are important to the analysis could be for example data on trends in and outside the municipality, the municipal organizational structure as well as previously agreed measures.

For those who are doing situation analysis as part of a larger energy and climate strategy for the entire geographical municipality, here are some general tips for collecting statistics. System boundaries are something that must be considered when the municipality makes a situation analysis. To look for example only on emissions from the consumed amount of fuel or take it with emissions from the entire life cycle (production, distribution and usage) into account? This is an example of a question you should answer before you begin with situation analysis.

There are different approaches to choose from when making data collection:

1. Use nationally produced statistics (Statistics Sweden's municipal energy balances and greenhouse gas consortium SMED statistics, www.rus.lst.se) for the municipality as a geographical area

2. Gather statistics on your own, both for the municipality as a geographical area and the municipal organization

3. Hire a consultant

Collection of statistics takes a lot of time, but in part, the municipality may choose the level of ambition itself - anything from a few hours to several weeks. One option might be to use consultant support but that the municipality loses knowledge of the production of statistics and the cost can become quite high.

Regardless of whether the municipality chooses to do the statistics compilation by itself or bring in a consultant, it is important that the methodology used is documented. This means for example, to write down the statistical sources, calorific values and emission factors

used when looking at energy consumption and carbon footprint. Furthermore, one should note the authorities from which figures were gathered and what people you had contact with. This way facilitates a follow-up that can reasonably be made within a few years.

According to Regulation (2009:1533) on state aid for energy efficiency in municipalities and counties your energy efficiency strategy should contain a situation analysis in the form of an identification and revision of the municipality or county designating energy aspects, which will form the basis for prioritizing between energy efficiency measures. The base year shall be the calendar year preceding the municipal or county council's application for the aid.

Municipalities that receive assistance must disclose certain predetermined basic data in the Energy Agency's reporting tool E-kanalen (E-channel). Examples of such basic data are:

• Statistics on local and residential areas from municipal-owned real estate companies and authorities

• Information on fuels used for heating of buildings

• Purchased energy for heating and vehicles

• Electricity consumption and production

• Analysis of the municipal fleet of vehicles including the driving statistics and information on fuel

• Passenger and goods transport

When reporting, the municipality will then have a number of indicators that Energy Agency calculates for the municipality based on reported basic data. If you want an in-depth analyze on these or a more comprehensive situation analysis there is the indicator handbook of “Sustainable Municipalities” (Uthållig kommun) that explains the Energy Agency's thinking and provides a wider range of indicators. The handbook can be ordered in the Energy Agency's web shop at www.energimyndigheten.se.

Klimatkommunernas, together with the Energy Agency of Sweden has produced a checklist for reporting, see: www.klimatkommunerna.se

How it’s done?

Climate Municipalities has prepared a tutorial for the current status analysis, both for the geographical area and the municipality as an organization. The part dealing with the municipality as an organization is meant to serve as support in the municipalities' follow-up support for energy efficiency.

Guidelines for energy and emissions statistics
A guide to using energy and emissions statistics is developed by the Energy Agency, the Environmental Protection Agency (Naturvårdsverket), the local authorities and regions and the County Administrative Boards. It will be published on the Agency's website.

Follow-up

A central component of the strategy is to regularly check whether measures have been implemented and that a move in the right direction regarding the goals was done.

For the proposed guideline the follow-up should be made annually and a major revision of the strategy every fourth year. One successful method used in many municipalities is to revise the follow-up of the strategy connected with environmental final accounts or budget work at the beginning of the year. This allows allocating more resources when not reached, or alternatively, clearer policy signals can be sent, if any administration did not implement what they promised.

It might be a support for the follow-up work to develop indicators (also called key performance indicators) for monitoring that the municipality is moving in the right direction. An indicator is data that is selected to investigate and illustrate the changes in one area, for example energy and climate change. An indicator provides the target group with further evidence to make them able to take decisions on measures.

When reporting, the municipality will get some indicators the Energy Agency calculates for the municipality based on the reported basic data. Examples of indicators can be found here:

Miljömålsportalen

www.miljomal.se

Uthållig kommuns indikatorhandbok

www.energimyndigheten.se/uthalligkommun

SKL presenterar miljöindikatorer på sin webbplats,

www.skl.se

Annex II

Table - Overview about EU institutions, EU initiatives and EU campaigns, international regular events, international associations, networks and initiatives of local authorities concerning energy efficiency

EU initiated Institutions, Initiatives and Campaigns	
DG ENER Directorate-General for Energy	Directorate-General for Energy (European Commission Department) Energy policy directly affects everyone in Europe. Whatever age we are, and whatever activities we undertake, energy plays a fundamental role in today's world. The issues and challenges connected to this policy require action at European level; no single national government can address them successfully alone. By working in concert, European Union Member States and European industry can develop energy sectors which best meet the needs of citizens and our economy, whilst minimising damage to our environment. The Directorate-General for Energy is responsible for developing and implementing a European energy policy. Through the development and implementation of innovative policies, the Directorate-General aims at: - Fostering sustainable energy production, energy transport and consumption, - Providing European citizens and businesses with competitive and technologically advanced energy services, - Creating the necessary framework for continuous and secure energy supply for the benefit of consumers and businesses in the European Union at affordable and competitive prices, including through international relations. In developing a European energy policy, the Directorate-General aims to support the Europe 2020 programme which, for energy, is captured in the Energy 2020 strategy. The Directorate-General carries out its tasks in many different ways. For example, it develops strategic analyses and policies

	for the energy sector; promotes the completion of the internal energy market encompassing electricity, gas, oil and oil products, solid fuels and nuclear energy; ensures that indigenous energy sources are exploited in safe and competitive conditions; ensures that markets can deliver agreed objectives, notably in efficiency and renewable energies; promotes and conducts an EU external energy policy; facilitates energy technology innovation; develops the most advanced legal framework for nuclear energy, covering safety, security and non-proliferation safeguards; supports the reinforcement of energy infrastructure, monitors the implementation of existing EU law and makes new legislative proposals; encourages the exchange of best practices and provides information to stakeholders. All this work is aided by expert input from the Executive Agency for Competitiveness and Innovation (EACI) and the Agency for the Cooperation of Energy Regulators (ACER, operational from March 2011), both of which under the supervision of the Directorate-General. Source: http://ec.europa.eu/dgs/energy/
DG ENV Directorate-General for Environment 	The Directorate-General for the Environment is one of the more than 40 Directorates-General and services that make up the European Commission. Commonly referred to as DG Environment, the objective of the Directorate-General is to protect, preserve and improve the environment for present and future generations. To achieve this it proposes policies that ensure a high level of environmental protection in the European Union and that preserve the quality of life of EU citizens. The DG makes sure that Member States correctly apply EU environmental law. In doing so it investigates complaints made by citizens and non-governmental organisations and can take legal action if it is deems that EU law has been infringed. In certain cases DG Environment represents the European Union in environmental matters at international meetings such as the United Nations Convention on Biodiversity. The DG also finances projects that contribute to environmental protection in the EU. Since 1992 some 2,600 projects have received some financing from LIFE, the EU's financial instrument for the environment. Source: http://ec.europa.eu/dgs/environment

DG MOVE Directorate-General for Mobility and Transport	Transport policy directly affects everyone in Europe. Whatever age we are, and whatever activities we undertake, transport and mobility play a fundamental role in today's world. The issues and challenges connected to this require action at European level; no single national government can address them successfully alone. By working in concert, European Union Member States and European industry can ensure our transport infrastructure meet the needs of citizens and our economy, whilst minimising damage to our environment The European Commission's Directorate-General for Mobility and Transport manages work in this area. Source: http://ec.europa.eu/dgs/transport/
DG REGIO Directorate-General for Regional Policy	The purpose of EU regional policy is to reduce the significant economic, social and territorial disparities that still exist between Europe's regions. Leaving these disparities in place would undermine some of the cornerstones of the EU, including its large single market and its currency, the euro. Regional policy is worth €347 billion between 2007 and 2013. It is not just about transferring wealth from well-off regions to poorer ones. The money is targeted towards economic growth and creating jobs, by, for example, improving transport links to remote regions, boosting small and medium-sized enterprises in disadvantaged areas, investing in a cleaner environment and improving education and skills. Regional policy also helps EU regions to address the issue energy supply: Security of supply, affordable energy for competitive economies, and environmental sustainability are the three pillars of the integrated approach to climate and energy policy which the EU pursues. It has the objective of saving 20% of energy consumption compared to projections for 2020 and of reaching a 20% share of renewable by 2020. Cohesion Policy 2007-2013 addresses the intensive use of traditional energy sources, energy efficiency and renewable energies in order to make regions a more attractive place while promoting renewable energies as motors for innovation and growth. In the regions falling under the "Convergence" objective, the European Regional Development Fund and the Cohesion Fund

	can support trans-European energy networks with the objective of improving the security of supply, completing the internal market, integrating environmental considerations, improvement of energy efficiency and development of renewable energies. For both Convergence and the Regional Competitiveness and Employment objectives an important ERDF priority is to stimulate energy efficiency and renewable energy production and the development of efficient energy management systems. Renewable energy activities have a large potential to foster the economic development in the EU regions, creating new jobs and giving new economic and social development impetus. This appears to be reflected in the fact that Cohesion policy allocations to renewable energies for the period 2007-13 are five times higher under the Convergence objective and seven times higher under the Regional Competitiveness and Employment objective compared to the period 2000-2006. In the framework programmes for 2007-2013, EU allocations of €4.8 billion have been made for projects in renewable energies (wind, solar, biomass, hydroelectric and geothermal), €4.2 billion for energy efficiency, co-generation and energy management and €1.7 billion for investment in traditional energy sources of which € 674 million is allocated for investment in Trans European energy networks in electricity and gas. Source: http://ec.europa.eu/regional_policy/
Build-up Initiative BUILD UP	BUILD UP is the European Web-Portal for Energy Efficiency in Buildings and serves the needs of building professionals, public authorities and occupants alike. The key aim is to reduce the energy consumption of buildings across Europe by transferring best practices to the market and fostering their uptake. BUILD UP will also keep you updated about EU energy policy for buildings. If you are a building professional keen to improve your skills about energy efficiency in buildings and learn more about the latest information on energy legislation. BUILD UP enables you to interact with others and to access: - The latest news and events in the field - A database of publications, links, tools

	- A database of case histories and a place to share your successes. - Communities and Blogs to share expertise with your peers - Answers to Frequently Asked Questions about energy efficiency in Buildings and the Energy Efficiency for Buildings Directive. If you are responsible for energy issues for Public Authorities BUILD UP offers you access to: - Many resources on the Energy Performance of Buildings Directive - Toolkits and guidelines produced by other cities, regions or countries - A way to share expertise with your peers. Source: http://www.buildup.eu/
CIVITAS Initiative	CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen. Within CIVITAS I (2002-2006) there are 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe will be funded by the European Commission. Objectives: - to promote and implement sustainable, clean and (energy) efficient urban transport measures; to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures ; to build up critical mass and markets for innovation

	Horizontal projects support the CIVITAS demonstration projects & cities by : - Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects - The organization of the annual meeting of CIVITAS Forum members - Providing the Secretariat for the Political Advisory Committee (PAC) - Development of policy recommendations for a long-term multiplier effect of CIVITAS Key elements of CIVITAS - CIVITAS is co-ordinated by cities: it is a programme “of cities for cities” - Cities are in the heart of local public private partnerships - Political commitment is a basic requirement - Cities are living ‘Laboratories' for learning and evaluating Source: http://www.civitas-initiative.org/
Climate Action Energy for a Changing World	European Commission’s overall informational website, containing lots of information about EU’s action against climate change, what consumers can do against climate change, how to receive funding and grants and provides all important documents and publications about energy and environmental issues. Source: http://ec.europa.eu/climateaction/

CONCERTO Initiative	The CONCERTO initiative, launched by the European Commission, is a Europe wide initiative proactively addressing the challenges of creating a more sustainable future for Europe's energy needs. Today, there are a total of 58 communities in 22 projects, each working to deliver the highest possible level of self-supply of energy. CONCERTO is part of the framework research programme supervised by the DG Energy and Transport of the European Commission. CONCERTO supports local communities, as clearly defined geographical areas or zones, in developing and demonstrating concrete strategies and actions that are both sustainable and highly energy efficient. Interactions and relevant energy flows between centralized and decentralized energy supplies and demands can be identified, measured and assessed. The CONCERTO initiative has been only possible as a result of the strong commitment from the relevant, local authorities and includes technical experts, academics, and private companies from across Europe. Throughout the 22 participating CONCERTO projects the focus is primarily on demonstrating the environmental, economic and social benefits of integrating renewable energy sources (RES) together with energy efficiency (EE) techniques through a sustainable energy-management system operated on a community level. The CONCERTO initiative provides a platform for the exchange of ideas and experiences between the 58 CONCERTO demonstration communities, and other cities that are committed to introducing similar strategies. Communities participating will benefit from the shared expertise of Europe's most advanced communities, active in the field of energy sustainability. Source: http://concertoplus.eu/
EIB	The European Investment Bank (EIB) is the European Union's financing institution. The EIB's role is to provide long-term finance in support of investment projects. Inside the European Union the EIB tasks supports EU policy by stimulating investment of small businesses, addressing economic and social imbalances in disadvantaged regions, the fight against climate change, investing in a cleaner natural and urban environment, promotes sustainable, competitive and secure energy, promoting an economy that stimulates knowledge

	and creativity through investment in information and communication technologies, and human and social capital, constructing cross-border networks in transport, energy and communications. In 2010, some 88% of the total EIB financing of EUR 72 billion went to projects in the EU. Source: http://www.eib.org/
ELTIS – European Local Transport Information Service	Eltis is an initiative of the European Commission's Directorate General for Mobility and Transport. The project is led by an international team of transport related organisations. Eltis facilitates the exchange of information, knowledge and experiences in the field of urban mobility in Europe. It is aimed at individuals working in the field of transport as well as in related disciplines, including urban and regional development, health, energy and environmental sciences. Eltis supports the creation of urban transport systems, which use less energy and produce less emission, while improving the competitiveness of urban areas and the mobility and quality of life of its citizens. Created more than 10 years ago, Eltis is now Europe's main portal on urban mobility. Source: http://www.eltis.org/
EMAS – EU Eco-Management and Audit Scheme	EMAS (Eco-Management and Audit Scheme) is a voluntary environmental management system (EMS), under which companies and other public organisations evaluate, manage and continuously improve their environmental performance. EMAS has been operative since 1995. The latest revision (EMAS III) came into effect on 11 January 2010. Currently, more than 4,400 organisations and approximately 7,600 sites are EMAS-registered. Since 2001 EMAS has been open to all economic sectors including public and private services (Regulation (EC) No 761/2001). EMAS was strengthened by the integration of EN/ISO 14001 as the environmental management system required by EMAS, by adopting an attractive EMAS logo to signal EMAS registration to the outside world, and by considering more

	strongly indirect effects such as those related to financial services or administrative and planning decisions. The possibility to use a single corporate registration eases administrative and financial burdens on organisations with sites in more than one country. Furthermore, a single EMAS logo will help communicate EMAS in one coherent and distinctive way. Participation is voluntary and extends to public or private organisations operating in the European Union and the European Economic Area (EEA) — Iceland, Liechtenstein, and Norway. An increasing number of candidate countries are also implementing the scheme in preparation for their accession to the EU. EMAS III makes registration to the scheme also possible for organisations and sites located outside the EU and EEA. The Commission , in cooperation with the Forum of Competent Bodies will develop a guidance on registration outside the Community. Source: http://ec.europa.eu/environment/emas/index_en.htm
EU Green Capital	Today four out of five Europeans live in towns and cities. Urban areas concentrate most of the environmental challenges facing our society but also bring together commitment and innovation to resolve them. The European Commission has long recognized the important role that local authorities play in improving the environment, and their high level of commitment to genuine progress. The European Green Capital Award has been conceived as an initiative to promote and reward these efforts. Annual Award from 2010 Starting in 2010, one European city will be selected each year as the European Green Capital of the year. The award is given to a city that: Has a consistent record of achieving high environmental standards; Is committed to ongoing and ambitious goals for further environmental improvement and sustainable development; Can act as a role model to inspire other cities and promote best practices to all other European cities.

	Cities as Role Models The award aims to provide an incentive for cities to inspire each other and share best practices, while at the same time engaging in friendly competition. In other words, the cities become role models for each other. “The finalists and winners of the European Green Capital Award provide us with valuable real-life examples of how respect for the environment, excellent quality of life and economic growth can all be successfully combined,” EU Commissioner for the Environment, Mr. Janez Potočnik. Source: http://ec.europa.eu/environment/europeangreencapital/
EUKN	The key objective of the European Urban Knowledge Network (EUKN) is to enhance the exchange of knowledge and expertise on urban development throughout Europe, bridging urban policy, research and practice. EUKN is characterized by a demand-driven approach, based on the needs of urban practitioners and policymakers. EUKN has developed an extensive, high-quality knowledge database, based on shared standards and protocols. This extensive e-library provides free access to case studies, research results, policy documents, context issues, network descriptions, updated news and meetings. Source: http://www.eukn.org/
FP 7	The Seventh Framework Programme for research and technological development (FP7) is the European Union’s main instrument for funding research in Europe. FP7, which applies to the years 2007-2013, is the natural successor to the Sixth Framework Programme (FP6), and is the result of years of consultation with the scientific community, research and policy making institutions, and other interested parties. Since their launch in 1984, the Framework Programmes have played a lead role in multi- disciplinary research and cooperative activities in Europe and beyond. FP7 continues that task, and is both larger and more comprehensive than earlier Framework Programmes. Running from 2007 to 2013, the programme has a budget of 53.2 billion euros over its seven-year

	lifespan, the largest funding allocation yet for such programmes. Source: http://ec.europa.eu/research/fp7/
IEE Intelligent Energy Europe	There are many untapped opportunities to save energy and encourage the use of renewable energy sources in Europe, but market conditions do not always help. The Intelligent Energy - Europe programme is the EU's tool for funding action to improve these conditions and move us towards a more energy intelligent Europe. The Intelligent Energy – Europe (IEE) programme works to make Europe more competitive and innovative while, at the same time, helping it to deliver on its ambitious climate change objectives. By 2020, the EU is committed to: > 20% less greenhouse gas emissions > 20% better energy efficiency > 20% share of renewables By improving energy efficiency and encouraging the wider uptake of new and renewable energies, the IEE programme aims to boost actions which will help achieve the EU's targets, including measures to: - foster energy efficiency and the rational use of energy resources - promote new and renewable energy sources and to support the diversification of energy sources - promote energy efficiency and the use of new and renewable energy sources in transport such as bio-fuels. The Intelligent Energy – Europe programme is run by the Executive Agency for Competitiveness and Innovation (EACI) on behalf of the European Commission, and seeks to bridge the gap between EU policies and how they impact on the ground.

	In mid-2008, the EACI managed more than 400 IEE projects and the establishment of 60 new local or regional energy agencies has been supported by the programme. IEE-funded initiatives also include the ManagEnergy Initiative and the Sustainable Energy Europe Campaign. We can all benefit from the better market conditions brought about by projects supported by the IEE programme. More actively, you can apply for funding in connection with your project: the 'calls for proposals' page of the Intelligent Energy – Europe website is a good place to start. Source: http://ec.europa.eu/energy/intelligent/
INTERREG IV C	The INTERREG IVC Programme is part of the European Territorial Cooperation Objective of the Structural Fund policies for the period 2007-2013. It aims, by means of interregional cooperation, to improve the effectiveness of regional development policies and contribute to economic modernisation and increased competitiveness of Europe, by: * Enabling local and regional actors across the EU to exchange their experiences and knowledge; * Matching regions less experienced in a certain policy field with more advanced regions; * Ensuring the transfer of good practices into Structural Funds mainstream programmes. It is implemented under the European Community's territorial co-operation objective and financed through the European Regional Development Fund (ERDF). The Operational Programme was approved in September 2007 and the period for INTERREG IVC will last from 2007-2013. This programme follows on from the INTERREG IIIC programme which ran from 2002-2006. The areas of support are innovation and the knowledge economy, environment and risk prevention. Thus, the programme aims to contribute to the economic modernisation and competitiveness of Europe. INTERREG IVc is linked to the objectives of Lisbon and Gothenburg agendas.

	Tools: Typical tools for exchange of experience are networking activities such as thematic workshops, seminars, conferences, surveys, and study visits. Project partners cooperate to identify and transfer good practices. Possible project outcomes include for example case study collections, policy recommendations, strategic guidelines or action plans. INTERREG IVC also allows light implementation or piloting, but only if these complement the exchange of experience activities. Source: http://i4c.eu
JRC	The Joint Research Centre is the scientific and technical arm of the European Commission. It is providing the scientific advice and technical know-how to support a wide range of EU policies. Its status as a Commission service, which guarantees independence from private or national interests, is crucial for pursuing its mission. The JRC's energy-related activities, conducted in the context of the EU's aim for an Energy policy for Europe, focus on sustainability of energy production systems – in particular, new and renewable energy sources –, security of supply and competitiveness. Source: http://ec.europa.eu/dgs/jrc/
ManagEnergy	ManagEnergy is a technical support initiative of the Intelligent Energy - Europe (IEE) programme of the European Commission which aims to assist actors from the public sector and their advisers working on energy efficiency and renewable energy at the local and regional level. More specifically, the initiative is targeted at: Local and regional energy agencies Local and regional public authority energy specialists Urban planners and elected officials (municipal, provincial and regional), especially signatories to the Covenant of Mayors

	(www.eumayors.eu). Other local and regional organizations with a public mission that are working on sustainable energy The ManagEnergy initiative includes: - The ManagEnergy website, which offers databases on case studies and good practices as well as a directory of energy agencies - Information on relevant European policy and legislation - Electronic newsletters - Capacity building workshops - Other networking facilities, such as online events, an Annual Conference and awards The website includes a partner search system containing some 4000 organizations, including almost 475 energy agencies, which can provide valuable expertise and partnerships on energy initiatives at local and regional levels. Source: http://www.managenergy.net/
SEEC Sustainable Energy Europe Campaign	The Sustainable Energy Europe Campaign showcases activities dedicated to energy efficiency and renewable energy solutions. Concretely the focus is on spreading best practice in sustainable energy technology, build alliances and inspire new energy ideas and actions. The Campaign has been created by the European Commission's Directorate-General for Energy back in 2005. Today it is managed by the EU's Executive Agency for Competitiveness and Innovation (EACI) on behalf of DG Energy. The campaign collects Campaign projects: Put your project in the spotlight and let others profit from your experience. Any project that is

	coordinated from Europe and supports the overall goal - to spread inspiring stories - can join. Campaign Associates: major and well-established umbrella and network organisations operating at a national or pan-European level Media Associates that support the goals of the Sustainable Energy Europe Campaign Key projects are EU Sustainable Energy Weeks (EUSEW), Sustainable Energy Days and other events. Source: http://www.sustenergy.org/
URBACT European Programme for Urban Sustainable Development	URBACT is a European exchange and learning programme promoting sustainable urban development. We enable CITIES to work together to develop solutions to major urban challenges, reaffirming the key role they play in facing increasingly complex societal changes. We help cites to develop pragmatic SOLUTIONS that are new and sustainable, and that integrate economic, social and environmental dimensions. We enable cities to SHARE good practices and lessons learned with all professionals involved in urban policy throughout Europe. URBACT is 300 cities, 29 countries and 5,000 active participants. URBACT is jointly financed by the European Union (European Regional Development Fund) and the Member States. Source: http://urbact.eu/

International Regular Events	
European Mobility Week	The **European Mobility Week** is an awareness raising campaign aiming at sensibilising citizens to the use of public transport, cycling, walking and at encouraging European cities to promote these modes of transport and to invest in the new necessary infrastructures. The overall aim of the European Mobility Week campaign is to encourage public awareness of the need to act against pollution caused by the increase in motorised traffic in the urban environment. In fact, it is not just a question of fighting atmospheric pollution or noise but also of improving the quality of urban life. Accordingly, that operation is centred on three types of measures, designed to: - encourage the use of alternative forms of transport and travel other than private cars, - raise awareness and inform city-dwellers of what is at stake so far as concerns long-term mobility in towns and the risks connected with pollution, - Show the town in another light thanks in particular to reduced motorised traffic within restricted areas. Source: http://www.mobilityweek.eu/
Open Days	Since 2003, the OPEN DAYS has become an annual key event at which cities and regions showcase their capacity for creating growth and jobs, implementing European Union cohesion policy, and prove the importance of the local level for good European governance. Conceived and developed by the EU Committee of the Regions and the European Commission, Directorate-General for Regional Policy, this communication and networking platform regularly enlists loyal support from thousands of local, regional, national and European decision-makers and experts, whose achievements have been manifold in the areas of economic success and social integration, co-operation between regions, fruitful public-private partnerships at

	local level, and with research centres and universities. OPEN DAYS 2011 will consist of about 100 sessions - workshops and debates – exhibitions and networking opportunities for the about 6,000 participants coming to Brussels. OPEN DAYS is organised in partnership with regions and cities from all over Europe, and including contributions by companies, financial institutions and international associations and academic organisations. Source: http://ec.europa.eu/regional_policy/conferences/od2011/
Green Week	The 11th edition of Green Week, the biggest annual conference on European environment policy, will take place from 24 to 27 May 2011 in Brussels and around Europe. This year's theme is "Resource Efficiency - Using less, living better". Over some 40 sessions, the conference will address the problem of resource depletion and scarcity, and the challenges and opportunities presented by constraints on resources. The conference will also showcase public and private strategies that are promoting a shift towards lower carbon use and a more efficient use of resources. Green Week offers a unique opportunity for debate and exchanges of experience and best practice. Over the past decade, the conference has established itself as an not to be missed event for anyone involved with protecting Europe's environment. The 2010 edition attracted some 3 400 participants from government, business and industry, non-governmental organisations, academia and the media. Green Week is open to the public and participation is free of charge. Source: http://ec.europa.eu/environment/greenweek/

International Associations, Networks and Initiatives of Local Authorities	
CEMR Council of European Municipalities and Regions	The Council of European Municipalities was founded in Geneva in 1951 by a group of European mayors; later, it opened its ranks to the regions and became the Council of European Municipalities and Regions. Today, it is the largest organisation of local and regional government in Europe; its members are over 50 national associations of towns, municipalities and regions from 37 countries. Together these associations represent some 100,000 local and regional authorities. CEMR's budget is about €2 million, the main part of which comes from the membership fees of its national associations. The rest (about 10%) consists of an annual grant from the EU Commission in the framework of the "Active European citizenship" programme. CEMR works in many fields of activity such as regional policy, transport, the environment, equal opportunities, governance... Its committees and working groups seek to influence draft EU legislation to make sure the interests and concerns of local and regional authorities are taken into account from the earliest stages of the EU legislative process. They contribute to CEMR's calendar of activities by organising seminars and conferences on a wide range of issues to promote the exchange and dissemination of experience at the local and regional level. Further information can be found in the CEMR work programme for 2011 and the Calendar of CEMR's events in 2011 Source: http://www.ccre.org/
Climate Alliance	The Climate Alliance of European Cities with Indigenous Rainforest Peoples is the largest European network of local and regional authorities dedicated to climate protection. Climate Alliance represents more than 1,500 local authorities in 17 European countries. When becoming a member of Climate Alliance, cities and municipalities commit to the ambitious target to reduce their CO2

	emissions by 10 % every 5 years and to halve them by 2030 (baseline year 1990). Climate Alliance has developed a comprehensive approach to support local authorities in their climate protection efforts – and to achieve their ambitious CO2 reduction targets. Simple and pragmatic tools & methods are available from the initial decision to become active in climate policy right through to monitoring of progress. As a Supporting Structure, Climate Alliance will promote the adhesion to the Covenant among its members and organise dedicated exchange of experience on its implementation. Furthermore we will promote actions and achievements of our members as a source of inspiration for other cities. We will provide dedicated tools and methods that help signatories to set up and implement Sustainable Energy Action Plans, like ECORegion for the CO2 emission inventories and CLIMATE COMPASS for the SEAPs as well as ready-made campaigns for the involvement of citizens and stakeholders. Source: http://www.climatealliance.org/
CoR	The Committee of the Regions (CoR) is the political assembly that provides local and regional authorities with a voice at the heart of the European Union. Established in 1994, the CoR was set up to address two main issues. Firstly, since around three quarters of EU legislation is implemented at local or regional level, it makes sense for local and regional representatives to have a say in the development of new EU laws. Secondly, there were concerns that the public was being left behind as the EU steamed ahead. Involving the elected level of government closest to the citizens was one way of closing the gap. Source: http://www.cor.europa.eu/

Covenant of Mayors (CoM)	The Covenant of Mayors is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories. By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO_2 reduction objective by 2020. After the adoption, in 2008, of the EU Climate and Energy Package, the European Commission launched the Covenant of Mayors to endorse and support the efforts deployed by local authorities in the implementation of sustainable energy policies. Indeed, local governments play a crucial role in mitigating the effects of climate change, all the more so when considering that 80% of energy consumption and CO_2 emissions is associated with urban activity. In order to translate their political commitment into concrete measures and projects, Covenant signatories notably undertake to prepare a Baseline Emission Inventory and submit, within the year following their signature, a Sustainable Energy Action Plan outlining the key actions they plan to undertake. Beyond energy savings, the results of signatories' actions are manifold: creation of skilled and stable jobs, not subject to delocalisation; healthier environment and quality of life; enhanced economic competitiveness and greater energy independence. These actions serve as examples for others to follow, notably through referring to the "Benchmarks of Excellence", a database of best practices submitted by Covenant signatories. The Catalogue of Sustainable Energy Action Plans is another such unique source of inspiration, as it shows at a glance the ambitious objectives set by other signatories and the key measures they have identified to reach them. Alongside financial assistance, Covenant Coordinators typically support signatories in conducting CO_2 emission inventory as well as in preparing and implementing their Sustainable Energy Action Plans. Both, National Coordinators (national public bodies such as Energy Agencies and Ministries) and Territorial Coordinators (decentralised authorities, such as regions, provinces or grouping of local authorities) are key allies of the Covenant of Mayors Office in reaching out to local authorities in their territory and providing signatories with the technical, financial, administrative and political support necessary to fulfil their commitments, Source: http://www.eumayors.eu/

C40 Cities	C40 is a group of large cities committed to tackling climate change. On this website you will find news and updates on current C40 initiatives, information about each of the cities involved, and links to useful documents. To be particularly mentioned are also the remarkable summary of Best Practices in the areas Buildings, Energy, Lighting, Ports, Renewables, Transport, Waste, Water from all participating cities. Source: http://www.c40cities.org/
Energy Cities	Energy Cities is the European Association of local authorities inventing their energy future. From 2009 to 2011, Energy Cities is under the Presidency of the City of Heidelberg (DE) with Board of Directors of 11 European cities. The association created in 1990 represents now more than 1,000 towns and cities in 30 countries. Energy Cities' premises are located in Brussels (BE) and Besançon (FR). **Energy Cities** is leading, in cooperation with Climate Alliance, CEMR, Fedarene and Eurocities, **the Covenant of Mayors Office** and is an official Supporting Structure. Other main projects are (selection): SESAC, Display® Campaign, European Mobility Week, IMAGINE, ENGAGE, MODEL, Smart-e Buildings, Ad Personam, Act2, SF-Energy Invest, Energy-Efficiency-Watch 2 (EEW2) Source: http://www.energy-cities.eu/
ESCT Campaign - Sustainable Cities and Towns Campaign	The Campaign aims to help local governments across Europe to mainstream sustainability best practice and to implement the Aalborg Charter and Aalborg Commitments to achieve tangible results in local sustainable development. The Sustainable Cities and Towns Campaign aims to replicate results and to gain wider political significance for sustainability policies. The Campaign is working towards mainstreaming sustainability actions throughout Europe, beyond singular awareness raising and knowledge development.

	The work of the Campaign is characterised by two major areas: European wide promotion for political support for the Aalborg Commitments European wide implementation of the Aalborg Charter and Aalborg Commitments The Campaign combines the expertise of eight local government networks (ACR+, CEMR, Climate Alliance, Energie Cités, ICLEI, Medcities, UBC, WHO Healthy Cities, Italian Association for Local Agenda 21) supporting local governments in their local action towards local sustainability. To date, more than 2,500 European local governments from more than 40 European countries have signed the Aalborg Charter, the 1994 founding document of the Campaign. Source: http://sustainable-cities.eu/
EUROCITIES	EUROCITIES is the network of major European cities. We bring together the local governments of more than 140 large cities in over 30 European countries. We influence and work with the EU institutions to respond to common issues that impact the day-to-day lives of Europeans. Our aim is to shape the opinions of stakeholders in Brussels to ultimately shift legislation in a way that helps city governments address the EU's strategic challenges at the local level. A large part of our work is aimed at reinforcing the role and place that local government should have in a multi-level governance structure. Based on the EU's three key challenges, EUROCITIES' policy priorities are: Climate, Recovery and Inclusion. Feeding into these, our network's activities address a wide range of policies concerning economic development and cohesion policy, the provision of public services, climate change, energy and environment, transport and mobility, employment and social affairs, culture, education, information and knowledge society, as well as governance and international cooperation. EUROCITIES provides a platform for its member cities to share knowledge and ideas, to exchange experiences, to analyse common problems and develop innovative solutions, through a wide range of forums, working groups, projects, activities and events. We are committed to working towards a common vision of a sustainable future in which all citizens can enjoy a good quality of life. Source: http://www.eurocities.eu/

European Energy Award® (eea®)	The European Energy Award® supports communities that want to contribute to a sustainable energy policy and urban development through the rational use of energy and an increased use of renewable energies. The European Energy Award® is a qualified instrument for steering and controlling communal energy policy in order to review systematically all energy-related activities. The European Energy Award® (eea®) allows municipalities to identify strengths, weaknesses and potential for improvement and, above all, implement effectively energy efficient measures. The success of a municipality's efforts is made visible by an award, namely the European Energy Award® (eea®). The standardised assessment permits a benchmarking between the eea® communities. It allows member cities to share their experiences and expertise. The European Energy Award® consists of two main elements: A quality management system for communal energy-related services and activities Certification and award for energy-related achievements and control of success through regular audits The step-by-step process Step-by-step communities improve their performance in their energy-related activities: Energy-related activities are reviewed Strengths, weaknesses an potentials for improvement are visualised Goals for the local energy policy and decision-making criteria are defined An energy policy work programme is developed comprising concrete long-term and short-term projects The work programme is implemented step-by-step A continuous assessment of the results is carried out

	The whole process is carried out by the Energy team, formed by representatives from the communities administration and politicians, assisted by an external eea® advisor expert in the field of energy. Depending on the degree of implementation of possible measures, a community can be gets certified and awarded with the European Energy Award®. Source: http://www.european-energy-award.org/
FEDARENE – European Federation of Agencies and Regions for Energy and Environment F·E·D·A·R·E·N·E	FEDARENE is the premier European network of regional and local organisations which implement, co-ordinate and facilitate sustainable energy and environment policies. Regional and local agencies, ministries and departments working in these fields, are represented in FEDARENE. FEDARENE's members act at local and regional levels, which being close to the citizens, make it possible to identify the needs and to bring about adapted solutions, on sufficiently vast and homogenous economical, demographical and political areas. The members' diversity implies there is a vast array of competencies, thus providing solutions to almost all energy and environmental concerns. Locally, they raise public awareness through a diversity of actions, such as exhibitions, conferences, documentation services and meetings with local schools and professional bodies. They serve equally local elected officials and the public by helping and advising them. FEDARENE, a non-profit association set up in 1990 at the initiative of six European regions, now has member regions from seventeen different European Union countries *Source: http://www.fedarene.org/*

ICLEI - Local Governments for Sustainability	Global challenges require local solutions and global governance. Protecting the climate, biodiversity, air quality and freshwater resources needs international commitment and cooperation between all levels of government. ICLEI is an: Association of over 1,200 local governments that represents the interests of local authorities within the United Nations and at international policy forums. A movement driving positive change on a global scale through programmes and campaigns on local sustainability. A resource centre offering information, tools, networking, training and consulting services, organizes conferences, city-to-city exchanges, carries out research and pilot projects. ICLEI is the only network of sustainable cities operating worldwide. The organisation facilitates local government input to United Nations (UN), processes such as the UN Framework Conventions on Climate Change, and Biodiversity. In partnership with the UN and other organisations, as well as national governments, ICLEI puts in the groundwork for more ambitious and more responsible international commitments - and seeks global recognition and support for local action. Members come from 70 different countries and represent more than 569,885,000 people. As an international local government association, ICLEI has forged strong ties with a range of institutions and partners. These include the European Commission; European Parliament; various UN institutions; the Council of Europe and Baltic 21, as well as many national bodies. ICLEI is also a founding and active member of the European Sustainable Cities & Towns Campaign. In Europe, ICLEI is dedicated to introducing and anchoring new instruments, mechanisms and tools for municipal management, in order to ensure the unwavering implementation, effective monitoring and continual improvement of sustainable development. The protection of common goods is an important priority area to European members. ICLEI also strives to help these

	members answer vital questions about both people and money: - Do we manage our cities smartly? - How successful are our local processes, plans and strategies in creating better quality of life without draining natural resources? - What can a city do when it believes it can't afford sustainability? By working with local governments ICLEI helps to generate political awareness of key topics; establish plans of action toward defined, concrete, measurable targets, work towards meeting these targets through the implementation of projects; and evaluate local and cumulative progress toward sustainable development. Source: http://www.iclei.org/
Local Government Climate Roadmap 	The Local Government Climate Roadmap is an advocacy journey that began at the Local Government Climate Sessions, held in parallel to the COP13, in Bali, in 2007. The Local Government Climate Roadmap aimed to voice local authorities worldwide, mirroring the launch of the United Nations Climate Change Conference Climate Roadmap, designed for nations, in determining a global action plan towards a post-Kyoto framework on climate change for the period after 2012. Since then, and through the negotiations at COP 14 in Poznan, Poland, in 2008, LGs have tirelessly campaigned, and obtained, preliminary referencing to sub national and local governments by national negotiators. The process was planned to be completed at the end of 2009 at COP15 in Copenhagen, through the adoption of a strong, comprehensive and global, post-2012 climate regime. This regime would have also provided a solid framework for all actors to maximize their contribution to climate protection and adaptation to climate change, and for local governments in particular, as key actors in the process. When COP15 did not result in the desired climate agreement, ICLEI and UCLG, leading local government organizations, agreed on continuing the Roadmap process of advocacy and awareness rising

	through COP16 and towards COP17. The Local Government Climate Roadmap is strongly supported by United Cities and Local Governments (UCLG) and ICLEI - Local Governments for Sustainability. Source: www.iclei.org/climate-roadmap
METREX	METREX, the Network of European Metropolitan Regions and Areas, provides a platform for the exchange of knowledge, expertise and experience on metropolitan affairs, and joint action on issues of common interest. The Network has members from some 50 metropolitan regions and areas and partners in many others. METREX contributes the metropolitan dimension to policies, programmes and projects on a European scale. The Network is a partner of European institutions, the research community, governmental organisations and other networks. Source: http://www.eurometrex.org/
Medcities	MEDCITES Web Site attempts to set up an advanced messaging system, to serve as interactive exchange vehicle, as place of common interest, as diffusion, dissemination and discussion site for a collective interest spread over cities of the Mediterranean basin. It is our hope that such a web site will also allow for an improvement of the working procedures and of the relationships within the institutional framework. Source: http://www.medcities.org/
UBC – Union of the Baltic Cities	Union of the Baltic Cities is a voluntary, proactive network mobilizing the shared potential of over 100 member cities for democratic, economic, social, cultural and environmentally sustainable development of the Baltic Sea Region. Today the UBC has twelve different commissions on: business cooperation, culture, education, energy, environment, gender equality, health and social affairs, sport, tourism, transportation, urban planning, youth issues. Much of the work of the Union takes place within these commissions. They have numerous activities in their respective fields ranging from music festivals and sports events to concrete projects and training seminars.

	The UBC Commission on Energy was established in October 2006. The focus areas are: Reduction of greenhouse gases, Energy efficiency programs, Higher self sufficiency and local energy production, (Dematerialisation of public sector). The overall Aims and Goals of the Energy Commission: We have looked at the energy system issue rather than individual sources, and we would like to introduce this to the municipalities. The Energy Commission will raise awareness about projects and take practical use from experience exchanges in projects within the UBC network and promote municipalities to use great examples to get more energy efficient. Our strength is our great contacts with universities where we can bring science and university knowledge closer to the municipal/local level. The UBC Energy Commission has an international board, elected at the first Commission meeting in November 2006. The Secretariat of the Commission is located in Oskarshamn. Sources: http://www.ubc.net/ http://www.nova.artisan.se/UBC_EC_Startsida.aspx
Worlds Mayors Council on Climate Change	The World Mayors Council on Climate Change is an alliance of committed local government leaders advocating an enhanced recognition and involvement of Mayors in multilateral efforts addressing climate change and related issues of global sustainability. This mission is broken down to two objectives: strengthening political leadership on global sustainability by building a group of committed local sustainability leaders; being the prime political advocacy force of cities and local governments on global sustainability matters; In order to implement these objectives, the Council breaks down its method of action as follows: showcasing local leaders'

	climate and sustainability actions that contribute to policy change at local and global levels; supporting its members to enhance their climate and sustainability leadership capacities; addressing global climate and sustainability policy makers as a global body of leaders from diverse local governments; politically steering the development and implementation of mechanisms that support local climate and sustainability action. In order to reach these objectives and implement actions, the Council receives a technical and strategic support from ICLEI – Local Governments for Sustainability since its foundation. Thus, synergies between technical expertise and political leadership are leveraging local climate action. Source: http://www.worldmayorscouncil.org/

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Declaration of honour

I do solemnly declare that I made this paper independently. Thoughts directly or indirectly taken from external sources are identified as such.

The work has not been submitted to any other examination authority and has not been published yet.

I am aware that a false declaration will have legal consequences.

Zittau, 11.11.2011

Armin Verch