ENHANCING PLANNING FOR LOCAL ENERGY SYSTEMS WITH THE STRATEGIC SUSTAINABLE DEVELOPMENT FRAMEWORK

Ann S. Cassidy, Delphine Le Page, Sean W. Spender

School of Engineering
Blekinge Institute of Technology
Karlskrona, Sweden
2007

Thesis submitted for completion of Master of Strategic Leadership Towards Sustainability, Blekinge Institute of Technology, Karlskrona, Sweden.

Abstract:
The world is facing energy supply challenges. Rising prices and finite reserves of fossil fuels, combined with necessary reductions in their use in order to mitigate anthropogenic climate change, will dramatically reshape the future energy supply. Among the greatest contributors to greenhouse gas emissions are the energy systems that power transportation, heating and cooling, and industrial processes. It is imperative that energy planning is sustainable, secure and effectively implemented for local development. The aim of our research is to enhance the planning process that can aid authorities moving towards sustainable local energy systems. Local energy systems refer to the supply, distribution and use of energy within a municipality. In this study, we advocate applying a strategic sustainable development framework based on 'backcasting from principles of sustainability'. We analyzed global, European Union and Swedish energy objectives, as well as the results of a survey of beacon European cities to inform strategic planning guidelines for authorities moving towards sustainable local energy systems. Our research suggests that the strategic sustainable development framework provides structure to inform strategic and critical decision points for planning and implementing local energy systems.

Keywords:
energy, backcasting, strategic sustainable development, local planning
Statement of Contribution

The research developed organically as a combination of our interests and emergent opportunities. Delphine’s interest in French NGO Energie-Cités, and advisor David Waldron’s involvement in the launching of the IMAGINE project within Energie-Cités combined with Ann and Sean’s interest in Sweden’s movement towards sustainability, created a setting to apply the SSD framework to a concrete real world situation. These ideas were organized around local energy planning.

Background Research: The background research consisted of three main areas. Each researcher was responsible for a section, and wrote the introduction and results. Sean focused on the analysis of policy objectives, Delphine on best practices of the Energie-Cités network, and Ann on Karlskrona’s energy plan.

Interaction with Karlskrona Municipality: We met as a group with Karlskrona Municipality’s energy planning department six times over the course of four months. Ann initiated the relationship with Karlskrona Municipality, organised all meetings and was our contact person with the municipality. The meetings were a collaborative effort. Typically, one researcher directed the structure of the meeting, produced a handout, presented ideas and facilitated discussion. A final deliverable which summarized lessons learned through our interactions with the Karlskrona Municipality energy department was created iteratively with contributions from each of the researchers.

Additional Interviews: Interviews were used to support our knowledge and understanding of the energy topic. These were conducted by Ann and Sean, both in person as a group and individually, as well as individually over the phone. When possible, interviewees received a list of questions in advance of the meeting, compiled by one group member and informed by the group. Notes from the interviews were shared amongst the group. Most interviews were recorded, some of which were transcribed by Sean.
Presentations: The presentations were created by Delphine and reviewed by Ann and Sean.

Survey: Delphine created the questions of the survey and Ann and Delphine compiled and analysed the results.

Editing: Each group member reviewed and revised each other’s work and reviewed the entire paper. Ann was the editor of the paper.

This has been a valuable group process learning experience.

Karlskrona, May 2007
Ann Cassidy
Delphine Le Page
Sean Spender
Acknowledgements

We would like to thank Professor Göran Broman at Blekinge Institute of Technology, and our advisors Daniel Johnson, David Waldron, and John Craig.

Members of the Karlskrona Municipality were particularly helpful with their insights, especially Johnny Lilja and Lisa Wälitalo, whose ongoing collaboration was critical for the research of this paper.

Kinga Kovacs and Gérard Magnin of Energie-Cités were instrumental in advising the survey.

Many thanks to the numerous interviewees for their contributions, to R.J. Gurley, and to the peer review groups for their feedback.

Karlskrona, May 2007
Ann Cassidy
Delphine Le Page
Sean Spender
Executive Summary

Introduction

Energy has been and is a concern for our society. Energy drives our industries, transports, food production, heating and cooling systems, and electricity services. It enhances quality of life. The current extraction, production and use of resources to provide energy are threatening the planet at global, regional and local levels partly due to the extensive use of fossil fuels. Recent reports of the International Panel for Climate Change state that climate change is very likely to come from anthropogenic activities, such as energy supply, and that negative consequences on our ecosystems and quality of life are to be expected from these activities. Communities planning for their territorial energy supply are dependent on national and international systems and actions. Most local energy systems today lack security due to broader geopolitical and economical instability, which can impact local development. One method to ensure a secure energy supply is for a territory to opt for local and sustainable energy systems. Energy planning engages many local stakeholders in the process, as energy concerns all the community. These factors make the energy planning process complex.

Figure - Five-level framework for planning in complex systems
In order to facilitate planning processes for local and sustainable energy systems, this paper uses a Strategic Sustainable Development (SSD) framework. The SSD process is based on a five-level framework for planning in complex systems, presented schematically in the figure above. Each of these schematic levels is defined as follows:

In the area of sustainable planning, the System level is defined as society in the biosphere, its basic functions and natural laws as well as the boundaries of the particular system studied. In this paper, a territory is defined as a region, island, city or town connected with some form of governance, typically referred to as “local authority”.

The Success level represents sustainability, which is defined by the four principles stated below:

In a sustainable society, nature is not subject to systematically increasing:

I…concentration of substances extracted from the Earth’s crust (i.e. fossil fuels, scarce metals)

II…concentration of substances produced by society (i.e. chlorofluorocarbons, greenhouse gases)

III…degradation by physical means (i.e. deforestation, intensive agriculture)

And in that society…

IV…people are not subject to conditions that systematically undermine their capacity to meet their needs (i.e. discrimination, dictatorship)

The Strategy level defines strategic guidelines to reach sustainability. The Actions level encompasses the measures taken under the strategic guidelines to reach Success in the considered System. The Tools level describes indicators or management systems used to monitor the Actions under the strategic guidelines aiming at reaching Success in the System.

Key to the strategic guidelines is the use of a backcasting approach from basic principles of sustainability (backwards looking planning). The backcasting methodology proposes to plan from a point of future success, such as a local and sustainable energy system. Planning becomes detached from current trends, such as the use of fossil fuels as energy sources. Pitfalls are avoided and the vision drives planning towards the future success. Within the SSD framework, the ABCD analysis is a strategic tool.
(using backcasting from principles of sustainability) to engage participants in creating a strategic plan.

Research Questions and Scope

The aim of our research is to enhance the planning process that can aid authorities moving towards sustainable local energy systems. In this context “sustainable local energy systems” refer to the supply, distribution and use of energy within a municipality, where sustainability is defined as full compliance with the four sustainability principles. To achieve this aim, the Strategic Sustainable Development framework is applied for local energy planning. Movement towards sustainability may be multi-directional (i.e. complementary initiatives in various sectors). Therefore, the research focuses on three levels of review: existing legislation, pioneer European territories in local energy planning, and an application to a specific territory.

The overarching research question is:

*What are some of the gaps, threats, opportunities and leverage points for local authorities moving towards sustainable local energy systems?*

This question is informed by answering three sub-questions:

1. *What are the strengths and weaknesses of global, European Union and Swedish objectives with implications for local energy planning, viewed through the lens of the SSD framework?*

2. *What are some lessons from the best practices of some leading European cities regarding sustainable energy planning?*

3. *What is Karlskrona, Sweden's energy planning process? How can it be improved with the SSD framework and the lessons from European best practices?*
Methods

The research uses the six following methodologies to answer the research questions:

– Discussion and group process where different perspectives and focal areas were discussed
– Literature review of publications in the areas of global, European, Swedish and Karlskrona Municipality energy policy and planning, backcasting and SSD
– Interviews with key community members in southeast Sweden involved in the field of local energy
– A presentation of the ABCD strategic analysis to Karlskrona Municipality, Sweden
– A survey of 17 cities, many that have been recognized by Energie-Cités (a French-based NGO promoting sustainable energy systems) for their energy initiatives
– Peer review amongst our colleagues in the Master’s program in Strategic Leadership Towards Sustainability at Blekinge Institute of Technology, Karlskrona Sweden

Results and Discussion

Research question 1 - Legislation
In our review of the objectives of the Kyoto protocol, the European Union (EU) and Swedish policies, we identified some general strengths and weaknesses including:

– The policies’ objectives lack a full sustainability perspective, as defined by the principles of sustainability. In each case, targets are set for sectoral issues such as percentage of renewable energy in the EU, without an overall sustainability perspective, which would prevent against potentially unsustainable forms of renewable energy (e.g. energy crops for biofuels disrupting agriculture).
– Targets that fall short of full sustainability are typically set without explicit mention of longer term, full sustainability goals leading to short term optimisation which may be at the expense of longer term, more ambitious measures (e.g. short term, incremental improvements to building efficiency that may exclude more ambitious, long term improvements).
– The acknowledgement of our biosphere’s limits is typically not explicitly considered, which may lead to the degradation of our ecosystems, especially in the field of biofuel production.
– Firm binding targets can be steps towards sustainability. However, agreeing on these targets is on a voluntary basis, such as for the Kyoto protocol and they are not incorporated within a strategy aiming at full sustainability, which limits their effectiveness.

Research question 2 – EU best practices
Our review of survey results from 9 beacon territories in sustainable local energy planning provided the following insights:
– The interrelationship of the energy sectors is significant; the overlap between land use, transport, heating, cooling and electricity services was noted. However, none of the ‘beacon cities’ visions are using a scientifically valid, principled view of sustainability as the required end-point of success; rather, they are focusing their efforts on incremental improvements (e.g. 20 percent) in certain areas of renewable energy or energy efficiency. A systems perspective required for sustainability would help promote a more integrated approach across otherwise competing sectors.
– During the planning process, the local stakeholders are typically not systematically involved from the beginning of the visioning process. More often, they are involved in subsequent actions and in financing the initiative. We suggest that this lack of early involvement may be a source of a predictable awareness/behavioural change barrier, as a meaningful purpose for all stakeholders has not been created.
– Funding is carried out partially through the national and European level. Funding can be a barrier to integrated projects towards sustainability as the proposed economic incentives are often sectors-oriented.
– Sustainable local energy planning can enhance local economic development, and specific partnerships (e.g. with NGOs or universities) can influence success.

Research question 3 – Karlskrona energy planning process
The research built onto a case study for local energy planning. Our survey results on European best practices, as well as the collaborative work with Karlskrona Municipality, allowed us to provide recommendations for enhancing their energy planning process. The case study gives opportunity
for future progress and transferability to other municipalities. The original process was called the ‘Ladder’, and it was organised around the four following steps:

– Understanding
– Acceptance
– Experimentation
– Integration in daily work

In order to foster this process, SSD concepts and insights from the survey were integrated in each step, with the goal of creating strategic planning guidelines towards sustainability for Karlskrona Municipality. The tool describes the need to have an understanding of the current situation, to assess it, to find solutions, to experiment with them, and to integrate the pertinent solutions into one’s daily work. Backcasting from a vision framed inside the four principles of sustainability is core to the proposed guidelines and helpful to promote a participative approach that engages the local stakeholders.

Conclusions

Our research identified current gaps in moving towards sustainable local energy systems, including a lack of a full sustainability perspective in legislation and in beacon cities (e.g. vision of success defined such as 25 percent decrease in energy consumption) and a gap between the overall objective of sustainability, defined by basic, scientifically-relevant principles, and sectoral strategies and targets intended to close this gap (e.g. EU target of 10% increase in biofuel consumption by 2020).

Challenges and threats for local authorities transitioning towards sustainable energy included a lack of public awareness and acceptance of the need for change; the increasing demand of renewable energy sources (e.g. biofuels) without taking into account the limits of the biosphere (i.e. SP3); and the increasing prices for energy including the food versus energy crop dynamic. Political acceptance and support may be a challenge, especially if there is a change in the local government.

Current opportunities which can be utilized by local decision-makers include: taking advantage of existing momentum around the sustainability agenda, particularly climate change; funding programs from the European Commission or national sustainability and energy programs; and local
economic improvements through the development of energy saving, diversification, and energy efficient technologies;

The research highlighted leverage points in local energy planning such as; the role of local politicians, who act as key decision makers and community builders; enlisting citizens and local businesses awareness and support to allow behavioural change. Collaborating with local universities can also leverage the engagement and awareness of the community as well as the future generations of decision-makers towards local and sustainable energy systems.

Moving forward, local authorities can close the gaps by seizing opportunities and being aware of the threats outlined above. In so doing, local authorities can take advantage of peer learning about trans-sectoral cooperation with other change agents through various networks such as Swedish eco-communities, Energie-Cités and other collaborations.
# Table of Contents

Acknowledgements ........................................................................................................ iv
Executive Summary .......................................................................................................... v
Table of Contents ............................................................................................................. xii
List of Figures .................................................................................................................... xiv
List of Tables ..................................................................................................................... xiv
Table of Abbreviations ..................................................................................................... xv

## 1 Introduction ................................................................................................................ 1

1.1 Energy, society and the environment ........................................................................ 1
1.2 The challenge of a sustainable energy system ......................................................... 2
1.3 The Strategic Sustainable Development Framework .............................................. 4
  1.3.1 The five-level framework for planning in complex systems ............................... 4
  1.3.2 The four sustainability principles ..................................................................... 6
  1.3.3 Implications of the sustainability principles for local energy systems ............. 6
  1.3.4 Backcasting from principles of sustainability .................................................. 7
  1.3.5 The ABCD analysis ............................................................................................ 9
1.4 Research questions and scope .................................................................................. 9
  1.4.1 Global, EU and Swedish energy objectives ....................................................... 10
  1.4.2 Pilot European cities in sustainable energy planning ....................................... 11
  1.4.3 Karlskrona Municipality energy planning ....................................................... 12

## 2 Methods ....................................................................................................................... 14

2.1 Research Design ......................................................................................................... 14
2.2 Discussion and group process .................................................................................... 14
2.3 Literature Review ...................................................................................................... 15
2.4 Interviews ................................................................................................................... 15
2.5 Working with Karlskrona Municipality .................................................................... 16
2.6 Survey ......................................................................................................................... 19
2.7 Peer review ............................................................................................................... 20

## 3 Results ........................................................................................................................ 21

3.1 Legislation analysis ................................................................................................... 21
  3.1.1 Presentation of the energy objectives ................................................................. 21
  3.1.2 Analysis of the energy objectives through the lens of the SSD framework ......... 23
3.2 Current practices of pilot cities in the European Union ......................................... 27
  3.2.1 Part One: Basic information about the participants ........................................... 27
  3.2.2 Part Two: The vision of success of the energy initiatives ................................ 30
  3.2.3 Part Three: The strategic plans of the energy initiatives ................................. 31
3.2.4 Part Four: the actions and tools related to the energy initiatives.....35
3.2.5 Part Five: Successes and barriers within the energy initiatives.......36

3.3 Towards strategic planning guidelines for sustainable local energy systems.................................................................38
  3.3.1 Current energy plan in Karlskrona..................................................38
  3.3.2 Current energy planning process in Karlskrona .......................41
  3.3.3 Enhancing the planning process with the SSD framework .42

4 Discussion ..............................................................................................................44
4.1 Legislation........................................................................................................44
4.2 Best practices and challenges of European cities for local energy planning...........................................................................46
  4.2.1 Acknowledgement of the system .........................................................46
  4.2.2 A vision for success .............................................................................47
  4.2.3 Strategy and actions ............................................................................49
  4.2.4 Best practices for success ...................................................................50

4.3 A sustainable energy planning process for local decision makers ..................................................................................51
  4.3.1 The municipality level ........................................................................51
  4.3.2 Specific comments for Karlskrona, Sweden..............................52

5 Conclusions ............................................................................................................55
  5.1 Opportunities for further research and transferability ..........57

References ...............................................................................................................58
  Cited References .................................................................................................58
  Additional References .........................................................................................62

Appendices .............................................................................................................64
  Appendix 1 - Survey of beacons regions, cities and neighbourhood64
  Appendix 2 - Strategic planning guidelines towards sustainability.72
  Appendix 3 - Table template for the survey analysis .....................79
List of Figures

Figure 1.1. Greenhouse-gas emissions by source, in 2000...........................1
Figure 1.2. The funnel metaphor, illustrating the sustainable development challenges ........................................................................................................3
Figure 1.3. The five-level framework for planning in complex systems.....4
Figure 1.4. The backcasting methodology.................................................8

Figure 2.1. A model for structuring an operational analysis......................17

Figure 3.1. Sectors of the energy initiatives.................................................30
Figure 3.2. Stakeholders involved in the creation of the vision.................31
Figure 3.3. Creators of the energy initiatives strategic plans.....................32
Figure 3.4. Stakeholders responsible for implementing the energy initiative strategies ..........................................................................................................33
Figure 3.5. Ways to finance the energy initiatives.................................34
Figure 3.6. Indicators used within the energy initiatives.........................36
Figure 3.7. District heating network in Karlskrona Municipality, 2007 ....40

List of Tables

Table 3.1. List of the beacon territories with their related initiative .........28
Table 3.2. Successes of the respondents’ cities----------------------------36
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFC</td>
<td>Chlorofluorocarbon</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>GWh</td>
<td>GigaWatt Hour</td>
</tr>
<tr>
<td>IEE</td>
<td>Intelligent Energy Europe</td>
</tr>
<tr>
<td>Klimp</td>
<td>The Climate Investment Program of Sweden</td>
</tr>
<tr>
<td>SSD</td>
<td>Strategic Sustainable Development</td>
</tr>
<tr>
<td>SFM</td>
<td>Sustainable Forest Management</td>
</tr>
<tr>
<td>SP1</td>
<td>Sustainability Principle 1</td>
</tr>
<tr>
<td>SP2</td>
<td>Sustainability Principle 2</td>
</tr>
<tr>
<td>SP3</td>
<td>Sustainability Principle 3</td>
</tr>
<tr>
<td>SP4</td>
<td>Sustainability Principle 4</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities and Threats.</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Energy, society and the environment

Over the past century, the exponential growth of the economy and industries in the western world has provided great advances in technology, and has enabled important societal and territorial developments. These advances are traditionally linked with an increasing consumption of energy. In 2004, 87 percent of our world energy supply came from fossil fuels (International Energy Agency 2006, 6). It results in pollution and destruction of our ecosystems with the mining, drilling and transportation of these resources. Moreover, significant quantities of greenhouse gases (GHGs) are emitted by the exploitation of fossil fuel resources (Figure 1.1). The GHG emissions related to energy use accounted for 65 percent of the total emissions in the world in 2000 and are rapidly increasing as many developing countries are approaching the same living standards as the western world.

![Energy Emissions Diagram]

*Figure 1.1. Greenhouse-gas emissions by source, in 2000
Source: www.WRI.org (2006)*
GHG emissions are problematic for our planet; they highly contribute to current climate change (Intergovernmental Panel on Climate Change 2007a, 7). The problem has great significance, although its consequences are difficult to predict and are interconnected from the global to the local level with a delay in their effects. Actions on one continent could lead to consequences on another continent, and may be direct (such as air pollution and health problems) or indirect (such as water stress due to impacts from melting ice). Current predictions suggest that ecosystems on Earth are likely to be impacted by storms, floods, wildfires, water stress and species shifts which threaten our current society as we depend on ecosystems for resources such as water, food and energy (Intergovernmental Panel on Climate Change 2007b, 15). Damages to ecosystems could lead to important damages in our society, such as increased poverty and diseases, as well as geopolitical conflicts for resources. (Steffen et al. 2004, 12).

1.2 The challenge of a sustainable energy system

Climate change exposes underlying flaws in our design of society. These flaws make our current societal design unsustainable. The threat of climate change exposes systematically increasing trends leading to impacts on our society, such as the use of fossil fuels and the destruction of our ecosystems for energy production. We can visualise the inevitable consequences of climate change pressure on our society by viewing the process as one where our society moves within a funnel (Figure 1.2) where the walls represent converging socio-ecological pressures, and increasing destructive trends. As society moves through time, less and less options are available per capita to manoeuvre between these two walls and sustain our society. “Hitting the walls of the funnel” is possible when encountering stronger legislation or scarcity of resources, which makes reaching sustainability more difficult. Finding sustainable solutions means strategically navigating between these two walls and finally leveraging them to live without destroying our planet and social fabric. The challenge facing our era lies in finding these sustainable pathways.
Energy supply and planning lies at the heart of our society’s development. It can enhance quality of life. Therefore managing, securing and sustaining its supply are important for populations. Current energy production and supply systems, such as oil and nuclear, are global. They are causing deterioration of the planet and are subject to complex global mechanisms. They can lead to geopolitical tensions and conflicts caused by an unequal spread of fossil fuel resources. As most territories currently depend on fossil fuel resources, not controlling their energy supply can lead to vulnerability. Planning for sustaining and securing energy supply at the local level is a solution to maintain or attain security and quality of life. This type of energy supply demands local strategic planning to be sustainable and avoid the global to local socio-ecological pressures on our society (Figure 1.2).
1.3 The Strategic Sustainable Development Framework

To assist strategic planning towards a sustainable society a Strategic Sustainable Development (SSD) framework has been developed (Ny et al. 2006, 63; Holmberg and Robèrt 2000a, 292; Robèrt 2000, 248). It provides guidance and structure for understanding the necessary steps to plan in complex systems and move towards sustainability. In this paper it has been applied towards local and sustainable energy systems.

1.3.1 The five-level framework for planning in complex systems

The five-level framework (Figure 1.3) is a comprehensive structured umbrella to provide and guide strategic planning and decision making towards success in any complex system. It has been adopted by leading sustainability experts to explain strategic sustainable development (SSD) (Robèrt et al. 2002, 198; Robèrt 2000, 248). The levels are interrelated to each other, which provide a dynamic model of the system studied.

![Diagram of the five-level framework](source: Robèrt et al. 2002, 198)

*Figure 1.3. The five-level framework for planning in complex systems*

*Source: Robèrt et al. 2002, 198*
We employed the SSD framework to understand the requirements for energy planning. At the System level, we considered the system studied and its mechanisms and boundaries. In our case, for sustainability, we understand that we are living in a closed system, the biosphere, subject to the physical laws of nature. While planning for a local and sustainable energy system, the territory boundaries are also defined and understood.

At the Success level, the vision of success for the system considered is defined. Four system conditions, explained below, define sustainability, as first order principles. While planning for a local and sustainable energy system, the territory also defines its vision of success at a certain point in the future such as being Fossil Fuel Free in 2050. The time component is important in this case. Using a time component emphasizes that our unsustainable society is moving through a funnel of decreasing sustainable solutions, and provides a time perspective on goals.

At the Strategy level, backcasting from the four system conditions for sustainability is used to create strategic guidelines to reach the vision of success in the system. The ABCD tool, including the backcasting methodology, is available to decisions-makers to guide a strategic step-by-step plan to reach success.

At the Actions level, actions are taken following the step-by-step plan to reach success in the system such as investing in renewable energy sources or in a public transport system.

At the Tools level, the tools are strategically chosen to monitor progress or to help management of the actions within the strategic plan, while aiming to reach success in the system. They can be a management system tool such as ISO 14001 or an indicator of progress such as the total energy use per capita.

---

1 Throughout this paper ‘territory’ means territory of land – i.e. region, island, city, town, etc. – connected with some form of governance, typically referred to as “local authority.”
1.3.2 The four sustainability principles

At Level 2 of the five-level framework described above, the four system conditions have been developed in order to provide a clear, principle-level definition of sustainability (Ny et al. 2006, 64; Holmberg et al. 1996).

As basic or first order principles, they are intended to be:
- Based on a scientifically agreed upon view of the world,
- Necessary to achieve sustainability,
- Sufficient to achieve sustainability,
- General to structure all societal activities relevant to sustainability,
- Concrete to guide action and serve as directional aides in problem analysis,
- Non-overlapping or mutually exclusive in order to enable comprehension and structured analysis of the issues (Holmberg and Robèrt 2000, 298).

They are expressed as constraints in order to free creativity. They state that

<table>
<thead>
<tr>
<th>In a sustainable society, nature is not subject to systematically increasing…</th>
</tr>
</thead>
<tbody>
<tr>
<td>I…concentrations of substances extracted from the Earth’s crust (i.e. fossil fuels, scarce metals) (SP1)</td>
</tr>
<tr>
<td>II…concentrations of substances produced by society (i.e., CFCs, GHGs) (SP2)</td>
</tr>
<tr>
<td>III…degradation by physical means (i.e. deforestation, intensive agriculture) (SP3)</td>
</tr>
<tr>
<td>And in that society…</td>
</tr>
<tr>
<td>IV…people are not subject to conditions that systematically undermine their capacity to meet their needs (i.e. discrimination, dictatorship) (SP4)</td>
</tr>
</tbody>
</table>

1.3.3 Implications of the sustainability principles for local energy systems

By adding, “not contributing to”, the sustainability principles can be translated for local energy system applications:
i.e. A sustainable local energy system does not contribute to systematically increasing

I…concentrations in nature of substances extracted from the Earth’s crust (i.e. fossil fuels, scarce metals) (SP1)

II…concentrations of substances in nature produced by society (i.e., CFCs, GHGs) (SP2)

III…degradation of nature by physical means (i.e. deforestation, intensive agriculture) (SP3)

And in that society, the energy system does not contribute to…

IV…conditions that systematically undermine their capacity to meet their needs (i.e. discrimination, economic barriers, etc.) (SP4)

Examples of implications of the sustainability principles for local energy systems are stated below:

– An energy system contributes to violations of SP1, for example, if a local community is powered by a coal power plant. Coal is a substance extracted from the Earth’s crust and burning it systematically increases the quantities of carbon entering the biosphere as carbon dioxide.

– Burning coal can also systematically increase the concentration of GHGs in the atmosphere. The emission of GHGs also contributes to violations of SP2.

– A local energy system powering its district heating system by clear cutting the regional forest violates SP3. Clear cutting can systematically degrade the natural forest system as well as reduce biodiversity.

– On a societal level, a local energy system with frequent power outages limits the ability of the community to heat their homes, cook their food and power industries. It can lead to the undermining of people’s ability to meet their basics needs for subsistence or protection. Therefore, the loss of power can contribute to violations of SP4. Alternatively, local energy systems enhancing the local economy and providing jobs to the population is a positive contribution towards meeting people’s needs and achieving compliance with SP4.

1.3.4 Backcasting from principles of sustainability

To create strategic guidelines and free ourselves from today’s unsustainable trends, backcasting is used to reach success (Holmberg and Robèrt 2000, 294). Backcasting consists of looking back in the present
from a clear vision of future success (Dreborg 1996, 813) (Figure 1.4). Two approaches exist to create a future vision from which one can backcast. The first, backcasting from a specific scenario, works well when a specific picture of the future is possible. Sometimes it is difficult for a group of people to agree upon a single, specific vision of the future, especially since the future holds many unknown considerations that may affect decision making (e.g. advances in technology). Instead, it may be preferable to backcast from principles (rather than specific scenarios). Principles, which are agreed upon by the entire group, can then guide the process towards success in a way that allows for the development of many possible scenarios over time. Backcasting from principles of sustainability is used within the SSD framework.

Using this process gives long-term direction to a strategic plan while taking into account current trends to solve short-term issues. It allows planners to avoid sub-optimization costs and dead ends.
1.3.5 The ABCD analysis

The ABCD analysis has been developed as a concrete tool to guide strategic planning processes, utilising the four sustainability principles (Ny et al. 2006, 65). It is composed of four steps leading to the creation of a strategic plan.

*The A step: Awareness.* It consists of sharing the same understanding of the system; its constraints, its mechanisms, and the need for sustainability. The principles for sustainability are understood and accepted.

*The B step: Baseline.* It consists of completing an assessment of the current situation against the four sustainability principles. All the current flows within the system are analysed considering the constraints of the principles, which provide an overview of the current strengths and weaknesses from a sustainability perspective.

*The C step: Visioning and Brainstorming solutions.* The vision to achieve success is created. From this vision of success, solutions to overcome problems and foster strengths highlighted in the B step are brainstormed. It is the backcasting process.

*The D step: Prioritization of solutions.* The solutions proposed in the C step are chosen and prioritised following three main questions:

- Is this solution going in the sustainability direction, towards our vision?
- Is this solution a flexible platform? Will it be possible to adapt this solution to reach sustainability? Are we avoiding blind alleys?
- Does this solution provide a good return on investment (i.e. financial, social, political capital)?

1.4 Research questions and scope

The aim of our research is to enhance the planning process that can aid authorities moving towards sustainable local energy systems. The main pathway we have chosen to achieve this is to apply the concepts of the Strategic Sustainable Development framework to energy planning at a local level. In this context “sustainable local energy systems” refer to the supply, distribution and use of energy within a municipality, where sustainability is
defined as full compliance with the four sustainability principles. Movement towards sustainability may be multi-directional (i.e. complementary initiatives in various sectors). Therefore, we have chosen to focus our research on three levels of review: existing legislation, pioneer European territories in local energy planning, and an application to a specific territory.

The main overarching research question is:

*What are some of the gaps, threats, opportunities, and leverage points for local authorities moving towards sustainable local energy systems?*

By gaps we mean the space between what is happening today and full sustainability with regards to the sustainability principles. Threats are sources of danger or risks to progress towards sustainability. Opportunities are considered to be possibilities due to a favourable combination of circumstances that help move municipalities, regions or territories towards sustainability. Leverage points are places to intervene in a system, “small shifts in one thing can produce big changes in everything” (Meadows 1997, 1).

The answer to our main research question is informed by answering three sub questions:

1. *What are the strengths and weaknesses of global, European Union (EU) and Swedish objectives with implications for local energy planning as viewed through the lens of the SSD framework?*

2. *What are some lessons from the best practices of some leading European cities regarding sustainable energy planning?*

3. *What is Karlskrona, Sweden's energy planning process? How can it be improved with the SSD framework and lessons from European best practices?*

### 1.4.1 Global, EU and Swedish energy objectives

1. *What are the strengths and weaknesses of global, EU and Swedish objectives with implications for local energy planning as viewed through the lens of the SSD framework?*
When trying to understand how authorities can move towards sustainable local energy systems, it is valuable to have an understanding of the institutional context within which local energy authorities must work. What measures are being taken at higher levels and how do they look from a strategic sustainability perspective at the territorial scale? We analysed the objectives set out in energy policy at various legislative levels. Since the focus of our case study at the municipal level was located in Sweden, our analysis included global objectives, followed by the objectives of the EU, and then the national objectives for Sweden.

_Rationale for discussing objectives._ Objectives were chosen as a means to assess energy planning on a broader scale for a number of reasons. Assessing specific policies at various levels of government was beyond the scope of this project. Objectives, are generally broader than policies, and allow easier comparison across systems. Objectives typically reflect an ideal vision of what legislators wish to achieve, and represent the upper limit of what will be achieved, if successful. Having a defined benchmark of success presents an opportunity to evaluate how success, as defined by the policy objective, compares with the goal of full sustainability. Furthermore, objectives considered too vague or weak with regards to progress towards full sustainability may be helpful in identifying specific barriers on the path to sustainability.

### 1.4.2 Pilot European cities in sustainable energy planning

2. _What are some lessons from the best practices of leading European cities regarding sustainable energy planning?_

In Europe, local energy planning has been, to varying degrees, adapted to each territory considering its local characteristics. The process to create and implement an energy plan can have similarities across territories, especially in the case of the EU where overall legislation, climate and culture can be shared across borders. However, authorities have limited capacity to gain experience from outside their territories as it demands time and finances. In this objective, Energie-Cités, a non-governmental organisation founded in 1990 in France to provide a platform for communicating common problems and finding solutions related to energy for territories. The organisation includes members from 24 European countries, and represents more than 500 municipalities (Magnin and the Energie-Cités team 2005, 4).
The Energie-Cités network is known for its work on energy performance, on renewable and distributed energy production and on climate protection. Energie-Cités also initiates multiple partnerships between local authorities, energy agencies, European institutions, and other networks of municipalities, banks, and companies. In the framework of our research, Energie-Cités has provided an opportunity to collaborate and learn from the best practices of its members.

Energie-Cités manages various projects around Europe on energy efficiency, awareness, education, and land use planning. The most recent project, launched in 2006, is called IMAGINE. The IMAGINE project aims to create a sustainable future for European cities in terms of local energy planning, while advocating a bottom-up planning approach using backcasting from principles of sustainability. As part of IMAGINE, Energie-Cités have documented European best practices in terms of local energy planning, citing examples from 16 beacon cities, regions and neighbourhoods. (Anderson-Pejovics et al. 2007, 3). For our research, these territories and their projects present opportunities to learn from pilot processes regarding local, sustainable, energy planning in Europe.

1.4.3 Karlskrona Municipality energy planning

3. What is Karlskrona, Sweden's energy planning process? How can it be improved with the SSD framework and lessons from European best practices?

Karlskrona is situated in the region of Blekinge, in southeast Sweden. The governing district of Karlskrona, referred to as the Karlskrona Municipality, has a population of 62,000, and the city of Karlskrona has 30,000 inhabitants. The population growth in 2006 was approximately 1 percent (Statistiska centralbyrån 2006). Karlskrona is the community where the authors live, and was chosen for this paper because of the authors’ awareness of local issues, and access to Municipality personnel. Karlskrona Municipality is a member of the Eko-Kommun network in Sweden.

Karlskrona has planned to adopt more stringent energy guidelines than the Swedish national goals. For example, the Swedish national plan is to be Fossil Fuel Free by 2050. Karlskrona has gone further than the national agenda, and has committed to be Fossil Fuel Free by 2020. An incentive that Karlskrona has utilized is Klimp, the Swedish Environmental
Protection Agency Climate Investment program. This government program provides grant money for projects that intend to reduce the emission of GHGs, to provide energy savings, or to represent new technology that can contribute to reaching national energy objectives.
2 Methods

Our research included six methods:

- Discussion and group process
- Literature review
- Interviews with key local community members involved in the field of energy
- A presentation of the ABCD analysis to Karlskrona Municipality
- A survey of 17 cities, many that have been recognized by Energie-Cités for their energy initiatives, and
- Peer review

2.1 Research Design

The goal of this research was to focus on energy planning at a local level and investigate the opportunities to apply SSD to local energy planning. The research also reviewed the best practices of 17 cities, regions and neighbourhoods to learn gaps and challenges encountered while implementing local energy planning. The highlighted projects of these territories were analysed through the lens of the SSD framework to highlight best practices and patterns for communities starting local and sustainable energy plan such as Karlskrona Municipality.

The research explored ways of enhancing planning for local energy systems with the SSD framework. The researchers noted the community’s concrete actions towards a sustainable energy plan, its intention to be Fossil Fuel Free by 2020, and its interest in working with the researchers to further the methodologies and practices in moving the Karlskrona Municipality towards a more sustainable energy plan.

2.2 Discussion and group process

The goal of the research was to utilize the framework for strategic sustainable development to assist in the development of a generic strategic plan towards sustainability for local energy planning with particular attention to the Municipality of Karlskrona. After the goal of the research
had been defined, each research team member did a literature search and review of their assigned section of the topic for background facts. Different perspectives and focal areas were presented in group process. Informed discussion around the main research question led to group planning of methods.

2.3 Literature Review

Researchers read relevant publications in the areas of global, European, Swedish and Karlskrona Municipality energy policy and planning, backcasting, SSD. The collected information was from books, published articles, transcripts of conferences and web sites. All information was shared amongst the researchers in order to inform discussions about what information was appropriate to further inform us about the research questions.

2.4 Interviews

Personal interviews with key community members in southeast Sweden involved in the field of local energy and with EU energy planners were an important method of research. Interviews were conducted with members of the Karlskrona Municipality, Gullberna, the district heating plant that provides home heating for Karlskrona; and Affärsverken, a company based in Karlskrona that builds, develops, and manages the electricity trade and district heating infrastructure in Karlskrona. Also interviewed were staff from Södra Skogsägärna Ekonomisk Forening, an economic association of private forest owners in Southern Sweden that provides the wood chips for Karlskrona’s district heating plant, and Energikontor Sydost, the Energy Agency for Southeast Sweden. Local politicians were consulted to capture successful working methods and innovative actions that would further move Karlskrona Municipality towards sustainability. A senior scientist from the European Environment Agency was also interviewed for a broader perspective on local energy planning in Europe.
2.5 Working with Karlskrona Municipality

A series of six meetings were held with Karlskrona Municipality in a four-month period. These meetings had three sequential goals: to explore ways of working together, to conduct an ABCD workshop with the Municipality, and to create a planning methodology that would enhance further development of the local energy plan.

The project manager of the Affärsverken energy planning department, a division of Karlskrona Municipality, and an Umeå University graduate student working with the Municipality, were the key contact personnel for the meetings. Lilja was the lead author of the 2006 Karlskrona Energy Plan and had begun to lead a Municipality of Karlskrona sanctioned campaign to integrate sustainability into Affärsverken several months before meeting with the researchers.

The initial meeting was an introductory session where the researchers and the members of the Municipality investigated a potential collaboration. They explained the current energy system in Karlskrona and the researchers explained the SSD framework. Goals were discussed and an agreement was reached to work together.

A workshop followed where researchers facilitated an ABCD analysis of the energy system for the Municipality along with Karlskrona Municipality and Affärsverken Staff. The workshop aimed to familiarize the staff with the ABCD analysis.

The workshop began with researchers describing the five-level model for planning in complex systems, and reviewing the ABCD tool. A visioning session ensued, followed by a brainstorming session, and ideas were generated to assist the Municipality in reaching its local energy planning goals.

The ABCD analysis is composed of four steps leading to the creation of a strategic plan, which we present here using examples from the Karlskrona workshop (Ny et al. 2006, 65).

*The A step: Awareness.* The first step, called the A step, consists of sharing the same understanding of the system, its constraints and sustainability. The funnel metaphor was created to provide a holistic understanding and
illustrate the urgency of the issue (See figure 1.2). Explaining the overall principles of functioning of the system, in this case, the biosphere and the human society helped the audience understand the need for sustainability. Once the basic principles of the interrelationship of biosphere and human development were explored, the researchers introduced the four sustainability principles. The audience also comprehend the aim of the strategic analysis, in this case providing Karlskrona with a local energy planning process towards sustainability.

*The B step: Baseline.* The B step consists of completing an assessment of the current situation with the help of backcasting from the four sustainability principles. All the current flows within the system are analysed against the principles, which provide an overview of the current strengths and weaknesses from a sustainability perspective. It aims to answer the following question:

*What do we do today which contributes or does not contribute to violations of the sustainability principles?*

To comprehensively respond to this question, the first step was to identify the flows and practices of the organisation. We used tools such as

- SWOT (Strengths, Weaknesses, Opportunities, Threats)
- A model for structuring an operational analysis (The “house model”)

*Figure 2.1. A model for structuring an operational analysis
Source: Robèrt et al. 2006, 238*
The next step consisted of classifying the flows and practices around the system’s conditions and identifying the positive and negative aspects. Then, the flows and practices identified above were quantified. This was helpful in the C and D steps to identify the importance of the flows and practices and to prioritise solutions.

*The C step: Visioning and brainstorming solutions.* In the C step, the vision and the paths to achieve success are created. The vision will drive the project until the success is reached. The solutions are brainstormed using a backcasting perspective. Each solution is imagined from a point of success looking back at the current reality. It aims to solve current problems and reinforces strengths highlighted in the B step (Figure 1.4).

**First part: creating a vision**
We created a compelling vision of what we wanted to achieve, such as being Fossil Fuel Free in 2020 or having a sustainable society for the next generation. Within the vision, we created main overarching goals. These goals should be general and audacious in order to motivate a community moving towards sustainability and to allow long-term plans to be created. It is also helpful to create core values within the vision. These values state what we care about and how we want to work to achieve the vision (Collins and Porras 1994, 220). The reason for the articulation of these parts in the vision is to be able to build a long-term project where any member of a community feels involved. The vision must also be constrained by the sustainability principles to achieve sustainability.

It is interesting to note that the more a community is engaged in this initial stage, the more the project will include the entire community, and the greater the opportunities for success (Kahane 2004, 129).

**Second part: brainstorming solutions**
We brainstormed many ideas and solutions to achieve the vision while resolving today’s issues and fostering today’s assets, as highlighted in the B step. This was the backcasting process, as illustrated in figure 1.4. Brainstorming sessions facilitated “out of the box” thinking.

*The D step: Strategic plan, prioritization.* In the D step, the solutions proposed in the C step are prioritised following three interdependent questions:
- Is this solution going in the sustainability direction, towards our vision?
- Is this solution a flexible platform? (i.e. will it be possible to adapt this solution to reach sustainability? Are we avoiding blind alleys?)
- Does this solution provide a good return on investment (i.e. financial, social, political capital)?

A revision period should be determined, in order to keep in mind that moving towards sustainability is a long and on-going process. It allows returning to the BCD part of the process to go deeper and possibly find more opportunities, gaps and leverage points.

The last goal of the meetings with the Municipality was to analyze the combined ‘Ladder’ methodology of Karlskrona Municipality and the ABCD tool to enhance Karlskrona Municipality’s strategy to reach their goal of Fossil Fuel Free by 2020. The integration of the ‘Ladder’ document and the ABCD tool led to a planning document referred to as the ‘Strategic Planning Guidelines towards Sustainability’ (Appendix 2). Throughout this paper, this document is referred to as “the Guidelines”.

### 2.6 Survey

A survey was sent to project managers in 16 EU territories that were recognized by Energie-Cités for their energy initiatives in local energy planning and to Karlskrona Municipality. The beacon territories survey was designed to capture best practices in leading communities, to understand their vision, the parties affected by the project, actions conducted, and to learn what opportunities and challenges that presented themselves to these municipalities. The survey was structured around the five-level framework to enable the researchers to rigorously analyse the initiatives and highlight important insights for Karlskrona Municipality. The survey questions are located in Appendix 1 of this paper.

The survey investigated gaps, threats, opportunities, and leverage points that cities have experienced in their energy planning.

An explanation of question 18 analysis method may be helpful. The question (Appendix 1) required respondents to rank their choices. To analyse the responses, the researchers weighted each answer by order of
importance to provide rigorous results. For example, the first choice was given three points, the second, two points and the third, one point. Each proposed response had a total point value, and their weighted relative contribution was thus determined.

2.7 Peer review

A peer group comprised of fellow Blekinge Institute of Technology Master’s students studying similar topics was available for support throughout the research process. Scheduled peer review sessions were held for dialogue and collaboration. The researchers met three times with their peer group for discussion on challenges within overall boundaries of the research topic, improvements on methodologies, and gaps in the analysis of results. The peer group provided regular feedback for opportunities for improvement, helped to identify weaknesses in the paper and offered advice and encouragement.
3 Results

3.1 Legislation analysis

3.1.1 Presentation of the energy objectives

*Global objectives.* Due to the absence of a significant set of global energy objectives, as well as the interconnectedness of energy and climate policy, a climate policy was chosen as the subject of study at the global level. The United Nations Framework Convention on Climate Change (UNFCCC) has set out this objective: “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner” (United Nations Framework Convention on Climate Change 1992, 4). This objective is applied through the proceedings of the Kyoto Protocol whose main strategy is quantitative reduction of GHGs.

The most recent targets that stem from it vary for each of the participant countries. The binding period of the agreement is from 2008 to 2012. During this period ‘industrialised’ or ‘Annex I’ countries will be subject to quantitative reductions for greenhouse gases by at least 5 percent. The EU 15\(^1\) are required to reduce their emissions by 8 percent; within this the EU 15 has a burden sharing agreement designed to even out inequities in per-capita emissions and the structure of energy and industrial sectors among member countries. The greenhouse gas reduction schedule of the Kyoto agreement includes what are called ‘flexible mechanisms’, which consist of a system for emission trading (UNFCCC1998, 15) and two project-based mechanisms: Joint Implementation (Ibid., 6-7) and the Clean Development Mechanism (Ibid., 11-12).

---

\(^1\) The EU 15 represents the 15 countries of the European Union before the expansion on 1 May 2004. They are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.
EU objectives. The most recent Presidency conclusions of the Brussels European Council in March 2007 identify three main objectives to be pursued within the energy policy for Europe: increasing security of supply; ensuring the competitiveness of European economies and the availability of affordable energy; and promoting environmental sustainability and combating climate change (Council of the European Union 2007, 11). The following excerpts from a recent communication of the European Commission to the European Council and the European Parliament on a new energy policy for Europe further characterise EU objectives: “A new European energy policy needs to be ambitious, competitive and long-term - and to the benefit of all Europeans”, and, “transforming Europe into a highly energy efficient and low CO\textsubscript{2} energy economy, catalysing a new industrial revolution, accelerating the change to low carbon growth and, over a period of years, dramatically increasing the amount of local, low emission energy that we produce and use” (Commission of the European Communities 2007, 3, 5).

On March 9, 2007 the European Commission adopted a new energy policy that sets a target of cutting 20 percent of the EU’s GHG emissions in relation to 1990 levels by 2020. They also expressed a willingness to raise the goal to 30 percent if the United States, China and India make similar commitments. A binding overall goal of 20 percent for renewable energy sources by 2020 was also set, compared to the present 6.5 percent. Finally, a binding minimum target of 10 percent for the share of biofuels in overall transport petrol and diesel consumption by 2020 was also set (Council of the European Union 2007).

Swedish objectives. Sweden’s National Energy Strategy has the overall objectives of: ensuring the supply of electricity and other energy; creating the right conditions for efficient use of energy, creating a cost-efficient Swedish supply of energy with a low negative impact on health, the environment and climate; and assisting in the changeover to an ecologically sustainable society.

Sweden has both short-term and long-term climate related targets. For 2008-2012, under the terms of the Kyoto Protocol and the burden sharing agreement within the EU, Sweden’s emissions may not exceed 104 percent of their 1990 emissions. The Swedish Parliament opted to be more ambitious under its National Climate Strategy and set its own target of 96 percent of 1990 emissions (however not legally binding) without the aid of
carbon sinks or flexible mechanisms such as those available in the Kyoto agreement. The long-term target for 2050 is that total annual carbon emissions per person are less than 4.5 tonnes CO$_2$ equivalents and continue to drop thereafter. To achieve this, the Swedish Government is using a variety of policy measures including taxes and economic incentives, energy efficiency programs, information and research (Swedish Energy Agency 2007, 16-25).

3.1.2 Analysis of the energy objectives through the lens of the SSD framework

The global, EU and Swedish objectives presented in section 3.1.1 were analysed through the lens of the SSD framework presented in Section 1.3.

Global objectives Energy systems which burn fossil fuels such as oil, gas, and coal, generate emissions that contribute to violations of SP1 through the systematic increase in concentration of GHGs in the atmosphere. The extraction of fossil fuels often results in land degradation, which may contribute to the violation of SP3 (i.e. systematic degradation of natural systems by physical means such as open pit mines for coal). Other violations of SP3 may be recognized through biofuel crops encroaching on natural lands and replacing them with monocultures (i.e. a systematic degradation of natural systems by physical means by diminishing biodiversity). SP4 may be violated by expansion of biofuel production competing with food production resulting in price increases in agricultural land and increases in food prices that make them unaffordable thereby undermining people’s ability to meet their needs. When viewed through the lens of the SSD framework the UNFCCC objectives seek to address many issues but represent only part of the solution.

The Kyoto Protocol is a very important step in international cooperation to address the global problem of climate change. The very existence of the protocol is recognition of our ability to affect the environment in which we live. A complete awareness of the system, however, is not explicit. The UNFCCC objectives speak of addressing the climate issue while at the same time maintaining biodiversity and not compromising food production. Such a definition of success implies a systems view but is contingent on how these terms are defined and the strategies and actions that stem from them. Recognizing that biofuels and food compete for the same land, there is a threat to the food supply and the price of food, considering the higher prices paid for biofuels. Likewise, expansion of biofuels may drive more
aggressive harvesting of forests for wood products, or deforestation in order to expand biofuel plantations; this may put pressure on conservation land and subsequently threaten biodiversity. There does not appear to be a mechanism or the capacity in place to address such risks. Only through cautious, appropriate use of biofuels may they contribute to solving the energy problem and help move towards sustainability.

At the global level relationships and partnerships for cooperation towards change take time to develop; this is an important understanding of the system. The Kyoto Protocol has shown that cooperation and consensus building between nations is a lengthy process. The UNFCCC agreement was first signed on May 9, 1992, the Kyoto Protocol was subsequently signed in 1997, and in 2008 the GHG reductions will become legally binding. Decision makers have worked for over 15 years to arrive at a set of agreed upon actions with ramifications for not achieving goals. Although the climate problem knows no borders, we all live within the borders of nations, and not all nations have agreed upon the urgency of the problem, or that the protocol is the right solution. The Kyoto Protocol has currently been ratified by 173 countries (UNFCCC 2007). However, some nations still refuse to join the agreement for reasons such as fear of losing competitiveness, or loss of economic development opportunities or because of large deposits of fossil fuels. Enforcement of the agreement may be a challenge, as participation in the agreement is voluntary and handing down penalties to participating countries that miss their targets may be complicated.

The Kyoto Protocol is commonly criticized for not being aggressive enough. It’s target of a five percent reduction in global GHG emissions with respect to 1990 levels is not reflective of the current gap between GHG emissions and the rate at which they are being taken out of the atmosphere. In fact if every country in the world including the United States and China followed the current Kyoto Protocol, GHG concentrations would continue to grow in the atmosphere forever. Stabilizing GHG emissions would take more than a fifty percent reduction in emissions (Senge et al. 2006, 15-18). Regardless what percentage of reduction, the fact that targets are binding quantitative reductions is a step in the right direction because they are essential to prevent further accumulations of GHGs in the environment. Perhaps the current targets for GHG reductions are the most aggressive ones that the participating nations could agree to, however these targets could be significantly strengthened if connected to
medium and long-range goals that go beyond incremental improvements and connect to an end goal of full sustainability (i.e. levels of GHG emissions that do not systematically increase in nature). On the positive side, a starting point for GHG emission reduction targets has been established, and the strategy can now be refined at to better address full sustainability.

There are two elements of the Kyoto Protocol that are elegant demonstrations of systems thinking. Joint Implementation and the Clean Development Mechanism represent opportunities to address more than one problem at once by helping to limit net emissions of GHGs to the atmosphere, while addressing inequities between developed and developing countries through investment in more efficient and lower GHG emitting technologies in developing countries.

**EU objectives.** The EU objectives seek to address the security of supply (i.e. prevent shortages in energy supply, and subsequent increases in energy price that could contribute to the systematic undermining of people’s capacity to meet their needs thereby violating SP4); the competitiveness of European economies and availability of affordable energy (i.e. keeping the European economy competitive with the rest of the world so that currency does not lose its value, potentially contributing to the systematic undermining of people’s capacity to meet their needs and thereby violating SP4); and promoting environmental sustainability (i.e. not contributing to the violation of SP1 through SP3) and combating climate change (i.e. not contributing to violations of SP1 through combustion of fossil fuels and subsequent accumulation of GHGs in the atmosphere).

Of primary concern to the EU is their dependence on imported sources of energy, the increasing demand for energy and the ability to meet those demands. Economic growth has traditionally been tied to energy consumption, and therefore reducing energy consumption may be viewed as a risk to growth. The SSD framework perspective redefines growth by decoupling economic growth from the use of physical resources. Efficiency through technological innovation is an opportunity for economic development for the EU. With the urgency of the climate problem, and anticipated price increases in fossil fuels and further legislation on GHG emissions, the alternative energy industry is expected to become more valuable in the future to fill energy demands without net carbon dioxide emissions. Additionally, with the understanding that today’s investments in
energy infrastructure will be with us for years to come, it is essential that we make wise investments now if we truly wish to address the sustainability challenge. Another consideration for the EU is its high dependence on imported sources of energy. Imported energy now accounts for approximately 50 percent of total EU energy consumption. Reliance on imports of gas is expected to go from 57 percent today, to 84 percent by 2030, and oil from 82 percent to 93 percent (Commission of the European Communities 2007, 3). This has been exacerbated by political instability in supply regions. Addressing this issue by replacing imported source of energy provides a unique opportunity aligned with the movement towards sustainability (i.e. compliance with the 4 sustainability principles).

The Communication from the Commission to the European Council and the European Parliament document entitled “An Energy Policy for Europe” (Section 3.1.1) discusses the EU’s most recent plans. In this document the need for policy to be long-term was recognized (Commission of the European Communities 2007, 3). From the perspective of the SSD framework this is a step in the right direction but could be strengthened even more when connected as a step towards a defined goal of sustainability. The social dimension of energy is indirectly addressed by the statement, "to the benefit of all Europeans" (Ibid). Currently, economic growth is strongly emphasised by EU policies (i.e. the EU’s main development strategy, the Lisbon Strategy). “An Energy Policy for Europe” discusses low carbon growth (i.e. economic growth as defined by the current economic paradigm, with low emissions of carbon dioxide to the atmosphere) (Ibid, 5).

The set of targets released by the European Commission on March 9, 2007 (Section 3.1.1) are in many ways a step in the right direction and necessary to more effectively address the climate problem. The stated policies are not necessarily part of an overall strategy towards sustainability. There does not seem to be a clear mechanism to prevent degradation of the environment from deforestation, and increased food prices due to expansion of biofuel crops into agricultural land. With the urgency of the climate problem, and anticipated price increases in fossil fuels and further legislation on GHG emissions, the alternative energy industry is expected to become ever more valuable in the future to fill energy demands without net carbon dioxide emissions. Additionally, with the understanding that today’s investments in energy infrastructure will be with us for years to
come, it is essential that we make wise investments now if we truly wish to address the sustainability challenge.

**Swedish objectives** Sweden’s National Energy Strategy seeks to ensure the supply of electricity and other energy (i.e. prevent shortages in energy supply, and subsequent increases in energy price that could contribute to the systematic undermining of people’s capacity to meet their needs thereby violating SP4); create the right conditions for efficient use of energy; create a cost-efficient Swedish supply of energy (i.e. reduce amount of imported energy that may have a low negative impact on health, the environment and climate (i.e. not contributing to the violation of all four SPs); and assisting in the changeover to an ecologically sustainable society (i.e. not contributing to the violation of SP1 through SP3).

Sweden emits a very small portion of global GHGs; approximately 0.2 percent of global emissions (Swedish Energy Agency 2007, 60). Though progress in Sweden alone towards sustainability may not have a great global effect in a direct sense, Sweden has a tremendous opportunity to influence the global system by being a leader in developing and disseminating technologies and progressive policies. These include taxation on energy use and emissions, support systems for renewable electricity production, regulations on buildings, technology procurement, energy research, development and commercialization.

Sweden has committed to a firm, binding target from the Kyoto Protocol, and has voluntarily created a more restrictive standard within which it has flexibility to achieve that goal through a variety of strategies. Using the Kyoto Protocol target as a benchmark upon which to improve is a significant step, however, each strategy should be assessed independently and holistically with regards to sustainability.

### 3.2 Current practices of pilot cities in the European Union

#### 3.2.1 Part One: Basic information about the participants

In March 2007, a survey (Appendix 1) was sent to the 16 beacon cities presented in table 3.1, as well as Karlskrona Municipality. The survey was designed to gather information about energy planning practices, as well as
information about lessons learned from their initiatives in local and sustainable energy planning processes. In order to provide structured information, the survey was designed around the five-level framework, focusing on the five general areas of the vision of success, the processes behind the creation of the vision, the strategic plan, the type of measures undertaken, and the lessons learned.

Table 3.1. List of the beacon territories with their related initiative

<table>
<thead>
<tr>
<th>City – Region</th>
<th>Population</th>
<th>Description of the initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Güssing – Austria</td>
<td>4,000</td>
<td>Only European town totally independent regarding energy supply</td>
</tr>
<tr>
<td>Litomeřice – Czech Republic</td>
<td>25,000</td>
<td>National pioneer in the production of heating and electricity from renewables</td>
</tr>
<tr>
<td>Odense – Denmark</td>
<td>185,000</td>
<td>Intelligent energy and transport management systems. Known as the bicycle capital of Denmark.</td>
</tr>
<tr>
<td>Samsø – Denmark</td>
<td>4,200</td>
<td>Project to produce 100 percent of the energy from local renewable in 2008.</td>
</tr>
<tr>
<td>Franche-Comté – France</td>
<td>1,130,000</td>
<td>High development of the biomass industry.</td>
</tr>
<tr>
<td>Nantes –France</td>
<td>800,000</td>
<td>Pioneer in clean transportation and reduction of energy use.</td>
</tr>
<tr>
<td>Eco-Viikki – Finland</td>
<td>2,000</td>
<td>District developed with the aim to preserve nature and public health.</td>
</tr>
<tr>
<td>Freiburg – Germany</td>
<td>215,000</td>
<td>Pioneer in energy and environmental projects in Germany. Positive results in transport and housing sectors.</td>
</tr>
<tr>
<td>Heidelberg – Germany</td>
<td>143,000</td>
<td>Political and community commitment since 1990s to combat climate change.</td>
</tr>
<tr>
<td>Kronsberg/Hannover – Germany</td>
<td>6,600</td>
<td>District developed in a sustainable manner.</td>
</tr>
<tr>
<td>Nyíregyháza – Hungary</td>
<td>119,000</td>
<td>Pioneer in energy management, driving the change in Hungary.</td>
</tr>
<tr>
<td>Växjö – Sweden</td>
<td>77,000</td>
<td>Objective to become free from fossil fuels and cut by half their greenhouse gases emissions by 2010.</td>
</tr>
<tr>
<td>City</td>
<td>Population</td>
<td>Energy Policy/Initiatives</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Basel – Switzerland</td>
<td>186,000</td>
<td>Pioneers in energy policy (2000Watt society(^2)) resulting in significant energy savings.</td>
</tr>
<tr>
<td>Lausanne – Switzerland</td>
<td>127,000</td>
<td>Programs to raise awareness and increase the use of renewables and energy efficiency.</td>
</tr>
<tr>
<td>BedZED/London – Great Britain</td>
<td>220</td>
<td>Eco-community with a goal to be carbon neutral and integrate social sustainability aspects.</td>
</tr>
<tr>
<td>Woking – Great Britain</td>
<td>90,000</td>
<td>Development of a Climate Change Strategy, pioneer in renewable energy in Great Britain.</td>
</tr>
</tbody>
</table>

Of the seventeen surveys emailed out, we received twelve replies. Nine of these cities (53%) replied to the entire survey, providing consistent analytical material. The responses of Karlskrona are included in the survey results as the municipality has already done some work towards sustainability and it presents value to compare Karlskrona activities to EU best practices.

The cities that responded to the entire survey are all located in Northern and Western Europe:
- Basel, Switzerland
- Eco-Viikki, Finland
- Güssing, Austria
- Heidelberg, Germany
- Karlskrona, Sweden
- Lausanne, Switzerland
- Samsø, Denmark

\(^2\) The 2000Watt Society is a concept developed in Switzerland. It describes a society where each person is allowed to use 2000W of energy per year (17,520kWh) while the society remains economically competitive. The aim is to reach the 2000W society in 2050 and to reach the 500W society in 2150.
As an introduction to the survey, we asked, “In which sector(s) is your energy initiative applicable?”:

- 75% of the respondents considered more than one sector for their initiative. (Figure 3.1),
- 55% of the respondents considered more than two sectors for their initiative,
- 42% of the respondents considered the combination of the four following sectors; “Transportation, Land use planning, Heating and cooling, and Electricity services”.

![Figure 3.1. Sectors of the energy initiatives](image)

### 3.2.2 Part Two: The vision of success of the energy initiatives

The second part of the survey was dedicated to the vision of success, with the question “What is the vision of success for your energy initiative?”:

- All of the respondents mentioned a vision,
- No vision mentioned sustainability or principles of sustainability,
- 89% of the visions were scenarios based,
- 42% of the visions mentioned an objective in time,
- 22% of the visions were based only on a numerical target, such as 25% reduction in water consumption.
To the question “What were the driving factors in creating the vision?”:
- 67% of the respondents mentioned the local authorities.

To the question “Who created the vision?” (Figure 3.2):
- 56% of the visions were created by two or three stakeholders,
- 89% of the local authorities participated in the creation of visions.

![Figure 3.2. Stakeholders involved in the creation of the vision](image)

To the question “How was the vision created?”:
- 78% mentioned participatory processes such as workshops within the community,
- 67% were helped by external consultants,
- 34% followed legislation.

### 3.2.3 Part Three: The strategic plans of the energy initiatives

To the question “Who was involved in the creation of the strategic plan?”:
- All the respondents involved local authorities (Figure 3.3),
- 44% of the respondents involved all the local stakeholders that were suggested by the survey instrument (local authorities, businesses, citizens),
- 66% of the respondents involved authorities beyond the local level (regional or national).
Figure 3.3. Creators of the energy initiatives strategic plans

To the question “How was the strategic plan for your energy initiative created?”:
- 78% mentioned participatory processes such as workshop with the community,
- 67% used the help of external consultants,
- 34% of the strategic plans were informed by legislation.

To the question “Who is involved in implementing the strategy?” (Figure 3.4):
- 89% of the respondents involved both local governments and local/regional energy agencies,
- 45% engaged with local businesses,
- 34% engaged citizens in the process.
To the question “Have you defined goals regarding energy efficiency? If yes what are they?”:
- All of the respondents defined goals,
- 56% of the respondents mentioned goals related to energy efficiency in buildings,

To the question “Have you defined goals regarding renewable energy? If yes, what are they?”:
- 89% of the respondents defined goals for renewable energy, e.g. some specified being powered by 100% renewable energies. Others specified that they would decrease their discharge on carbon dioxide by 20% by 2010.
- 13% of the respondents mentioned sector goals for specific types of renewable energies,
- 75% of the respondents have an overall goal to substitute fossil fuels with mixes of renewable energies.

To the question “What criteria did you consider to align your everyday decision making and investments with your long-term targets?”:
- 67% of the respondents answered the question,
- 33% mentioned the difficulty to define criteria because of the variety of stakeholders,
The various responses mentioned by the 67% of respondents included criteria such as: local ownership, public participation, and the ecological building criteria in Eco-Viikki.

To the question “How did you finance the steps taken?” (Figure 3.5):
- 67% of the energy initiatives were partly financed by national grants,
- 56% of the energy initiatives were partly financed by direct contributions of the citizens, either by user-fees or taxes.
- 78% of the respondents considered two or more ways to finance their initiative.

To the questions “Has the strategic plan been revised since it was first adopted?” and “Is there a process in place for periodically revising the strategic plan? If yes, who revises it and with what information?”:
- 67% of the respondents have revised their energy plan since it has been first created,
- 67% of the respondents have a process to revise their plan,
- 44% of the strategic plans are revised by the local governments.
3.2.4 Part Four: the actions and tools related to the energy initiatives

To the question “Please rank your top three measures undertaken within your energy initiative?”:
- Policies/regulations and public/private partnership tied as the most cited answers,
- Awareness and public campaigns was the third most cited answer,
- Direct investments came fourth,
- Rewards and subsidies such as feed-in tariffs came fifth.

To the question “Who is affected by those measures?”:
- 100% of the measures targeted local governments and businesses,
- 89% of the measures affected the citizens,
- 67% of the measures concerned NGOs.

To the question “What are the criteria for the prioritization of your measures?”:
- 38% mentioned cost-related criteria,
- The rest of the responses varied, i.e. the order of the initiative, the experience or CO₂ emissions.

To the question “How do you monitor progress?”:
- All of the respondents responded,
- CO₂ emissions appeared as the sole common progress measurement, it was mentioned in 22% of the responses.

To the question “Which indicators do you use to monitor progress?” (Figure 3.6):
- 89% of the respondents used a mix of indicators (Including, for example total energy use, energy use per capita, percentage of energy reduction and growth indicators, emissions levels
- 67% used only indicators related to energy. (Including total energy use, energy use per capita,
- 33% used growth indicators.
To the question “Which tools do you use to measure progress?”:
- ISO was the most widely cited tool amongst the initiatives (33%),
- 78% of the respondents created their own tool.
- Eco-Budget and Ecological Footprint were cited as tools.

### 3.2.5 Part Five: Successes and barriers within the energy initiatives

To the question “What are the main successes for your energy initiative?”,
the cities cited the responses shown in table 3.2.

| Basel                        | – Leading research institutes work together in close collaboration with governmental authorities.
|                              | – The population’s awareness for the vision of the 2000Watt society is significant in the area of Basel, where the initiative is most active.
| Eco-Viikki                   | – 25 % less than normal heating consumption in buildings
|                              | – 22 % less than normal water consumption
| Güssing                     | – The regional added value, which amounts to more than 13 million Euros per year for the town of Güssing (4,000 inhabitants)
|                              | – The creation of more than 1,000 jobs and the settlement of more than 50 companies in the last 15 years.
<table>
<thead>
<tr>
<th>City</th>
<th>Achievements</th>
</tr>
</thead>
</table>
| Heidelberg | - Co-operation and networking,  
|           |   - City as a model and promoter                                              |
| Karlskrona | - The awareness and the educational campaigns to the public.                 |
| Lausanne  | - A network of district heating with more than 50% of renewable energy.   
|           |   - The construction of 2 subways to generate a modal transfer towards public transport.  
|           |   - The creation of a solar grant and the realization of a wind mill of 2 MW  
|           |   - The Energie-Cités campaign Display about energy labels on the buildings and EDEN about education for energy |
| Samsø     | - The Samsø Renewable Energy Island project is successful because of wide spread public participation and a willingness to invest private money in a renewable energy project.  
|           |   - High level of activity, new jobs and improvement of local economy.      |
| Växjö     | - 51 % of all the energy supply to Växjö was renewable in 2005. This includes the transport sector. For the heating sector, 88% was renewable. |
| Woking    | - Reduction of energy consumption in council buildings by 52% from 1990 levels.  
|           |   - The ability to generate sustainable and renewable energy for local use by businesses and residents.  
|           |   - The creation of a comprehensive climate change strategy covering all of the council's services. |

89% of the respondents are recognising awareness/behavioural change to be a barrier as well as the economy/market forces. 89% of those cities used awareness campaigns to overcome the behavioural change barrier.

In 89% of the cases, the legislation, generated by the local, national and European levels, has been favourable to the respondents.
3.3 Towards strategic planning guidelines for sustainable local energy systems

3.3.1 Current energy plan in Karlskrona

The Karlskrona energy plan gives an overall picture of the Municipality's direction within the energy area. The overall regional objective for the environmental plan is referred to as “the generation objective”, meaning that the next generation will be left with a society where the biggest current environmental problems are solved. Among other goals, human impact on the environment and on people's health will have been reduced from current levels, and by 2010 the district heating energy supply will be from renewable energy sources. All electricity customers in the public sector will buy only renewable energy, and the electricity consumption will have decreased by 10 percent from 2000. This will happen through an efficient improvement of total energy usage and a smaller proportion of energy supplied by fossil fuel. District heating will also be utilized in all municipalities (Lund 2007; Ryke 2007).

In addition to a renewable energy supply, the Municipality has developed an energy plan that provides an overall picture of their direction within the energy area. The 2006 Karlskrona Municipality energy plan specifies that the Municipality work towards an effective energy supply and transition to a long-term sustainable energy system that has a low negative impact on people’s health and the environment, is secure, and promotes a positive economic and public development. The vision is to create a sustainable society for the next generation.

The 2006 Karlskrona Municipality local energy plan has a well-defined path towards satisfying the goal of “Fossil Fuel Free by 2020”.

The energy plan is divided into five strategies:
- Investment in renewable sources of energy and new technologies
- Energy conservation
- Development of the district heating system
- Physical planning for more efficient energy use
- More efficient and environmentally friendly energy use

The energy planning will create solutions that:
- Minimize environmental pollution
- Decrease energy allocated to electrical and energy use
- Create possibilities for cost effective energy solutions
- Decrease the Municipality's dependence on fossil fuel for heating and transportation
- Facilitate a transition to renewable sources of energy

The goal is to move to an energy system with renewable energy sources while meeting the objectives of Karlskrona Municipality's environment plan. The use of fossil fuel will cease, and by 2015, 50 percent of the Municipality's energy supply will be based on renewable energy. Further objectives are to decrease the carbon dioxide emissions by 20 percent by 2010 (Lilja 2007).

The district heat facilities are fuelled primarily by wood chips, with pellets and oil as needed. Using wood as an energy source is increasingly important to Blekinge, in order to comply with the Swedish government's vision and the Municipality’s own energy plans. The Gullberna district heating plant is the primary source of home heating and Västerudd is the secondary district heating plant in Karlskrona (Lund 2007; Ryke 2007) (Figure 1.5). Fifty percent of the buildings in Trossö, an island and the town centre of Karlskrona, are connected to district heat. This 50 percent in Trossö utilizes 75 percent of the heat produced by Gullberna, which suggests that the larger buildings and estates are connected to district heat, while smaller dwellings have yet to be connected. The district heat statistics for the other sections of the Municipality were not available to researchers. The buildings that do not utilize district heating obtain their energy from oil, electricity, wood pellets and heat pumps (Ibid).
The Södra Skogsägärna Ekonomisk Forening, an economic association of private forest owners in southern Sweden that has provided the wood chips for Karlskrona’s district heating plants, has a forest management program and anticipates continuing to fulfil the Municipality’s energy needs (Södra 2007). At the national policy level, Sustainable Forest Management (SFM) is determined by several factors (Fries 2006):

- Integrated management for all forest values – wood and other items and services,
- Meaningful participation of all stakeholders,
- Landscape level planning and management,
- Comprehensive monitoring, evaluation and reporting on indicators of sustainability.

All Södra Skogsägärna wood is from a source no more than 200 kilometres from Karlskrona Municipality. Only indigenous trees are grown, and the entire felled tree is utilized. Timber, pulp and biomass are the products. The wood is harvested first by machinery, then, if necessary, by hand; and clear cutting is prohibited. This harvesting method allows for leaving residual stumps that provide protection for the forest’s plant and animal life, and eases replanting.

In order to satisfy the objective that all households utilize district heating, Karlskrona Municipality municipal executive board has recommended that
a biofuel plant be built (Bothorp 2007). The new energy plant is one method of securing sustainable local energy. The Karlskrona Municipality executive council decided in April 2007 to build a co-generation plant that will primarily use locally produced woodchips and pellets as its energy source to produce both electricity and heat (Bothorp 2007). The oil that is required by the plant to initially start the boiler and to supplement demand in extreme cold weather conditions will be regionally produced rapeseed oil or other bio-oils.

3.3.2 Current energy planning process in Karlskrona

The municipality does not currently have a well defined process of creating an energy plan. In 2006, Karlskrona Municipality revised their local energy plan. The plan had not been revised since 1999. The 2006 plan was created mainly by the project manager of the Affärsverken energy planning department to satisfy the requirements of a funding application from Klimp, the Climate Investment Program of Sweden.

The project manager had expressed an interest in greater structure and a more participatory approach in future planning process. In an effort to illustrate ways to move towards a sustainable energy system, he developed a methodology tool which invites the community, stakeholders and politicians to hold workshops and brainstorming sessions with the intent to plan and prioritise ways to reach the Municipality’s vision. In this paper, this tool is referred to as the Karlskrona Municipality ‘Ladder’. The goal of the ‘Ladder’ is to move a community to an energy system with renewable energy sources while meeting the objectives of Karlskrona Municipality's environment plan. The steps of the ‘Ladder’ are sequential. They are: Understanding – Acceptance – Experimentation – Integration. The tool describes the need to have an understanding of the current situation, to assess it, to find solutions, to experiment with them, and to integrate the pertinent solutions into one’s daily work. It supports the vision of the Karlskrona Municipality, which is “a sustainable society for the next generation”. The tool was a starting point and required additional structure to be efficiently utilized in future planning process. This need was an opportunity to restructure the local energy planning process using the SSD framework.
Enhancing the planning process with the SSD framework

Over the course of several meetings with Karlskrona Municipality energy managers, strategic planning guidelines towards sustainability were developed to enhance the Karlskrona Municipality ‘Ladder’, presented in 3.3.1, with the SSD concepts. The intent of “the Guidelines” document (Appendix 2) was to integrate principles of Strategic Sustainable Development (SSD) into Karlskrona’s existing strategy for a sustainable local energy system, and to offer further structure and guidance for strategic planning. It was necessary to incorporate the concept of a systems perspective and backcasting from sustainability principles when utilising the tool, so the principles and methods for SSD planning were integrated into the four steps of the ‘Ladder’. The intent is for the Guidelines to be used in brainstorming sessions and workshops by Karlskrona Municipality. The Guidelines are explained below:

‘Förstå’ – Understanding. The principles of sustainability and the need for a systems perspective are explained to participants, followed by brainstorming sessions and workshops. Participants also learn best practices that would allow them to avoid ‘hitting the walls of the funnel’. The ‘Eko-Kommun’ ideas, embraced by Karlskrona Municipality, reinforce the use of sustainability principles.

‘Acceptera’ – Acceptance. Tools such as the SWOT analysis and the “house model” (Figure 2.1) are used to compare existing flows and practices with the four sustainability principles to further understand the current situation. The flows and practices are quantified. The need for public acknowledgement and legislation to enforce regulations is recognized.

‘Pröva i handling’ – Experimentation. Brainstorming sessions based on the ABCD analysis (Section 2.5) create an action plan that participants embrace and ‘take into their hearts’ (Lilja 2007). A vision is created with specific goals such as to invest only in renewable sources of energy and new technologies, efficient energy usage, and further development of the district heating system. The plan is long term and, because participants create it, they feel involved in the plan.
'Integrera i det dagliga arbetet’ – Integrate into Daily Work. Participants create a strategic plan and a set of prioritized measures in a group process based on the D step of the ABCD analysis. They determine who is responsible for goals, and what actions need to be taken. They also determine deadlines, budgets and resources required. The plan will be revisited to establish more opportunities, gaps and leverage points to bring the Municipality closer to a sustainable local energy plan.
4 Discussion

4.1 Legislation

The analysis of legislation through the lens of the SSD framework revealed ways to inform local energy planning. The time span between the signing of the UNFCCC document to the legally binding targets of the Kyoto Protocol took over 15 years. The planning process, especially when it is participatory and includes many stakeholders, takes significant time. Since 1977, Sweden has required municipal energy plans, yet many countries do not require municipalities to have energy plans (Olerup 2000). The plan is a starting point that can later be refined.

As shown in the results, existing climate and energy objectives at all levels are not explicitly connected to a defined end goal of sustainability. When sustainability is mentioned in climate and energy objectives, its meaning is implied as the Brundtland definition, “To meet the needs of the present generation without compromising the ability of future generations to meet their own needs” (Brundtland Commission 1987, 43). This definition gives a basic premise of sustainability, but lacks specific parameters of how to achieve it. Authorities using this definition may encounter difficulties in creating objectives and strategies to achieve sustainability. An opportunity exists using the SSD framework to have a clear definition of sustainability and to make targets more effective by clarifying the gap between current situation and sustainability, and bridging that gap. The SSD framework can help authorities prioritize actions, clarify targets and avoid sub-optimal planning. Authorities may then have a clear definition of sustainability and a clear definition of what is meant by success in achieving it.

Within the three analysed levels of legislation, an awareness of the threat to biodiversity and food production, for example, is apparent. Both of these are relevant to sustainability, as explained above. However, no mechanism appears to be in place in decision making to prevent such threats. An example is the expansion in the field of biofuel energy. In Sweden, biofuel for transport is using an increasingly greater portion of forest resources and affecting prices (Mattsson 2007). Increasing demand for biofuels creates pressure to increase harvest, which is a threat to the sustainability of supply. Biofuel reliance may create pressure to harvest conservation lands.
This can be a threat especially if industrialised countries begin large-scale imports of biofuel resources from countries where environmental regulations are not as stringent or enforcement is lacking. Authorities moving towards sustainable local energy systems may prevent further problems by being aware of this threat.

The Joint Implementation and Clean Development Mechanism programs of the Kyoto Protocol address multiple problems with a single creative solution. These programs have the potential to help reduce inequities between developed nations and nations with economies in transition while at the same time help limit quantitative emissions of global GHGs at the lowest cost. This could drive new policies for local authorities to address poverty with measures working toward sustainable local energy systems.

The results also make clear a great opportunity to address many of the aims of the objectives. Based on the researchers’ analysis, investments in clean local energy and the research and development of these industries can:

- Address dependence of foreign sources of energy,
- Put security of supply into the hands of the local stakeholders,
- Protect economies from price volatility,
- Drive local economic development, and
- Create the potential for exports that have great value to the entire world as we shift away from fossil fuel use.

These investments are great opportunities for local decision-makers to move towards sustainable local energy systems when considered in a systemic way. An upstream solution is reducing energy consumption, which can be achieved through behavioural changes, resulting in less use of energy (i.e. turning off the lights when not in a room, or walking instead of driving) or intelligent control systems (i.e. motion sensors on lights). Reducing energy consumption can also be achieved through improvements in efficiency at end use (e.g. more energy efficient light bulbs or refrigerators) or using appropriate energy technologies for the specific application (i.e. using low density energy such as waste heat from electricity generation to heat houses, instead of high density energy such as electricity). Energy production and transmission are other areas in which energy efficiency can be improved. The efficiency of the European power sector is approximately 30%; energy in the form of heat is being wasted. This waste heat can be used to heat houses and industry through combined

There are many funding opportunities available to territories. For example, in 2008 the EU program Intelligent Energy Europe (IEE) will begin to distribute €52 million for initiatives designed for energy savings and encouraging the use of renewables. There are currently 350 IEE projects underway in the following major areas: new and renewable energy sources; energy aspects of transport; local approaches, monitoring and financing; energy efficiency, notably in buildings and industry; and cooperation with developing countries. The IEE program recommends consulting local and regional energy agencies for support in creating proposals for funding (Intelligent Energy Europe 2007). An example of such a regional agency is the Energy Agency for Southeast Sweden. Other opportunities exist through aligning with NGO’s for support, publicity and awareness building. Participation may also help the NGO to leverage policy that works towards sustainability. Energie-Cités is an example of such an NGO. The municipality of Växjö, Sweden has been very effective in connecting with a variety of networks and funding sources. Växjö, is a member of the Energie-Cités network as well is connected to the Energy Agency for Southeast Sweden. Karlskrona could benefit from Växjö’s knowledge.

4.2 Best practices and challenges of European cities for local energy planning

The survey results from Section 3.2 were analysed using the five-level framework integrated in a table (Appendix 3). Results from the survey allowed us to perform an analysis of the energy planning initiatives in order to highlight gaps, threats, opportunities, best practices and leverage points using the SSD framework.

4.2.1 Acknowledgement of the system

Seventy five percent of the respondents mentioned more than one sector was involved in their energy initiative. This suggests that awareness for the interrelationship of sectors is becoming important. However, 55 percent of what are considered beacon local authorities in Europe considered two or more sectors, suggesting that considerable additional improvements could
be made by a broader, more holistic approach to local energy planning within an overall strategic sustainable development framework. It would allow going deeper into the interrelationships of the various energy sectors. Planners would benefit from a systemic perspective that avoids creating new problems while solving the current ones.

Forty two percent of the initiatives reported the consideration of three sectors while planning for sustainability: land use planning, transportation and energy production. The consideration of all three of these sectors is a step towards a more integrated planning process as advocated by Belaieff et al. (2007). The cross-sectoral consideration of these three aspects is an important and, in the majority of respondents, missing aspect of local energy planning by these progressive local authorities. Its potential importance can be substantiated by examining the strong correlation between land use (indicated by population density), transport patterns (km/capita) and energy use (per capita) (Newman and Kenworthy 1999, 42). Given that it is generally missing from the majority of these progressive example cities, it is reasonable to expect that it is also missing from many more local authorities across Europe.

None of the initiatives mentioned or defined the global need for sustainability (Section 1.2) and related it explicitly to their visions and strategies. This could be an important missing element for increasing public understanding and support for ambitious energy-related initiatives. Understanding the ultimate purpose of an initiative can help stakeholders to relate to short and medium-terms goals. It helps to make sense of these goals and frame them within a bigger and more meaningful picture, such as enhancing the quality of life of the community or reaching sustainability for coming generations.

4.2.2 A vision for success

Visions were structured in different ways from one respondent to another, and often lacked a time constraint. For example, in Eco-Viikki, the vision was expressed as “about 25 percent energy savings compared to the conventional building and water consumption about 22 percent less than normal” and in Växjö the vision was expressed as “to become completely free from fossil fuels” Clear, structured objectives and time-sensitive objectives can be valuable components of a functional vision. Often, objectives are expressed as a desire for incremental improvement (e.g.
“minimize…” as opposed to being anchored in a long-term view of success (e.g. “being fossil fuel free…”). This can lead to compromising what might otherwise be ambitious innovations towards full sustainability. It is also valuable to consider time constraints while planning for sustainability, since time constraints provide a goal to aim for and create a tension between the current situation and the desired one, leading to engagement and motivation of the people involved. In the survey, time objectives were expressed in only 42 percent of the visions. It should also be noted, however, that using time objectives could become a risk as missed deadlines can cause the loss of political credibility along with creative tension and engagement of the population that is necessary to accomplish the initiative. One suggestion is a long-term principle-based and meaningful vision coupled with medium-range specific targets such as Karlskrona’s will to have 100 percent renewable sources in the district heating system by 2010.

Eighty nine percent of the visions were presented as scenarios to reach sustainable objectives, yet none mentioned principles of sustainability. Scenarios included qualitative descriptions of the future such as “to involve local citizens and local companies” and “city as a model” and specific targets such as “all buildings of the city connected to a network of district heating powered by 100 percent with renewable energies” or “25 percent energy savings”. None of the surveyed local authorities mentioned sustainability principles. Scenarios provide engaging visions for the people involved, but it can be difficult to agree on them as people can disagree regarding details. Combined with the time consideration discussed above, we can see that perhaps framing a scenario based vision within principles for sustainability can help make smart choices and avoid conflicts around details while engaging the community towards a meaningful purpose.

Regarding the creation of the vision, it was noticed that participatory processes were chosen in 78 percent of the cases and only 56 percent of the territories involved two or three stakeholders. The inclusion of multiple participants is not a usual practice in the beacon cities as only 11 percent of the initiatives involved all three local stakeholders suggested by the survey instrument. This indicates that additional synergies in local energy planning may be realised by extending the energy planning processes to include a broader range of stakeholders. It appears especially important to engage interested businesses and citizens in such planning efforts, as they participated in 22 percent of the cases. Involving all the stakeholders from
the start of an initiative, materialised by the creation of the vision, conveys a logical flow in the implementation of the initiative as well as a desire to create participatory democracy. Inclusion can be more time consuming, however, providing greater results and synergies for the future of the territory.

The local governments were involved 89 percent of the time in the creation of the vision, the first stage of the energy initiatives. This result shows the importance of the involvement and the need for buy-in by the politicians in a territory. With the project managers and initiators, they are instrumental in the decision making process. Politicians also have the power to engage the community in their projects as citizens elected them. Their understanding of the overall situation and the need for sustainability is a leverage point as they can engage community support.

4.2.3 Strategy and actions

The local government is playing a key role in the creation, development and implementation of strategic plans, as they were always involved in the beacon cities. It was noticed that local stakeholders were more involved in the strategic level than in the visioning level (44 percent versus 11 percent). One of the reasons behind the awareness/behavioural change barrier may come from the lack of stakeholder concern of energy plans, as they are not involved from the beginning of the process, (i.e., the creation of the vision) and do not grasp the overall aim of building a sustainable energy system in their territory.

The European beacon initiatives have gone beyond the sectoral renewable energy goals of the EU legislation. 75 percent of the survey respondents aim to become free from fossil fuels by a mix of renewable energies without precision on the sectors chosen. It allows them flexibility and geographical adaptability in the renewable energy mix.

Sixty seven percent of the respondents stated that financing the initiatives involved national and European funds. Financial dependence on the EU, which implies acceptance of EU sectoral thinking, may make it difficult for the territories to propose integrated initiatives to reach full sustainability. The alternative could be to choose a variety of financing solutions as 78 percent of the respondents chose two or more financing options such as grants, taxes, and user-fees.
Citizens are partially funding projects, 56 percent of the time, through taxes. Financial involvement is one more reason to invite citizens to participate in the planning process. Expanded participation in all steps of the planning process may help to overcome the acknowledged awareness/behavioural change barrier for communities. It would help the community understand the need for the project within the overall global need for sustainability and therefore personally relate to the initiatives. Citizens and businesses were also highly affected by the proposed energy policy measures (respectively 89 percent and 100 percent), which is another reason to involve both in the development of the initiative.

The economy plays a role in the selection of the measures (mentioned 38 percent of the time). There was insufficient data to support generalisations about prioritisation criteria development as well as regarding monitoring tools and indicators by municipalities. In the case of a structured strategy developed around a vision of success and strategy, specific tools can be used, as they are more likely to be adapted to the specific situation. One concern is using a tool without specific strategy and goals, as the tool could lose its efficiency or help to optimize the unsustainable. An example is implementing actions within a powerful management tool such as ISO 14001 without defining its purpose within a strategy towards a vision of success. This lack of strategy could lead one down a blind alley.

4.2.4 Best practices for success

Best practices have highlighted key partnerships for success such as in Basel Switzerland, where the local university helped the territory in the development, implementation and monitoring of the initiative. This kind of partnership can leverage awareness of the future generations of decision-makers as well as apply the theoretical field of research to practical local cases.

Güssing Austria, an economically depressed city at the beginning of their project, mentioned that the local community gained economic growth and development by undertaking their energy initiative. This result identifies an important leverage point for engaging local economic development interests and stakeholders in communities wishing to institute sustainable energy plans. It also suggests that energy planning for sustainability may help develop the new Eastern European economies.
The successes mentioned by the cities vary regarding their respective vision of success. Some cities have reached their vision of success, which does not mean they have reached sustainability. Many of the achievements can be considered as early successes, which are highly important to celebrate and communicate in order to keep the excitement towards the ambitious vision of success towards sustainability.

4.3 A sustainable energy planning process for local decision makers

4.3.1 The municipality level

The territorial officials in Sweden are legally bound to create energy plans (Lilja 2007). The requirement of the funding program can shape the actions of energy plans. On a larger scale, providing economic incentives such as Klimp, the Swedish Climate Investment Program, and having legislation obligating energy planners to go towards sustainable energy systems could drive change towards sustainability.

A municipality intends to develop programs to benefit from the last grant from the national Klimp grant program. A Municipality may join Energie-Cités and benefit from the transparency and dialogue of like-minded territories that are dealing with energy planning. They also could profit from funding through IEE and EU projects, such as IMAGINE from Energie-Cités, to develop their energy future. For example, Woking Great Britain, a surveyed beacon city, has benefited from cross party political support and corporate support for its initiatives. Potential financial barriers have been overcome through innovative funding mechanisms particularly through the council's Energy Saving Trust.

There exists the need for awareness on the part of the politicians. Politicians are leverage points; they approve projects, and they make final, binding decisions. The Municipal Executive Board of Karlskrona Municipality is comprised of members from five different political parties. The Executive Board has several subcommittees. The addition of a subcommittee with diverse membership, to focus on sustainability, could assist the municipality with their planning process. Government involvement and shifts in government can have an effect on the planning process. As beacon city Samsø, Denmark reported, “We saw a change in
the government in 2002 and the feed-in tariff was changed and the energy legislation became not so favourable. This caused a break in a positive attitude. It took a long time to start up the development again”.

Engaging towards a local and sustainable system for a community can bring attractiveness to a community as well as to a region. The initiative can spread and collaboration can take place at the regional level such as sharing an energy grid fed by sustainable energy sources. Beacon city survey respondent Samso, Denmark noted that an initiative from Denmark’s National Energy Agency launched a competition to be the Danish Energy Island. As the winner of the competition, Samsø benefited with renewed local investments, creation of new jobs and civic pride. Güssing Austria also mentioned that the local community gained economic growth and development by undertaking their energy initiative.

Involving external, third parties for assessments or audits may help the planning process by carefully examining the planning process for accuracy with the intent of verification.

### 4.3.2 Specific comments regarding Karlskrona, Sweden

Convincing the politicians to follow through with Karlskrona’s original energy plan can be a challenge. The Affärsverken project manager who wrote Karlskrona’s current energy plan wants to assist politicians to make informed decisions. A series of awareness talks have been given to each of the political parties with the intent to inform the parties of the current situation. These awareness talks could be enhanced with the generated “Guidelines” on SSD concepts. It will allow getting buy-in from the politicians regarding the overall energy planning process as the survey expressed their high involvement.

The personal influence of the Affärsverken project manager with the implementation of the results of the research paper is another point of discussion. It seems likely that SSD concepts will be used in the Karlskrona Municipality energy plan. The project manager is a dedicated change agent who will benefit from “the Guidelines” and can instruct others in using the SSD framework. Though, having only one individual involved with the energy plan is a resilience issue. The Municipality would benefit by involving politicians, technical managers, planners and local stakeholders in the planning process.
The ‘Ladder’ document builds on previous work of Karlskrona Municipality. The ‘Ladder’ has been organised in a more structured way. It adds SSD concepts to their local energy plan and makes it a living document. The ‘Eko-Kommun’ concepts were not previously considered in Karlskrona and the ‘Ladder’ document brought them to the forefront by using the SSD framework.

Within Karlskrona, the Swedish military is a significant local stakeholder and has the potential to influence municipality decisions. This unique situation creates a challenge for the energy planning process. Inviting the military to participate in one of the subcommittees on the Municipality’s board would allow an exchange of ideas that may bring sustainability to the forefront of planning. On a broader scale, inviting all local stakeholders to participate in the planning process can overcome barriers and facilitate dialogue. Involving external, third parties for assessments or audits may help the planning process. Involving the stakeholders in the processes of the planning would be beneficial in order to gain efficiency. Campaigns can be conducted such as the one done for the waste management, which has been successful.

The researchers found some uncertainties surrounding satisfying the future wood chip demand and whether the wood chip supply will be sustainable. There are diverse points of view within the authorities on this topic. If the forests are managed under the Sustainable Forest Management regulations they should remain healthy and able to meet demand. But the region’s growth and increasing demands on the forest for biofuel may jeopardize the ability to continue to supply all of Blekinge.

The co-generation plant, burning waste and wood pellets, has not been approved by the Municipality Executive Board. It is a decision moving in the right direction, as waste will not become a resource for district heating, which is in accordance with the waste management plan of reducing waste. This decision brings up further questions surrounding the proposed co-generation biofuel plant. The Municipality must thoroughly investigate energy sources to be used at the plant and whether Blekinge has the ability to meet its own supply needs.

Karlskrona has not utilized its prolific wind resources as a power supply. An offshore wind farm plan in the 1970s was never realized, and there exists a lack of substantial information for the rationale of this decision.
The Municipal Executive Board of Karlskrona Municipality would like to see substantial development of wind power within the region, considering Blekinge has access to some of the best unexploited areas for wind power in Sweden (Bothorp 2007). They are also considering photovoltaic cells for sustainable energy. The proximity of the sea with regards to heating and cooling systems has not yet been considered by the executive council (Ibid).

An integrated transportation network is being planned for Blekinge region (Lilja 2007). It aims at converging the efforts and the funds of the Blekinge municipalities towards a more sustainable and integrated transportation network. The Municipality could learn from the best practices of the surveyed beacon cities to implement some of their actions. Basel Switzerland had two visions that Karlskrona could draw from: establish collaboration with the local university and take findings and results from recent research within the university’s domain and apply them to projects to promote sustainable development in the Municipality. A second vision from Basel is for a transportation plan to make passenger transport more sustainable, by four coordinated steps: reduction in transport demand; shift to environmentally sound public transport as far as possible; improvement of remaining passenger cars by means of low-pollution and energy-efficient technologies; and a changeover from fossil to renewable fuels.
5 Conclusions

What are some of the gaps, threats, opportunities, and leverage points for local authorities moving towards sustainable local energy systems?

Reviewing the research questions of this paper has uncovered areas for improvement and suggests ways to introduce strategic sustainable development in local planning. Two aspects were uncovered from our study. The first was that politicians typically wield influence in the local energy system planning, and pass the responsibility for developing and implementing the planning onto others in the community. The second aspect was that behavioural change is often cited as a significant obstacle in survey results, interviews and literature. Successful buy-in of all stakeholders is a key component for SSD to successfully be utilized in the planning process.

Gaps
We found that, across diverse platforms and processes, there are several recurring gaps in moving towards sustainable local energy systems. There is a lack of a full sustainability perspective (System level from the 5-level framework) in EU, national, and local legislation. Beacon cities also lack a full sustainability perspective, even while taking many actions that are incorporating sustainability principles. A gap exists between the overall objective of sustainability, and sectoral strategies and targets. Another gap is failure to take into consideration other sectors, such as the triad of land use planning, transportation and energy production, which would be a step towards a more integrated planning process, as advocated by Belaieff et al. in their master’s thesis (2007).

Threats
We also identified the following threats to success for decision makers: The increasing demands of renewable energy sources without taking into account the limits of the biosphere (i.e. SP3), the low prices for energy and the higher cost for renewables. Food production may be discontinued and substituted in order to grow biofuel plants if they are more profitable. Proposed solutions to the climate change issue, which are unsustainable, such as nuclear energy, are another identified threat. Lack of support for change agents is a concern. Once a territory has change agents that are working towards sustainable principles, it is important to ensure they are
given the support by the community and the politicians to continue their work, and that their message is in a consistent and clear platform.

**Opportunities**

We identified current opportunities, which can be taken by local decision makers. Existing momentum around sustainability should be utilized to help politicians make informed decisions. Funding from EU programs, such as IEE, is an opportunity for territories to secure funding for their programs. Växjö Sweden, a beacon city survey respondent, stated an opportunity with government and business, “The politicians saw that it was important that we at local level also dealt with global environmental problems. We cooperated with the biggest environmental NGO in Sweden, which of course was a great driving force for the decision as well.”

Energy conservation, diversification, and efficiency technologies, such as those implemented by Heidelberg Germany, are opportunities which utilized government subsidies. The funds provided local programs for renovation, offset construction of low energy houses and passive solar houses.

Joining groups of eco-communities and joining the European projects from Energie-Cités called IMAGINE are opportunities. Belonging to organizations that allow exchange of ideas and technologies, or provide funding options may allow for more possibilities for new programs. Opting for trans-sectoral collaboration and planning in order to improve efficiency may be another possibility for territories.

**Leverage points**

The research highlighted the following leverage points in local energy planning: Politicians, who act as key decision makers and community builders are imperative for a successful planning process. An example is the beacon city survey respondent town of Güssing Austria, which cited the “driving force behind all of these efforts was the town council which participated in the investment”. Enlisting population awareness and support to allow behavioural change has been effective for many of the beacon cities and for Karlskrona Municipality, and having an employee dedicated to the project to ensure it stays on schedule could also benefit territories. For example, Woking, Great Britain stated “awareness campaigns are important to raise awareness of the projects amongst officers, residents and businesses within the borough” and Karlskrona Municipality has stated,
“the most important thing so far is the awareness and the educational campaigns to the public”. Finally, commitment to the vision and the cause; without a meaningful purpose people do not engage (Carstedt 2006). This can be a leverage point to increase the participatory process in planning. Key partnerships such as with an NGO in Växjö or the university in Basel can also leverage the awareness of the community and educate future generations for more sustainable energy planning.

5.1 Opportunities for further research and transferability

Further research opportunities exist surrounding the process of planning for local energy systems with the strategic sustainable development framework. Collaboration with the Blekinge Institute of Technology may be considered. Basel Switzerland, a beacon city survey respondent, cited “leading research institutes work together in close collaboration with governmental authorities” as one of their successes.

One gap is that beacon city survey respondents were not further interviewed. Such personal contact may provide additional insight and afford researchers the opportunity to go into greater detail with them. Further research would benefit from learning more about the trials and errors of the beacon cities.

Ways of gaining local engagement of stakeholders in Karlskrona could be follow-up on the work presented in this paper. The local politicians, in particular the Karlskrona Green Party elected official, Sofia Bothorp, intend to work with students of the masters in Strategic Leadership Towards Sustainability program to address ways to further incorporate community involvement (Bothorp 2007).

One limitation was the language barrier that existed while working with Karlskrona Municipality. The Guidelines have been translated into Swedish to allow better utilization of the document. The researchers feel the Guidelines also possess transferability, and other European Union territories or European organizations working with local energy planning may benefit from using it because it discusses the process of planning and is generic.
References

Cited References


Intergovernmental Panel on Climate Change. 2007b. *Climate change 2007: the physical science basis—Summary for policymakers*. Geneva: Intergovernmental Panel on Climate Change Secretariat.


Additional References


Appendices

Appendix 1 - Survey of beacons regions, cities and neighbourhood

This survey is designed by three graduate students at Blekinge Tekniska Högskola (Karlskrona, Sweden) to learn from your leading practices in local energy planning.

The survey takes 15 minutes to complete. You may leave the survey and return to it later to finish it.

##You may reply in English##

##Vous pouvez répondre en Français##

The survey will close on the 23rd of March at 7:00pm.

The survey focuses on your desired success, your strategy, actions and also any barriers to your achievements.

We intend to share your experiences with new communities engaging towards sustainability within the Energie-Cités network.

We will provide the results of the survey to you in mid-April.

Thank you for your input!

Delphine Le Page - delphine.lepage@gmail.com
Ann Cassidy - ann.cassidy@lenlolabs.com
Sean Spender - seanspender@yahoo.ca
Energy Initiative

1. Where is your energy initiative as reported by Energie-Cités in the Imagine booklet "Beacon regions, cities, neighbourhood...." located?

   Güssing-Austria
   Litomeřice-Czech Republic
   Odense-Denmark
   Samsø-Denmark
   Franche-Comté-France
   Nantes-France
   Eco-Viikki-Finland
   Freiburg-Germany
   Heidelberg-Germany
   Kronsberg-Germany
   Nyíregyháza-Hungary
   Väjxö-Sweden
   Karlskrona-Sweden
   Bâle-Switzerland
   Lausanne-Switzerland
   London/Bedzed-Great Britain
   Woking-Great Britain
2. In which sector(s) is your energy initiative applicable? (Select all that apply)

- Transportation
- Land use planning
- Heating and cooling
- Electricity services
- Environmental protection
- Other (please specify)

**Energy Initiative Vision**

3. What is the vision of success for your energy initiative?

4. What were the driving factors in creating the vision?

5. Who created the vision? (Select all that apply)

- Regional authorities
- Local authorities
- Businesses
- Citizens
- Other (please specify)
6. How was the vision created? (Select all that apply)
   - By following legislation
   - Workshop with community
   - Workshop with business and/or government partners
   - External consultants
   - Other (please specify)

7. Have you defined goals regarding ENERGY EFFICIENCY?
   - NO
   - YES (please list goals)

8. Have you defined goals regarding RENEWABLE ENERGY?
   - NO
   - YES (please list goals)

**Energy Initiative Strategy**

9. How was the strategic plan for your energy initiative created? (Select all that apply)
   - By following legislation
   - Workshop with community
   - Workshop with business and/or government partners
   - External consultants
   - Other (please specify)
10. Who was involved in the creation of the strategic plan? (Select all that apply)
   Regional authorities
   Local authorities
   Businesses
   Citizens
   Other (please specify)

11. Who is involved in implementing the strategy? (Select all that apply)
   Local government
   Local/regional energy agency
   Local/regional transport agencies
   Utility companies
   Customers, citizens
   Other (please specify)

12. What is the time frame for your energy initiative?
   <5 years
   5-15 years
   15-25 years
   25-35 years
   >35 years
13. What criteria did you consider to align your everyday decision making and investments with your long-term targets?

14. How did you finance the steps taken? (Select all that apply)
   - Taxes
   - User-fees
   - Donations
   - European Union Grants
   - National Grants
   - Regional Grants
   - Local Grants
   - Other (please specify)

15. Has the strategic plan been revised since it was first adopted?
   - YES
   - NO

16. Is there a process in place for periodically revising the strategic plan?
   - YES
   - NO

17. If yes, who revises it and with what information?

**Energy Initiative Measures**
18. Please rank your top three measures undertaken within your energy initiative:

   - Policies/regulations
   - Direct investments
   - Penalties e.g. carbon taxes
   - Rewards/subsidies e.g. feed-in tariffs
   - Public/private partnerships
   - Awareness/education campaigns
   - Other(s)

19. What are the criteria for the prioritization of your measures?

20. Who is affected by those measures? (Select all that apply)

   - Local governments
   - Businesses
   - NGOs
   - Citizens
   - Other (please specify)

21. What are the main successes for your energy initiative?

   **Energy Initiative Monitoring**

22. How do you monitor progress?
23. Which indicators do you use to measure progress? (Select all that apply)
   - Total energy use
   - Energy use per capita
   - Percentage of energy reduction
   - Growth indicators
   - Emissions levels
   - Other (please specify)

24. What tools (e.g. ISO, Factor X, Ecological Footprint...) are utilized within your energy initiative?

25. What barriers were encountered while implementing your energy initiative?

26. What solutions/strategies have you used to overcome these barriers?

27. Was the national legislation/policy favourable for the implementation of the project?

28. Any comments?

Thanks for your collaboration!
Appendix 2 - Strategic planning guidelines towards sustainability

The following Guidelines have been established over the course of the 3-months collaboration with Karlskrona Municipality. The document has been translated into Swedish in order to be available to a large public.

Towards a Strategic Plan for a Sustainable Energy System

Integrating sustainability principles to enhance energy planning in Karlskrona and gain acceptance from the community including politicians, business and citizens.

Karlskrona Municipality has already shown a commitment to moving towards sustainable future in many ways:
- member of the Swedish Eco-municipality network since 2002
- 2006 Energy Plan vision "Ett hållbart samhälle till nästa generation" - "A sustainable society in the next generation"
- a specific target of 'Fossil Fuel Free by 2020'
- extensive progress in district heating

The intent of this document is to integrate principles of strategic sustainability into Karlskrona Municipality’s existing strategy, the ‘Ladder’, for a sustainable local energy system and offer further structure and guidance for strategic planning.

Two important overarching concepts to always keep in mind…

1) **A systems perspective**…this means seeing the big picture, without it we run the risk of creating new problems while trying to solve our current ones.

2) **Backcasting from sustainability principles**…a process of planning that opens up our creativity while working within solid scientific constraints

The original ‘Ladder’ is the representation of the process of planning and implementation consisting of four levels. Within these four levels we can integrate principles and methods for strategic sustainability planning.
1. ‘Förstå’ - Understanding

The basic principles for life on Earth (i.e. the laws of nature)

“Nothing is created, nothing disappears, it is only transformed, and tends to disperse in Nature.”

The funnel metaphor
Resources are declining and problems increasing. The space between the walls is narrowing, limiting our opportunity for action.
**Principles for sustainability**

In a sustainable society, Karlskrona Municipality does not systematically contribute to an increase in...

I...concentrations of substances extracted from the Earth’s crust

II...concentrations of substances produced by society

III...degradation by physical means

And in that society...

IV...people are not subject to conditions that systematically undermine their capacity to meet their needs.

**Emerging Opportunities**

Organizations that can avoid 'hitting the walls of the funnel' can realize a competitive advantage in many ways…

- anticipate legislation
- minimize health and legal risks
- reduce costs e.g. energy, disposal of waste
- increase employee productivity
- act as a community model
2. ‘Acceptera’ - Acceptance...a further understanding of today’s situation

What do we do today which contributes or does not contribute to violations of the sustainability principles?

Identify Flows and Practices
We can use tools such as:
- SWOT (Strengths, Weaknesses, Opportunities, Threats)
- The model for structuring an operational analysis represented in the figure below

![Diagram](image)

Classify Flows and Practices
The next step is to classify the flows and practices around the system’s conditions and identify the positive and negative aspects.

Quantify Flows and Practices
It is useful to quantify the flows and practices identified above. It will be helpful to identify the importance of the flows and practices and to prioritise solutions.
3. ‘Pröva i handling’ - Experimentation

...after this stage we will have created a plan that is a living document, one that people can take into their hearts.

Part One: Creating a Vision

We create a compelling vision of what we want to achieve:

“A sustainable society for the next generation”

Within the vision, we create more specific goals, such as:

- Invest in only renewal sources of energy and new technologies
- Efficient energy usage
- Development of the district heating system
- Physical planning for a more effective energy use
- More effective and environmentally friendly energy use within transport sector

It is also helpful to create core values within the vision such as transparency, honesty, and participation. These values state what we care about and how we want to work to achieve the vision.

The reason for of this part of the vision is to be able to build a long-term project where any member of the community feels involved.

The community is engaged in this initial stage, the more they will take ownership over the project and the greater the opportunities for success.
Part Two: Brainstorming solutions

We brainstorm many ideas and solutions to achieve the vision while resolving today’s issues and building today’s assets. This is the backcasting process.

This brainstorming session facilitates “out of the box” thinking.

Visioning creates a shared mental model that people can take to their heart regarding:
- Sustainability and what we want in our future
- The vision of Karlskrona Municipality

Stakeholders can make their own story of a sustainable society in the next generation...this leads to actions and projects they will be more likely to engage in.

Actions can further be checked against three interrelated questions:
1) Is the action or project headed in the right direction towards our vision and sustainability?
2) Is the idea a flexible stepping stone towards our vision?
3) Is there potential for this project to generate savings or income that can be invested in further projects?

And also against the SMART guidelines:
- Specific
- Measurable
- Attractive
- Realistic
- Time constraints

It is now possible to test the measure before integrating them in everyone’s daily work.
4. ’Integrera i det dagliga arbetet’ - Integrate into Daily Work

Now we have created a vision and a plan through a group process...

After having a set of prioritized and tested measures we create a strategic plan.

Within the plan, each measure responds to:
- Which overall goal does it belong to?
- Who is responsible for its implementation?
- What actions should be taken?
- What is the deadline, the timeline?
- What are the budgets and the resources needed?
- How will we measure progress? What are the indicators?

At this stage it is good to share a general view of the plan with the community to further engage them in the process.

Revision and Monitoring
It is good to set a monitoring process to follow our progress. Knowing our progress will enable us to scheduled revision period in order to adapt our plan to new findings and come back and go deeper and potentially discovering more opportunities, gaps and leverage points. Therefore, we are keeping in mind that moving towards sustainability is a long and ongoing process.

Plan, do, check, analyse.....this can be envisioned as a spiral that continues and evolves over time.
Appendix 3 - Table template for the survey analysis

The following table is a template for the analysis of the survey by the 5-level framework. It enabled the researchers to have a structured understanding of the responses. The researchers are providing the template to allow replicability of their research.

<table>
<thead>
<tr>
<th></th>
<th>Best Practices</th>
<th>Opportunities</th>
<th>Threats</th>
<th>Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUCCESS LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STRATEGY LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIONS LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOOLS LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>