Visions and Realities: Tensions in the field of urban sustainable development with Malmö and energy as a case study

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VISIONS AND REALITIES

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Preliminary version
of a licentiate thesis

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Abstract

This thesis is an exploration of the interdisciplinary field of urban sustainable development in the first stage of a PhD project in human ecology. The purpose of the PhD project is to study the premises for urban sustainable development in the context of (relatively) affluent economies in Europe or, more generally, in the North. My case study is Malmö placed in the Öresund region farthest south of Sweden with around 300 000 inhabitants. Malmö is interesting from the researcher's point of view since its sustainability ambitions are very high still the city is confronted to problems typical for many urban areas in Europe.

With its main focus on the ecological dimension of urban sustainable development, this thesis uses the tensions between *local-global* and *discourse-reality* as structuring concepts. As will be shown, sustainability assessments on Malmö will look very different depending on if one uses a local and territorially based or a global and consumption based approach. While improvements have been made when it comes to locally situated problems – although there are still important issues to solve – the big challenge lies in the fact that Malmö, as well as other modern urban regions, has a continuously large and globally dispersed socio-ecological impact. The effects of a continued high level of material and energy input have changed from a local and contemporaneous problem into a sustainability challenge with high spatial and temporal complexity. This tension is accentuated in light of the local discourse on urban sustainable development, which declares grand ambitions yet shows no persuasive signs of coming to grips with the basic trends of unsustainable material- and energy consumption. I explore this further using the concepts of *discourse* and *ecological modernization* in order to understand the context in which contemporary sustainability policies are situated.

In a deepened case study I elaborate on one big sustainability challenge: energy. In light of the global energy situation and with special attention to global warming, cities and regions are now making efforts to promote fossil-free, efficient and long term sustainable solutions. The City of Malmö has recently adopted an ambitious Energy strategy aiming at a system completely run on renewable energy by 2030. Given that the contemporary energy system is to at least 2/3 dependent on non-renewable sources, as will be shown, I point to some of the main challenges to realize this long term goal. The discussion is mirrored against the more general themes forwarded in the thesis. By keeping the tensions between a local and global sustainability approach, as well as a critical awareness of the discursive level in mind, I highlight the complex reality in which the visions of a fossil-free city now is to be realized.

Key words

Malmö, urban, sustainable development, human ecology, interdisciplinary, discourse, ecological modernization, Ecological footprints, and energy.

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Sabina Andrén
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Part I.
CONTEXT

1. Introduction

Getting started

The world has problems, but
universities have departments.
G.D. Brewer[1]

This thesis is an explorative effort. It is the result of two years of studies trying to grasp modern urban sustainability issues. It is the fruit of having indulged in the field of Malmö, a middle sized city in southern Sweden, that has made itself known for its urban sustainability efforts yet at the same time is confronted with problems typical of many West European cities. It is inspired by contacts with a broad range of local actors – people who are often deeply concerned with the development of their own city. It is supported by literature studies of academic and other sources. And yet, all this is of course not enough. Much more time would be needed to really grasp the issues that will here be discussed. Why then this intermediate station of a PhD project?

Getting into the research field of urban sustainable development I soon realized its large proportions. It certainly covers a wide range of issues: ecological, economic, social, cultural and, above all, the mixture of them all. Urban sustainability is obviously not only about environment. Social and cultural issues are indeed important. And yet, the ecological (un)sustainability of modern cities remains a crucial question, at least in the eyes of a human ecologist. So I dived into my case, Malmö, a city which had caught my eye as an ambitious player in the field of urban sustainable development, at least on the level of discourse. Malmö has succeeded in establishing itself as an internationally known example of urban sustainability projects. In the plans and strategies from the City I could read that Malmö has placed urban sustainable development among its overarching goals and that progress has been made in many areas.

In my case, and as a newcomer moving in from outside, I was impressed by all these ambitions. At the same time, and in light of my education in human ecology, I was somewhat suspicious as well. It was not clear to me *what* really had gone through that huge transformation that seemed necessary in order to talk about a 'sustainable city'. Energy, trade and consumption, land use, physical planning? What about the realities? How sustainable was actually Malmö, one quite typical and 'ordinary' city in a West European context? For example, how was a city like Malmö supplied with energy? I was committed to get to know the field, deeply and thoroughly, to really grasp the context in which the policies of urban sustainable development were proclaimed.

[1] Quoted in Hirsch Hadorn et al. 2008: 4.

Tensions as structuring concepts

Soon my attention was directed to what I felt were some important tensions, or paradoxes one could say, within this research field. First, in getting more acquainted with the discourse on sustainable development in Malmö, and in other cities, I was struck by its brave or, one could even say, bold ambitions. In the language of these sustainability agendas, these cities seemed to be in fast progress towards becoming 'green', 'clean' and 'sustainable'. Malmö was surely one excellent example of managing to acquire international acclaim, receiving several awards and high rankings connected to urban sustainable development.

However, to me reality revealed itself as something quite different. In my eyes Malmö and other cities were still confronted with serious sustainability challenges. Talking only about the environmental side of it, even though improvements had taken place since the industrial era, with heavily polluted local environments, many problems persisted. Moreover, what was considered improvements at the local scale, were for me intimately connected to the exploitation of other socio-ecological systems on the planet, not least in the industrializing South. Thus, as the West European cities had become increasingly 'cleaner' and 'greener', at least in some aspects, the environmental impacts could be assumed only to have moved to other places in a global system of production, trade and consumption. For me, the industrial smog of China was the other side of the coin of the 'deindustrialised' environments of for example a city like Malmö.

The tensions between the visions and what I perceived as 'realities' – and between the local and the global outlook – opened up a whole spectra of questions to me: Which perspectives could lead different actors to arrive at so disparate answers in assessing urban sustainable development? What were the main features of the local discourse, features that one could expect to shape the City's policy making? And, taking a step back: How close, or far from, sustainable development was actually a city like Malmö if one went into the field and into one concrete topic, such as energy? These are some of the questions which have led me into this research. Below, I will now expand this introduction by presenting some more details about the research project. Further elaborations on the general research theme, and the specific research questions, will be made, followed by a section on methodological considerations. Finally, I will give some instructions to the reader to help to navigate through this thesis.

Research theme

More than half of humanity is urban today, and around 5 billion people are expected to live in cities in 2030 (unfpa.org 03/05/09). The challenge of an urban sustainable development in the South, but also in the North, is hereby huge and I see it as a crucial task for interdisciplinary researchers to engage in the field. This thesis is the first report of a PhD project with the working title 'Urban sustainable development – Case study Malmö'. The general purpose of the PhD project is to study the premises for urban sustainable development in the context of (relatively) affluent economies in Europe or, more generally, in the North. In my research I am interested in exploring questions like:

- Considering an urban region as a socio-ecological system dependent on other areas as sources of import of resources and as a sink for export of waste of different qualities, what is (can be) meant by the concept of urban sustainable development?

- A sustainability assessment of an urban region will heavily depend on the approach taken and on the assumptions made. What are the merits and shortcomings of different approaches considering the relevance for local and regional sustainability policies? How can cities develop urban sustainability policies in new and progressive ways based on such assessments?

- What is policy making in the field of urban sustainable development looking like in contemporary cities in Europe, or more generally, in the North? [2] What are the main problems and priorities, what are the visions and the chosen policies? Based on my research, I would like to contribute to the evaluation of the ongoing process and to the development of forward looking sustainability policies in an urban context.

Case study and research questions

As a case study I will use Malmö, Sweden's third biggest city with around 300 000 inhabitants situated in the Öresund region of southern Sweden. I have chosen this city, since I have found it especially interesting in highlighting some key perspectives of urban sustainable development that I will elaborate on in this thesis. The development of Malmö is in many ways a typical example of a modern West European urban history. After an industrial decline and economic crisis in the 1970's and 1980's the city is restructuring towards, what many hopes for, a 'post-industrial', service- and knowledge-based economy with ambitious sustainable development policies. As Malmö has managed to become internationally known for its urban sustainability projects, this is another motivation for the choice of this case study. Above all, however, I have chosen Malmö due to personal engagement and a commitment to contribute to the discussion of a sustainable development of this city.

As stated above, this thesis is the product of a choice to gather the information from an initial phase of studies into a first report. Having engaged in the field for a while, I feel that my material is already so large that I hesitate to let another two years go by before trying to bring it all together. Besides fearing that it would turn out overwhelming, I see many advantages in letting my project be presented by an intermediate report. Firstly, following my ambition of working participatory, action-oriented and close to the field, I think that these issues are of current interest and in only some years much of the data will need to be revised. Secondly, this gives me some flexibility to moderate the research theme. I am sure I am not the only one who, getting deeper into the field, sees new issues which were not first thought of but which later turn into focus. This first report thus gives me the opportunity to elaborate on the direction of the study and to ponder what will be the next step of the research project.

[2] Of course there is not *one* type of city, or an 'average' city, as the cities in the North are *very* different in size and in characteristics. Rather, one could safely argue that *all* cities are situated in a unique context of one kind or another. Following from this, I do not claim that Malmö is any 'typical' city only that I have found it suitable for my case study.

Most important, however, is that when engaging myself as an interdisciplinary researcher I felt the need to start with answering some basic questions. Thus, the specific goals of this thesis are:

1. To understand what kind of city Malmö is in the context of urban sustainable development. The purpose of this theme, which is elaborated in chapter 2, is to get acquainted with Malmö in a general and historical perspective in a way that enhances the understanding of urban sustainability issues now high at the City's agenda.

- What characterizes today's Malmö?
- How may a historical background of Malmö help to understand contemporary sustainability issues?

2. To discuss some key perspectives on urban sustainable development inspired by my background as an interdisciplinary researcher in human ecology. These key perspectives will revolve around what I call the tensions between 'local - global' and 'discourse - reality' and are developed in part II of the thesis with examples from Malmö.

- Which perspectives of urban sustainability are relevant for a human ecological research project?
- How can a city like Malmö be described using these perspectives?

3. To elaborate on one concrete topic connected to urban sustainable development and mirror this to the general findings and perspectives in 1-2. I have chosen energy issues as this deepened case study, as they fit well with the ambition to contrast the local and the global sustainability challenges as well as to highlight the tensions between discourse and reality.

- What are the main challenges to realize a sustainable and renewable based energy system in Malmö?
- How can the key perspective in this thesis help to discuss these challenges?

Research method

Urban sustainable development is a complex socio-ecological research field. It demands not only fundamental knowledge of ecology and environmental sciences, but insights in the social sciences and humanities as well. Further, it is a research field that we are confronted with here and now: at the core of the modern society. It is a high-stake social process where people, including myself, are engaged not only as professionals but also as citizens and human beings. The unsustainable development concerns our own lives and it is happening right now. It is a research topic that inevitably challenges you as a researcher: what is my task in the context of urgent problems and demands for change?

To reflect on your research approach is thus not only a privilege – it is absolutely crucial. As this thesis is written in an interdisciplinary field, I will combine some methods and perspectives from different disciplines, in my case from the natural sciences (e.g. ecology, energy studies) and the social sciences (human ecology). The thesis will include research based on both quantitative and qualitative[3] methods, visible in for example the field study on energy.

An approach in progress

Getting indulged in the field of urban sustainable development, I became inspired by the literature on transdisciplinary, participatory and action-oriented research.[4] These approaches often challenge traditional and disciplinary sciences and nourish a wish to develop the way research goes about. Hirsh Hadorn et al. (2008: 20) mean that the transdisciplinary orientations in contemporary science is a reaction against the dissociation of scientific knowledge and 'the most recent step in reshaping the conception of science and the distinctions between science and the life-world'. Baumgärtner et al. argue that what distinguish this kind of research is that it is not only driven by a *cognitive* interest, but also by an *action* interest (2008: 385).

According to Hirsch Hadorn et al. (2008: 30) the basic motivation behind applying a transdisciplinary approach lies in the art of the research problem:

> There is a need for TR [transdisciplinary research] when knowledge about a societally relevant problem field is uncertain, when the concrete nature of problems is disputed, and when there is a great deal at stake for those concerned by problems and involved in dealing with them. TR deals with problem fields in such a way that it can: a) grasp the complexity of problems, b) take into account the diversity of life-world and scientific perceptions of problems, c) link abstract and case specific knowledge, and d) constitute knowledge and practices that promote what is perceived to be the common good.

Often, transdisciplinary research is problem and solution oriented and concerned with real world and real peoples' situations. Instead of defining research problems 'internal' to a scientific community, the transdisciplinary researcher goes 'out' to listen to the issues at stake among actors in a given context. This ambition raises many questions on the research agenda including what can be called the 'ownership' of the research process. Who defines the research problem and who controls the research process and the use of the results? Whose agenda does the researcher fulfil? In the most radical variant the problem definition as well as the research process takes the feature of a transdisciplinary collaboration where a broad range of stakeholders are involved. It is obvious that such an ambition deserves a great deal of caution from the point of view of staying an 'independent' researcher.

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[3] What is meant by 'quantitative' vs. 'qualitative' may of course get questioned (cf. Andrén 2008a). Here I refer to them only as general models, wherein a quantitative approach aims at measuring something or at conducting an analysis answering questions such as that of *what*, *where*, and *how much*. By qualitative methods I mean research focused (mostly) on the human and social domain, often aiming at answering questions of *how* and *why*. The methods used are not those of measurement and quantification but rather builds on interpretation and in-depth understanding. In my view, both types are needed to grasp an interdisciplinary research field like urban sustainable development.

[4] This section is based on a working paper preparing the interview study on energy (Andrén 2010).

Integration and pluralism

Transdisciplinary research aims at wide integration and acknowledges a pluralistic knowledge generation. According to Hirsch Hadorn et al. (2006: 125) it encompasses empirical, evaluative as well as instrumental aspects which is connected to different kinds of knowledge, namely to *systems knowledge, target knowledge* and *transformation knowledge*. Even though I am sure they do not mean that these three are perfectly separable in the actual, concrete research process, the authors point to their different character. The first one, systems knowledge, is knowledge about the origins and development of the research problem, including its 'interpretation in the 'life-world''. The second is knowledge about the needs for change, desired goals and possible pathways of acting. The third, transformation knowledge, is 'knowledge about technical, social, legal, cultural and other means of transforming existing ways of action in desired directions' (Pohl et al. 2008: 414).

Transdisciplinary approaches are thus *inter*-disciplinary in the sense of drawing upon bodies of knowledge from a variety of academic disciplines, but also *trans*-disciplinary in its ambition of openness to, and integration with, knowledge domains from sectors and actors outside of academia (ibid.). Further, according to the quote above, it is proposed that the goal of the transdisciplinary approach is to 'constitute knowledge and practices that promote what is perceived as the common good'. A radical position and, as anyone can see, a difficult one, as this immediately imply normative, ethical and political judgements. Is the researcher to make these judgements, and if so, on what grounds? Is he or she then doing *research*? To some this perhaps makes the transdisciplinary approach look fuzzy and dubious. I would on the contrary say that this is precisely what makes it seem so relevant for sustainable development research. Considering a research field that is far off from being neutral, objective or non-political. How do we go about doing good research – research that will matter?

Participatory and action-oriented

Close to the idea of transdisciplinarity we find the participatory and action-oriented research approaches. There is a vast literature on participation. According to Elzinga (2008: 349) one may detect two main approaches: the liberal functionalist or pluralist one which emphasises group representation, and a theory of direct participation, which gives priority to the involvement of the individual citizen as an 'amateur' in the process. Both perspectives, to follow Elzinga, converge on some common criteria which are that 'the participant should be independent, involved in the research process as early as possible, and be given resources to effectively influence decision making'. A basic condition for participatory research to work, based on the experiences presented by Hirsh Hadorn et al., is that some degree of *trust* has to exist, or be built, between the participants involved (ibid.: 352).

Participatory research may take place in the whole research process or only in some parts of it. It may be used in the problem framing, when the researcher wants to understand a field and grasp a problem (ibid.: 350 ff). It may be used in the studying phase, that is, during the part of the research process where the

problem is examined and the results are searched for. And finally, participatory methods may be chosen as a way to implement and/or deliberate research results. For example, researchers may organize public workshops or write popular handbooks to engage stakeholders with the results. Not seldom participation is involved in all of these stages, and this is also the ambition that I would like to follow.

What distinguishes action research is that the goal of the research is to benefit not only science and knowledge building but also practice and social change. Action research was introduced as a concept in the 1940's by Kurt Lewin at the Center for Group Dynamics at MIT (Stokols 2006: 63f). The aim of Lewin was to establish a new kind of psychological research where scientists and practitioners worked collaboratively to analyze and ameliorate social problems. Interracial conflict, for example, was investigated jointly with civil servants resulting not only in scientific publications but also in practical recommendations, etc. According to Lewin, the basic feature of the action research process is that *action*, *research* and *education* form an interlinked triangle (Hirsch Hadorn et al. 2008: 26). This is to be seen in contrast to other types of social research that was criticised as a kind of 'hit and run' model, as described by R. Sommer (Stokols 2006: 64):

> A psychologist cannot simply walk in off the street, tell other people what they are doing wrong, walk away, and expect them to change their behaviour. Rather, one must work with people … to facilitate the change process.

There are three basic principles in action research commonly referred to (Hirsch Hadorn et al. 2008: 26). First, the starting point of the research is social reality, that is, in people's interpretation of reality. Second, action is part of the field research, so that the researcher is both acting *and* researching, thereby integrating the research with the promotion of, and the comparison of different forms of social action. Third, there is the principle of the subject status of the research object or participation: the researcher as well as the people researched is doing research and being researched. There is no research object but only research subjects. Everyone concerned should be able to participate and intervene in the process to create social change.

The actual method

I was thus convinced that I would aim at some kind of participatory and action-oriented approach. I further argued that as I intended to work in close contact with actors outside of academia, and to situate myself in the local sustainability debate, my project would get a *transdisciplinary* quality. Based on this inspiration, and with help of PhD courses in e.g. philosophy of science, I discussed such a potential approach in some working papers (Andrén 2008a, 2008b, 2010). Still, this thesis is not in its essence a product of such an approach. Rather this is a report that precedes such possible research of mine. Why?

While engaging in the field of Malmö and with different actors connected to urban sustainable development, I felt a need to first be able to stand back and to view the whole issue from 'outside'. That perspective of the 'outsider' seemed necessary to get a clearer picture of what was really going on. Thus, while I

certainly wish to be able to develop myself in the sphere of these alternative approaches, this report is made with a fairly traditional research method. I have combined the study of written sources with a field study including two concentrated periods of interviews (in total some 30 interviews). The exact conduct of these interviews is elaborated in the chapters concerned. Further, as I live and work in Malmö on a daily basis, I have been situated in my own research field in contact with actors inside as well as outside of academia and from diverse angles and perspectives. I am grateful for all these people's input without which this thesis would not have been easy to accomplish.

What has been central to me methodologically is to reflect on my work in its many dimensions: the problem-framing, the interaction with stakeholders, ontological, epistemological and ethical positions, how perspectives and theories are handled, and so on. At the same time, I have made an effort to describe as systematically as possible the field and to analyse and synthesise in a clear and accurate manner; to be consistent, honest and transparent with what I am doing, how I am reasoning, and why. This lies close to what Alvesson and Sköldberg (2009: 317) call 'reflexive interpretation' in the context of qualitative research methodology. 'Good qualitative research is not a technical project; it is an intellectual one', these authors argue. What primarily determines the value of this research is not the way its different components are managed but an 'awareness of the various interpretive dimensions at several different levels, and the ability to handle these reflexively'. The reflexive methodology is neither a postmodern project aimed at disarming all kinds of rationality nor is it to claim the supremacy of anyone, Alvesson and Sköldberg argue. Rather, this research can be seen as a 'provisionally rational project, in which the kernel of rationality is a question of reflection rather than procedure' (ibid).

Important to note, while thus working mainly as a 'traditional' researcher in this first phase, the transdisciplinary, participatory and action-oriented approaches have constituted a valuable framework for reflection. I have found the action-oriented approach very relevant and I have been inspired by participatory methods in the way I conducted my field study. As stated already, I am working with a local community in where I also live and have my family. I am engaged in the process of promoting a change on many levels: as a researcher, but also as a resident, parent, and citizen. As a researcher I work in contact with local practitioners and participate in diverse events and processes on urban sustainable development.[5] Further, the working papers behind my thesis have continuously been distributed to a local network, thus constituting a sort of 'extended peer community' (Funtowicz and Ravetz 2008: 363 f). Even though I do not consider myself a trained action researcher, I have the intention not 'only' to build knowledge but also to facilitate change.

[5] For example, I have followed the collaboration of WWF and the City of Malmö on the *One Planet Mobility* project (search via http://www.wwf.org.uk) and the development of the software tool REAP (see p. 61). I have also written columns and articles in local newspapers and during 2009 I have been engaged in writing a popular science book on Malmö and urban sustainable development on behalf of the Environment department and the City Planning office (Andrén 2009).

Position of the researcher

Sustainable development is not only a complex research field, but one with high stakes and no easy truths. It is a research field where one can not avoid normative positions and value judgements. The questions posed, the process of researching them, and the answers arrived at will inevitably relate to the sphere of *politics.* It is thus crucial that the researcher states his or her position in some important aspects, so that the reader can understand some of the underlying premises. As Costanza argues (2009: 360), there is always a 'pre-analytic vision' in every researchers work, an underlying framework consistent with that person's knowledge, history and experiences. This inescapable component of subjectivity does however not rule out the possibility for doing good research. The best way to go about, and which in turn will enhance honesty and thereby the credibility of science, is according to Costanza to be explicit and clear with your pre-analytic vision. In other words: as a researcher I should not be afraid, on the contrary I should be eager to make explicit my normative position and the personal framework that inevitably will colour the context of my research.

So, this is the context where my contribution is to be understood. I am a woman who since my earliest youth has been engaged in environmental and, later, in broader sustainability issues. I have an interdisciplinary background with a basis in the natural sciences complemented with studies in the social sciences and in the humanities. Besides master level studies in human ecology, I have worked in the field of sustainability issues for quite many years. Concerning pre-analytic visions, I think it is fair to say that I am much into the ecological economics' realms of thinking (cf. Costanza 1997; Daly 1996; Daly and Farley 2004; Söderbaum 2008). This is supported by studies in e.g. ecology and ecological economics and by my writings on sustainable production, consumption, and 'sustainable growth' (Andrén 2005; ibid. in Hornborg 2004). I have through human ecology and human geography also been influenced by more critical strands of thinking (e.g. Hornborg 2001; 2010; Harvey 1996; 2005; Wallerstein 2005). Turning to the private, I live in Malmö with my little son and thus have a strong bias in the sense that I am of course engaged in the way the city develops. It should be no secret to anyone that I *want* the city to pursue ambitious policies and that I *want* to contribute to an honest debate about urban sustainable development. If one should judge me in political terms, I am a believer neither in the very left nor the very right, but instead one should probably place me in some middle position. Add to that some green colour in the sense that I judge the contemporary socio-ecological issues as absolutely crucial for a sustainable – and enjoyable – human future on this planet.

Knowledge-power awareness

In the same way as there is no science free from values, there is no science free from power or politics either. If there has ever been science that is non-political – it should be doubted – today it seems increasingly clear that these spheres are intermingled (cf. Luks and Siebenhüner 2007: 419). For example, one may expect power structures to heavily influence research on sustainable development. How

is the 'problem' perceived, how do we go about to research it, and how are the results used? And more: what if power structures constitute the very fundaments of the research problem? Must we then not find ourselves, as representatives of science, deeply involved in this same problem? In any case, to say that knowledge, science and power are interconnected should not be very controversial. As was the message from Foucault: 'the rhetoric of a dominating narrative will reflect the rhetoric of the dominating power structure' (Meppem and Bourke 1999: 391). The 'truth' is always dependent on power relations, on what can be said – and thought – and not. Science is definitely no neutral player, but on the contrary one of the institutions we should expect to gravitate close to existing power structures. The making of knowledge and the exercise of power should rather be seen as intimately dependent, as co-existing, and as mutually supporting.

The researcher in the field of sustainable development will thus inevitably get connected to spheres of power and politics; there is no 'outside'. Scientists *are* a critical stakeholder group, as Costanza puts it (2009: 369). The challenge is then to be willing, and make yourself able, to see through the power-containing narratives, or at least, to be able to grasp more than the dominating one(s). As we know, if we look beyond the official version of 'sustainable development', we find highly divergent and conflicting views. While it is of course important to stay critical to each one of them, the researcher must struggle not to just become part of the prevailing dominant narrative. As each of us understands, this is no easy task. But, to follow the arguments of Luks and Siebenhüner, the imperative of involvement is something we must embrace, rather than try to escape (2007: 421, my italics):

> Given the inevitably connected and embedded nature of scientific research in particular in the field of sustainability studies, we argue that science as one actor group in the social learning process has a distinct *responsibility* to become involved in political decision making processes.

This however creates an extra demand on the researcher to be aware of what quality criteria good research must fulfil. The knowledge generation must be '*salient* to potential users', but it must also be *credible* and *legitimate* with regard to scientific methods and performance (ibid.: 422). The researcher must actively balance between a distancing and critical position, on the one hand, and an open and constructive-minded on the other. One has to be able to scrutinize the state of the art and to reveal uncomfortable facts, but also to be able to give credit and point to ways forward. Flyvberg, whose *phronetic planning research* I find interesting, argues that 'at the same time as continuing the critique /… / alternatives must also be developed'; we have to 'operate on both fronts, critique and reconstruction' (2004: 286 referring to Fisher).[6] This critical but communicative mind is something that Meppen outlines as (2000: 48): 'A transdisciplinary orientation [that] aims to problematise 'conventional wisdoms' or disciplinary boundaries by promoting communicative strategies that recognize 'different ways of knowing' in sustainable policy development processes'. To me,

[6] Phronetic planning research emphasizes practice and involvement in real-world processes, careful case studies and includes a methodological set of critical questions and guidelines (see Flyvberg 2004).

this seems to be much about being able to oscillate between presence and absence, closeness and distance; between being fully present and warm-heartedly engaged and to pull back and have a detached and 'cool' look at the whole process including yourself.

The importance of a critical stance must however be underlined, as will be further discussed, since the dominant discourse and the 'normal' practices tend to conceal alternative ways of perceiving, explaining and acting. The researcher must therefore make an effort not simply to reflect and reproduce the mind and the practices of the 'normal'. This will take not only radical thinking, but courage. The 'normal' as well as the 'alternative' should be subject to critical scrutiny and one should avoid judging any of them too hastily. The temptation to just fight the dominant discourse should be resisted as well as the uncritical acceptance of it. This reminds me of the always present research subject – the researcher him/herself – who will deserve ongoing reflection. Viewing the unsustainability of the present as something connected to deep structures of the society, and thus as embedded in the mentality of every individual, self-reflection must indeed be key to progressive research in this field.

Limitations

Before proceeding, some notes on the limitations of this thesis. Even though I will discuss urban sustainability from a broad perspective, I will not go into the specific details of the social dimension of a sustainable development.[7] Surely, poverty, health, employment, education, gender, and so on are all very relevant in the context of urban sustainable development. Even for Malmö, a city safely placed in the affluent cores of the world, many problems in this area are not satisfyingly solved. However, I will mainly concentrate on the interactions connected to *ecologically* sustainable development even though, as we will see, this inevitably brings us to some critical socio-economic issues. Further, I will mainly concentrate on the present, the agenda of Malmö today, even though the thesis includes a historical overview as well. The main limitation of this first report though, is that it is the outcome of an *initial* phase of studying and thus will naturally leave many questions unanswered, albeit open for future efforts.

[7] The concept of sustainable development is used in this thesis even though I am aware that it is a criticised one (cf. Krueger and Gibbs 2007). Especially problematic from the viewpoint of human ecology is the division of reality into three 'dimensions' (environmental, economic, social), which despite good intentions often results in a tendency to separate rather than to integrate. From a human ecological perspective, this categorising of reality can rather be seen as an example of the limits of the contemporary discourse to really grasp the fundamental *interdependence* of the socio-ecological systems on our planet. Another critique concerns the lack of awareness of power dimensions, conflicting interests and inequality in the discourse. Rather than a neutral and consensus-driven process involving all stakeholders, we should expect that the quest for sustainability is highly embedded in existing power relations (cf. Hornborg 2009). I however still choose to use the concept in my writings as I want to engage in the contemporary debate and in a critical discussion of modern society, including the elaboration of *what* a sustainable development actually might be.

To the reader

Even though the demands of academic writing have shaped the text, my personal aim has been to write a book interesting for more than an academic audience. I hope that many kinds of actors connected to the field of urban sustainable development will find it useful, at least in opening up some questions for reflection. This has inspired me to write in not too heavy a style and I have tried to give the thesis a structure easy to overview and find your way through. It is very possible to read just some parts of the book and jump others.

The thesis is divided into four parts (I-IV) of which the titles bear a meaning in relation to the main picture. Thus, part I (Context) gives an introduction to the whole study, mainly by introducing the research project and by giving a general presentation of Malmö in light of the research theme here pursued. Then, in part II (Tensions), I proceed by selecting some key perspectives that I have found relevant to understand the field of urban sustainable development, in Malmö and in other urban contexts. In two chapters I elaborate on these, what I call tensions between local-global and discourse-reality with examples from my studies on Malmö. Part III (Case) then turns to one concrete topic namely energy. After presenting some general perspectives on energy, I turn to the energy system of Malmö which is discussed in relation to some of the key perspectives of this thesis. As an empirical point of departure, I use the new municipal Energy strategy of Malmö which states the vision of a fossil energy free city by 2030. To be able to assess the premises for realizing such a vision, in chapter 6 I investigate the share of renewable and non-renewable energy in the contemporary system. In the end of part II and III, a general discussion is held that tries to connect to the general themes of this thesis. The final part IV is a sort of checkpoint that shortly summarizes this research project by looking ahead to possible future research questions.

Finally, one small note on the use of concepts. In Sweden some of the larger municipalities are now naming themselves as ‘Cities’. That is, while the former name of Malmö was ‘Malmö municipality’ it is now the ‘City of Malmö’. This may cause some confusion in English, as when using the word ‘city’ it is not always clear if one means the city in general or the municipality in particular. I will here use City with a capital C when referring to the municipality of Malmö (that is, political institutions, departments, municipal companies, etc.) while I will spell city with lower case letters when referring to the city in general (e.g. the geographical area, the public, Malmö in general).

2. Malmö: Setting the scene

Built on sand and herring… [8]

Getting acquainted

My first personal acquaintance with Malmö was when moving to Scania to study at Lund University some 20 years ago. I remember my initial impression of the landscape as one of crowdedness. With a background in a more rural part of Sweden, I found the landscape of southern Scania exploited. My perspective was probably quite the contrary to what people from many other parts of the world would have. To me, the landscape was crowded with settlements, roads, power lines, industries, railway tracks, agricultural land – and people. More than the rest of Sweden it resembled northern continental Europe with vast open plains used for industrial agriculture, sparsely forested, densely populated, and enmeshed with human infrastructure of all kinds. But this concentrated area, moulded through thousands of years of human settlements, was also a very rich landscape. Its closely situated urban centres, its dense network of transport systems and its intensively used agricultural fields indicated a long history of human-nature interaction. Despite the reluctant, rural mind of mine, I slowly began to like it.

What kind of city is Malmö – today and in a historical perspective? This introductory chapter gives an overview of the context in which the policies for urban sustainable development are now launched. Trying to understand this context – and hence perhaps also something about the realities behind the visions of a 'sustainable city', is part of the scope for this thesis. The chapter is based on a literature survey. As the purpose is to give an overview – to make the reader acquainted and to set the scene – rather than to contribute to new scientific knowledge, the sources are to a relatively large extent secondary sources, public reports, popular books and internet information. I have chosen to insert some pictures on today's and yesterday's Malmö as I think these give a valuable contribution to the verbal presentation.

Location and landscape

Malmö is the third biggest city in Sweden and is located in the region of Scania farthest south of the country (figure 1-2). The flat landscape is shaped by its close contact with the sea and the geological processes of the glacial period. On top of the ancient rock seam of chalk, the upper soil layer consists of moraine mixed with clay (IK Foundation & Co 2000: 18). Sand and gravel form part of the visible landscape. The climate is mild and maritime with humid winters and, in a Scandinavian context, a quite long summer period. The flat coastline with sandy beaches and vast meadows (*strandängar*) has historically been an important source of food gathering, fishing, and grazing. These extensive meadows, which for centuries served as an important basis for local livelihood, are today almost gone. Instead the coast of Malmö is intensively used for industrial activities,

[8] In Swedish: 'Uppå sill och lösan sand'. From Lindström (ed.) et al. 1989: 4 on the origin of Malmö. My translation.

The Oresund area
Denmark (left) with Zealand and Copenhagen
Sweden (right) with Scania and Malmö

Figure 1. Malmö situated in the Öresund region and in the European Union
(Map above: City of Malmö. Map below: The European Commission, Directorate General for Press and Communication. © European Communities, 2004)

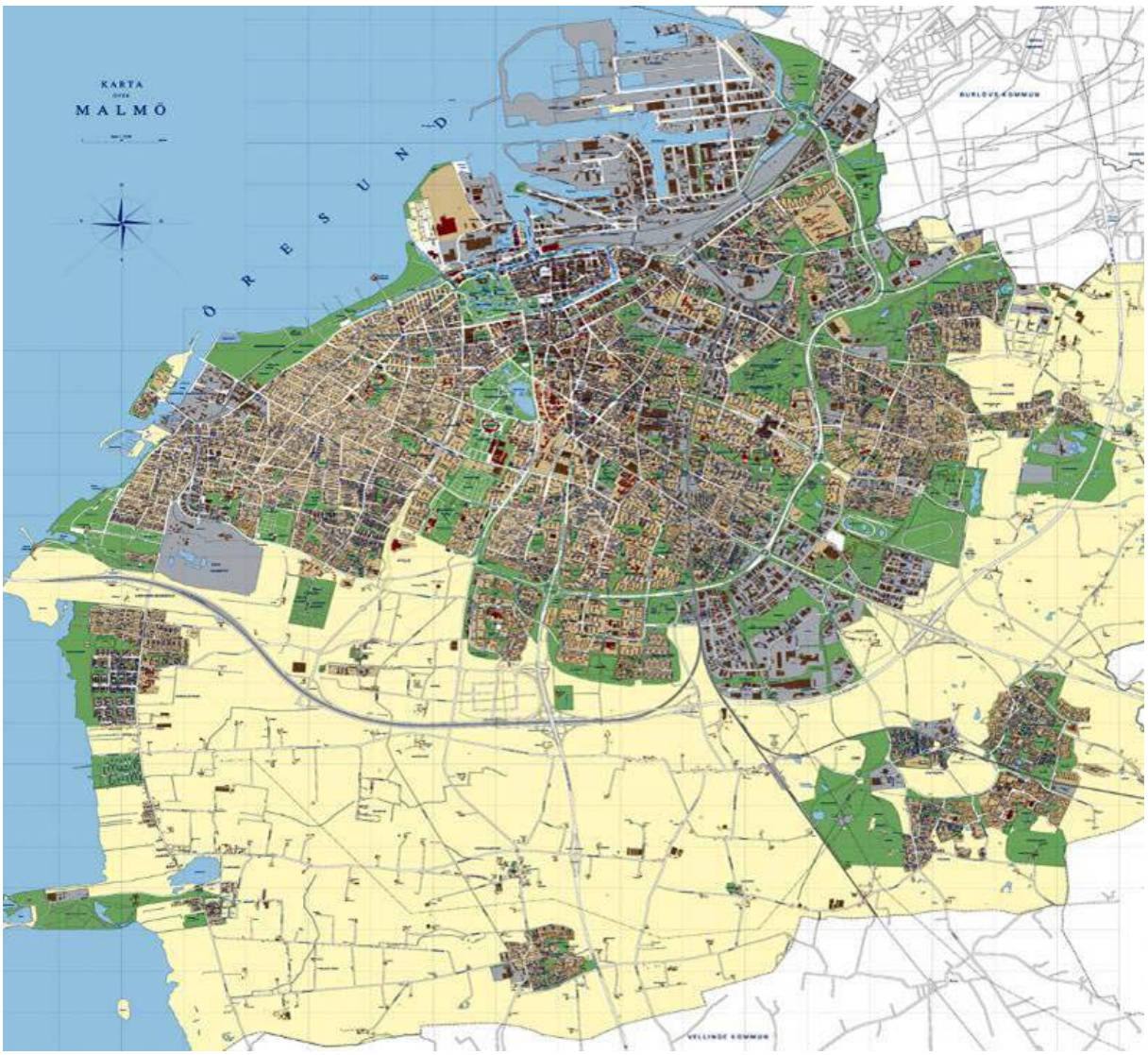


Figure 2. City map of Malmö
(City of Malmö. © City Planning Office)

settlements and recreational purposes. In addition, vast areas of formerly open water along the city's coast line have been subject to substantial land fillings.[9] The south west part of Scania (*Söderslätt)* is known for its fertile arable land and the plains dominating the Malmö region are intensively farmed. Flora and fauna are relatively rich due to climate and geology, but the impact of industrial agriculture and urban settlement has put a hard pressure on biodiversity. Many species that once thrived in the landscape are now either gone or threatened. The City's Environmental accounting points to fundamental difficulties in halting biodiversity loss and restoring ecological habitats (e.g. City of Malmö 2008a: 36).

[9] For example the northern port area of Malmö is land filled. A small rest of the old coast meadows one can find in southern Malmö, at *Bunkeflo strandängar*, near to the Öresund bridge.

Malmö in some figures

Malmö is a growing city with a relatively young population. As will be shown in the section on history below, the city has undergone large structural changes from one of the industrial centres of Sweden to an economy mainly based on the service sector, retail and wholesale trade, education and knowledge industry. The statistics presented in this overview are taken from the City of Malmö (malmo.se; City of Malmö 2008b)[10] and from Statistics Sweden. If not mentioned, the figures are from 2007-2009.

Population

Malmö had around 294 000 inhabitants in December 2009 (malmo.se 02/03/10). The population of the city is in rapid growth and already in 2011 it is projected to pass 300 000. Counting the region immediately surrounding the municipality it contains around 635 000 people, and in the wider so called *Öresund Region* the total population amounts to almost 4 millions. Considering Copenhagen, Malmö and other cities together, the Öresund region is one of the important urban regions in Scandinavia. The area of the Malmö municipality covers 155,6 km^2 which gives a population density of 1 865 persons per square kilometre.[11] The average age of the Malmö citizen is 37, which means that Malmö has a younger population than Sweden in general (41 years). Of the adult people aged 25-64 years, around 42 % has a higher education level (post-gymnasium), which can be compared to the Swedish average of 36%. Almost one third (29%) of the residents of Malmö have a foreign origin in the sense that they were born abroad. The biggest immigrant groups are from Denmark, former Yugoslavia, Iraq and Poland but there are some 150 languages and 171 different nationalities represented. 60% of the immigrants living in Malmö are Swedish citizens.

Housing and living conditions

The housing supply of Malmö is composed of a majority of block of flats (82%) and a minority of small houses (18%). Almost half of the citizens are tenants while the other half own their apartments or small houses. There is quite a large proportion (45%) of small one-room or two-room apartments. Of around 140 000 households, around three quarters (76%) are made up of one or two persons. Families with children constitute around 20% of the households, and senior households 30%. The average level of income per capita in Malmö was some 14% lower than the Swedish average in 2007 (ekonomifakta.se 03/04/10). Around 8% of the Malmö inhabitants were recipients of social security allowances (2007). The number of cars per 100 inhabitants was 29 in 2006, a figure lower than the Swedish average of around 46 (sika-institute.se 02/03/10).[12]

[10] General statistics from the Strategic development unit at the City office (City of Malmö), including the fact sheet 'Malmö in short' (*Malmö i korta drag*) accessed at the City's web site.
[11] This 2009 figure is calculated for the land area of the municipality (Scania County Adminstrative Board. 2007: 67). If one instead turn to the statistics on Swedish population centres (*tätorter*), as defined by Statistics Sweden, Malmö had 3 596 inhabitants per km^2 in 2005 (scb.se 02/03/10). An average Swedish population centre had 1 444 persons/ km^2. The figure for the whole area of Sweden is only 21 persons per km^2 (2009).
[12] The national figure is from 2007.

Employment and transports

There was in total around 149 000 jobs in Malmö in 2007 and of these 31,5% were to be found in the private sector of trade, services and communication; around 5,5% in public administration; 21% in finances and consulting; 15% in the care sector; 10% in the manufacturing industry; 7,5% in construction, energy, waste and water management; and finally, 9% in education and research. Following the recent economic recession, Malmö as well as many other cities has experienced falling employment rates. The unemployment estimate for Malmö in 2009 passed 10% compared to the Swedish average of 8,3% at that time (ekonomifakta.se 28/04/10).[13] The share of adults in some sort of employment was 64,4 % in 2007, a figure considerably lower than for some other large cities in Sweden as well as the national average of almost 78%.[14] The daily commuting in the region is intensive. There are approximately 58 000 persons travelling into the city each day while another 26 000 are going out to other places. The total commuting across the Öresund Bridge amounts to 70 000 persons per day (train around 40%, road traffic 60%). Among the biggest employers one finds public bodies and private enterprises such as the City of Malmö, the Region of Scania, the National Swedish Police Board, the University of Malmö, Skanska Sweden AB, Manpower AB, Posten Meddelande AB, ISS Facility Services AB, and Pågen AB. But the large number of employers in Malmö (around 75%) is small companies with less than 10 employees.

Local politics

The municipal government is led by a left-wing coalition consisting of the Social Democrats with around 38% of the seats in the municipal council, the Left Party (6%) and the Green Party (6%).[15] The parties in opposition are the Conservatives (25%), The Liberal Party (8%), the Swedish Nationalist Party (7,5%), The Christian Democrats (2,5%), and the Swedish Pensioner's Party (3,5%). These figures will be subject to change in the coming election of September, 2010. The participation in the local election of 2006 was 73,5% compared to the Swedish average of 79,4% (scb.se 28/04/10). The municipality of Malmö is divided into 10 city districts (figure 9) which have some degree of self-government including their own district offices and local councils.

[13] This estimate follows a new EU- standard and concerns all persons aged 15-74 years (16-64 before) in the working force including full time students who are registered as in search of a job.
[14] According to Statistics Sweden 'labour intensity' (*sysselsättningsintensitet*) is defined as the number of adults between 20-64 years in activity on the labour market – including both regularly employed and state subsidized activities – divided by total adult population (scb.se 04/03/10). The figures for some other Swedish cities in 2007 are: Stockholm 77%, Gothenburg 74%, Helsingborg 74% and Lund 71% (malmo.se 04/03/10).
[15] All are rounded figures from the election in 2006. Parties with less than 2% are not included. The translation of the parties' names has been done with help of their national home pages. In Swedish and in order: Socialdemokraterna, Vänsterpartiet, Miljöpartiet de gröna, Moderaterna, Folkpartiet liberalerna, Sverigedemokraterna, Kristdemokraterna, and Sveriges pensionärers intresseparti.

A historical overview

If we could visit this area some 20 000 years ago, during the latest Ice age, we would find that what today is the Öresund region was covered with a heavy mass of ice. A melting period started around 12 000 years ago, but took several thousands of years to complete. Dramatic landscape changes took place as a result of the melting process, the land rise and the sea level changes. Following the retreat of the ice humans began to enter southern Scandinavia. In the Öresund region the records tell us that humans have been present perhaps as early as 12 000 years ago (Björk et al. 2009: 7). These people were hunters and gatherers who followed the tundra zone and prey such as the reindeer (IK Foundation & Co 2000: 21).

Etymologically the name Malmö is composed of the words *malm* and *hög* meaning sand/gravel and ridge respectively. In older sources one finds the place named as for example *de Malmøghe* (1303) and *Malmøi* (1145) (Swedish National Encyclopaedia 1991). The settlement that was to become a town was built on a bank of gravel along the coast. From the beginning there were two settlements, one 'higher Malmö' and one 'lower', of which the former was a small church village situated a bit from the coast whose influence never became dominant. Instead it was the 'lower Malmö' that during the 13th century grew and by 1275 is known to have a town charter (Sandstedt 1970: 6 f). During a relatively short period Malmö grew in importance and competed with older towns such as Helsingör, Skanör and Helsingborg. This development shall be seen in the context of the emerging Danish medieval empire, where Malmö was of both military and commercially strategic importance. Öresund marked the border between the western and the eastern provinces of Denmark, the latter being what is today southern Sweden including Scania.

It was the herring in the Öresund that built the first golden age of Malmö in the 14th century. The supply of fish was affluent and the trade of the season's catches was organized into an event called the Scanian fair (*Skånemarknaden*) not only in Malmö but in several towns along the coast. Merchants from Germany and the Hanseatic League brought salt from Lüneburg and silver coins from Harz to trade with the fishermen – and special working women gutted and salted the catches of herring – and then the products were brought back to the continent (Jahnke 2009; Berggren and Greiff 1992: 8 f). The Hanseatic League gained increased economical, political and cultural influence. Tradesmen from Lübeck but also Rostock, Wismar and Stettin organized themselves into guilds, and this process also served as a basis for the emergence of a local and wealthy merchant class. This capital-strong class, as we will see, remained an important source of power during the centuries to come and influenced Malmö history into modern times.

Figure 3. Early Öresund region in the 16th century
The map shows Öresund with the Kronborg Castle near to Helsingör in focus. At the Swedish side we see Helsingborg, Landskrona and Malmö denoted Elbogen (above to the right), which is an older name of the city (Danstrup 1946: 196 with reference to original source c. 1580).

In the end of the 15th century the herring vanished as a trading commodity (ibid.: 9 f).[16] But Malmö was geographically well situated along Öresund and also had a wealthy agricultural hinterland, and managed to restructure its economy. Now grain, oxen and other agricultural products became the basis for continued trading activities with Northern Europe. During the 16th century Malmö experienced another period of economic prosperity being one of the important international trading ports in Scandinavia. This was also a period of power concentration. The reformation had a strong impact on Malmö and was supported by the local merchant's class trying to decrease the power of the church and the monasteries. Craftsmen of different kinds – such as rope makers, tanners, carpenters, bakers, shoemakers, and blacksmiths – began to organize themselves into associations. These guilds were to become another force behind the development of Malmö and, as we will see, constitute a background for the proletarian movement in the late 19th century.

But during the 17th century trade stagnated and Malmö entered a period of over a hundred years of economic decline (Sandstedt 1970: 15 ff). An important background was the Thirty Years war in Northern Europe destroying much of the hanseatic powers. Deepened and prolonged conflicts between Sweden and Denmark also made Malmö a place of warfare and misery. In 1658 Scania was

[16] One may wonder about the roots for this disappearance: overfishing, environmental deterioration or natural variations? This question is however beyond scope for this thesis.

transferred to the kingdom of Sweden in the peace treaty of Roskilde. Instead of being a trading point in the central sphere of Denmark, Malmö now became a town dominated by its fortification buildings in the periphery of Sweden. A campaign of 'Swedification' was initiated by the new sovereign, and as this process was not voluntarily accepted by the local powers, anti-Swedish movements contributed to the tumults of the second half of the 17th century. An important tool of power was the ability of the Swedish regent to set the terms of trade for the different towns in the kingdom. Malmö now was laid on tariffs on incoming goods as well as outgoing products such as grain, oxen and horses to the former so important sales areas in Denmark and Northern Europe, resulting in an abrupt decline in international trade (Berggren and Greiff 1992: 10 f). A combination of economic-political unrest, war, plunder and plague decimated the population from around 5 000 in the 16th century to around 2000-3000 during the 18th century (Sandstedt 1970: 19).

Industrial Malmö

In the 18th century small manufactures producing textiles, wool, leather, tobacco, limestone and bricks, etc. emerged as the first signs of the coming industrial revolution.[17] An important background was the structural changes in agriculture that began in the southernmost parts of Sweden in the end of the 1700's and which spread during the 19th century. Technological innovations and socio-political restructuring including land reforms (*skiftesreformer)* and reclaimed land raised productivity. The increased agricultural production was accompanied by lowered mortality and continued high fertility, resulting in a rapidly growing population. During the 19th century the population of Scania grew from around 260 000 to 630 000 (Stigendal 1996: 7). A rural land owner class gained power and especially in Scania large feudal like estates dominated the countryside. The class of people without ownership to any land grew accordingly. These rural proletarians now had to make their living either at the commercial estates of the countryside or, moving away from their home villages, as an urban proletariat engaged in different wage earning activities in the towns. They were also found among the big emigrant groups leaving for other countries such as the United States.

The urban merchants and the capital-strong feudalist class in the countryside began to see new opportunities. The Enlightenment and the so called 'Period of Liberty' in Sweden probably had some influence (Sandstedt 1970: 19 f). But the fundamental basis for what was to become an industrial breakthrough in Malmö was surely of material and geo-political kind: its strategic location as a trading point at the Öresund, its fertile and prosperous agricultural hinterland, and its already established and wealthy class of merchants and feudalists with accumulated capital ready for use. One bottleneck for Malmö was its degraded port compared to other cities in the region. In 1775 a plan for a reconstruction of the port in Malmö was launched by one of the influential men of the 18th century, Frans Suell (Berggren and Greiff 1992: 11 ff). He is a good example of the emerging enlightened capitalist class, engaging in an immense range of activities

[17] Manufactures are defined as production units of larger scale than traditional handcraft but still not mechanized (Berggren and Greiff 1992:13).

such as tobacco, sugar and clothing industry, agricultural restructuring of large land properties, and local policy making.

During the 19th century an industrial boom took place in Malmö and a period of profound societal change began, that would peak in the modern industrial city of the mid 20th century. The sectors that dominated in Malmö were engineering, textiles and food manufacture (Berggren 2009: 114). One industrial flagship born in this period was Kockums (*Kockums Mekaniska Verkstads AB*). This company was started by one of Frans Suells inheritors Frans Henrik Kockum (Stigendal 1996: 5). He took advantage of the profits from the tobacco industry that the older Suell had started as early as in the 1720's, and invested this capital in new industrial activities. One of them was the establishment of an engineering workshop and a foundry in the 1840's, close to Kockum's summer residence and near to what is today Davidshall square. This by the way gives a quick image of what must have been totally different infrastructural and social patterns. Industrial development was located just next door to the industrialist's own summer house – revealing something about the attitude to industrial environment as well as the patriarchal culture of that time. The enterprise slowly expanded from making household items, ovens, equipment for farming, distillery, and hatchers, to the construction of railway wagons, steam boilers and tractors in the 1850's. Maintenance and repair of ships developed into the construction of new ships and in 1873 the company's first ship *Tage Sylvan* was launched. Over a thousand people worked at Kockums in the 1870's.

Figure 4. Kockums shipbuilding yard somewhere in the mid 20th century
(City Planning office, City of Malmö, with reference to the town archives)

.

Other examples that give an image of the massive industrial development of Malmö in this period are (Björk et al. 2009; Berggren and Greiff 1992: 13 ff):

- **Textile and clothing**. Wool manufactories emerging already in the early 1700's developed into for example the company MYA (*Malmö Yllefabriks Aktiebolag*), which became Sweden's most important wool industry in the 1890's. Another growing enterprise was the clothing company *Concordia*, one of Frans Suell's creations, early applying modern labour organization and technologies. Raw cotton was cheap to import and free from tariffs and was used by for example the MAB (*Manufaktur Aktiebolaget)*, which was a modern cotton-mill built on knowledge from the Lancashire textile district in England.
- **Sugar industry**. In the 1770's sugar refineries were established in Malmö taking advantage of cheap import of raw sugar cane originating from slave based production. From 1865 when slavery was forbidden in North America sugar cane prices increased on the international market. Industrialists in Malmö then restructured the sugar production to be based on locally grown sugar beet, resulting in the construction of a big sugar refinery in Arlöv in 1869.
- **Cement production**. Building on the local rich reserves of limestone and clay that had long been used in human activities, production of cement was developed first in Lomma north of Malmö and then in Limhamn in the south. *AB Skånska Cementgjuteriet* (later *Skanska*) was one of the off shooting companies from this sector, specializing in the refinement of cement into building materials.
- **Bicycles and automobiles**. Construction of bicycles was part of the production at the *Humber & Co*, a company that later was restructured into *Scania*, which delivered the first industrially produced automobile in Sweden in 1902.

This tremendous rate of industrial growth was possible because of a heavy input of labour, which in turn was fuelled by a quadrupling population of Malmö between 1860 and 1910 (Stigendal 1996: 7).[18] Not only men were working in the industrial sector, women's part of the working force rapidly increased as a result of the expanding textile industry. In 1870 women constituted 31% of the industrial working force and in 1910 almost half of it (Berggren and Greiff 1992: 18). Many of these women were unmarried mothers or widows with children. Child labour also played an important part of industrial development. In for example the tobacco industry children constituted 40% of the working force in the first half of the 19th century (ibid.: 14). Not seldom these children were recruited among orphans using what today would be considered cynical methods (for example that they were discharged when growing old enough to have an adult's job, and replaced by new children). Along with the mechanization of the industrial sectors child labour diminished in importance and by 1898 the tobacco industry used 'only' 6% child labour.

[18] Compare with the population development of Malmö in figure 8 below.

An energy revolution

In pre-industrial Malmö access to energy was limited in time and in space (Eliasson 2009). The main energy source to fill society's different needs was from contemporary biomass production (fuelled by the sun) and the human and animal work that could be supported from this.[19] In contrast to many other cities in Sweden, such as Gothenburg and Stockholm, Malmö lacked access to fast-flowing water, larger forest supplies, and a natural port. The situation was more similar to that of the continent, for example in Denmark and Germany. Eliasson argues that pre-industrial Malmö therefore, more than rest of Sweden, was 'a prisoner of energy poverty' (ibid.: 91). But with the industrial revolution came an energy revolution as well. Or, rather, they should be seen as aspects of one and the same socio-ecological process. By appropriation of the steam engine technology and fossil fuels – and of course by the use of an extensive supply of labour – the industrial breakthrough came into being. Coal import from England took off during the first decades of the 19th century and already in the 1840's one quarter of the Swedish import went through the port of Malmö (ibid.: 93). Later on, electricity and oil supplemented coal as drivers of the industrial expansion.

Following the industrial development, demand for energy as well as transport infrastructure increased. In 1856 the railway mainline connecting Malmö northwards to the rest of Sweden, including Stockholm, opened and gave important spin-off effects for trade and industry. The need for electricity to the machines at the industrial sites and to lighting grew as well (Berggren and Greiff 1992: 20 f). In an initial phase, the industries as well as the municipality had their own steam-driven generators. But with technological development and rising demand this import-dependent and coal-powered system was possible to substitute. In 1906, *Sydsvenska Elektriska Kraftaktiebolaget* (today within E.ON), was started by initiative from industrial leaders in Malmö at that time. Instead of imported coal the company turned to the use of hydroelectric power from the stream *Lagan*, situated northwards, from which the electricity was transported and sold to companies and municipalities in western Scania.

During a period of only around 100 years, between 1820 and 1920, the former energy limitations of Malmö were thus broken (Eliasson 2009). It will be interesting to bear this historical period in mind when later on discussing the contemporary energy challenge. Is it that we are again in the midst of a transition – but this time not into but away from the fossil-fuelled society? Or is this still more on the level of ideas and visions – and as part of the rhetoric – than something that *actually* happens?

[19] One important exception to this is peat that was extensively used as a fuel to kitchen ovens, etc. As peat replenishes very slowly it is rather to be judged as a 'fossil' energy source.

Urban environment and living conditions

Urban Malmö, as any area of concentrated human activities, has surely since the first settlements struggled with different kinds of environmental problems. As this thesis takes as a point of departure, one necessary condition for urban life is the import of resources and the export of waste of different kinds and qualities. But, even if urban centres always have been connected to some degree of environmental exploitation, which in turn influences the living conditions, the situation of Malmö in the period of early industrialization was one of peaking socio-ecological distress. The industrial expansion took place right within the city centre often close to the canal as well as residential areas. Deteriorating air- and drinking water quality and uncontrolled waste flows escalated as a result of rapid industrialization, population growth, and lack of prevention systems. Malmö, a town with already limited fresh water supply and access to sewage disposal, was put under increasing pressure (Eliasson 2009: 100 ff). In the eyes of a citizen of today, the situation seems indeed extreme. One picture, rich in detail, of the local environment in 1894 somewhere along the canal in central Malmö, is given by the socialistic agitator, writer and journalist Axel Danielsson (Berggren 2009: 115):[20]

> The canal, which, with its semicircle, like two arms stretched out from the sea, separates the suburbs from the old city, is stirred up by the surge and spreads in all directions a thick, horrible smell of all the dissolved refuse of industry, all blended together. The water is black and oily, but as the factories begin discharging their sludge different coloured spots arise at the outlets of the sewages, and each of these stains has its own odour until it floats together with the others. Here, factories of all kinds vomit their filth: weaving mills, spinning mills, workshops, lime works, slaughter houses, oil works, laundries and tanneries; factories that emit, in another form, chocolate, sweets, margarine, macaroni, sausage, mustard, white grease, vinegar, matches, cigars, lightning conductors, ink, guano, soaps and perfumes. The bouquet of it all is provided by the gutter, the content of which slowly runs down along the banks. This is how the atmosphere of the city is created.

These ecological conditions are of course *social* conditions as well. In addition to the hard terms of the working classes in general at that time, polluted living- and working environments were part of life. One is really struck by the extreme poverty shown by the housing conditions of the lower classes. During the second part of the 19th century the population boom created a heavy deficit in apartments, resulting in an exploitative situation where landlords could charge exorbitant rents offering very poor facilities. Actually, the same group of capitalists that owned the estates often also controlled the factories, that is, we see a kind of double exploitation (Berggren and Greiff 1992: 27). It was not unusual to find whole families living in small poky holes in the basement floor only with earthen floor and sparse (if any) warming possibilities. The hygienic situation was a catastrophe and epidemics common. The inadequate status of the local environments and housing conditions were early given attention to, but the actual improvement was a very prolonged process (cf. Berggren 2009; Niléhn et al. 2000: 20 ff). It was not until in the first half of the 1900's that the working classes' living conditions became a central issue to the new social democratic rule.

[20] This slightly revised translation is borrowed from Berggren 2009, who gives the quotation with reference to *Axel Danielsson – levnadsteckning, karaktäristik, urval av skrifter...*, p. 686.

In my opinion, this historical background of poverty and local environmental degradation is important to bear in mind. From that position, we can reflect on today's Malmö and its connections to a world system in where people are still exposed to living conditions like those of this city in its early industrialization. The contemporary environment of Malmö has surely improved immensely when considering aspects of living conditions and material standards. Nevertheless, and as we shall see, this modernization and welfare revolution places its socio-ecological burden not in the area of the consumers of the same, but in other parts of a global system of production, trade and consumption. What can be seen as a history of poverty here – is now reality elsewhere. The contemporary discourse on sustainable development easily forgets this intertwined quality of socio-ecological processes as well as its own context in the history of modernization and development.

Figure 5. Working environments of Malmö in an early period of modernization
(City Planning office, City of Malmö)

Social movements – social change

It is not difficult to see how this period of industrialization and urbanization paved the way for social movements. Actually, Malmö turned out to become one of the most important bases for the proletarian movement and the birth of labour unions and socialistic parties in Sweden. The background for this includes several aspects. Firstly, capitalist production methods started to permeate several economic sectors already from the 1750-1850's, gradually replacing the old traditions of master-apprenticeship with the urban proletarian wage earner (Berggren and Greiff 1992: 28 ff). Still, workers' collaboration in the traditional crafts such as among bricklayers and building workers persisted. Secondly,

socialistic influences spread easily from Denmark and Germany by for example labour migration.[21] This made southern Sweden and perhaps especially Malmö a hot zone for the workers movement. Another famous quote from Axel Danielsson highlights what in his opinion is an early 20th century unsustainable situation (Bringmark 1962: 7):[22]

> Malmö is a town, which contains many inflammable questions and a lot of dynamite. The social line of demarcation between rich and poor is here drawn up more sharply than in most towns. The large scale industry has undermined the ground beneath the walls of society; cracks in the walls, thunder in the air, peoples' minds in ferment.

In the 1880's labour organizations started to manifest themselves and a class consciousness emerged that distinguished itself from earlier guild traditions and craft-based status (cf. Berggren 1991). This occurred mainly in traditionally male dominated sectors such as masonry, metal working and construction. Women dominated sectors became organized much later, around 1900. This period in Swedish history is also known for the awakening of other social movements: revivalist movements, temperance movements, women's rights organizations and also a growing public interest in sports and health. These movements did also exist in Malmö but in comparison to the workers' and the left wing movements they were not so powerful (Berggen and Greiff 1992: 37).

The Social democratic party that was to dominate Swedish politics during the 20th century had many connections to Scania and Malmö but was eventually founded in Stockholm 1889. In the 1890's Malmö got Sweden's first new 'Peoples Palace' (*Folkets hus*) and also the first 'People's Park' (*Folkets park*), the latter still today a popular resort. A socialistic newspaper *Folkviljan* ('People's will') was started by August Palm, one of the early Swedish social democrats, and influenced the social movements of this time. Another important left wing newspaper, *Arbetet* ('Labour'), was started by Axel Danielsson in 1887. *Arbetet* competed with the liberal *Sydsvenska Dagbladet* as the dominant local newspaper in the region during the 20th century, until in 2000 when it went bankrupt.

Not without resistance the industrial owners realized that a strategy of collaboration was necessary. In 1890 one of Sweden's first collective wage settlements was agreed upon in Malmö (Stigendal 1996: 10). Still, the achievements of the workers movement continued to demand a heavy struggle. Even as late as 1917 there were hunger demonstrations taking place in Malmö and in 1926 the so called riots of Möllevången took place (*Möllevångenkravallerna)*. Another famous and violent incident was in 1908 when young socialists, among them Anton Nilson, blew up the ship *Amalthea* which accommodated strike breakers from England in the harbour of Malmö.

In the first decades of the 20th century a profound socio-economic structural change was slowly breaking through in Malmö as well as in the rest of Sweden. This has been called the 'Swedish model' – and sometimes the 'spirit of consensus' (*samförståndsanda)* – and includes a labour market with collectively

[21] This also partly because the better organized Danish workers made efforts to spread the movement across Öresund to prevent Swedish strike breakers to enter the Danish labour market (Berggren and Greiff 1992: 31).
[22] Author's translation.

based negotiations between strong workers unions and employer associations. This model was actively supported by the social democratic government. In parallel, the social democratic regime developed a welfare ideology known as *Folkhemmet* ('Peoples home'), here exemplified by a quote from the Malmö born social democratic politician Per Albin Hansson in the Swedish Parliament in 1928 (Stigendal 1996: 14):[23]

> In the good home there is equality, care, cooperation, helpfulness. Applied to the larger home of people and citizens, this would mean the dismantling of all social and economic barriers, that now divide the people into privileged and neglected, ruling and dependent, rich and poor, propertied and impoverished, plunderers and destitute.

This was the outline of an economic-political model that became the fundament of the modern Swedish welfare state for a long period, in Malmö as well as in the rest of the country.

Figure 6. Recreation at the Ribergsborg beach with industrial background somewhere after 1956 (City Planning office, City of Malmö)

The industrial golden age and the 'strong society'

The postwar period from 1945 and into the 1960's is a golden era of industrial Malmö as well as a phase of prosperity for the social democratic regime. The industrial sectors were working at high production volumes and with top levels of employees. Kockums, for example, was one of the world's prime shipbuilding yards. Malmö had Sweden's lowest municipal tax levels as well as the lowest rents (Billing et al. 1989: 136). During this period of relative stability, which has been called 'the decades of hegemony' (Billing and Stigendal 1994), strong

[23] Author's translation.

economic growth went hand in hand with a rapid expansion of the Swedish welfare state.

When universal suffrage was established in Sweden in 1919 the Social democrats immediately came into power in Malmö, a position they kept unthreatened until 1985. This meant an extremely long period of permeation of social democratic politics. The public sector including social welfare systems was expanded. Full employment, which was seen as the guarantee not only for social justice but also for a strong economy, and the ambition of public welfare dominated the political agenda. Economic growth was high and so was population growth, with levels of around 3000 persons adding to the Malmö population each year in the 1960's.[24] This period is also known for the so called 'Million Homes Programme' (*Miljonprogrammet*), which was a large-scale building programme in Sweden to create a massive improvement in the supply of affordable apartments for the working class. In Malmö the result was the construction of large areas of high-rise buildings mainly outside the city centre for example Hermodsdal, Nydala, Söderkulla and Rosengård. These areas are today part of the sprawling suburbs of Malmö and are often subject to expressions of love as well as hate and debates on segregation and urban regeneration (cf. Stigendal 2007).

Figure 7. Housing areas outside the city centre in present times
(City Planning office, City of Malmö. Photo: Ronny Bergström)

An important quality of the social democratic regime of this period was, again, the ability to do politics by consensus. In Malmö this spirit dominated most of the 20th century and has even gotten its own name: *Malmöandan* ('the Malmö spirit') (Stigendal 1996: 17). The social democratic chair councillor of the 1950's, S-A Johansson, used to describe 'his' Malmö as 'the friendly window' /… / 'which do not apply only to the friendly attitudes shown by the Malmö citizens to visitors –

[24] This can be compared with today's growth rate of over 5 000 persons annually.

and to each other – but to the general atmosphere in itself' (my translation). Perhaps this quote reveals the social democratic self-confidence more than the actual spirit of the city's residents. Nevertheless, the local powers of Malmö early realized the advantages of alliances and cooperation (Berggren and Greiff 1992: 42 ff). Partly this was of necessity: the right wing parties had a historically established power position and important connections to industry and capital. Further, decisions in the municipal council for a long time had to be taken with a two thirds majority. But it may perhaps also reflect an old experience of the merits of pragmatism. As we have seen, a balance of cooperating and competing power interests have influenced Malmö throughout the history.

The crisis of the industrial city

As experienced by many industrial cities in Western Europe, international competition increased during the later postwar period and a global economic restructuring took form (cf. Vall 2007). The global recessions following from the oil crisis in the 1970's were one important factor behind this general trend (Anderberg 2009: 19). Traditionally important sectors in Malmö such as textile, shoes and leather industry restructured already in the 1950's and continued its decline in the 1960-1970's (Berggren and Greiff 1992: 55). In the whole of Sweden, the working force in these sectors fell by 1/3 between 1950 and 1965. The next sector to be challenged was the shipbuilding yards, which met heavy competition in the 1970's from newly industrialized countries in for example South East Asia. As Kockums shipyard was one of the most important working sites in Malmö, local as well as national opinion demanded political intervention. In 1979 the Swedish government nationalized Kockums, but already in 1986 the civil production was closed down anyway. What was perhaps the crown jewel of the industrial age, the silhouette of the huge 'Kockums crane' (*Kockums kranen*) at the Malmö horizon, was now a dead symbol – and was exported to South Korea in 2002. A compensating industrial location was immediately urged for, but the establishment of SAAB:s modern car factory failed and closed down only a few years later, in 1991 (Billing 2000: 6).

But this first chock was only the beginning. Several industrial sites such as *Fazer* (chocolate), *Nordiska Fjäder* (bedclothes), *Malmö Strumpfabrik* (textile), and *Pripps* (brewery) was about to close down. The working force in the manufacturing industry declined from 40% in 1960 to 15% in the mid 1990's (ibid.: 10 ff). In the initial phase of the crisis the public sector expanded and could absorb the redundant working force. But as public finances deteriorated, the situation changed and during the first half of the 1990's, when almost 27 000 jobs were lost, unemployment rates were peaking at 16% in 1993. Malmö now was on the headlines in media not as the flagship of industrial Sweden but as an area in deep crisis and depression.

But the Malmö crisis was not only due to the industrial decline, even if that was one of its main causes. During the early postwar period population increase and raised tax levels had financed much of the public sector expansion. Now these prerequisites had changed. Malmö was instead experiencing a population decrease for a period of some 15 years, between 1970 and 1985 (see figure 8). Only in the first half of the 1970's around 35 000 persons left Malmö because of diminishing

job opportunities and for other reasons. As resource-rich socio-economic groups tended to move out to what was considered as more attractive surrounding municipalities, a process of social segregation had taken a hold of Malmö.

This trend shifted around 1985 and a population increase started that in another 15 years (1985-2000) restored the 1970's level of Malmö inhabitants to around 260 000 (Billing 2000: 13 ff). The level of net immigration reached 27 000 people in the 1990's being the highest rate of the whole 20th century. But this time the population increase was not matched by the creation of new job opportunities. The influx of foreign labour that previously had been a prerequisite for the expansion of the industrial sector were now a massive immigration from war zones such as Iraq, Yugoslavia, and Africa. The number of refugees arriving in Malmö in for example 1994 was at a level comparable to 1946, after the end of the Second World War. During the 1990's foreign immigrants constituted 90% of the net immigration to Malmö and in 1999 more than 1/3 of the city's inhabitants had a foreign background. With poor prospects to make a living and few chances to successfully enter the Swedish society, clusters of ethnic groups tended to become economically and culturally isolated in some of the city districts. This general picture of social segregation remains to this day, even though the whole problem of course needs a much more nuanced description than here can be given (cf. Stigendal 2007). Without going into depth, one could perhaps say that the social dimension of a sustainable development is the biggest unsolved issue of today's Malmö as well its largest unrealized potential.

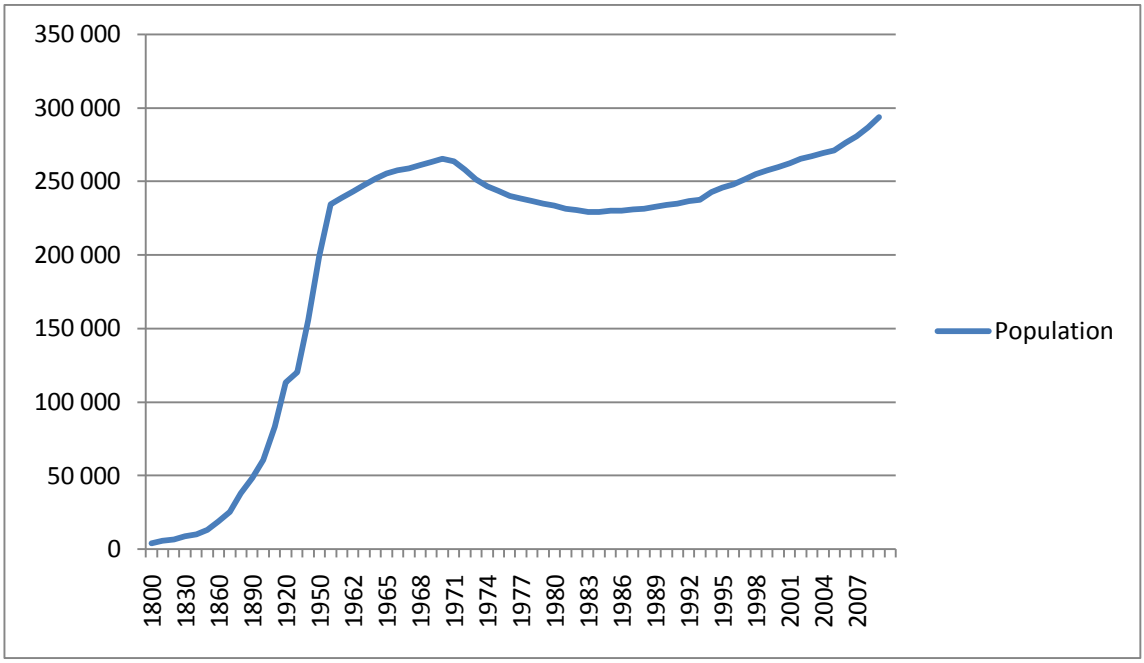


Figure 8. Population development in Malmö 1800-2009. Based on data from City of Malmö.

Returning to the crisis years, this process of population increase and socio-economic segregation resulted in high levels of public expenditures in combination with decreasing tax incomes. Political signals from the national government opposed the option of an increase of local tax levels. In 1985 the

municipal right to impose taxes on companies was finally removed. All this, and probably for still more reasons, resulted in rapidly worsened municipal finances, so bad, that the left wing and right wing political leaders jointly made an appeal in 1995 to the Swedish government claiming that: 'Malmö is threatened by something that can be called a financial meltdown' (Stigendal 1996: 28, my translation).

Recent Malmö

From around 1995 the economy of Malmö started to recover. This was not solely an act of local agency, but rather a result of external as well as internal forces. Political responses and other efforts were initiated on a local, regional and national level to stop the negative spiral. A series of events, which Billing has characterized as taking place in 'effective contemporaneousness'[25], reinforced a trend shift (2000: 46 ff):

- **A tax equalization system** was decided upon in the Swedish Parliament in 1995, and was designed to equal out municipal differences due to socio-economic structures. The system worked both to redistribute unbalances between the income and the expenditure side of the Swedish municipalities. The City of Malmö was one of the winners in this reform, and already in 1996 it had doubled its incomes from state subsidies, helping to combat the crisis and counteract the budgetary deficit.
- **Initiation of large scale infrastructure projects**. The most important one was the decision to build the *Öresund Bridge* in 1991 followed by the construction phase in the 1990´s and the opening in 2000. This was an infrastructure project not without political complications, but an investment that radically changed the position of Malmö in the region not least in relation to its neighbour Copenhagen. During the years after the opening the number of people commuting the region has steadily increased.[26] The bridge project was accompanied by an effort to brand the Öresund Region into the image of a knowledge- and service-based economy with high levels of investments, trade, IT, education, and culture.[27] The second infrastructural project of importance is the construction of the *City Tunnel*, a railway tunnel through the city of Malmö which makes the railway net more speedy and accessible.
- **Establishment of higher education**. In 1998 the Malmö University was opened and today it is Sweden's eighth largest university and an important research and educational institution with over 20 000 students and 1 400 employees.[28]

[25] In Swedish: 'den kraftiga samtidigheten' (my translation).
[26] Although a dip in the travelling volumes have recently been noted following the effects of the global recession in Copenhagen and in Scania (sydsvenskan.se 19/03/10).
[27] For examples of the branding efforts see e.g. http://www.Öresundregion.org.
[28] The number of students attending full year courses are around 12 000. Figures from 2006. More info at http://www.mah.se.

- **Regional government reform**. The fusion of the two Scanian counties *Malmöhus län* (south/west county) and *Kristiandstads län* (north/east county) into one bigger unity called *Region Skåne* ('Region Scania') in 1997. This process started first at an experimental stage in the late 1990's and was established in the following years. The Region governs areas such as health care, public transport, culture, tourism and strategic regional planning including sustainable development issues. Compared to the former structures this new unit has a higher degree of political self-government.[29]

Political fights and cooperation

The last two decades of the 1900's was also a period of political turmoil in Malmö. In the election of 1985, the right wing coalition took power in the City council for the first time since 1919 (Berggren and Greiff 1992: 60 ff). In the next election in 1988, the Social Democrats were back in power, then followed by another right wing comeback 1991-1994. The 20th century era of unthreatened Social democratic power was over. The crisis years became characterized by a harsher tone and more severe political conflicts. The 'politics of consensus' seemed to have come to an end. One can argue as Stigendal (1996: 30 f) that a new political climate was emerging. This on the one hand included more distinct borders between the political camps, on the other hand it released opportunities for new actors to gain influence. According to Billing (2000: 48), the political culture of Malmö has however retained many aspects of the consensus culture. But whereas the earlier postwar period was characterized by a 'culture of corporativism', the local policy making in the 1990's has developed according to what he calls a 'mutual understanding of pragmatism'.[30] Despite ideological differences, there is still consensus in many key issues such as infrastructure projects, the University, and the way the City makes contact to business.

An example of the political fights during the 1990's is the so called 'City district reform' (*Stadsdelsreformen*), that is, the decision to split Malmö municipality into ten smaller units with selected areas of self-government. The initiative was taken by the Social democrats in 1995 and met heavy opposition from the right wing parties, who claimed that it would result in artificial borders dividing the city and in inefficient management, a growing bureaucracy, as well as an unfair treatment of tax payers from different districts (for example the richer districts in the south west having to subsidize the poorer ones in the east). The reform was finally implemented and the districts are still in function (figure 9). Other political fights covered such areas as the degree to which the City should privatize parts of the public sector and how to combat the crisis to reach budgetary balance.

[29] See http://www.skane.se.
[30] My translation. In the original text and in Swedish these two cultures are termed 'korporativistiskt samförstånd' and 'pragmatiskt samförstånd' respectively.

However, the crisis of the late 1900's also brought in a need for renewed political cooperation. In 1995, the City executive board initiated a process called 'Malmö 2000', which was a dialogue and vision project involving politicians, civil servants and other employees of the Malmö municipality (Billing 2000: 31). This process intended to support the development of long-term strategic plans that would enable an overview of the contemporary crisis and the future potential of Malmö. This 'vision process' covered certain areas: economy and business, education, environment, city planning, culture, social issues and youth. According to local actors I have spoken to this process was fruitful in the sense that it redirected the divided opinions on the ongoing crisis into a joint visionary process of future possibilities. Of course, this project was only a part of a much bigger phase of socio-economic restructuring. In any case, Malmö greatly improved its situation and the municipal economy recovered. The global economic recession from 2008 and onwards is now changing the context to an unknown degree – but will surely affect the region in the years to come.

Figure 9. City districts in today's Malmö
(City of Malmö. © City Planning Office)

Malmö today: two stories

What kind of city is Malmö today – and what will it become in the future? Malmö is undergoing continued economic, infrastructural as well as cultural change. The population is at the moment growing at historically high rates. Only in 2009 some 7000 persons were added to the population of Malmö (malmo.se 28/04/10), which in the perspective of a small/middle-sized city is like adding a whole city district in only a few years. It comes as no surprise that many local actors articulate their

satisfaction with this trend which seems to secure the prosperity of the city making it more attractive. But this rapid expansion also puts strong pressure on many vital sectors of society, such as housing, child care, schools, and transports.

A green knowledge city?

When I think of contemporary Malmö I can see at least two stories that seem to run in parallel but which do not easily combine. The first one is the story of a city that managed (or had the luck?) to rise from the late postwar crisis as a renewed and revitalized city. The other is a story about a city in continued social distress and socio-economic segregation (cf. Mukhtar-Landgren 2008). The first one is the success story about an emerging 'knowledge economy', the idea of a city that thrives on the service- and knowledge sector and on culture, events and entertainment. Surely, it is not difficult to see how actors both public and private are making efforts to brand Malmö as such a post-industrial, hypermodern, service and knowledge based economy, an 'Event city' pulsating with culture, creativity and people.[31] These trends are discussed by for example Ristilammi (2008) in terms of an 'urban globalization' in which the physical environment as well as the citizens in different ways are attuned to the mode of the 'globalized city'.[32] This economy is often seen as characterised by *decoupling* and *dematerialization*, that is, on production and consumption patterns that do not involve high levels of material input and energy consumption. As this thesis argues, as long as the total ecological footprint of Malmö and other modern urban regions remain at a very high level, one must consider such a dematerialized city more of a hope than a reality.

Taking a critical stance or not, environmental concern is high on the contemporary political agenda and the City of Malmö has managed to establish itself internationally as a forerunner in urban sustainability projects.[33] The City has placed itself high in different kinds of sustainability rankings and has received several awards for urban sustainable development (cf. Hallin and Johansson 2008: 151).[34] Since the 1990's, when early initiatives were taken in the context of the Rio conference and *Agenda 21*, political attention to urban sustainable development has grown immensely. Large urban projects with a sustainability profile have been launched such as the Western Harbour (Bo01) and the Augustenborg Eco-city project.[35] A new Environmental programme 2009-2020 has recently been adopted, stating the City's ambition of holding a frontline position, nationally and internationally, in urban sustainability efforts. As we will

[31] See e.g. the City's presentation at http://www.malmo.se/english or the tourist marketing at http://www.malmo.com/start.asp. Other examples include *A platform for the Knowledge City Malmö* ('Plattform för Kunskapsstaden Malmö') issued by the City of Malmö and Malmö university (2008); *Malmö - The growth city of the year* ('Malmö – Årets tillväxtkommun') a supplement issued by the City of Malmö and with advertisers from local businesses and organisations to the national business paper *Dagens industri* (November, 2009). My translations.
[32] Ristilammi however problemizes a one-sided view of the 'globalised city' and uses the district *Möllevången* in Malmö as a contrasting example to other developments of the city core. Ristilammi also discusses how processes such as gentrification and place branding influence the city's development.
[33] See e.g.: http://www.malmo.se/servicemeny/malmostadinenglish/sustainablecitydevelopment.
[34] Some examples: the environmental magazine *Grist* ranks Malmö as the 4th greenest city in the world; Malmö appears in a report on 'Sustainable cities' from the World Watch Institute; Malmö received the UN Habitat's Scroll of Honour Award in 2009 (malmo.se 05/03/10).
[35] More information about Bo01 and Augustenborg at e.g.: http://www.ekostaden.com .

see, while it may be true that Malmö has succeeded in praiseworthy flagship projects, the general trends of material and energy use are still what must be considered unsustainable.

Dannestam (2009) argues that Malmö is one of many cities in the world that are engaged in what may be called entrepreneurial city politics (*stadspolitik*). In contrast to a traditional and welfare-oriented policy frame, at least in the Nordic perspective, the entrepreneurial city politics is directed to enhancing economic growth and the competitiveness and attractiveness of the city, by such methods as urban renewal projects and place marketing (ibid.: 281 ff). In the aftermath of the industrial crisis, a new discourse has gained influence in Malmö which includes the idea of a transformed and post-industrial city and which stresses the role of the City not only in welfare policy but also as a provider for economic growth and to act as an 'regional growth machine'. Dannestam sees the discourse on urban sustainable development as an alternative discourse that has emerged in recent Malmö but which still is quite weak in comparison to the more powerful discourse on the entrepreneurial city (ibid.: 122 ff). Perhaps, Dannestam speculates, in light of the contemporary recession and with raised criticism of neo-liberalistic policies at a global scale, alternative discourses may gain influence (ibid.: 275 ff). One of them could be the urban sustainable development discourse, which would probably highlight some key challenges to the growth-oriented paradigm now in dominance. As I will discuss in more detail later on, there already seems to be quite a strong position of the 'urban sustainable development discourse' in my material. However, at the same time this does not seem to challenge the entrepreneurial discourse at its fundaments, but rather to adapt to it and to support it.

Anderberg (2009) argues that we may understand the recent efforts in eco-branding and urban sustainability projects as part of a larger socio-economic restructuring, and its political responses, in the last 15 years. This regional restructuring concerns basic factors such as population growth, economic growth, trade and industry, education and so on, and has, as Anderberg writes, 'been strongly influenced by the trends of 'ecological modernization' and green 'branding''(ibid.: 11).[36] In company with Copenhagen, the eco-profiling of Malmö can thus be viewed as an effort aimed at synergies with this larger economic revitalization, one in which the political responses are ultimately aimed at holding the positions in a system of competing cities and regions at an international level. A 'green' and 'sustainable' profile is in this context an important 'asset' adding to the competitiveness of the cities. Since one of the effects of the recent economic restructuring is an improved environmental quality at a local scale, at least in some aspects, this supports the general image of a 'greening' city. As I will return to, such improvements must however be seen in the context of a growing international dependence of the region. Many of the goods and services that once were produced locally, and thus placed an ecological footprint at a very local scale, are today produced in other parts of the world system, with their socio-ecological effects detached from the Öresund region. Easy to forget, however, and as Anderberg reminds us of (ibid.: 20), this picture of 'deindustrialization' needs to be a bit nuanced. Actually, the industrial sector of

[36] With reference to Anderberg and Clark in press in Vojnovic, I. (ed.), *Sustainability: A global urban context* (Michigan State University Press).

the Öresund region is still quite strong in many respects. Some industries, such as the chemical industry, have even expanded. It is the proportions that have radically changed so that the service sectors, especially the private one, have expanded in combination with a general population growth.

A segregated city in distress?

The other story of contemporary Malmö is a less heroic one, and it is the story about a city with continued social problems and unacceptable levels of socio-economic segregation. It is the story about high levels of youth unemployment, unsatisfactory educations levels, public insecurity, gang criminality, overcrowding and degraded housing conditions. In 2008 and 2009 the public was disquietingly reminded of this by the media reports on riots taking place in the city district of Rosengård. In the Welfare report of 2008, the City states that in light of the crisis in the 1990's, many trends are definitely looking better today. However, Malmö must still be seen as a largely segregated city. Public welfare and public health are strongly correlated to ethnicity, gender, education and different socio-economic groups, which in turn are very segregated in different districts. In comparing the 10 city districts by a so-called *welfare index*, the south-western district Limhamn-Bunkeflo gets 7,9 (out of 10) while the south-eastern district Rosengård reaches only 3,1 (City of Malmö 2009a: 10).[37] As if this was not bad enough, the gap between 2007 and 2008 is widening, not narrowing. This segregation has a strong connection to ethnicity. Around half of the children with a foreign background live in families defined as low-income households while only 11% of the Swedish children belong to this category (ibid.).[38]

So what is Malmö then? There is certainly not *one* story, but many. There is a multifaceted context. There is a self-confident and ambitious City trying to realize a 'post-industrial' green dream. And there is an every-day reality in some parts of Malmö coloured by socio-economic segregation, degraded housing conditions and poor prospects to enter the labour market and the Swedish society. There is the top-down perspective which may give the impression of large sustainability improvements. And there is the view from underneath in which life goes on much in the same way as always. The title of the next part of this thesis, called 'Tensions', was chosen so as to highlight some important aspects of the context in which the contemporary policies for sustainable development are to be realized. Even if I will from now on take a more limited perspective, focussed mostly on the socio-*ecological* interconnections, I have here stressed the importance of a broader understanding of Malmö. Without social and cultural considerations about the development of Malmö, I fear that possible gains will risk to turn into failures. Dealing with these crucial aspects of an urban sustainable development must however be somebody else's work.

[37] This aggregated welfare index is based on 40 indicators, e.g. income-, education- and employment levels, participation in elections, crowdedness, homelessness, public health, sexual health, obesity, security, and drug abuse. In the 2008 report, the highest ranked city districts were Limhamn-Bunkeflo (7,9 trend ↑), Västra Innerstaden (Western city district) (7,4 trend ↓), while the lowest ranked are Rosengård (3,1 trend ↓) and Fose (3,4 trend ↓).

[38] This estimate is given with reference to a report from the NGO 'Save the Children Sweden'.

Part II. TENSIONS

Key perspectives

Tensions as structuring concepts

How close, or far from sustainable development is a city like Malmö? This question will get quite different answers depending on who you ask. Why is that? How can we understand that in one moment we may hear that Malmö, and other cities in Europe, are becoming increasingly cleaner and 'greener', and in the next we hear that the same fundamental trends of unsustainability persist? In this thesis I suggest two ways of deconstructing this apparent contradiction. Firstly, there are fundamental discrepancies in the approach taken by different actors and institutions when judging the sustainability of an urban region. If we focus solely on the city as an isolated phenomenon, on urban sustainability as a local and place based issue, then we get one picture. If we instead look at an urban area as in *relation* to other areas, as a global and system based issue, then we get another one. Secondly, we need a critical awareness of the influence of different discourses to better understand the disparate messages we are confronted with.

A discourse can be seen as a pattern of language, ideas and metaphors that constitute the framework through which we perceive reality and shape our thoughts and our speech. We live in a time when 'sustainable development' is no longer a controversial term, but something that almost every actor and institution put high on their agenda. Still a lot seems unclear when it comes to *what* a sustainable development actually is, no less *how* it can be achieved. It is not difficult to understand that certain ways of referring to, and interpreting, the concept of sustainable development get more dominant than others. Following Foucault and his view on the close relationship between power, knowledge and discourse, we are rather to expect that the evolution of discourses will mirror the interests of dominant actors/institutions of society. At certain times one discourse may gain a hegemonic position. As many have argued, the contemporary dominant discourse of sustainable development has some common features of which many fit what has been called *ecological modernization*. Does this discourse permeate the Malmö context as well? How is that expressed in that case?

This part of the thesis puts forward some key perspectives that I have chosen as points of departure in a critical analysis of urban sustainable development with the case of Malmö. Firstly, as argued above, there is the tension between a local and place based versus a global and system based assessment of urban sustainable development. Secondly, there is the tension between different discourses and, also, between what may be called discourse and reality[39], that is, between what is claimed by different actors and what is revealed about the state of the art when

[39] Of course, concepts such as 'reality' need a clarification. I will take the position of neither a strict *objectivistic* view (independent and given reality) nor a totally *constructivist* one (reality as a social construct), but rather an in-between and *relational* view. I thus see different levels of our human 'reality' not as independent but as interrelating aspects (cf. Steiner 1993). I do believe that there is a biophysical reality 'out there' – with or without us humans. And I do think that different measures and indicators help us to reveal something important about the biophysical processes that are part of shaping our 'reality'. At the same time, these indicators are of course in themselves socially constructed and deserve caution and interpretation when used.

using different quantitative and biophysical indicators. These key perspectives, *place vs. system* (or local/global) and *discourse vs. reality*, will generate the platform on which I aim at a better understanding of the conditions for solving contemporary sustainability issues in Malmö. They constitute the main analytical structure of this thesis. As these key perspectives are not ground-breaking in any academic sense, the focus is not on developing the concepts as such or to put a great effort on the theoretical level. Instead, my aim is to bring these key perspectives into the field of Malmö and to see how they work when applied to a field study.

Method and limitations

While the introductory part of this thesis relied on a literature study, the chapters in this part are based on a field study in combination with literature studies. The exact conduct of the interview study is described in chapter 4. As the section on method already has stated, my research is inspired by transdisciplinary, participatory and action-oriented approaches. In this context it means, among other things, that the scope of the study is aimed at giving a critique that is not only abstract and distanced, but close-to-the-field, constructive and forward-looking, trying to give a better understanding of the local context as well as contributing to a discussion on future developments of urban sustainability policies.

When discussing urban sustainability many broad ecological, economic and social topics are relevant. As the former chapter has showed, poverty, public health, employment, education, gender, and many other issues are all very relevant for contemporary Malmö. As a thesis however has to find its focus, I have here chosen to concentrate mainly on the socio-*ecological* dimensions of an urban sustainable development. Even though everything surely is 'ecological' in some sense, what I essentially mean is that I will here not go into the specific details of the social or economic issues of an urban sustainable development. Instead I will mainly concentrate on the ecological aspects and especially on interactions between the local and the global level. However, as we will see, this will inevitably bring us to some critical socio-economic issues.

Disposition

This part is divided into two chapters. First, an outline of the place based sustainability approach is given which shows the direct and often production based effects of a region's economy. In the same chapter a system based sustainability approach is then elaborated pointing at the indirect and consumption based effects of globalized patterns of production, consumption and trade. Examples from the local context will be given to illustrate the general approaches. In chapter 4 I then take the reader into the field of Malmö to get acquainted with actors with influence on local policies connected to urban sustainable development. In this interview study I try to shed light on how different actors view urban sustainability issues within their local context. Reflections and issues for discussion will be treated integrated within the chapters as well as in a short final section.

3. Urban sustainable development: a place based and a system based approach

All models are wrong but
some models are useful.
William Deming [40]

The aim of this chapter is to discuss urban sustainable development by contrasting two perspectives which I will call a *place based approach* and a *system based approach*.[41] These approaches may also be characterized as a local, direct or emission based versus a global, indirect and consumption based approach. All of these designations contribute to explain the main differences between the approaches. As I will show, in the case of Malmö many improvements have been made when it comes to locally situated problems – although there are still important issues to solve. However, the big challenge lies in the fact that Malmö, as well as other modern urban regions, has a continuously large and globally dispersed ecological footprint. That is, the socio-ecological impacts from a continued high level of material and energy input have changed from a local and contemporaneous problem into a sustainability challenge with high spatial and temporal complexity (cf. Rockström et al. 2009).

A place based sustainability approach

A place based approach focuses on the actual geographical site and the ecological status of that place caused by for example emissions, resource extraction, landscape exploitation and other human activities. A production focus is often implicit, meaning that one takes into consideration the emissions and other effects from the producing sectors of the area in question. The place based view is frequently used in environmental policy making in for example international negotiations on air pollutions such as sulphur dioxide (SO_2) and carbon dioxide (CO_2). The emissions are thus allocated to certain geographical areas, for example to a nation or a region, as being produced/emitted from this site. One may accordingly call this approach a local, emission based or production based approach as well.

An example of what I consider a mainly place based sustainability approach is the Swedish Environmental Quality Objectives (EQO) adopted by the Parliament in 1999, which also forms the basis of the environmental accounting of the City of Malmö.[42] The principal aim of the Swedish EQO's is that the major

[40] Quoted in Costanza 2009: 360.
[41] The choice of 'place based' versus 'system based' was made to illustrate what I gather as the main difference between them: the point of departure in the local, concrete site versus the starting point in relations connected to production, trade and consumption at a global level. I am aware that the use of 'place' is done without references to other notions of this concept for example in human geography.
[42] General information about the EQO:s at http://www.miljomal.se/Environmental-Objectives-Portal. The Swedish EQO:s have recently been subject to political debate and revision (based on e.g. SOU 2009: 83). Here I only discuss the general structure of the goals without this recent debate taken into consideration. The City of Malmö also follows another structure in its new programme 2009-2020 although the national Environmental quality objectives will likely remain an important structure in the coming implementation and monitoring plans (cf. p. 100).

environmental problems should be solved within one generation (Environmental Objectives Council 2008). There are 16 objectives which describe a sustainable and desirable environmental standard that is to be met by 2020 or, for the climate objective, by 2050 (see table 1). Examples are reduced climate impact, zero eutrophication, a non-toxic environment, sustainable forests, good quality ground water, and a rich diversity of plant and animal life. In addition to these overarching objectives there are some 70 intermediate goals and 100 indicators used to monitor the process. As one can see from the list, albeit with some important exceptions (e.g. 1 and 3-5), the objectives are mainly outlining the desired ecological status in a direct and site based perspective. Even if there of course are all kinds of connections to the indirect and global level for each of the targets, most objectives are addressed and structured according to a place based approach. For example, the objective 'A rich diversity of plant and animal life' concerns the status of the nation, not what effects on biodiversity the consumption patterns of the Swedish population causes. As will be further discussed, of course there are great strengths in the way the Environmental quality objectives are structured. Besides their impressive ambitions, they are efficient in setting a clear focus on local environmental issues and of providing a tool for regional actors in their sustainability policies.

The Swedish Environmental quality objectives

1. Reduced Climate Impact
2. Clean Air
3. Natural Acidification Only
4. A Non-Toxic Environment
5. A Protective Ozone Layer
6. A Safe Radiation Environment
7. Zero Eutrophication
8. Flourishing Lakes and Streams
9. Good-Quality Groundwater
10. A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
11. Thriving Wetlands
12. Sustainable Forests
13. A Varied Agricultural Landscape
14. A Magnificent Mountain Landscape
15. A Good Built Environment
16. A Rich Diversity of Plant and Animal Life

Table 1. The Swedish Environmental quality objectives
(Environmental Objectives Council 2008)

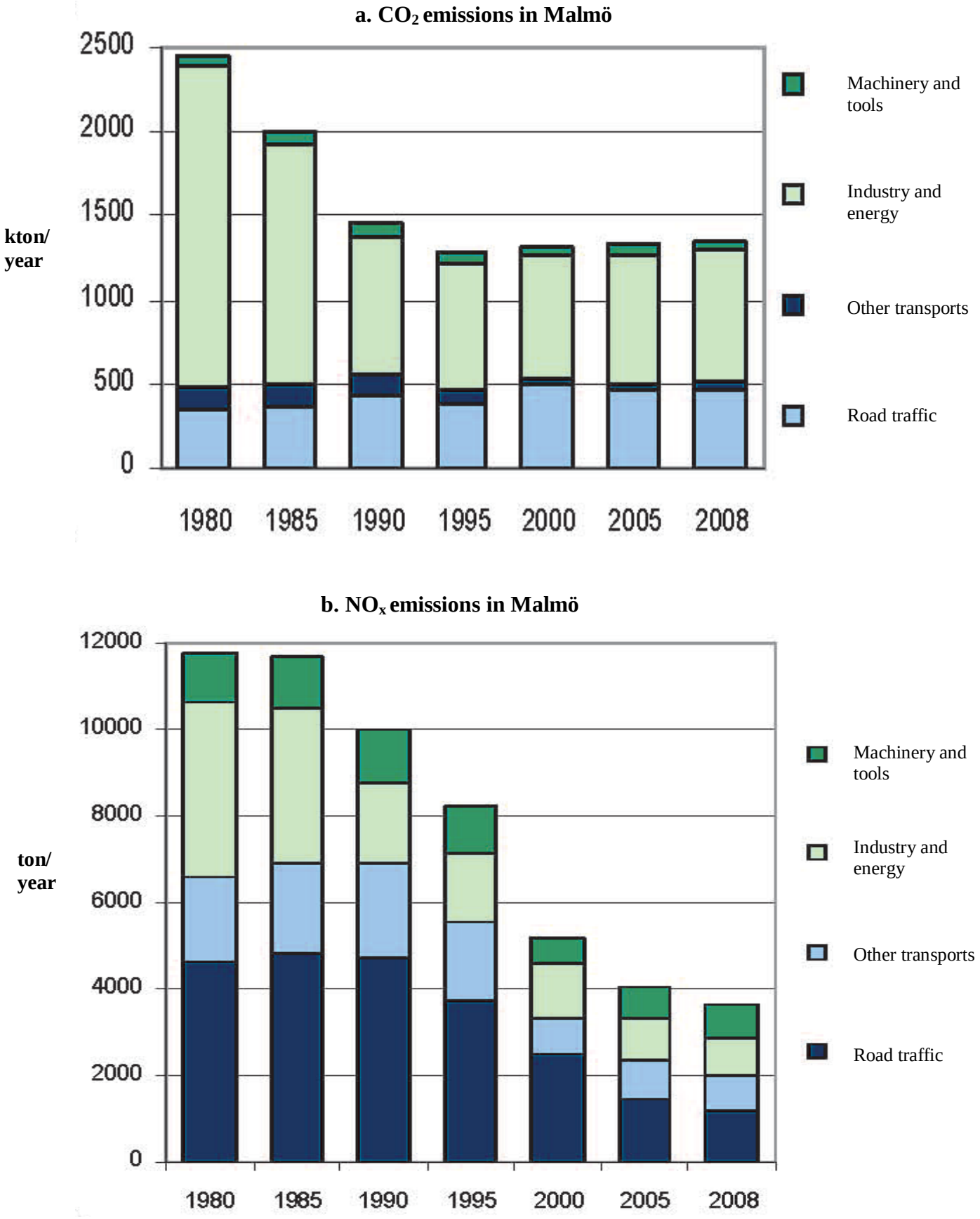
Let's now turn to Malmö and how it can be described by a place based sustainability approach. The most striking impression, looking at the recent development of say 25-30 years, is the overall environmental improvement resulting from deindustrialization and, also, from sharpened environmental policies at the national level. As we have noted, during the late postwar period the industrial sectors in Malmö met heavy competition from abroad resulting in either their moving out, their modernization and streamlining – or their closing down.

During the late 1960's an increased public awareness and political debate at the national level resulted in the establishment of the Swedish Environmental Protection Agency and an Environmental Protection Act. Higher demands and stricter control was now placed on industry as well as on other actors impacting on the environment (i.e. municipalities, farms, households). The oil crisis during the 1970's further created a strong incentive to decrease the use of fossil fuels. All of these factors were now shaping a trend of decreasing environmental impacts which, important to say, were less connected to the environmental ambitions of the municipality than to broader economic-political considerations and to external forces. As an example, a large improvement was when the city became connected to a district heating system, thereby phasing out many small-scale and relatively inefficient and polluting oil- or coal fired boilers.

As a result, local environmental pollution in Malmö has declined sharply, for some important emissions such as carbon dioxide (CO_2), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) with more than 50% since 1980 (City of Malmö 2009b). The trends for the last 30 years are made visible in figure 10 a-c. It is noteworthy that we are talking about absolute figures, not per capita figures, meaning that total reductions have taken place despite a high population growth in Malmö as described in chapter 2. If first looking at CO_2, we can see that the industry and energy sector stands for a vast part of the sharp decline in emissions since 1980, while the trend of the transport sector is not that positive but rather stagnating or even reversing in the last few years. As will be subject to further attention in the case study on energy, the emissions of CO_2 will now almost double by the establishment of a new combined power and heating plant. While certainly not looking good for the local climate statistics, it is an interesting example of the tensions between a place based and a system based approach and the need to understand strengths as well as weaknesses in both of them.

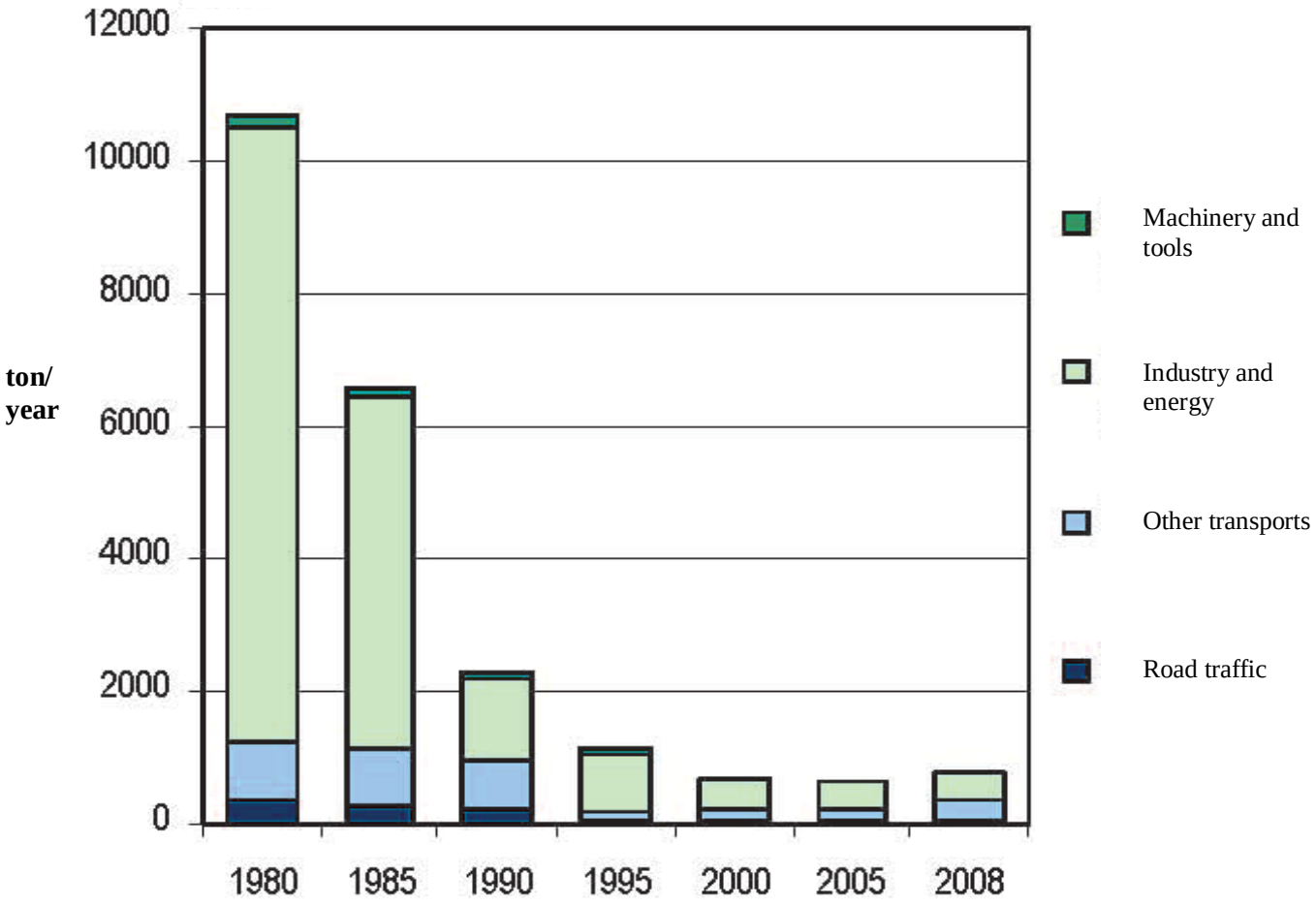
The emissions from nitrogen oxides (NO_x) also show a sharp decline since 1980 due to the general trend of deindustrialization, but also the implementation of pollution prevention systems in the industry and energy sector, as well as cleaner fuels and vehicles in the transport sector. As we will see however, local air quality problems with rising levels of nitrogen oxides persist in several city areas. The decline of emissions of acidifying substances (SO_2) is perhaps the most impressive example of a trend of improvement. In some 30 years, emission levels of over 10 000 tons/year in 1980 has been reduced to less than 1 000 tons/year in 2008. A small trend shift is detectable in the recent years though, with the SO_2-emissions from the sector 'other transports' (mainly railway and shipping) slightly increasing. In the case of acidifying substances one should remember that a large part of the local deposition has its origin in foreign sources, and the other way around; much of the SO_2 that is emitted locally is transported away. Acidification is thus a typically regional issue, which points to one of the limitations of a strictly local approach.

Figure 10. Development of CO_2, NO_x and SO_2 emissions in Malmö between 1980 and 2008 (City of Malmö 2009b)



Notes: My translation. In Swedish the segments of the bars refer to: 'Arbetsmaskiner och redskap, industri och energi, övrig trafik, vägtrafik'

c. SO_2 emissions in Malmö



Pollutions of heavy metals such as cadmium (Cd), lead (Pb) and mercury (Hg) have also decreased sharply, even if one still finds increased levels due to long term accumulation in for example sea sediments. The emissions of volatile organic compounds (VOC) have followed a declining trend from deindustrialization as well as from cleaner vehicles and the introduction of catalytic converters. The emissions of nitrogen from the sewage plants in the municipality have more than halved since the 1990's although one can now see a small upward trend. According to the Environmental Report of the City of Malmö (2008), other examples of noticeable improvements are the phasing out of atmospheric ozone depleting substances (CFC's) and the efforts to meet the objectives 'Flourishing lakes and streams' and 'A balanced marine environment'.[43]

Local problems persist

This said, it should immediately be noted that these examples do not imply that all problems are finally solved and the negative impacts levelled down. Despite the positive signs there are still important problems threatening the local environment. In the City's yearly Environmental report, an overall assessment is

[43] The positive trend in the objective 'Flourishing lakes and streams' is however revised to 'progress uncertain' in the 2008 report (City of Malmö 2009b), which points to the importance of caution in the interpretation of a single year's account.

made in comparison to the objectives set by the municipal Environmental programme.[44] These objectives are set locally but correspond in a large extent to the 16 Swedish environmental quality objectives in their structure and scope. In the programme of 2003-2008 there were over 50 local objectives for the City of Malmö, aimed at taking further steps towards sustainable development in line with the overarching national goal of solving the main environmental problems by the next generation (City of Malmö 2003). In the latest Environmental report of 2008, one can read that out of 14 areas of objectives,[45] only 2 get the assessment 'Prospects are looking quite good', while 8 are judged as 'Progress uncertain, additional work is needed' and another 4 as 'Bad progress, considerably more work is needed'.[46] The most problematic areas, according to the City of Malmö (2009), concerns the objectives Reduced climate impact, Zero eutrophication, Sustainable forests and the goal of a Varied agricultural landscape. In comparison to the local Environmental objectives these 4 areas show especially poor progress while yet another 8 show unclear progress.[47]

Even though this evaluation emanates from a very ambitious target level, there is no doubt that many local environmental problems persist. In Sweden it is the County Administrative Boards that monitor the state of the regional environment and also play a role in the assessment of regional sustainable development. In the Environmental quality programme of Scania (2003: 4) the Board highlights the following regional problems:

- **Agriculture**: The impacts from the intensive and large scale industrial agriculture in the region, for example leakage of pesticides, eutrophication of inland and coastal waters, loss of biodiversity and other types of pressure on the cultural landscape.
- **Traffic**: The negative aspects of the heavy traffic in the region such as emissions to air, water and soil, crowdedness, noise and dangers to health and safety.
- **Chemicals**: The diffusion of hazardous chemicals, or other possibly dangerous compounds, into the environment from all sectors of the society, for example from consumer products, waste, and sludge.
- **Landscape exploitation**: The total impacts on the landscape from human exploitation including urban infrastructure, a relatively dense population (at least in a Swedish comparison), a far-reaching transport network and a large-scale agricultural sector. These impacts consist for example of loss

[44] These local objectives, at least up to 2008, correspond to the national environmental quality objectives listed in table 1. This may be subject to change in programmes to come. This discussion is based on the Environmental programme of 2003-2008.
[45] These 14 areas correspond to the 16 Swedish environmental quality objectives, except for the objective on Mountain landscapes, which is irrelevant for Malmö, and the most recent addition to the national list, 'A rich diversity of plant and animal life', which is not included in this programme.
[46] These judgements are a popular summary of a large process of evaluation of the environmental status in comparison to the objective areas. For the whole picture, see the Environmental reports of the City of Malmö (e.g. 2008, 2009).
[47] The areas with 'Progress uncertain' concerns e.g. local urban air-quality, acidification, toxification, radiation, groundwater quality, wetlands and built environment.

of biodiversity and threats to natural and cultural landscapes including cultural heritage.

In the case of Malmö, the biggest urban area in Scania, these prioritized concerns hold rather well for the city level as well (City of Malmö 2009b). The main difference lies in the obvious fact that specific urban issues get a higher weight in the Malmö account than in the regional assessment. While as we have seen the industrially connected problems in many cases have been considerably improved, several and partly new problems connected to modern urban development persist or even increase. The following examples illustrate what is judged as problematic local environmental issues in today's Malmö (ibid.):

- **Urban air quality**. Even though several polluters have decreased on a general level, national air-quality norms for nitrogen dioxide (NO_2) are exceeded on a regular basis at several sites in Malmö. This is mainly caused by local traffic emissions and contributes to the pollution of air, water and soil and acts as a hazard to health. Also, low level ozone (O_3) and air particles occasionally show increasing levels but stay within air quality norms. Even if the times of urban smog are gone one can conclude that the air quality standard for some sites in the city centre does not meet environmental and health based requirements.
- **Traffic situation**. In the whole region commuting has increased not least due to the improved connections to Denmark and its capital Copenhagen via the Öresund bridge (Scania County Adminstrative Board 2007: 66). Heavy goods traffic and other transit traffic also show a steadily growing trend. In Malmö, even if more environmentally friendly alternatives like bike, pedestrian and public transport are increasing their share of total transport, the car is still the dominant mode of conveyance (City of Malmö 2009b).[48] The traffic situation may perhaps look quite harmless compared to other world urban centres, but many residents experience it as a source of pollution, noise, insecurity, and crowdedness.[49] More than 11 000 residents in Malmö have an indoor environment where the environmental quality objective levels of 35 dBA are exceeded. In total, at least 50 000 inhabitants are in some way or another negatively affected by traffic noise in their indoor environment.
- **Contaminated soil and ground water and the use of chemicals**. Even if the levels of several chemicals and heavy metals connected to the industrial era have decreased, many threats are still present as these compounds are accumulating on a long term basis in the ecosystems including in the living organisms. In the city area of Malmö, ground water quality shows increased levels of hazardous chemicals and soil remediation is often necessary when redevelopment projects are planned. In addition, the City Environmental department points at a general

[48] Although a recent survey (City of Malmö 2009c) points to a trend of a decreasing total share of car driving compared to alternatives (from 52% in 2003 to 41% in 2008). However, car is still the dominant mode of conveyance in all types of travels except for school transports where bus and bike are larger.

[49] In a project called 'The Malmö panel' (*Malmöpanelen*), around 1600 residents are regularly given questions by the City of Malmö on the city development. In the first panel round, air quality was mentioned as one important problem to solve. More info at: http://www.malmo.se/panelen.

knowledge gap when it comes to judging the amounts of, and potential effects of chemicals and heavy metals accumulated in the urban structures and ecosystems for example PCB in building materials and compounds that may be carcinogenic or act as an endocrine disruptor.

- **Eutrophication and linear flows of phosphorous**. Although sources of nitrogen (N) and phosphorus (P) leakage have diminished due to for example better sewage treatment and fertilising strategies, these emissions are still a problem. Phosphorus demands special attention as it is a non-renewable resource essential to food production and the metabolism of all living organisms including the human body. Eutrophication is a persisting problem in inland water (streams and lakes) and also in some coastal areas. Due to the time lags and accumulation effects in the nutrient chains of the ecosystems, and also because the origin of these emissions lie in many sectors of the society (including non-Swedish sources), no clear improvements in the trends are yet to be seen.
- **The landscape threats from urban activities**. In the case of Malmö one prime concern is the pressure that a growing population and economy puts on the surrounding landscape. Only in some fifteen years (since 1995) more than 1/6 of the agricultural land areas of Malmö have been exploited for other purposes (City of Malmö 2008a: 34). Organic farming is practiced only on around 4% of the total agricultural land in the municipality. Even if the ambitions of nature protection are generally very high, as mirrored in the EQO's, the pressure on the landscape is fundamental. In the area of Malmö many biotopes, including rare species of fauna and flora, are either gone or under threat. Efforts are made to protect and reconstruct wetlands, for example, but one must keep in mind that this is from an extremely impoverished level. Larger areas of forest are on the whole non-existent in Malmö, which is totally dominated by urban structures and agricultural land. The coastal areas including Öresund are subject to ambitious environment monitoring but threats such as oil spills from shipping in transit are permanently present.

To conclude, in taking a place based perspective on Malmö a picture is given of an urban area still confronted with many problems, old and new ones, but at the same time of a city where important trends of local environmental pollution have been halted or even reversed. Taking a 30-years perspective, one may well argue that that the general environmental standard has been clearly improved seen in a local and place based perspective. In addition, one could further argue that the environmental problems are today subject to efficient monitoring and ambitious target setting aiming at coming to grips with the remaining local problems in line with the national environmental quality objectives. In this view, while a lot certainly remains to be done, the City seems to be on the right track towards an ecologically sustainable development.

A system based sustainability approach

One may argue that for several reasons a place based approach does not give a comprehensive sustainability assessment. Firstly, many activities connected to the urban metabolism are not easily located within specific geographical borders as for example international flight and shipping. Secondly, many environmental problems of today are not primarily local in their nature but are connected to global biosphere responses. The typical example is of course climate change caused by greenhouse gas emissions. Further, the ecological burden of one geographical area may be very – and in some cases extremely – shaped by its production sector, and may not mirror the activities of that area in general. A relevant example for Malmö is that when a fossil gas-fired power and heating plant is now established in the harbour of the city, the greenhouse gas emissions will drastically increase, making the local climate statistics look worse. But at the same time, at least according to the arguments of its advocates, the plant will replace older coal-based production on a regional level and thereby lower the total emissions (cf. p. 109f). The main argument against a place based sustainability approach, however, is that our societal metabolism – and by this I mean the total material and energy throughput to cover human needs (and desires one should add) and to produce and reproduce infrastructure – is essentially global in its nature. For example, one can find very clean and healthy environments but where the inhabitants' consumption patterns indirectly cause a heavy ecological footprint. The lifestyle of this population thus relies on material extraction, energy consumption and environmental impacts in other parts of the world, a phenomenon called *environmental load displacement* (cf. Hornborg et al. 2007b).

As argued by many researchers, as well as NGO's, another way of depicting the socio-ecological system is therefore to pay attention to global production, consumption and trade patterns (cf. Global footprint network 2009). We can call this a system based view or an indirect, global or consumption based approach. What is in focus when assessing urban sustainability is here the impact from the total consumption, irrespective of where the different parts of the production chain and the environmental impacts from it are located in time and in space. For example, the energy consumption of a typical urban region is connected to the extraction, refinement, distribution and consumption of fossil fuels, of which the socio-ecological consequences are spread all over the world including as waste molecules into our biggest global common, the atmosphere. The consumption based approach focuses on the total lifecycle of goods and services but puts the price tag at the stage of final demand which can be either private or public consumption. The most important difference is that in a system based approach attention is paid to the consumption patterns and the lifestyles of a given population, rather than to the production sectors or the place-specific characteristics of a certain area.

Ecological footprints as example

As the purpose of this chapter is to illustrate a general perspective rather than to examine different methodologies in detail, I will here only point to some examples of the system based approach. I will exemplify with figures for the local case as far as possible, but as this approach is yet less developed than the territorially based statistics, I will also use national and other relevant figures to illustrate the case of Malmö. The first example of a typically system based approach is the methodology of *Ecological footprints* (EF), which was developed by Mathis Wackernagel and William Rees (1996; Wackernagel et al. 1999). The Ecological footprint measures humanity's demand on the biosphere in terms of the biologically productive land and sea areas required to provide the resources used and to absorb the waste generated (WWF 2008).[50] A nation's (or a city's) footprint is the sum of all the cropland, grazing land, forest and fishing grounds required to produce the food, fibre and timber it consumes, to absorb the wastes emitted from energy use, and to provide space for its infrastructure, regardless of where these areas are located on the planet. In 2005 the global EF was *2,7 global hectares per capita* (Global Footprint Network 2008).[51] A global hectare (gha) is a hectare with a world-average ability to produce resources and absorb wastes and is yearly estimated by the GFN and used in the standards of the methodology.[52]

The single largest demand humanity puts on the biosphere, around half of the total EF, is the so called *Carbon footprint*. In the GFN framework this component represents the bio-capacity needed to absorb CO_2 emissions from fossil-fuel use and land disturbance, other than what can be absorbed by the oceans.[53] In the general debate the concept is however often instead used denoting tons of emissions per capita, that is, not an area measure.[54] For the purpose of clarity, I will in this text note when I use Carbon footprint as related to the GFN methodology and when referring to consumption based emissions per capita. On the supply side the total bio-productive area on a planetary scale was estimated to *2,1 gha per capita* in 2005. Humanity's footprint thus exceeds the Earth's total bio-capacity by around 30% and is growing. This overshoot implies an overexploitation of the ecological systems and a depletion of natural resources and may result in impaired bio-capacity and/or irreversible loss of ecosystem services.

[50] The general description of the EF, including the Carbon footprint, has been taken from the WWF's Living Planet Report (2008). For an overview of the concept of EF please visit http://www.footprintnetwork.org. The EF methodology has been celebrated for its strengths as well as criticised for its weaknesses and is subject to a continued development. For critical comments see e.g. Moore (forthcoming) or Marcotullio et al. 2006: 286, 315 ff.
[51] All EF data are taken from the Global Footprint Network 2008.
[52] More specifically, the global hectare is normalized to the area-weighted average productivity of biologically productive land and water areas on the planet in a given year.
[53] The Carbon footprint is thus partly a hypothetical figure since contemporary CO_2 emissions from fossil fuel burning are not absorbed by the Earth's land ecosystems but are accumulated in the atmosphere.
[54] There is an ongoing debate concerning the concept of 'Carbon Footprint'. See e.g. the comment in Global Footprint Network 2008: 75 and at footprintnetwork.org (01/05/10).

There is a clear North-South divide apparent in the EF statistics. High-income countries have an average EF of 6,4 gha per capita, middle-income countries 2,2 gha/cap and low-income countries only 1,0 gha/cap. As an example, the average US citizen has an EF of around 9,4 gha, the average European Union citizen one of 4,7 gha, but the average Chinese and Indian citizen only 2,1 and 0,9 gha respectively. Even if many high-income countries have abundant natural resources and a high bio-capacity, as for example Sweden, it is evident from both the global nature of the Carbon footprint and the typically large proportion of imported goods into their consumption portfolios, that their area requirements and environmental impacts do not stay within their own borders.[55] This must thus also be the case for a typical European urban region, such as Malmö. We may expect that the metabolism of such urban economies is not only connected to the exploitation and degradation of their own environment but to a spatial displacement and a temporal diffusion of impacts. As consumption levels have increased, following general GDP growth, the throughput of material and energy and the total environmental burden has reached a level that is by many judged as unsustainable (cf. Steffen et al. 2004).

The Ecological footprints of every nation in the world are calculated each year by the Global Footprint Network. In 2005, the Ecological footprint for Sweden was estimated to *5,1 gha per capita*. The exact figure of the EF for Malmö is so far not calculated but is at present subject to investigation.[56] It should be noted, that the Swedish EF figure has recently been subject to a revision when it was decided that nuclear energy should be omitted from the international footprint standard (Global Footprint Network 2008: 30 ff). If nuclear energy would be included, the Swedish figure would increase with some 20%.[57] In my example below I use EF figures with the nuclear energy footprint excluded, but I will note the figure with nuclear energy included as it was part of the calculations of the study in question.

[55] Of course, all high-income countries do not have a high bio-capacity or a high import share of their economy. In the case of Sweden it is both an import- *and* export-oriented economy. The share of imported goods in private consumption, as well as in public consumption and investments, is relatively high (konj.se 04/05/09). See also Edman 2005 for a discussion on Swedish private consumption in a sustainability perspective.

[56] A software tool called REAP (*Resource and Energy Analysis Programme*), for assessing local Ecological footprints as well as other consumption based statistics, is currently developed in a Swedish context. Some preliminary findings will be discussed in the section on consumption based carbon emissions below.

[57] This fact points to an important discussion on the strengths and weaknesses of aggregating many different factors into one single indicator (cf. Hermele 2009). To convert nuclear energy into an area demand – a 'footprint' – may be seen as helpful to get a coherent view on society's resource requirements. This energy type does however not easily translate into *area* requirements, and one may argue that the critical sustainability issues connected to nuclear energy are essentially of a whole other type. In this study I do not go into further details on nuclear energy, but I note that in the case of Sweden (incl. cities as Malmö or Gothenburg) this revision has a stark influence on the total figure. Wrongly interpreted, this revision may give the impression that there has been a great improvement of the sustainability status of Sweden in recent years. It is further important to keep this revision in mind when comparing the Swedish figures with the international ones.

As there is not yet a detailed figure of the EF for Malmö, I will use a study of another city in Sweden to give one example. It should be noted that these findings are still to be viewed as preliminary as consumption based assessments on a local scale are still in an early phase of development. The study is taken from Gothenburg, the second biggest city of Sweden located on the southwest coast and with some 500 000 inhabitants. Gothenburg is bigger than Malmö but with fairly similar climate and development paths and I thus find the comparison reasonable.[58] In this study made by the Environment department of the City of Gothenburg (2007) the local EF was estimated to around *4,2 gha per capita* in 2002, or to 5,5 gha/cap with nuclear energy included. As a comparison to the GFN figure above, the aggregated EF for Sweden was estimated to 6,7 gha/cap in 2002 in this study, including a nuclear energy footprint of 1,5 gha.[59] Two other smaller Swedish municipalities were also estimated, Robertsfors and Luleå, and their EF was 4,7 gha and 4,5 gha per capita respectively (6,3 and 6,1 gha with nuclear energy included).

As we can see, Gothenburg thus had a slightly lower footprint than the two smaller and more rural municipalities, which may be a consequence of the more dense structure of bigger cities allowing for lower average travel distances, more developed public transport systems, relatively efficient district heating systems, etc. However, this higher density of an urban structure probably also means that it is more dependent on the appropriation of spaces outside of its own land area for its consumption of material and energy. We can illustrate this by the following example. Let's make the hypothesis that Malmö had the same Ecological footprint as Gothenburg in 2002, that is 4,2 gha/cap (nuclear energy excluded), and add to that the population of that year of around 265 500 inhabitants (malmo.se 24/04/09). This means that the total appropriation of bio-productive land and water areas from the consumption of Malmö amounted to 1,1 million global hectares, or 11 000 km^2, including areas needed to absorb carbon dioxide from fossil fuel use (the Carbon footprint). This is approximately the size of the whole of Scania.[60] The total area of the Malmö municipality is around 335 km^2.[61] Coming as no surprise, Malmö is thus extremely dependent on areas outside of its own borders, its own area covering only a few percent (around 3%) of the totals required to match its consumption patterns.[62]

[58] Even though Gothenburg has still a significant industrial sector within the municipality.
[59] The results from the Gothenburg study differs slightly from the GFN figures, but the author of the report gives comments on where the findings differ and points to possible explanations.
[60] The land and inland water area of the region of Scania is 11 368 km^2. If adding sea water the total area reaches 17 123 km^2.
[61] The land and inland water area of the Malmö municipality is around 156, 5 km^2 but I here add the sea water area of 178,7 km^2 as the city is located at the coast line of Öresund which ought to be counted as a bio-productive area (Scania County Administrative Board 2007: 67).
[62] I am aware that this is not an exact but rather a very rough estimate as it mixes different measures (global hectares versus 'local' hectares). As the bio-capacity of the land and water areas of Scania is relatively high the region will count as larger when measured in 'global hectares' than in 'local' hectares. I have however not gone further in detail as the purpose is only to show a general tendency, namely that modern urban areas are entirely dependent on peripheral areas.

Of course, one should be aware that this whole example is a very hypothetical one, since a typical European urban structure does not have the kind of bio-productive qualities needed for biological production and assimilation in any case. One could further argue that the appropriation of areas outside of its own borders is a natural part of what an urban structure is, and perhaps, can be. In this view, the dependence on peripheral systems is an inevitable part of the metabolism of a city, in present times as well as historically, even if this dependence certainly has taken new proportions by the emergence of modern urban centres.[63] The concentrated nature of an urban structure makes it first and most a *consumer*, although to a larger or smaller degree. While there are of course other ways of conceiving this relationship,[64] I think that one should not judge it a problematic thing per see that urban centres are dependent on peripheral areas. But the whole question becomes another considering the contemporary trend of urbanization with a steadily increasing demand on global bio-capacity. Then it is no longer a question about matching surrounding production- and assimilation capacity of regional hinterlands, but about a system with large socio-ecological inequalities and in an expansion overshooting the Earth's total bio-capacity.

Consumption based greenhouse gas emissions

The second example of a system based approach concerns greenhouse gas emissions caused by the average Swedish consumption patterns including, I here assume, the case of Malmö.[65] In a report from the Swedish Environmental Protection Agency (2008) a production versus a consumption based approach is discussed for three greenhouse gas emissions: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The result is illustrated in figure 11. As we can see, the production based emissions totalled around *76 million tons of CO_2 equivalents*, including air and sea transports and the production of exports. In a consumption based perspective, the export-connected emissions are to be excluded (24 Mtons CO_2e) while the emissions from manufacturing and transportation of imports are to be added (43 Mtons CO_2e). Swedish consumption in 2003 altogether caused greenhouse gas emissions of *95 Mtons CO_2*e. This equals around 10 tons CO_2e per capita which is allocated between private consumption (around 80%) and public consumption (20%). To put this figure in perspective, it has been estimated that the emissions of an average Swedish consumer needs to decrease to half of the present level in 2020 and to a fifth in 2050 if they are not to exceed the desirable trend in global per capita emissions (ibid.: 13). The conclusion from the Swedish EPA study is that the greenhouse gas emissions are at least 25% higher from a consumption based than from a production based perspective. The report underlines that what is described is only

[63] This was discussed already by Marx by the concept of *metabolic rift* where the relationship between urban centres and its rural hinterland and, more generally, the relationship between man and nature was problemized. See e.g. Foster (1999) and Moore (forthcoming).

[64] In my interviews I have come across ideas of high tech bio-productive areas and energy production within dense city areas, for example by advanced solar and wind power installations, vertical agriculture (plants and/or animal farms) and biotechnological production of biomass.

[65] Here I will first use average Swedish figures as a basis for a general reasoning that should apply to Malmö to some degree. A detailed analysis of Malmö greenhouse gas emissions using a consumption based approach is currently being carried out and I will give some indications on the preliminary findings below.

orders of magnitude and that there are large uncertainties, especially concerning the consumption related emissions from non-EU trade, which is probably underestimated (ibid.: 25 f; see also Carlsson-Kanyama 2007). Thus it is very likely that the consumption based emissions are even higher.

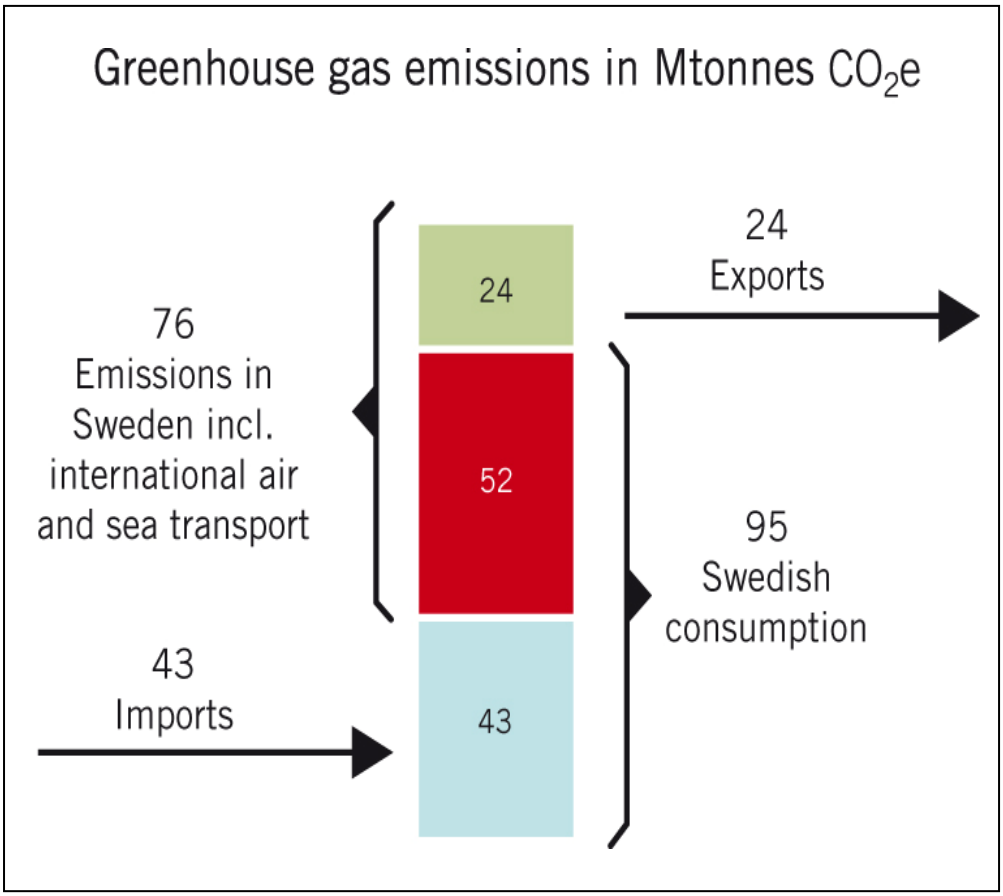


Figure 11. Swedish greenhouse gas emissions in 2003 (Swedish Environmental Protection Agency 2008)

Another initiative showing the magnitude of consumption based emissions is by the *Resources and Energy Analysis Programme* (REAP), developed by the Stockholm Environment Institute (SEI).[66] REAP is a software tool including a database and a scenario editor that is able to generate indicators showing the total impacts of the consumption activities of individuals and households within a given geographical area (SEI 2008; Paul 2010). Among the indicators that so far have been developed within the programme are greenhouse gas emissions and other air pollutants, Ecological footprints, emissions of heavy metals and some other examples of material flows. REAP was first developed in a British context but is now adapted to other countries and regions, among them Sweden. The scenario editor included in REAP can be applied to a wide range of policy areas including energy, transport, food, housing and physical planning. After its final development and local establishment, REAP scenario-based planning may gain increasing importance at the municipal policy level of Malmö and other cities in Sweden.

[66] For more information about REAP please visit: http://sei-international.org/?p=publications&task=view&pid=1534.

In a joint project between SEI, the World Wide Fund for nature (WWF) and some Swedish cities, including Malmö, the Carbon footprint measured as consumption based CO_2 emissions at national, regional and local levels have recently been subject to calculations.[67] The figures presented for Sweden (2004) are in line with the EPA-estimate above, showing according to a preliminary analysis that the import component of the Carbon footprint is around 50% (SEI 14/04/10). Out of the estimated total figure of 11 tons of CO_2 per capita, around 60% originates from household consumption (13% direct and 46% indirect emissions). The remaining 40% is distributed between other transports, government consumption and capital investments.

Turning to the local level, the household based CO_2 emissions were estimated to around 6 tons per capita for Malmö, a figure a little below the average national household level of around 6,5 tons. One should note that this household indicator can not directly be compared to the *total* per capita figure for Sweden mentioned above (11 tons per capita), as a part connected to national and government level emissions is here omitted.[68] The household's emission level from the Swedish municipalities range from around 5,5 up to some 9 tons per capita in this survey. The general picture is that urban regions in the South, and especially those with lower per capita income,[69] have lower emissions while the more rural and larger municipalities in the North have a higher figure. Besides evident explanations to this such as the climate aspect and the longer travelling distances in the North, these findings are now subject to further review and analysis. Out of the total household based emissions of Malmö, around 28% belong to transports, 22% to housing/energy and around 16% to food and drinking.

Once again, it is of course important to put figures like these in perspective. If we keep in mind the assessments made on the global and long term demands on per capita reductions – in the case of carbon dioxide from contemporary 10 or 11 tons per capita (in total for Sweden) to perhaps around 2 tons in 2050 – we are reminded of why there are good reasons to judge for example the Malmö household figure of 6 tons per capita as, although *relatively* low, still far from sustainable.

[67] Please note that these figures are still preliminary and are now subject to further analysis.
[68] To proceed from the household based figure to the average Swedish per capita figure one must add a national component that belongs to emissions from e.g. the state sector and capital investments. These sectors, including 'other transports', add up to some 40% of the total Swedish Carbon footprint (SEI 04/14/10).
[69] This reminds us that the ecological footprints are closely related to income levels. See e.g. the conclusions from a recent study by UNEP's International panel for Sustainable Resource Management (2010) or a case study on Canada by Mackenzie et al. (2008).

4. Urban sustainable development: a dominant discourse

What I like with Malmö is that
it's a little rock 'n roll.
Interview person

Getting into the field

How do local actors involved in different kinds of policy making view urban sustainable development? How do politicians and officials meet the sustainability challenge? As stated in the introduction of the thesis my ambition is to take a step further from only describing the urban sustainability dilemma in an abstract and distanced way. Instead I intend to bring the issues with me into the social context of Malmö and to take part in the ongoing dialogue on urban sustainable development. I will here probe a more participatory and action-oriented research approach, trying to climb down from the 'ivory tower' of science and staying close to the field and to the actors of the local context.

This chapter aims at giving a picture of the contemporary discourse on urban sustainable development in Malmö: tensions as well as convergences, conflicts as well as cases of consensus. Besides pointing at some general features, I will pay extra attention to the issue of a place based versus a system based sustainability approach. That is, I want to mirror the discussion in the former chapter with the view of the local actors. Are these people, engaged in local policy making, aware of the tensions between a locally based and a global and consumption based approach? If so, how do they judge the scope of local policies for urban sustainable development? What should, and can, a City like Malmö do?

During the spring of 2009 I have conducted an interview study as part of an introductory survey of my research field (March-June). In total 16 interviews have been done with actors connected to urban sustainable development in one way or another. The interviews took place at the participants' offices and each lasted around 40 minutes. All interviews, expect two, were recorded and in all of them careful notes were taken.[70] In addition to some 5 semi-structured questions or themes, which are listed in appendix 1, I also included a small questionnaire the results of which may be discussed in quantitative terms. This field study has been basically qualitative in its nature, as the principal aim is not to gain quantitative results but a deepened understanding of a social context. The persons interviewed represent the highest political level in the city (City executive board) and relevant positions, often directors, at the City administration level and other public bodies:

[70] Due to practical or technical reasons two interviews were not recorded. Careful notes were however taken. The files with the recordings are stored safely and form part of the empirical material of this thesis. As I have made in total some 30 interviews to accomplish this thesis, the material is quite heavy and I have made the choice no to make a transcription of the material in its totality. Instead I have picked certain quotations and in other cases I have made a summary of the persons' accounts. This is of course one limitation but due to time restrictions a necessary choice in this first part of the research project.

- Local Government Commissioners from the Social Democratic Party, the Conservative Party, and the Green Party [71]
- City Office
- City Planning Office
- Environment Board and Environment Department
- Department of Internal Services
- Trade and Industry Agency
- Street and Parks Department
- City District Departments
- VA SYD (water supply, sewage treatment and waste management)
- Malmö University

As the scope of the survey is quite limited, the results will only give some directions and questions for further research without any aspirations to make general statements about the opinions in Malmö. Further, the purpose is not to mirror the exact statements of different actors, and therefore I do not name persons when referring or quoting. All interviews were done in Swedish and so the material has been subject to the author's translation. The result from the questionnaire is presented in tables 2-3 with capital letters marking the different questions. The empirical material from this interview study, including the analysis of the questionnaire, will now serve as a basis for some reflections on Malmö and urban sustainable development with the place based and the system based approach in mind. But first, some elaboration on two concepts that are important for this study.

Discourse

Discourse is often loosely connected to 'conversation', 'debate' or 'societal discussion' but its Latin root *discu'rsus* originally stands for something that is 'running to and from'.[72] Other ways to conceive of discourse is to view it as the 'fibres' permeating our perceived reality or as a 'dictionary': the language available to us in a certain context.[73] The concept is applied in many academic contexts and two prominent examples are that by Foucault (1971, 1982), where discourse is a rule-governed structure rooted in power relations organising social practices, and another that by Habermas (1984, 1987), who uses the concept in connection to a theory of argumentation in his writings on 'communicative action'. Here I will mainly follow the work of Foucault, viewing discourse as a social practice including language as well as actions and materiality, which produces meaning and order. Below, I will first describe some main features of the discourse concept that I will here adhere to and then I will exemplify why it may be suitable for research on urban sustainable development.

[71] Malmö is governed by a left wing majority in cooperation with the Greens. The City Council Election in 2006 gave the Social Democrats 38%, the Conservative Party 25%, and the Green Party around 6% of the votes (cf. p. 24).
[72] This translation was chosen by a search on the Internet. In the Swedish Encyclopaedia (1991) *discu'rsus* is translated to 'kringlöpande' in Swedish.
[73] The fibre metaphor was chosen with inspiration from a seminar with PhD candidate Carl-Johan Sanglert who used it in the context of the landscape protection discourse with reference to M. Winther Jörgensen and L. Phillips.

Structures constituting our reality

What characterises a discourse, and what makes it so powerful? A discourse is a kind of structure – or we may call it praxis or matrix – governed by powerful autonomous practices of which we are all included and which constitutes a 'significant impacting social system' (Höög 03/04/08).[74] Discourses shape our thoughts and influence our perceptions, and thus set the limits to reality as we know it. Our lives are by no little degree channelled through the frame of different discourses including for example politics, economics, law, health, and gender. In the most radical interpretation of discourse the agent/subject is ruled out as structure and context supersedes any intentional source. A more modest interpretation of discourse is to acknowledge that there are several and different discourses, and the hegemony of one may be replaced by another, and there is a constant struggle over dominance. The agent in that perspective is not only shaped by the discourses but may play an active part in forming and transforming them. This is the position that I will take in my studies on the contemporary development of Malmö.

Power, knowledge and science

Intimately interwoven with the discourse concept is the recognition of power. According to Foucault power is relational and always present in all kinds of human relations. During history there have been different dominant power structures, but with Enlightenment and modernity these structures have become increasingly complex. What Foucault sees is no longer a specific source of power, but a modern system of disciplinary power permeating the whole society and the mind and body of all of us. This 'bio power' does not imply brutal domination and oppression, but a controlling system based on supervision, education, examination, and 'normalization'. As individuals we are not coerced but rather educated, raised and cared for by this system. Interacting with the individual's self forming processes, most of us are unconsciously – and even happily – normalized, the result of which is modernity itself. At the basis of the modern power structures are some fundamental techniques of control:

- *Exclusion*, such as the formal or informal rejection or prohibition of certain ways of talking, behaving, etc.
- *Division and dividing*, for example the division between statements based on 'science' and 'lay man' statements.
- *Truth coercion*, differentiation of what counts as true and false and of whom may be listened to, and not listened to, as telling the truth.

Further, knowledge and power are not independent but they are articulating each other: 'in knowing we control and in controlling we know' (SEP 2008).[75] Instead of seeing the Enlightenment as the liberation of man from authorities and power structures, Foucault sees new and refined forms of control and suppression taking over. The modern rationality is at the very heart of this process, and science is the

[74] The section on discourse was written with inspiration from a lecture in Philosophy of Science (VEKSAM) with Victoria Höög at Lund University in 2008.
[75] Stanford Encyclopaedia of Philosophy, article on Michel Foucault, quotation with reference to Foucault's work *Discipline and Punish: The Birth of the Prison*.

prime example of the fusion of power and knowledge. With its main tendencies of examination, classification and organization, science exercises the modern techniques of control itself. Presenting itself as a neutral promoter of universal truths, the fact is disguised that science actually is a result of contingent historical forces and expressions of specific ethical and political judgements.

As power is inherent in all human relations there is no way to totally get rid of power structures. But it is possible to become aware of them and one way of doing that is by discourse analysis, the specific methodology derived from discourse theory. I will not go into details of Foucault's archaeological and genealogical methods or the developments of discourse analysis connected to the field of sustainable development (cf. Hajer 1995; Dryzek 1997). Suffice it to say is that they aim to uncover the invisible structures of a discourse in a specific historical context, such as to lay bare the ruling metaphors and the formal and informal rules guiding norms, values and behaviour and to uncover the unspoken rules governing legitimacy, authority and trustworthiness. This approach implies a general view of history that is contextual in the sense that what dictates one discourse may vary radically from one historical context to another – as exemplified in Foucault's famous work on the history of madness (1961).

Discourse and sustainable development

Sustainable development is today a buzzword used by a horde of actors: politicians, economists, business people, NGO representatives and the man on the street. With the rise of the climate issue it has attained increased attention, and the struggle over the interpretative prerogative has sharpened. Different groups claim different 'truths' concerning for example what sustainable development really means, what the vision of a sustainable society is and what changes are needed to counteract the unsustainable trends of modern society. The discourse on sustainability is now on the desks of the highest politicians as well as on every person's kitchen table. To understand the concept of sustainable development, and why it has gained increasing power, discourse theory seems a promising approach. In my view, discourse theory may be especially rewarding in highlighting the following critical aspects of sustainability research:

Increased self awareness and critical self reflection
Discourse theory as outlined by Foucault is a permanent reminder of the need to be self aware and self-critical. As each and everyone is part of powerful discursive structures, we should pay close attention to our own line of thinking and acting. What do we as researchers encounter as reasonable, reliable, and relevant information – and what do we exclude? Especially that which is sorted out, the deviating, the abnormal, should be carefully reinvestigated. We should also be constantly aware of the roles of researchers as part of the power containing structure of modern science.

Attitude to 'truth'
Essential to discourse theory is a relative rather than an absolute definition of truth. What is considered the truth – and opposite, the false – is shaped by contingent historical forces and moulded through complex structures of power relations. Discourses produce 'truth effects' not truths. As researchers on

sustainable development we may use this insight to be able to see the very many 'truths' that exist in parallel and that aggravates constructive communication and problem solving between stakeholders.

Attention to structures and power
Applying discourse theory necessarily involves a critical attitude to existing social institutions. Power structures are not surprisingly at the very heart of sustainability issues. Without resorting to the position of a totally disarmed subject, saying structures rule everything – one can develop an awareness of the powerful discourses surrounding us and their socio-ecological effects. We must be able to critically examine what is perceived as 'normal' and self-evident, and to scrutinize the origin and motives of the disparate voices in the sustainability debate.

Ecological modernization

The environmental debate has changed. In the movements of the 1960's and 1970's capitalism and the present world order was often seen as incompatible with environmental protection and, also, with social justice. The logic of capitalism, and especially the demand for endless economic growth, was seen as inherently contradictory to the preservation of nature and natural resources. Today, there are instead many voices arguing for win-win solutions and for the synergies between economy and ecology. The environment is now to be saved by those who where formerly seen as its enemy. Instead of revolution and radical system change the current society should engage in a step by step process of ecological reforms. The successful result of many small actors developing their activities in environmental friendly ways is not only to the benefit of the ecosystems – but to the economy as well. The business as usual is not to be wiped out, but instead adapted to the mode of sustainability.

This new line of thinking began to gain ground in the 1980's and arguably established itself with the Brundtland report and the UN agenda on sustainable development. The academic society was not isolated but an active part in influencing the course of events. At a general level, and with Foucault in mind, the breakthrough of this paradigm can be considered against the background of the special interests and the ideological and political intentions of different power constellations. In the late 1900's, the general ideological outlook was one in which the western capitalist system dominated the scene more or less alone. The failure of Soviet union power and other alternative ways of organizing societies could be seen as verifying the superiority of the current system and dismissing the possibility of any alternatives.[76] In the environmental context, many were also disappointed with the poor achievements of the nation states in response to the strong critique from the 1960-1970's (Mol and Jänicke 2009: 18).

In this environment, a model of thinking emerged that may be summarized by the concept of *ecological modernization theory* (EMT). It has its roots in environmental sociology and was developed in a West European context

[76] One much discussed example of such position is Francis Fukuyama's *The End of History and the Last Man* (published in 1992, based on an article from 1989).

beginning in the 1980's (ibid.: 17).[77] Labelled as the 'sociology of environmental reform',[78] some leading EMT scholars write that (Mol et al. 2009:3):

> Strongly driven by empirical and ideological developments in the European environmental movement, by the practices and institutional developments in some 'environmental frontrunner states', and by developments in private companies, some European social scientists began reorienting their focus from explaining ongoing environmental devastation towards understanding processes of environmental reforms.

Ecological modernization theory had already from the beginning a strong connection to policy and praxis, something that one may argue is still the case. It can thus be seen as both a descriptive-analytical theory and prescriptive-normative project (Mol and Jänicke 2009: 23). In any case, EMT has proven successful in reaching out into a wider academic context, as well as establishing itself as a keyword in the sphere of politics. In a popular context, ecological modernization is alternately treated as a policy strategy, a term for denoting the modern environmental debate and an analytical concept connected to academia. Summarizing the academic achievements of EMT, it has opened up a new field within social theory by systematic studies of institutional environmental reform; innovated theoretical concepts on the relation between society and environment (e.g. *political modernization* and *ecological rationality*); elaborated new approaches to policy and practice; and it has contributed to the globalization of general social theory (Mol et al. 2009: 502 ff). What does ecological modernization, then, stand for?

Change from within

In short, ecological modernization theory argues that the former ecology-economy divide needs to (and can) be transcended (ibid.: 7). Instead of seeing contradictions the advocators of EMT sees industrialization, technology, economic growth and capitalism as not only compatible but also as potential key drives for environmental reform (York and Rosa 2003: 274). By internalising 'externalities' into the functioning of the market and the political system, and by a strong focus on technological but also on social innovations, sustainability may be developed from 'inside'. Central to EMT is to rethink state-market relations and the scope for environmental reforms within the existing framework of modern welfare states and a market-oriented economy (Mol and Jänicke 2009: 19 ff). Technological and scientific innovations are key elements. However, in most cases it is not a naïve belief that technology will save us all but rather a balanced view of technological achievements paralleling social and institutional reform. For example, in creating a sustainable waste management system one needs to innovate along the whole lifecycle chain: from the origin of waste production to the different systems securing efficient recycling and management procedures.

[77] According to Arthur P.J. Mol and Martin Jänicke (2009: 17) the concept was first launched by Martin Jänicke in the Berlin state parliament in 1982 (reference to Jänicke 1979; 1984). Another early writer was Joseph Huber (reference to Huber 1982, 1991) who laid the foundations to the 'greening of the industry theory'. Ecological modernization became a central theme in the German environmental policies in the 1990's and inspired a broader European and later international context. In Sweden, Prime Minister Göran Persson's launching of the 'Green Peoples Home' (*Gröna folkhemmet*) in the 1990's is one example.

[78] With reference to Fred Buttel.

Included are not only technological advancements, but management and ownership models, price mechanisms, new roles for state and politics, and institutional and cultural change.

At its fundaments ecological modernization theory should be seen as placed within the 'paradigm of modernity' (ibid.: 19).[79] It follows a reformist trajectory and, although not without nuances and reservations, holds an optimistic view on the premises for change within capitalism and present society-environment relations. In its essence, and contrary to some radical critics, what EMT urges for is not less modernity – but more; the contemporary society must be subject to reforms and substantial change from within; it must be *ecologically* modernized to fit the demands for sustainability. Instead of suspiciousness or even hostility to the intentions of business and other actors in the economic-political spheres, EMT argues for a sense of pragmatism and belief in communication and cooperation for the individual as well as the common good. Arthur P.J. Mol et al. explain (2009: 7):[80]

> To make this 'structural anchoring' of environmental concerns in the market possible, it was necessary to leave behind prior tendencies within organised environmentalism that favoured vitriolic critiques of capitalism and industrialism and focused on making a fundamental break with modernity /… / Environmental futures were not to be 'imported from the outside' but instead developed progressively from within the existing constellation of modernity in a way that reconstructed and redefined extant institutions so that environmental risks and side effects were addressed in a structural manner.

Martin Hajer (1995: 25), another scholar influential in developing the theory around *environmental discourse*, defines ecological modernization 'as the discourse that recognizes the structural character of the environmental problematique but none the less assumes that existing political, economic, and social institutions can internalize the care for the environment'. One result, clearly visible today, is the tendency towards *integration* and *normalization* of environmental interests into almost every actor's agenda. What was before 'green radicals' on the margins of society are now 'sustainability strategists' in large companies and government agencies. Environmental concern is no longer a subject for struggles in the streets but a 'normal' issue at the agenda of national and global institutions.

Critical voices

Not surprisingly, EMT has been subject to strong debate (cf. Fisher and Freudenburg 2001). One topic concerns its assumed 'technological determinism' and emphasis on production processes; another its possible bias towards a West European and social democratic welfare state context; and a third that EMT is seen as weak when it comes to grasp power, conflict and injustice (Mol et al. 2009: 23 ff, 507 ff). Many scholars rooted in traditions within neo-Marxism, political economy, human ecology, and/or inspired by radical green/deep ecology, have come with harsh criticism. In the view of these opponents, EMT fails to attack the fundamental roots of the present ecological crises and thus promotes

[79] With reference to one of the EMT originators, Joseph Huber.
[80] With reference to O. Ullrich and E.F. Schumacher.

superficial and cosmetic reforms. In the worst case, EMT is a sort of 'green washing' as it defends established socio-economic practises to the benefit of the current holders of power. EMT may thus act as a reliever for business as usual and make the current system more immune to 'green' critique and to real change. Ecological modernization theory may also be seen as an elite-centred approach neglecting bottom-up drivers of political change and the capacity of grass-root actors to challenge the structures of late modernity. A common feature of the opponents is that they criticise EMT for not addressing some basic, structural forces behind the global sustainability dilemma which makes it overly naïve/optimistic about the potential for change within the current system.

York and Rosa (2003: 274 f) see EMT as a prominent neoliberal theory arguing that 'continued industrial development, rather than inevitably continuing to degrade the environment, offers the best option for escaping from the global ecological challenge'. With reference to EMT developers mentioned above, they are strongly critical to the position that 'the only possible way *out* of the ecological crisis is by going further *into* the process of modernization'.[81] Instead these authors want to challenge the structural relations and values of modern western society that they see as the very cause behind the global sustainability dilemma. York and Rosa develop three main critical lines of arguments. First, EMT has so far predominantly been occupied with demonstrating cases of *institutional* reform – but less concerned with to what degree *real* ecological improvement has actually taken place. To convince them EMT would need not only to show cases of institutional responses, but their actual efficacy. Second, the advocates of ecological modernization must proceed from a variety of small scale, case based studies to larger scale system analyses showing that improvements are spread and possible to generalise beyond the single case level. Even if there are many small examples of environmental reforms in for example industries and sectors, these authors are not convinced of the capacity of EMT to point to a full scale societal transition. Third, EMT must take a global and system based perspective to prove that local and case based improvements are not only a matter of increasing environmental loads in other parts of the system (cf. Environmental load displacement p. 56). Ecological modernization theorists must increasingly focus the entire (global) economy rather than individual organizations or, even, countries. Fourth, the theory must still prove that gains in eco-efficiency are not only outweighed by expanding total demand in late-modern capitalist economies (i.e. *Jevons paradox*[82]). Contrary to the intuitive conclusion that highly advanced economies of the West are the most environmentally progressive, York and Rosa argues that these high-income countries are actually the ones with the highest resource use and the heaviest ecological burden per capita (cf. Ecological footprints p. 57 ff).

[81] This quotation is given with reference to a work of Arthur P.J. Mol in 1995 with emphases in original.

[82] The proposition made by William Stanley Jevons in his 1865 book *The Coal Question* that technological progress that increases the efficiency with which a resource is used tends to increase – rather than decrease – the rate of consumption of that resource. In contemporary ecological economics this is also referred to as the 'rebound effect'.

Interview study: Voices from Malmö

A dominant discourse

The interviews were introduced with some general questions on Malmö and urban sustainable development. As I wanted to get a picture of different actors' personal views I started with a very open question, that is, I asked something like: "What does the concept of urban sustainable mean to you"? Then, as the conversation had warmed up, I continued by introducing the questionnaire which as you can see in tables 2-3 included three different tasks with in total 13 questions or statements that the participant was asked to respond to. Then I returned to the remaining interview themes (see appendix 1). I will below present the analysis of the questionnaire integrated into the discussion on the other more qualitatively oriented questions.

The first thing that strikes me is the similarity in the way urban sustainable development is viewed upon among the 16 participants. Almost all give a general description which in one way or another refers to the famous definition of the Brundtland report, where: 'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, chapter 2, paragraph 1). For example, one politician chooses to say that sustainable development means to 'think one step further' and to see to that the decisions taken today will 'hold for the future' for example by economizing on resources. An official means that it demands the City to apply an integrated approach on social, environmental and economic issues: 'we have to work with it all together, all of the time'.

Following the Brundtland report and the international UN-conferences of Rio and Johannesburg, the idea of a three-dimensional model of a sustainable development has successfully established itself.[83] The general idea is that there are three basic dimensions – the environmental, social, and the economic – that all must be subject to consideration to secure a continued but 'sustainable' development on a global scale. This dimensional model of thinking is a main thread through the majority of the participant's answers. In many of the interviews it is used as an overarching structure in the way of answering, for example when listing different problems and priorities. To me this indicates how important models for thinking are and how some of them gain influence and become manifest in a social context – and then tend to be taken for granted.

The 'environmental dimension' is often brought up first, expressed for example as managing the environment in a way that future generations can take over. It is further argued that the environmental dimension was attended to first, since it initially tended to be the main focus in the Agenda 21 movement of the 1990's, in Malmö and in rest of Sweden (cf. Forsberg 2002: 81). It was only later that the social and economic dimensions were added on to the sustainability debate,

[83] The Brundtland commission and the following UN conferences were an important part, but of course not the only driving forces, of the successful establishment of the concept and policy view of a global 'sustainable development'. I will here refer to this as the 'modern' or 'mainstream' discourse on sustainable development (cf. Dryzek 1997: 145 ff).

according to some participants. Even if Malmö has a long history of policy making in the field of social and socio-economic issues, it is not until in the last 10 years that the social and economic aspects have become connected to the concept of urban sustainable development. In the eyes of several participants, this is welcomed as crucial to the Malmö sustainability challenge.

Overall, I find a quite strong unity among the participants in stressing a responsibility for the environmental dimension as something self-evident or indisputable. It is as if the environment is not an area of conflict at this general level of discourse; of course it must be taken care of. As we shall see, this is not the same thing as saying that there is agreement on exactly *what* is to be done to guarantee the prosperity of the environment. Rather, I think, it shows how successful the environmental 'input' to the sustainability discourse has been in the last 20-25 years, putting the 'environment' on a pedestal, at least in a vague and general sense. It would certainly be extremely difficult to find someone among the higher-level policy makers in Malmö claiming that the environmental dimension is unimportant or irrelevant. This consensus is probably also due to the fact that social and economic issues are classical areas of ideological conflict. The environment may perhaps be regarded as an 'easier' topic to handle – at least so far.

If there is a general commitment to the environmental dimension, I find considerably vaguer and more disparate answers when it comes to a 'socially' or 'economically' sustainable development. Even if welfare, culture, integration and other keywords are mentioned, there is uncertainty and the impression is that sustainable development tends to include everything that is judged as 'good' for the society in the eyes of that person.[84] In the task of defining a socially and economically sustainable development, we are also moving into more delicate political grounds. While some suggest social equity and general welfare, others stress the importance of securing good terms for business and a high quality infrastructure of the city to meet the demands of a modern 'Knowledge city'. In this context, the 'attractiveness' of the city is further mentioned as one important and overarching goal that runs in parallel with that of an urban sustainable development. What exactly an 'attractive' city is, is not totally clear but in the view of one participant it could be things like giving a strong 'impression', to have a 'character', to offer experiences and places to meet and come together, and a city that sees to security, comfort and well-being. This discussion on 'attractiveness' is closely connected to the values put forward when supporting Malmö as a 'Knowledge city' in development. In the case of the economic dimension, and at the level of the general discourse, I have earlier discussed how the concept of 'sustainable growth' has offered a relief to some of the most apparent conflicts in the three-dimensional model of sustainable development (Andrén 2005). The belief in 'sustainable growth' is manifest among the majority of the participants, although not completely without expressions of uneasiness and doubts.

[84] This reflection is inspired by a LUCSUS seminar in March 2007 with Paul Ekins who, in a slightly humoristic way, suggested that the contemporary definition of sustainable development has boiled down to include everything that in one way or another can be viewed as 'nice'.

A three-dimensional balancing act

What is the relationship between the three dimensions then? Here we are once again reminded of the strong similarity to the discourse of the UN-agenda and the establishment of the concept of 'sustainable development' at a global level. The relationship is thus generally described as one of 'interplay', the three dimensions mutually supporting each other but also conflicting to some extent, one important task for politics thus being to monitor the progress of them in a well-balanced mode. Urban sustainable development is about managing and balancing resources of different kinds, one participant holds, and the definition of resources in this context is a very wide one: It is everything we need and use, material as well as immaterial resources such as culture. Sustainable development is then ultimately about creating something good and sustainable with the resources available, this politician argues.

Many scholars have highlighted the conflicting goals that are inherent in the definition of sustainable development as put forward by Brundtland and her followers (cf. Campbell 1996). For example, while economic growth is stressed as a key factor in the economic dimension many ecological indicators judged unsustainable, such as CO_2-emissions and waste levels, show a correspondence to the general growth trends of the global economy. There thus seems to be a fundamental conflict between the scope of the economic dimension and the goal of an ecologically sustainable development – at least if one looks at the situation up to this date and at the level of the total and the global (Andrén 2005). In my material, I find an awareness of this potential conflict and also some frustration about this indistinctness. 'What *is* sustainable?' one person asks and while appreciating the concept of sustainable development also expresses some frustration with its width and vagueness: 'there has gone inflation into it'. In sum, even though such awareness is evident, and also an uncertainty on how these potential conflicts are to be handled, there is yet a strong confidence in the possibility to achieve this balancing act. The implicit reasoning seems to be something like this: as it is necessary to balance the three dimensions – we simply must make it possible.

A strong belief

Turning to the questionnaire, my intention with the tasks no 2A-B and 3A was to assess the importance of the concept of urban sustainable development and at which stage in this process the participants consider Malmö to be. As you can see, there is a strong agreement on that Malmö has become a more sustainable city in the past 20-30 years, that is, since the industrial crisis and the following structural changes. When asked to assign a weight between 0-10 on how close Malmö is to something they consider as urban sustainable development the average weight amounts to 6,1. However, one may note that the answers range from a maximum of 8 to a minimum of 2, implying that the persons have rather divergent views on how close – or far from – urban sustainable development Malmö really is. In any case, *all* of the participants agree that Malmö is moving in the direction of urban sustainable development right now. As we have seen from the system based

Table 2. Number of participants answering yes, no or don't know to the following questions

No	Do you agree on the following question (Yes / No / Don't know)	Yes	No	-
A	Do you think that Malmö has become a more sustainable city in the last 20-30 years?	14		2
B	Do you think that Malmö is moving in the direction of urban sustainable development right now?	16		
C	Do you think that the infrastructure and metabolism of Malmö is connected to global sustainability issues?	13		3
D	Should the City of Malmö actively try to influence its citizens to adopt sustainable consumption patterns?	16		
E	Should the City of Malmö actively try to influence its citizens to adopt sustainable lifestyles?	15		1
F	Should the City of Malmö actively try to decrease the throughput of material and energy in the city?	13		3
G	Should the City of Malmö try to radically increase the levels of Fair trade consumption in the city?	14	1	1

Table 3. Weights between 0-10 given to the following questions or statements

No	Assess a weight between 0-10 to the following questions	Average	Median	Max	Min
A	How close to urban sustainable development would you consider Malmö to be right now?	6,1	6	8	2
B	How worried are you about the local environmental problems such as urban air pollution, traffic volumes, and land use issues?	6,1	6	10	2
C	How worried are you about the global situation concerning sustainable development, for example climate change, poverty, resource conflicts?	8,6	9	10	3
D	How important is the concept of urban sustainable development for the strategic discussion of Malmö's future?	9,5	10	10	8
Distribute the weight 0-10 between the following two statements					
E	Malmö should prioritize to work with local and place based sustainability issues, such as urban air quality, the traffic situation, the waste system and the social dimension of sustainable development in the city.	5,8	6	7	3
F	Malmö should prioritize to work with global and indirectly connected sustainability issues, such as climate change, fair trade, global justice and ecological footprints.	4,3	4	7	3

approach, this optimistic view may in some respects be questioned as Malmö, as well as other European urban regions, has typically improved its local environment (more or less) but still causes a large and even growing global footprint.

Further, one can note that all of the participants agree that the concept of urban sustainable development is *very* central to the strategic discussion of Malmö's future (3D). The most frequent weight given is the maximum of 10. The consensus about the importance of the concept, even if the policy implications surely differ, is strong all across the study. As already proposed, I see this as a clear sign of a successful establishment of what I here call the mainstream discourse on sustainable development. Even if this of course should not come as a total surprise, I still find it noteworthy how such a model or discourse has managed to permeate the local context not only strongly but quite homogenously as well. I suspect that this is caused not only by the public debate in general, but by conscious efforts to launch the concept of urban sustainable development in a local context. The strength of the local discourse can be exemplified by the answer that one of the participants gives to my question: 'What does the concept of urban sustainable development mean to you?'. This person then replies that I should be aware that his/her view will inevitably be coloured by, what this person calls, the 'acclimatization to the Malmö model on what sustainable development means'. This does not mean that this person felt indoctrinated but rather, as he/she says, that it is like a general perception of an acknowledged and commonly shared vision.

As I have here stressed the relatively strong convergence in the view of the participants, it is important to note that there are exceptions and deviant viewpoints as well. In a critical line of reasoning, one participant points to the risks in simply trying to 'add the term sustainable' to the ordinary agenda of city development planning, something that will inevitably turn out unsuccessful. Urban sustainable development must be a much stronger break with earlier patterns of planning and policy making. It will imply a fundamental break in the trends – a paradigm shift which alters the 'filters' through which we see reality – of all important policy areas such as physical planning, environmental, economic and social policy making. But Malmö is still to a large extent stuck in an 'old socio-technical discourse', mirrored by the master plans from the postwar period of the 1950's and 1960's,[85] this person argues. Heavy and long-term structures are built into this discourse, not only physical but also cultural, institutional and mental structures. At the same time, this situation must be seen in a broader historical perspective. What has inevitably been in focus in the last 15 years is to lift Malmö out of a severe crisis, to simply make the city work in a normal way. But now, in the view of this participant, even though still in its beginning, there are signs of an 'identity crisis' in this socio-technical discourse and the traditional view of the city and its development is challenged.

[85] In Swedish, this person refers to the 'Generalplan' of 1966.

In sum, even if there certainly are divergent opinions on the implications of urban sustainable development, which will later be discussed, there seems to be a basic framework and also some kind of shared commitment between these actors. This is on the one hand encouraging for the many of us concerned with sustainability issues in Malmö. On the other hand, there is of course a danger if a certain view becomes so strong that critical voices, and other ways of perceiving reality, are dismissed or simply seen as illegitimate. A hegemonic discourse will, as was the message of Foucault, inevitably tend to exclude other views, although not explicitly or openly violently, and will always be part of the existing power relations of a society. A dominant discourse will also tend to hide its internal conflicts, contradictions and failures. In this case we see that while the dominant discourse seems confident that we are on the right track, the implications of the system based approach challenges this view.

A successful branding process

In my interview material it seems clear that the policy process to brand Malmö as a city in strong progress towards sustainability has been very successful. The use of some dominating key concepts mirroring the messages of a 'green' and sustainable 'knowledge city' is frequent. Several of the participants depict Malmö with words like 'young', 'creative' and 'courageous', a city where people are excited about their lives and optimistic about the future. There seems to be quite some shared optimism in the future prospects of Malmö as a 'City of events', a 'Knowledge city', and an exciting city to visit and live in. 'Hot, hip and sustainable',[86] as one slogan goes. The realization of several ambitious pilot projects connected to urban sustainable development have probably contributed to bringing the general vision down to a concrete level, making it more clear and attractive to many actors and to the general public. Several participants express their esteem when talking about the projects in for example the Western Harbour and Augustenborg. These frontline projects have generated a 'positive spiral', as one person puts it. They have demanded efforts from many actors involved in the development of the city – and caused a lot of attention from media – and thus opened up the eyes to and increased the general acceptance for urban sustainability policies in Malmö.

I think all of these observations point to some important questions about the interplay between discourse and realities. On the one hand it is of course easy to see that much of the grand words are very fluffy, vague and mostly belonging to the sphere of story-telling and marketing. On the other hand I find it relevant to ask if this orientation towards a strong *image* of urban sustainable development also to some extent affects the identities of these actors and, further, the real outcome of decisions and policy orientations. This is of course a too big question to answer by such small investigation as this, but I would speculate and say that I think it may do – but not necessarily in a positive way. I think that such a massive impregnation of the messages of urban sustainable development *will* affect actors including the public, slowly and partly in some cases, stronger and faster in other, and to some extent make them more receptive to change. At the same time, I think there is a risk in overloading the city's actors and citizens with grand

[86] In Swedish: 'het, hipp, hållbar'.

sustainability messages. Firstly, it may create a fatigue. Secondly, and which is more severe, the public (and even politicians and officials) may be fooled by a too strong and optimistic message, claiming that everything is running well or is soon to be. This may result in a schizophrenic situation in which people carry a view of reality which does not correspond at all to what different indicators on socio-ecological sustainability show. Some people may also react the other way and find all messages so loosely connected to his or her perceived reality so as not worthy to take seriously. For the one who really scrutinizes facts, and especially if one broadens the perspective to the global level, there is as we have seen no unanimous picture of Malmö as close to becoming a 'sustainable' city. While this branding may thus act as a positive driving force, it may also risk to obscure and to confuse an honest debate on urban sustainable development. I will take with me these impressions into the case study on energy.

Worries

I was interested in knowing how worrying different actors find the sustainability issue at a local but also at a global level, as this may be reflected in the motivation to pursue different policies. On a general level most persons find the global situation considerably more worrying than the local level. Global issues like war, population growth, poverty, climate change, and resource conflicts are mentioned, often in a tone expressing deep concern yet some distance to the problems. Looking at the questionnaire, we can see that when asked how worrying local environmental problems such as air pollution, traffic volumes, and land use issues are, the average weight in the study is 6,1 out of 10 (3B). When asked instead how worrying global sustainability issues such as climate change, poverty, and resource conflicts are, the average weight is 8,6 with 9 as median (3C). This shows that in general the participants are much more worried about the global situation than about the status of the local environment. However, there is a large variety of given weights with a maximum/minimum of 10/2 for the local (3B) and 10/3 for the global (3C). It can also be noted from my material, that more than 50% of the participants give a weight higher than 5 when assessing their worry for the local problems. The local sustainability challenges most often mentioned are:

The energy system
The energy consumption of Malmö is still to a major extent directly, and certainly indirectly, dependent on fossil fuels and, as one person argues, on large units for energy production which may be sensitive to world market fluctuations and to global geopolitics. Several of the participants mention the local potential of building a clean and environmentally friendly energy system, based on local and renewable energy sources such as wind, solar, biogas, and geothermal energy.

The traffic situation
The majority of the participants see a big problem in the current traffic situation which is found to be crowded, polluting, noisy, occupying large surfaces of the city, dangerous to health and safety, and dependent on fossil fuels. To transform the structure into an environmentally sound, efficient, quiet and safe traffic system is mentioned as one of the top five challenges for Malmö in the years to come.

The gap between pilot projects and mainstream solutions
Malmö is known for ambitious sustainability projects such as the Western Harbour (Bo01), Solar Region Skåne, and Augustenborg. The participants mean that such frontline projects have been inspiring in visualising that much is possible and that they have enhanced a common understanding among local actors. They have also been valuable in the branding process of putting 'Malmö on the map'. But at the same time what is lacking is the progression from these single case good examples to a comprehensive and, using the words of one participant, 'whole-city-approach'. This is connected to another and broader issue which brings us to the most frequently mentioned sustainability dilemma.

The social dimension
Malmö, being no unusual case, has a history of uneven distribution of income and welfare between different city districts. Especially during the economic crisis in the 1980-1990's a process of segregation started to take hold of the city development. Today Malmö, as a geo-physical as well as a socio-economic entity, is a very segregated city or, as one participant puts it, a 'divided city'. There is a clear socio-economic stratification between the south/east districts and the central and western districts. A relatively high level of unemployment, lack of education, poverty and poor living conditions is the everyday reality in some parts of the city. This segregation is also physical in its nature. The huge high-rise areas from the so called Million Homes Programme in the 1960-70's, of which many are in strong need of refurbishing, are located mainly in the south and east parts of Malmö.

Even if this thesis does not go into details of the social issues, I would here like to point to one viewpoint from the interview study on how Malmö could work to bring together the social segregation problem and the need to develop sustainability policies from pilots to mainstream, to the whole-city perspective. In this line of thinking the actors concerned with urban renewal projects, now high on the agenda, should work not to solve the problems one by one, but *all* in one: the physical, environmental *and* the socio-economic problems, the material *and* the 'immaterial' aspects of the total infrastructure. By using what Malmö has learned from for example Augustenborg, and other relatively successful projects, these experiences could be used as a lever to reach out into other areas and to initiate new city transformation projects.

Connections

As we have seen in the former chapter, the infrastructure and metabolism of Malmö is intimately linked to global sustainability issues through production, trade and consumption. Most of the participants agree on this global connectedness, as seen in the questionnaire (2C), although there is also a slight uncertainty on this subject. Perhaps it is more a matter of how one poses the question as we are often not inclined to apply a system based view on the infrastructure of our daily lives. Taking a broader view on the connections between Malmö and the surrounding world, there are clear expressions of what many of the participants consider a *heavy* dependence on a larger economic-political system. As one politician puts it: 'Malmö is only a small, small rowing-boat' out there in a big ocean; a small agent in a huge and very complex global

system. We are nothing less but ‘terribly dependent’ on each other and the fortune of Malmö depends on ‘our ability to exist in this small rowing-boat in a sensible way’, according to this person. Another person stresses that sustainable development policies in Malmö are in strong need of a supporting structure from the national and international level.

Concerning if the City should *actively* try to influence its citizens to adopt ‘sustainable consumption patterns and lifestyles’ the answer is very positive (2D, E). In retrospect I see that to these questions it is perhaps too easy to feel obliged to answer yes, and too incorrect to answer no, but this also and once again hints at the strong commitment to the mainstream sustainable development discourse. The strong consensus probably also reflects a Swedish tradition of policy making that is directed – and accepted – to interfere with the private sphere of individuals. However, and important to note, in most cases the view held by the participants does not imply any tough or radical policies, rather a quite soft and supportive lifestyle policy. This is illustrated by the view of one politician, who means that sustainable lifestyles will not demand a radical shift on an individual basis, but rather that we can live on much in the same way as now only that we will do things smarter and more efficiently.

Conflicts

Despite this agreement on the relevance of policies directed to affecting the consumption and lifestyles of people there is, not surprising, divergent opinions on *how* these policies are to look. Several respondents stress that they favour such policies that pull rather than push people toward sustainable choices and habits. The City must offer attractive choices and sustainable urban structures so that individual citizens are facilitated to adopt more sustainable lifestyles. When it comes to practical examples the views diverge due to the ideological point of departure and to different political programmes. One relevant example is the traffic situation. The structure of the city is designed much for road traffic and the ‘car society’. Everyone agrees that urban structures must facilitate a sustainable transport system. But what about habits and lifestyles? For example, should people be encouraged or forced to drive less in the city? Some persons propose road taxes and physical restrictions on car traffic. Others have a strong reservation against such policies: ‘We do not want a prohibiting city’, one person says, and regards such restrictions as ‘killing the city centre’. As Malmö is steadily growing, some do not at all think that the car traffic can be diminished but rather that its level will stay constant or even increase. The task for the municipality, then, should rather be to increase the *share* of public transport out of the total transports. Others have a quite contrasting view that the traffic situation *must* be radically changed with less cars and more cycling, pedestrian, and public transports. Despite these diverging opinions there is now an agreement on the development of a modern tramway system in Malmö, which may come into function in the next ten or fifteen years.

Another example of how opinions diverge is on the question if the City should actively try to increase the share of fair trade labelled consumption (2G). The City of Malmö has actually already taken a step in becoming the first *Fair trade City* in Sweden, which of course is an obligation in itself. Most participants are generally positive to 'fair trade': it fits the social issues of sustainable development with which Malmö itself struggles, one person says. To expand our borders of solidarity is not only an act of altruism but is also a matter of self-interest, this person continues. Another more pragmatic argument is that Fair trade is important in the branding of the city. But, as one critical voice asks, is fair trade-labelled consumption and procurement a cost-efficient way for the municipality to support the poorest people in the world? This person rather sees a risk in labels such as Fair trade, arguing that it is expensive and inefficient in comparison to efforts more directly aimed at improving the environment and the living standard in developing countries.

Explicit and implicit conflicts

Even if the participants overall choose to articulate their satisfaction and optimism about the situation, I also find many examples where implicit and explicit conflicts are expressed. One example is how the City in its sustainability visions argues for resource efficiency and a sustainable land use, yet continues to expand over its rural hinterland with residential areas, transport infrastructure and shopping zones. This is connected to a larger discussion on the sustainability of modern cities expanding out over rural and agricultural land, something that is often called *urban sprawl*.[87] Another problem, according to one official, is the contradictory policy making of the City concerning agricultural land use and local food consumption. As this person argues, there are ambitious efforts to increase the share of organic products in municipal procurement, for example in school meals, but at the same time there is a poor statistics on organic production on the agricultural land outside of Malmö (City of Malmö 2009b: 34).[88] The municipality could much more firmly steer towards ecologically certified farming, especially on the land areas that the City leases out to private farmers, this person argues. Another expression of this ambiguity is when one official connected to the environment sector describes the planning processes of the City as 'straggly'. Often he/she does not really understand *who* has the last word and why some decisions really are taken and not resisted. Who is the player of the hand? According to this person the fundamental challenge for the City is to *really* have the strength and courage to offer resistance: to steer towards sustainability and to reject development projects and propositions that run contrary to this ambition. In light of contemporary cities struggling to increase their competitiveness at an international arena, one may ask how the actors of Malmö are to gain such

[87] The argument that Malmö is subject to urban sprawl is supported as well as opposed in my material. One argument is that the expansion of Malmö has not been an uncontrolled or unplanned process, something that may be seen as part of the definition of 'urban sprawl'. Instead it has been a democratically decided, publicly planned and controlled process. Here I will however refer to a more general understanding of 'urban sprawl' as any expansion of urban structures out over rural land at the periphery of an urban area – and in that sense this has happened also in Malmö.

[88] The area of organic production (that is, agriculture with some ecological brand such as the Swedish KRAV) has increased in the last 10 years to around 300 ha, but represents only around 6% of the total areal. Moreover, the total of agricultural land is in decrease due to the expansion of urban structures out over rural areas (cf. p. 55).

strength – and if they have the ability at all. In my own view, I think it would be interesting to ask if the 'attractiveness' of the city, so desired, would not *increase* rather than decrease with a City showing a strong and convinced leadership at the various levels of policy making on urban sustainable development.

The task that caused most trouble in the questionnaire was no 2F which brought up an important discussion: Should the City of Malmö actively try to decrease the throughput of material and energy in the city? Even if 13 out of 16 approve that so should be done, there is a general hesitation and 3 persons choose not to answer. Of course it is difficult to give a quick yes or no to such big question. But I do think that this highlights one difficult paradox in the quest for urban sustainable development: growth versus sustainability. Malmö is a growing city both physically and economically. As has been shown, *absolute decoupling* of material and energy consumption from economic growth is still not the general case in the EU economies (cf. Azar et al. 2001; EEA Agency 2005). There are positive examples, often related to end-of-pipe solutions bringing environmental pressure from resource and energy use down. But in many cases of decoupling this is rather a sign of an increased import of natural resources and goods placing their environmental burden from production elsewhere. The total input of material and energy generally remains at a high level. In the context of a growing GDP what we then have is a case of *relative decoupling*, meaning a decline in relative terms but which may still imply constant or even increasing consumption of material and energy in *real* terms. Relative decoupling seems to appear in Malmö in some important cases such as in the local energy consumption (City of Malmö 2008a: 40). But as for transport and waste, two other important examples, the volumes continue to follow the growth trends of the economy.

One obvious reason for the hesitation on this question is that if the population of Malmö grows, the added per capita consumption contributes to the total volumes. But at another level of interpretation, this once again reveals the features of a hegemonic discourse on sustainable development. What is immanent in the reasoning of most participants is an awareness of the possible conflicts between growth and sustainability, and at the same time a confidence in some basic assumptions about the nature of 'development' and 'welfare'. In short, this can be articulated as a belief that a growing economy and high levels of employment are *necessary* requirements for an urban sustainable development. And a high level of economic activity demands material and energy. A business-as-usual scenario – even in a greened version – thus requires material inputs at the same or perhaps even at increasing levels, although efficiency gains may to some extent outweigh this trend. The task for the City, according to this view, is therefore to monitor growth so that it does not conflict with but rather supports the goals of a social and ecologically sustainable development. As everyone can see this leads us back to the three-dimensional balance act of sustainable development and to the concept of *ecological modernization*: an optimistic and reform oriented view on present society-environment interactions including the potential of the market economy and technological and scientific progress.

Priorities

One interesting discussion emerged from the questionnaire in the task to distribute the total weight of 10 between two policy priorities. Should the City of Malmö prioritize:
- Local and place based sustainability problems, such as air and water quality, traffic, the waste system and the social dimension of sustainable development of the city, or
- Global and indirectly connected sustainability issues, such as climate change, fair trade, and ecological footprints?

Even if these two policy areas should be seen as running in parallel, I was interested in seeing how the representatives of the City regard the scope of municipal policy making (3E-F). As we can see the weights given point to the prioritization of local and place based issues (average 5,8 – median 6) before global and indirectly connected ones (average 4,3 – median 4). A common view among the participants is that the local issues must always come first, as this is the principal task for every municipality. This is where the City *shall* and *can* do things; this is where we have the responsibility *and* the ability to take action, it is declared. But at the same time there is an awareness of that the global links may become increasingly important. 'If global sustainability is an issue for the citizens of Malmö– then it is also our issue', one official argues. This is a matter of trustworthiness and democratic principles, this person holds. As the global and consumption based sustainability issues have gained increasing attention in the whole of society, it must also be an issue for us, another politician argues. At the same time, and as shown in several answers, these 'indirect' sustainability issues are often more complex and difficult for a local actor to grasp and to act upon. Moreover, consumption- and lifestyle-directed policy making, if radically developed, belongs to a policy arena more delicate and controversial than traditional policy making.

Many stress that it is wrong to separate these two policy directions, as local polices taken will in many cases link to the global level. What the municipality achieves at a local scale may seem minor, but it is precisely those small steps that contribute to a transformation on a larger scale, one participant argues. When discussing this subject it becomes clear that the two perspectives are often hard to separate in practice. If for example Malmö develops a successful transport policy, this will not only have local but also systemic effects: physical and ecological (improved local environment as well as reduced greenhouse gas emissions), and economic-political (increasing demand on alternative transport solutions and reduced demand on fossil fuels). Acting as a good example will also have social and pedagogical effects not only on a local but on an international scale. The place based and the system based approaches should therefore not be seen as mutually excluding, but rather as both necessary and in many cases reinforcing and complementary. The new thing, then, is that the *relevance* of a system based perspective needs to be made more explicit in local policy choices.

Discussion: place, system and discourse

The socio-ecological consequences of the consumption levels of modern West European cities are today a concern not only for the regions and inhabitants themselves but for the global society. As has been evident in this part of the thesis, the place based and the system based approaches are not to be seen as mutually excluding but rather as both necessary. A municipality not taking care of local problems can hardly be trustworthy. On the other hand, a modern urban region with sustainability ambitions that does not consider the global ecological footprints of its metabolism must be questioned as well.

The place based sustainability approach can be called the traditional approach and is so far the most common in environmental policy making. It suits the normal state of affairs with bodies of authorities at different geographical levels such as municipalities and national governments. One can argue that the place based approach is advantageous since normally actors in a given geographical area have some sort of control over the activities at their own location (even if this certainly is not always the case), for example emissions from production units or the energy infrastructure. The approach may be helpful with its clear focus providing tools for local target setting and sustainability assessments.

However, as we have seen it is hard to argue against the relevance of a system based approach in assessing modern urban regions such as Malmö. Urban economies are typically dependent on the interaction with surrounding socio-ecological systems including distant areas on the globe – and with consequences not only for contemporary but also for future generations. This makes me inclined to say that the system based sustainability approach necessarily has to complement the place based approach in modern city governance. There are of course also shortcomings with the system based approach. As it aims at being comprehensive it is also complex and demands a high quantity and quality of data input on a multi-level scale (local, national and international statistics). The consumption based approach is younger and demands continued local development and training as the methodologies improve. Further, one can argue that one must be aware that the results from the system based approach do not automatically correspond to the level of responsibility or mitigation. Even if an urban resident's Ecological footprint may be assessed, this is not the same as saying that this person is the one to whom we should place responsibility or in whom we should find the source of change. As individuals, and also as communities, we are inevitably connected to higher-level systems which we can not fully control. Especially at the individual level we may find ourselves structurally locked up in certain aspects. At a community level the possibilities are greater as municipalities, at least in a Swedish context, have quite a strong influence on their development.

A main challenge in city governance is therefore to negotiate on, and to the degree possible decide upon, *what* scope local sustainability policies should have. To what extent are the indirect socio-ecological impacts of trade and consumption a relevant matter? To what degree should for example the City of Malmö try to deal with the global footprints of its citizens' life styles? Traditional municipal

environmental policy has often focussed on local and regional problems. To take another standpoint and to develop new strategies is to challenge a tradition. As Malmö is a city seeking a new 'post-industrial' identity, I suggest it could be a possible pilot in developing *integrated* sustainability policies, by which I mean to actively take into consideration both the place based and the system based implications in its policy making. As so often is the case in life, the key perhaps lies less in the ability to choose – but in the ability to manage to do both.

Many sustainability experts argue that the total levels of material and energy throughput must be radically decreased in high-income countries. Relative decoupling will not be enough, taking into consideration a growing global economy with special attention paid to the economies in the South. An absolute decline of total resource use is needed. With the long-term and global perspective in mind, my reflection is that the dominant eco-modernist and growth-oriented discourse must be at the core of a deeper reflection on urban sustainability in already affluent economies.[89] What connections are there – looking closely – between local growth-oriented policies and global sustainability trends? At the same time as there are great possibilities for local action, including challenging traditional solutions, there are also restrictions. How are different policy goals interplaying with each other? What is the mandate for action? How do local power relations look like? Which restrictions and opportunities can be identified given present societal structures? And, also, what is the message from local opinions? It is easy to fall into the trap of only seeing problems. But, inspired by one of the interview persons, perhaps there is a tendency to view different 'restrictions' as more rigid and definitive than they actually are? May these obstacles sometimes be of a mental and social character rather than of an economic or physical one? I find this line of thinking encouraging, as I myself consider the transformation towards urban sustainable development a process where creative rethinking on the definitions of the problems as well as the solutions are needed.

Finally, a personal reflection. Even if the global and system-oriented view has here been argued for, the very concrete place in which we live is of an outstanding importance. The physical and down-to-earth quality of our living environment is never negligible. A 'sustainable' city, if there is one, must be something more than simply one in which all the 'hard' data is fixed. To me, urban sustainable development is also about quality of life in a very physical and tacit sense; it is about a city offering healthy and enjoyable living environments for its citizens, a city that provides spaces of beauty, tranquillity and room for the unplanned and the non commercial. If we cannot envision urban sustainable development in this very local and concrete context I believe we will fail also on a grander scale. And there is a big hope to it. To work with local and place based issues has double effects: it challenges and reconstructs the structural and physical reality as well as, although slowly, the mental and social reality of our lives. I believe this also influences our ability – and willingness – to act upon more complex and global sustainability challenges.

[89] For further discussion on the growth-oriented paradigm in the context of local governance on sustainable development, see e.g. Forsberg 2002.

Part III. CASE

The case study

Malmö and the urban energy challenge

How is Malmö to deal with the energy challenge of our time? What does the energy system[90] look like and what are the possibilities and obstacles for a transformation towards a more 'sustainable' system?[91] The tensions between a place based and a system based sustainability approach have been discussed in part II. As has been shown, Malmö has made some progress when ecological sustainability is viewed as a local and place based issue. However, along with these improvements, Malmö as well as other modern European cities has a continued large, and by many judged as unsustainable, socio-ecological impact resulting from the citizen's consumption and lifestyles. This means that the effects from total resource use in Malmö, including energy consumption, is still high but now dispersed in a global network of production, trade and consumption.

This case study focuses the local and contemporary energy challenge of Malmö with the municipality's policies as well as the global perspective in mind. I have specifically chosen energy as a case for deepened studies, since it fits the ambition of contrasting local and global sustainability issues. Further, energy issues are central to contemporary policy making on urban sustainable development and the tensions between discourse and reality[92], as pointed at in chapter 4, will constitute another focus. The investigation will include questions like: How much energy is consumed and what energy sources are dominant? Who are the main users and for what purposes? Who are the agents in control of the energy system? To what extent is the city's energy system founded on renewable or non-renewable energy? That is, how far from, or close to, a fossil-free energy system is actually Malmö and what prospects are there of phasing out fossil fuels? As the City has recently adopted a new Environmental programme, including an Energy strategy, I see this work as an excellent opportunity to raise some critical issues connected to policy making on urban sustainable development.

[90] By the term 'energy system' I will mean the total primary supply of energy in the Malmö municipality, including the different energy types, as well as the total consumption of energy for different uses.

[91] What actually is a 'sustainable' energy system may of course be disputed. For example, while some see nuclear energy as a 'climate-neutral' and therefore 'sustainable' energy source, others argue that a sustainable energy system must solely build on renewable energy. In this case study, I will not go into the details of nuclear energy but will focus on the *relation* between renewable and non-renewable energy sources and the conditions for phasing out fossil fuels in Malmö as intended by the Energy strategy.

[92] For a comment on the use of 'reality' in this thesis, see footnote 39.

Disposition

The chapters are structured as follows. In this introductory section the case study is presented and placed in its context. In chapter 5, the scene is set by pointing at some general aspects of the energy challenge of our time. Some concepts surrounding energy are defined and a brief overview of the global and the Swedish energy system is given. This is done so as to get the big picture and to be able to understand the general context in which Malmö is situated. In chapter 6 I then turn to the energy system of Malmö which is presented and discussed in light of the 2030 vision of the Energy strategy with a particular focus on the share of renewable versus non-renewable energy. Finally, I will conclude with a discussion connecting to the general themes of this first part of the PhD project as well as raising some questions for further studies that will be fed into the final part IV.

Research method

This case study takes advantage of a mix of quantitative and qualitative research methods (cf. Andrén 2008a). While relying on quantitative data mainly from other sources I use these actively in for example an elaboration on the share of renewable energy in Malmö. I also use quantitative descriptions of the energy system as a framework for engaging with different actors in an interview study. Even though the study mainly relies on a qualitative approach, I see it as part of an ambition to work interdisciplinary, bridging typically natural scientific topics (energy systems) and issues from the social sciences (actor, discourse, power, etc.). As has been discussed in the introduction of this thesis, my research approach is further inspired by participatory and action-oriented methods. Overall, my ambition is to transcend the role of the 'traditional' and disciplinary researcher making 'neutral' science. As described in Andrén (2010), I am in search of what can be called a *transdisciplinary* approach, by which I mean to actively bring my results with me into the field and to take part in the debate on urban sustainable development in different contexts. To me, the unsustainability of the present society is not only a relevant research problem – but something that challenges me as a person on many levels: as a researcher, as a citizen, and as a human being. I simply find the global socio-ecological distress impossible to reconcile with staying detouched. Rather, an important way forward for sustainable development research must be critical engagement in ongoing societal processes.

The case study has been done in a two step process. First, I investigated the energy system of contemporary Malmö by studying literature, public reports, information on the internet, etc. Here I had great use of the many reports that the City of Malmö and other public bodies have published. In parallel I developed an interview study, which was in the beginning an active part of the investigation process since it turned out necessary to complement the literature study. After a while, when I felt that I had gotten the general picture, I changed the interview

scope so that it would help me to get new and additional perspectives, for example on how the actors viewed possibilities and restrictions to meet the City's energy goals. The interview themes, summarized in appendix 2, were thus never fixed but were adapted over time. Before every interview I reviewed my interview questions and chose a certain angle or selection that fitted the context of this person/institution. This means that I do not have a coherent interview material of the type gained in the field study of chapter 4, but instead the interviews here act as a valuable supplement to the literature study.

In all, I have met with 16 persons in 13 interviews during autumn 2009 and spring 2010.[93] The actors interviewed are officials at public administration bodies or private/semi-private companies, consultants, academics or other experts connected to the energy system and/or energy policies of Malmö in one way or another. The interview persons were selected by a 'snowball method', that is, I collected names of persons to contact and then let contacted persons name new possible contacts, and so on. The persons finally interviewed represent the organizations or other categories presented in table 4. The interview study is in other respects similar to the one in part II. The interviews took place at the participants' offices or at public meeting places, except for one made over the telephone, and each lasted around 45-60 minutes.[94] All interviews, expect the telephone interview, were recorded and in all of them careful notes were taken.[95] In chapter 6 the interviews will provide examples of how the participants view different issues and contribute with additional information. The results presented from the interviews do not imply any aspirations to make general statements about the opinions of different institutions/companies in Malmö. Further, all interviews were done in Swedish and so the material has been subject to the author's translation. As the purpose is not to mirror the exact statements of certain persons, I will refer or quote anonymously by using a general signature of that person's position and/or working area. But first, let's turn to some general perspectives on energy.

[93] The number of interviews and interviewees differ because I used group interviews in two cases. This turned out to be a rewarding contribution to my ambition of working participatory and action-oriented as these events took the form of an open dialogue between me and other actors engaged in the energy challenge of Malmö. I would certainly want to develop collectively based interviews and dialogue forms in possible future research projects.

[94] There were some exceptions of longer duration especially the group interviews.

[95] The files with the recordings are stored safely and form part of the empirical material of this thesis. As I have made in total some 30 interviews to accomplish this thesis, the material is quite heavy and I have made the choice not to make a transcription of the material in its totality. Instead I have picked certain quotations and in other cases I have made a summary of the persons' accounts. This is of course one limitation but due to time restrictions a necessary choice in this first part of the research project.

Table 4. Interview study on energy

Actor/institution	Notes[96]
Skane Energy Agency	A unit within the Association of Local Authorities in Scania with the purpose to work for efficient energy use and the increased use of renewable energy in Scania. The unit has no decision making authority but works with education, information, consulting, and by partnerships and projects, etc. (5 persons: 3 individual and 1 group interview covering areas such as solar energy, biogas, municipal energy planning, and energy efficiency)
Skånetrafiken	Regional public transport company responsible for the city buses in ten major cities and for all the regional buses and trains in Scania. The company plans, develops and promotes the public traffic but the actual transports are executed by entrepreneurs.
E.ON	International energy company with its Swedish main office in Malmö. E.ON is one of the world's largest privately owned energy companies. E.ON Sverige produces and supplies energy and energy-related services to approximately one million customers.
SYSAV	South Scania Waste Company. Regional waste management company described at p. 115.
Department of Internal Services, City of Malmö	The Dep. of Internal Services takes care of the service operations carried out by the municipality involving maintenance of real estate, technical services, management of the municipality's properties including energy issues, and other types of services to the administration and the public.
Environment department, City of Malmö	The Environment Dep. has an operational area covering supervision and monitoring of different environmental issues in the municipality including water- and air pollution, noise and environmentally dangerous operations, food, health and animal protection. It carries out projects for urban sustainable development and is also responsible for consumer guidance and energy- and tenant advisement. (4 persons have been interviewed covering environment-, energy- and climate strategy and planning issues)
City Planning Office, City of Malmö	The City Planning Office is responsible for the municipality's structure planning, detailed planning, land parcelling, building permission, building notification, measurement, mapping and services to Malmö residents and the parties on the housing market. It has had the coordinating role in the preparations of the Energy strategy.
Scania Wind power Academy[97]	A network promoting knowledge building and sharing of experiences on wind power and its establishments in Scania. (Group interview with 3 persons, of which these persons all belong to other organizations as well)
Hydrogen Sweden	A public private partnership with members from industry, NGO:s and local, regional and national government bodies promoting the introduction of hydrogen as an energy carrier in Sweden by demonstration projects, information and collaboration projects, etc.
Malmö University	Malmö University is Sweden's ninth largest university of undergraduate studies (cf. p. 38).

[96] The information on these institutions is taken from their official web pages or from the interviews. The purpose is only to give a brief overview in relation to the context of the interview study. If else not mentioned, one person per organization is interviewed. In a few cases persons are overlapping in their roles, for example by working in two institutions at the same time.
[97] In Swedish: 'Skånes Vindkraftsakademi'. My translation.

5. Perspectives on energy

An unsustainable system

Greek ἐνέργεια - energeia: 'activity, operation'
ἐνεργός – energos: 'active, working' [98]

The fossil-fuelled economy will come to an end, sooner or later but for sure. Firstly, because the fossil energy sources are non-renewable and thus *quantitatively* finite. Secondly, and as important, because the *qualitative* aspects of a fossil based economy are so detrimental to the global ecosystems – of which we are ultimately dependent – including to the social and economic dimensions of a sustainable development.[99] For example, one may argue that fossil energy is part of a world trade system and of geopolitical power constellations that makes it vulnerable, dangerous and unjust.

The global energy supply of today is based largely on fossil energy sources (around 80%), that is on oil, coal and fossil gas (IEA 2009). And a majority of the emitted greenhouse gases – around 80% in the EU for example – have their origin in the energy sector including transports (EEA 2010). This fossil-dependent energy system has a whole range of negative consequences to environment, health and to the economy, among which global warming arguably is the most pressing issue. According to the latest IPCC-estimates, the average global temperature is likely to rise a further 2-6°C in this century, the lower as well as the higher estimates negatively affecting socio-ecological systems at all levels (IPCC 2007). An increase in global temperature will have severe consequences such as sea level rises, changed precipitation patterns, a continued retreat of glaciers, permafrost and sea ice, expansion of deserts, increases in the intensity of extreme weather events, species extinctions, and changes in agricultural yields. Even though the exact range and feature of these consequences can not be fully known, it is generally agreed that global warming is threatening the socio-ecological systems at their fundaments. In the worst-case 2100 scenario discussed by Schneider (2009), with a tripled atmospheric CO_2 level of 1000 ppm and global temperature rises of perhaps 7°C, the global ecosystems including our own civilization are at stake as we know them.[100]

Much political and public debate is now committed to how to transform the contemporary energy system – including how to mitigate greenhouse gas emissions and adapt to climate change. As we shall see, these issues are high on the agenda in Malmö too, and certainly very relevant considering its continued fossil-dependence and, also, its location at the coastline of the sea. The reasons for Malmö, and other local communities, to promote a phasing out of fossil energy are thus several, e.g. to:

[98] From an internet search on 'energy' with reference to *Online Etymology Dictionary* at: http://www.etymonline.com.
[99] For a comment on my use of the concepts around sustainable development, see footnote 7.
[100] This 1000 ppm CO_2 level should be compared with today's level of around 380 ppm (2005) and a pre-industrial level of 280 ppm (IPCC 2007: 37).

- Lower the costs
- Improve local environmental quality and contribute to solving global problems
- Mitigate greenhouse gas emissions and adapt to climate change
- Increase local self-reliance and energy security
- Assume responsibility for creating an energy system that is more fair and sustainable in a global and long-term perspective.

To put it short: the contemporary energy system is *not* sustainable, neither from an ecological, nor from a social or an economic point of view. To transform the contemporary fossil-based economy is therefore a key to anything that might possibly be more 'sustainable'. Important to say, however, is that many 'alternative' energy sources called for have negative socio-ecological effects as well. For example, biofuels may not be that innocent concerning CO_2 emissions when seen in a broader life-cycle perspective (cf. Fargione et al. 2008). They are further criticised for having very negative effects of other kinds, such as heavy landscape exploitation, often in the South, including loss of biodiversity. I therefore adhere to the view that any sensible 'sustainability' transformation, especially in the context of already affluent economies, necessarily must include a *quantitative* reduction of total energy use. This argument will not always be explicit in the following inquiry, but should be seen as an underlying premise.

What I will here call the 'energy challenge' touches upon all aspects of contemporary society – and will inevitably highlight some core issues surrounding the idea of a 'sustainable development'. What would a global carbon-neutral economy look like?[101] How can we envisage such a huge transformation given the highly fossil-dependent socio-ecological institutions of today? And what about the local and concrete scale: what possibilities and obstacles are there for a locally promoted transition to a fossil-free energy system in for examples cities and regions? Even at a first glance one is struck by the seemingly extreme difficulties. But, on the other hand: what alternatives do we have? To me, there seems to be no escape but we are already in the midst of it happening.

Energy and human ecology

Human ecology is an interdisciplinary research field with focus on how social relations influence the use of ecosystems and environmental change and vice versa. Traditional disciplines often have a tendency to concentrate either on the ecological/physical dimension (natural science) or on the social and institutional spheres (social science). Further, the acknowledgement of power dimensions and unequal social relations in the use of natural resources and in environmental change often seems to escape the discussion as such. While 'disciplinary' science thus tends to *separate* socio-ecological issues – 'ecology without humans and

[101] As discussed by Lennart Olsson (lecture 08/10/09) the contemporary system is a net contributor of carbon dioxide to the atmosphere (*carbon-positive*), while a *carbon-neutral* economy would have reached a balance between emissions and uptakes. However, what we might need in a foreseeable future is actually a *carbon-negative* economy which systematically decreases the level of atmospheric greenhouse gases.

humans without ecology'[102] – the interdisciplinary research field of human ecology instead tries to *integrate* them.

To apply human ecology in my context is to acknowledge that the global (and local) energy challenge is deeply embedded in a system of social relations which includes conflicting interests, inequalities, and the exercise of power (cf. Hornborg et al. 2007a; 2007b). To see this, we may only think of the uneven distribution of the burdens of global warming between rich and poor countries (Roberts and Parks 2007). 'Sustainable energy' in this sense is not only about physical and technical applications (which to my understanding of human ecology never *can* be isolated) but concerns as much culture, politics and economy. The fossil-based energy system of today is highly interwoven with the economic-political power relations of the modern world system. It should not be too controversial to argue that the contemporary fossil-fuelled capitalism is not only a *high-energy society* but a system with strong vested interests and power connections. The transformation to a fossil-free energy system will therefore be no easy, neutral or consensus-driven process concerning only technological change and social engineering. There are definitely high stakes: which are the energy sources capable of substituting for fossil fuels and who is in control of them? Are they possible and profitable to develop on the 'free' market or do they demand political intervention and public investments? Further, what incentives are there for a total *reduction* in energy use, something that many have argued is necessary for an ecologically sustainable development? Is a low-energy society a realistic scenario and how will it be reconcilable with the logic of the present socio-economic system?

Alf Hornborg (2009) argues that we must be prepared to face that the contemporary fossil-based capitalism has been an exclusive and privileged *cheap-energy era*, at least for the core of the world system. In fact, the modern energy system is heavily reliant on unequal social relations in global terms of trade which is revealed in the huge gap in living conditions between the poorest and the richest nations of the world as well as in the extremely uneven distribution of environmental burdens. A future energy system that is disconnected from the acquisition of energy extracted from ecological production of the past (fossil energy), will likely have to be much more dependent on the capacity of the ecosystems of the present (renewable energy). According to Hornborg (ibid.: 241), this highlights the very *political* ecology of energy:

> The prospect of peaking oil extraction presently prompts us to rethink processes of development and decline in the world-system. Rather than simply revive Malthusian concerns over the dismal destiny of humankind as a whole, we need to approach the popular notion of 'cheap energy' as an experience situated in societal space as well as in historical time. Energy has been perceived as 'cheap' only within core segments of world society, whose ideology of progress and development has tended to construe contemporary global inequalities as representing different stages in time. Draught-animals and wood fuel are here often perceived as elements of the past, yet remain an everyday reality for significant parts of the world's population. Conversely, fossil-fuel technology is

[102] This expression originally concerned the field of political ecology ('ecology without politics and politics without ecology') but I think it holds for a general statement on what human ecology intends to as well. The idea is inspired by a lecture by Lennart Olsson 08/10/09 at a course in Political ecology in 2009.

> conceived as a 'now' rather than a 'here' /… / As we begin to anticipate its demise [the cheap energy era], we might reflect on the fact that the war in Iraq and global climate change are opposite sides of the same coin. The structural problem of fossil-fuelled capitalism is to maintain imports of energy (e.g. oil) and exports of entropy (material disorder, e.g. in the form of carbon dioxide), two imperatives of 'development' that are both increasingly difficult to sustain.

Some concepts around energy

Energy is a word used by everyone but understood by fewer.[103] It is an indispensable part of human life, still often invisible. In physics, energy is a scalar physical quantity that describes the amount of work that can be performed by a force.[104] There are different forms of energy such as kinetic, potential, thermal, gravitational, nuclear and electromagnetic energy. The thermodynamic laws state that the sum of energy is always constant and all that exists are transformations of energy. Energy in this broader perspective can neither be 'produced', nor 'consumed', only transformed between different states. So, what we normally view as 'energy' is rather a certain state of energy, a useful *quality* of energy for human purposes. In the language of thermodynamics, this quality is called *exergy*; the potential of a system to cause a change and to carry out work. In the human context, what we actually make use of is thus the exergy consumed in different kinds of energy transformations. When exergy is consumed the quality of the energy is degraded and the *entropy* is increased.

Another important concept is that of an *energy carrier*, which is a substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes.[105] Energy carriers are for example dammed water, hydrogen, petroleum, coal, fossil gas, electrical batteries and wood. In Malmö, as we will see, important energy carriers are fossil fuels, electricity and waste for combustion. Further, it is important to define what is meant by renewable and non-renewable energy. *Renewable energy* is derived from processes – with their origin ultimately in the incoming solar radiation or in heat generated within the earth – which are replenished constantly or in a relatively short-term perspective. Common forms of renewable energy sources for human use are wind and solar power, hydroelectric power, different types of biofuels, and geothermal energy. Included in this category is also electricity, heat and hydrogen gas derived from any of these renewable sources. *Non-renewable energy*, on the other hand, is energy with an origin in finite resources that will eventually dwindle or become too expensive or difficult to retrieve. Fossil fuels, such as coal, petroleum products and fossil gas belong to the non-renewable energy carriers. Nuclear power is dependent on a finite resource, uranium, and should therefore be counted as non-renewable.

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[103] By the word 'energy' in this context I will mean energy used for the production and reproduction of society on a larger scale, that is, energy directed for purposes such as heating, industrial production, transports, household maintenance and the use of the service sector. Other meanings such as connected to the metabolism of the human body, spiritual, etc., are not included.
[104] This description of some concepts around energy was written with help of an internet search on British Encyclopaedia online, Wikipedia and Wikia Green using search words energy, exergy, energy carrier, renewable and non-renewable energy.
[105] This definition found on internet is borrowed from an ISO-standard (ISO 13600) with reference to the International Organization for Standardization.

Energy in a global context

For the purpose of getting the big picture and to understanding the general context in which Malmö is placed, I will now give an overview of the global and the national energy situation. This presentation mainly relies on the overview given by the Swedish Energy Agency (2008) which in turn uses statistics from e.g. the International Energy Agency (IEA). In 2006, the total primary supply of energy on a global scale was 137 000 TWh, a figure hard to grasp in concrete terms. As a comparison, Sweden's energy use is on average around 1 TWh per day and the total yearly energy consumption of Malmö around 7 TWh. The primary energy supply is a rough estimate of the gross energy input at a global scale. As you can see from figure 12, fossil fuels are very dominant with around 80% of the total supply (oil 33%, coal 26%, fossil gas 21%). Nuclear power adds up to around 6% of world primary energy supply.

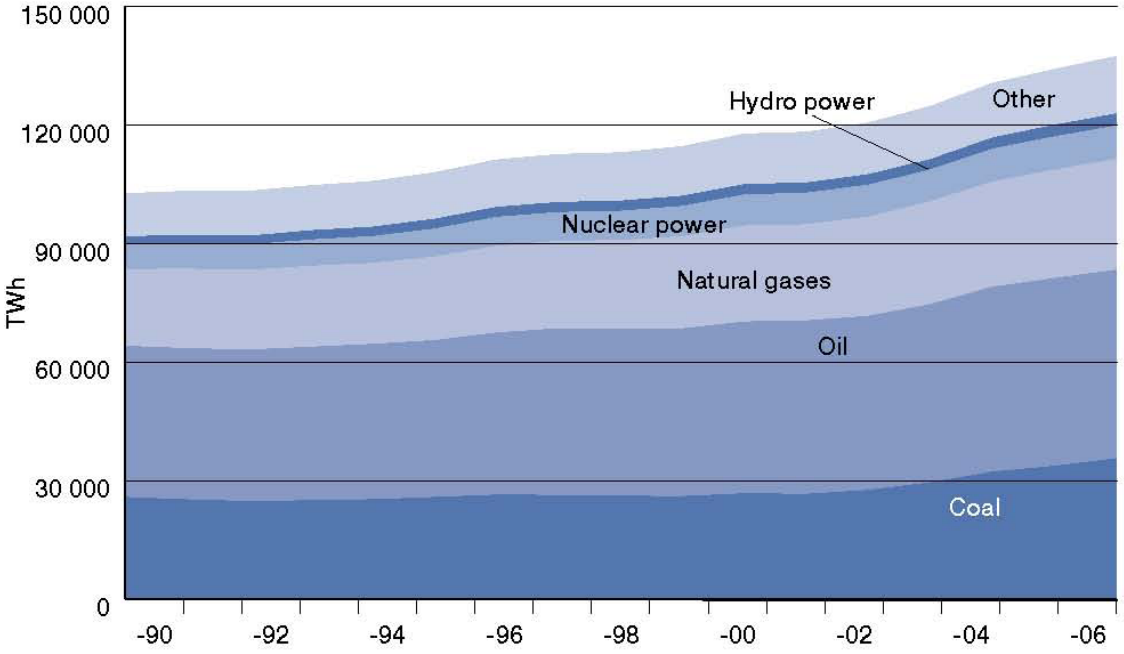


Figure 12. Global primary energy supply 1990-2006
(Swedish Energy Agency 2008a: 128 with reference to IEA Energy balances of non-OECD countries 2008)

Renewable energy sources such as hydroelectric power, biofuels, wind and solar power had a global share of around 13% in 2006 (Swedish Energy Agency 2008a: 133 ff). In Africa, over half of the total energy use stems from renewable sources, mainly biomass. Also in Asia and in Latin America this share is relatively high, 1/3 and 1/5 respectively, while it is lower in Russia, Middle East and the United States. In EU the share of renewable energy was 8,5% in 2005 while the Swedish share was as high as 42% (ibid.: 59 and 2008b: 14). We will return to the fact that Sweden, as well as Malmö, may be judged as having reached relatively far in the transformation to renewable energy, at least in a European comparison, but why this still deserves further attention.

In contrast to what one may think, the share of renewable energy in the global energy supply has been quite constant in the last ten years. Even though there are investments made in renewable energy systems, these are still at a low level and with modest total shares in comparison to their fossil competitors. Despite all talk about a sustainable development, what we are facing today is essentially a *fossil* energy system. Further, the overarching trend is one of increasing energy consumption. The global energy use has grown with around 2% annually in the last ten years (ibid. 2008a: 128). China alone is responsible for over 50% of this increase but other countries in Asia and also Northern America have a growing energy demand. In the European Union, on the contrary, total energy consumption has been stagnating in the recent years and decreased with 2,2% in 2007.

If we then have a look at figure 13, were global energy consumption and also the use of energy and electricity is shown on a regional per capita level, another important feature is revealed. While the United States consumes on average over 90 000 kWh per capita and year, EU-27 has a middle position with 43 000 kWh/cap but Africa less than 8 000 kWh/cap and India less than 6000 kWh/cap. The average world consumption on a per capita level is around 21 000 kWh. This can be compared to the yearly consumption of the Malmö inhabitants of around 25 000 kWh/cap (City of Malmö 2008c: 5). This figure interestingly places Malmö only modestly above world average consumption levels. This can be interpreted on the one hand as evidence of that Malmö is quite energy efficient in comparison to its generally high living standard. On the other hand, this also reminds us that the Malmö citizens are dependent on energy consumption taking place in other parts of the world system as embedded in imported goods and services.

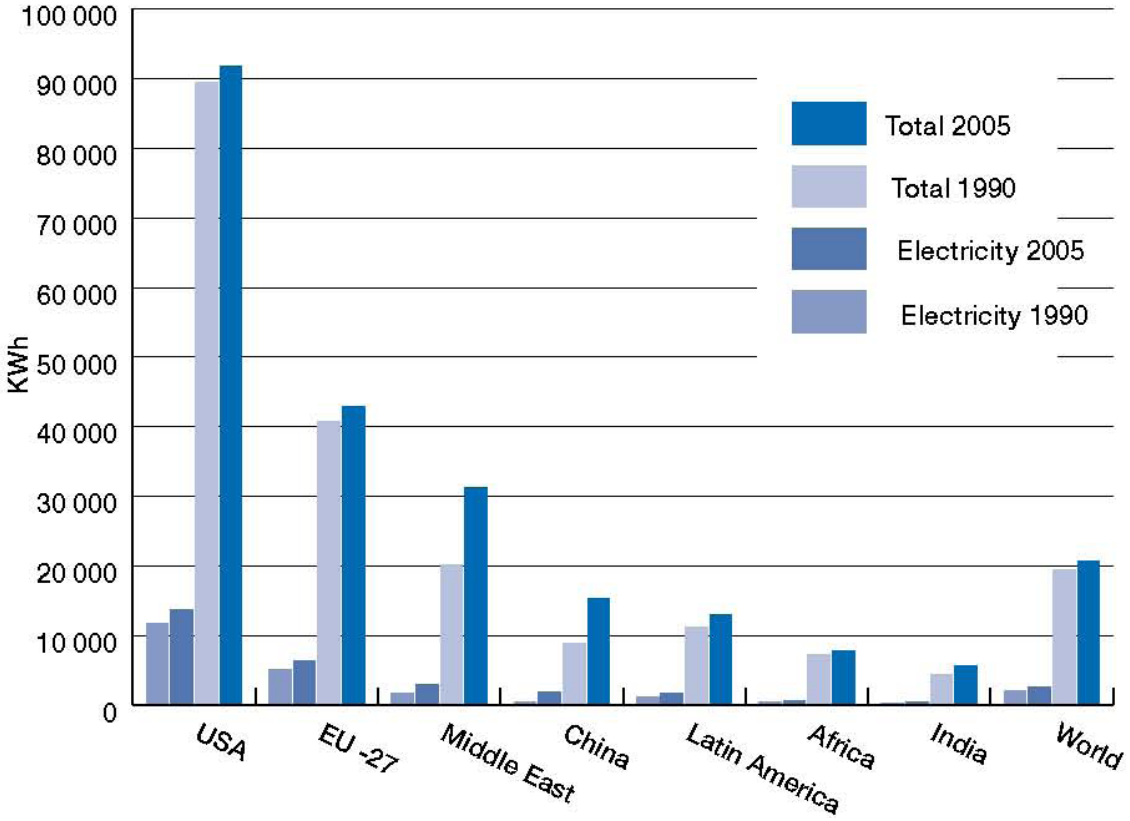


Figure 13. Regional energy use per capita 1990 and 2005
(Swedish Energy Agency 2008a: 137 with reference to IEA Energy balances of OECD and non-OECD countries, 2008. The figures refer to primary energy use including losses.)

Let us now focus on the trends of the energy carriers in use. Notable is a rapid yearly increase in coal consumption of around 4,5% (2007), especially in China (Swedish Energy Agency 2008a: 131 ff). Fossil gas consumption is also growing with around 3% annually. Electricity is increasingly used as an energy carrier at a global scale, with an annual growth of around 3%. The production of electricity is dominated by coal (40%) while renewables as input to the production amounted to only around 2%. Oil's share of global energy supply is slowly decreasing, but this still does not imply that the *total* consumption level is lowered. Also in the case of oil, the main increase in demand stems from the developing economies of Asia and Latin America, while demand in Europe and even North America show a decreasing trend. The continued high demand in combination with diminishing total rates of extraction of oil globally puts pressure on the prices. We are now witnessing a trend of price increases on oil, accompanied by rises in coal and fossil gas prices as well (ibid.: 128 ff). The investments in renewable energy such as hydroelectric-, wind- and solar power and biofuels are at a competing rate with for example coal, but from much lower total levels.

The global energy use is allocated to some main sectors in accordance with figure 14 below. As we can see, the industry, transport, household and service sectors are the predominant categories of users. Industry adds up to around 26% of the total share, transports to 28% and household/services to around 37% (ibid.: 135 f). All sectors' energy demand have been growing seen in a 10-year perspective: the household/service sector with the highest annual rate (around 4%), and industry and transport with a little above 2% per year. Fossil fuels are totally dominant in the transport sector with shares of bio-energy not even detectable in the global statistics. The household/service sector is of a more mixed character but traditionally a large consumer of renewables (e.g. biomass) and also, of electricity (57% of world production). Important to note however, and as we can see from the left bars in figure 13, is that electricity use is very unevenly distributed between different world regions.

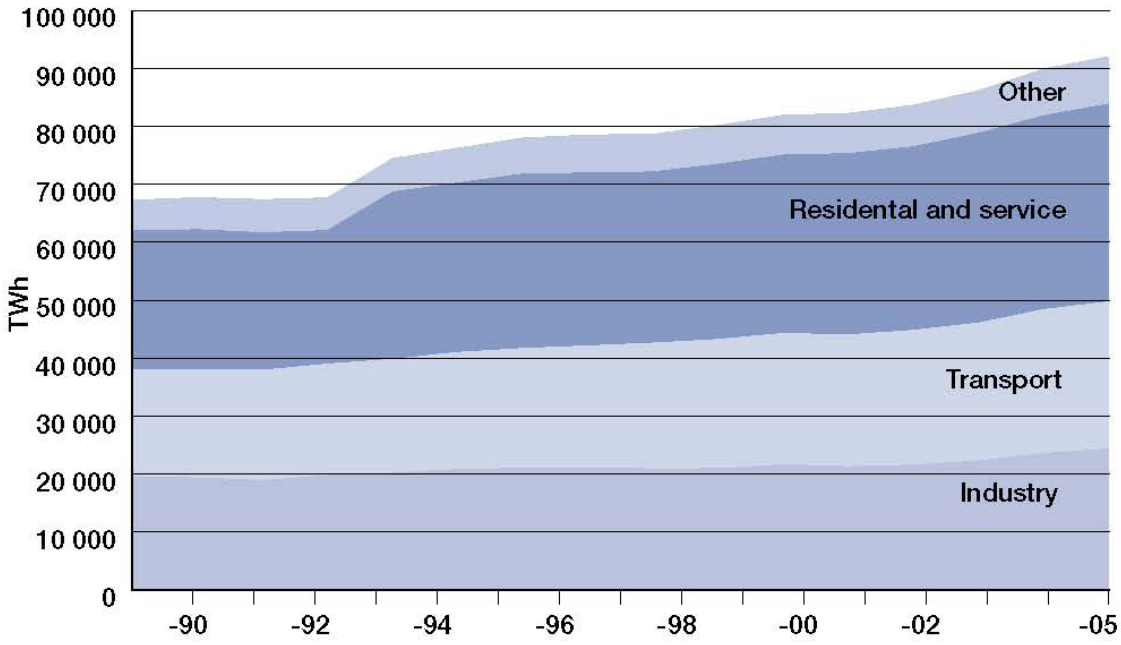


Figure 14. Global energy use by sectors 1990-2005
(Swedish Energy Agency 2008a: 136 with reference to IEA Energy balances of non-OECD countries 2008)

The Swedish energy system

Let us now have a brief look at the Swedish energy system as it is relevant to give yet another perspective. In figure 15 below the Swedish energy system is summarized. The total primary energy supply added up to 624 TWh in 2007. From this figure around 35% (or 220 TWh) is to be excluded as it consists of losses due to transformation and distribution, especially from nuclear energy production, as well as of a segment for other than national energy purposes (ibid.: 54 ff). The final energy use therefore added up to 404 TWh.[106]

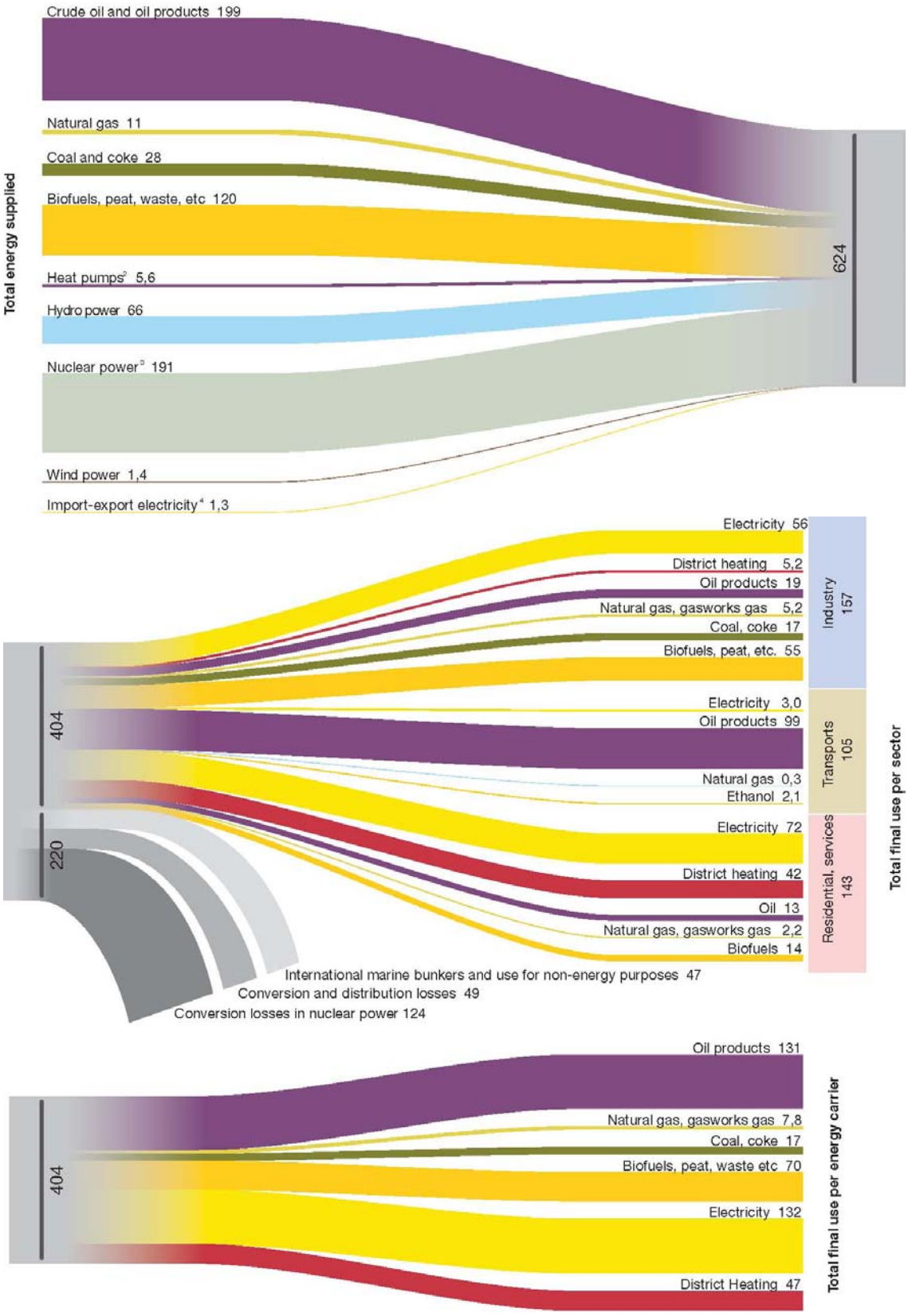
The Swedish energy system and the trends since 1970 can be further studied in figure 16. As we can see, fossil energy (mostly oil products) and nuclear energy are the largest categories, followed by biofuels and hydroelectric power (including wind power). Since the 1970's the share of oil products have decreased with more than 40%, and instead nuclear power and hydroelectric power have increased their shares. As a result of this expansion the production of electricity has radically grown, with around 145% since 1970. This places Sweden among the worlds' largest electricity users seen on a per capita level (ibid.: 84).[107] Hydroelectric power and nuclear power contribute with around 65 TWh/year each,[108] together covering almost the total of Swedish electricity production of 132 TWh/year. The increase in the supply of energy from biofuels is also dramatic, around 180% since 1970.

The share of renewable energy in the Swedish energy use was around 42% in 2005. This figure is much higher than both the global average (13%) and the EU average (8,5%) (ibid.: 133, 59). The reason for this is that Sweden has a relatively large share of hydroelectric power in its energy mix and an industrial structure where waste energy is often taken care of in different ways (e.g. from forestry and pulp mills). In addition, the Swedish cities and towns often have well established district heating systems that may be fuelled by biomass of some kind. Other kinds of (wholly or partly) renewable energy inputs in the Swedish system are heat pumps, biofuels, waste, and wind power.

The final energy use in Sweden is distributed between the main sectors in a quite similar way as we saw in the global figures. The main difference is that industry has a larger share, around 39%, which is due to the existence of quite an energy-intensive industry sector in Sweden, such as pulp- and paper mills, iron- and steelworks, and chemical industry. The household and service sector accounts for 35% of final energy use, of which the energy needed for heating/hot water and the use of electricity are predominant. The transport sector accounts for 26% of total

[106] This example of gross and net figures reveals the importance of knowing which category of the energy system you are discussing. The primary energy supply is always higher than the final energy use. Compare for example figure 12 and 14 where the global primary supply and the final energy use are illustrated.
[107] This is, according to the Swedish Energy Agency, explained by the high share of electricity-intensive industry in Sweden, the cold climate, the fact that electricity is used as a source of heating, as well as by comparatively low prices on electricity.
[108] The exact figure: hydroelectric power 67,5 TWh (average year) and nuclear power 64 TWh (2007).

Figure 15. The Swedish energy supply and energy use in 2007 (TWh)
(Swedish Energy Agency 2008a)



Notes: 1. Preliminary statistics, due to rounding up of figures. There may be differences in the totals. 2. These are large heat pumps in the energy sector. 3. Nuclear power is shown as gross power, i.e. as the nuclear fuel energy input, in accordance with the UN/ECE guidelines. 4. Net import of electricity is treated as supply.

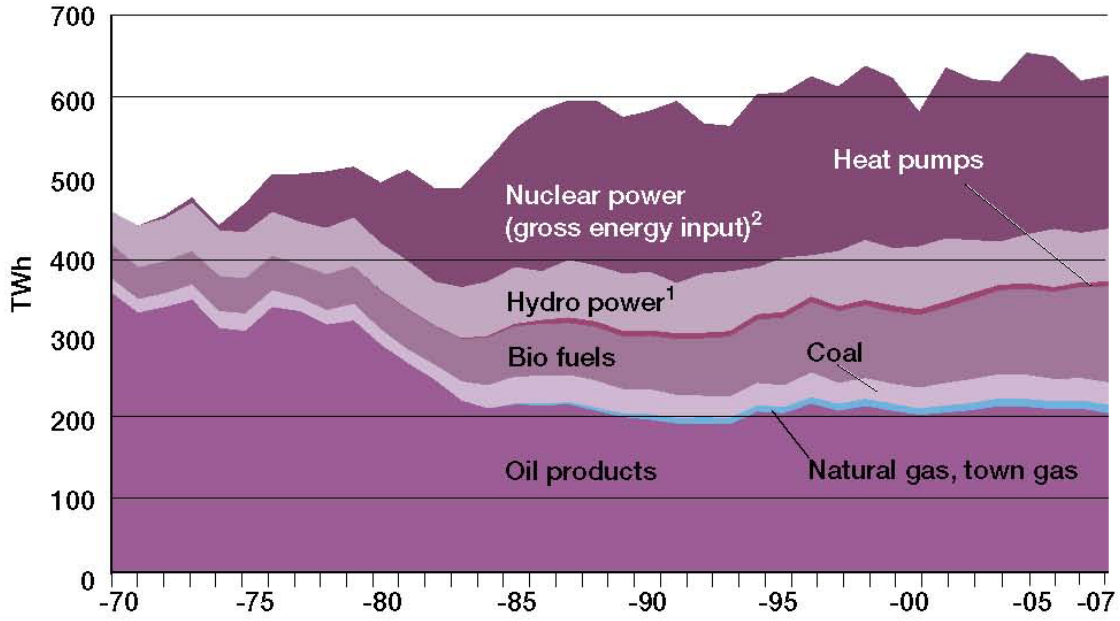


Figure 16. Total energy use in Sweden 1970-2007, net electricity exports excluded
(Swedish Energy Agency 2008a: 59 with reference to Statistics Sweden, additional processing by the SEA. Notes: 1. Including wind power until 1996, 2. Calculated in accordance with the UN/ECE method for energy supply from nuclear power.)

energy use – larger if one include bunkering for foreign maritime traffic and air transport – and is almost entirely dependent on fossil fuels (90%). Alternative fuels such as electricity, ethanol and biogas only have a very small share so far. For example, and in contrast to what one may think listening to the debate, biogas, ethanol and FAME[109] added up to only 4% of the energy use in road traffic in 2007 (ibid.: 76).

Behind this statistics there are features and trends which one does not see but which are relevant for a discussion on sustainable energy (ibid.: 56 ff). Beginning with industry, energy consumption has been quite constant since 1970 while the production volumes have increased considerably. The household and service sector has slightly diminished its total energy use, while the population has grown and so has the area of heated spaces (housing and other buildings). The transport sector is one important exception to the general picture: along with increasing transport volumes the sector's total energy use has almost doubled since 1970 (87%). Even if there are some statistical reservations, for example on how energy losses are transferred to either primary supply or final use, there thus seems to be a trend of increasing energy efficiency at the general level – at least if looking at the Swedish energy system in isolation.

[109] FAME is an abbreviation for fatty acid methyl esters of which RME (Rapeseed Methyl Ester) is the most used.

6. Malmö and the energy challenge

> We take on the challenge: Malmö will be the best city in the world for sustainable urban development by 2020.
> City of Malmö [110]

It is now time to move to the energy system of Malmö and to the case study of this thesis. As presented above, in this chapter I intend to discuss the local energy challenge with the energy policies of Malmö as well as the global context in mind. The chapter begins by describing the Malmö vision: a fossil-free energy system by 2030. This is the vision set by the City council in the recently adopted Energy strategy. I will shortly describe the context of this strategy and explain how it works as a platform for this case study. Then I will proceed by giving an overview of the energy system of Malmö, with a special focus on the shares of renewable versus non-renewable energy. This is important to know as I want to get a grip on the main challenges when contrasting the contemporary system with the goals of the Energy strategy. The case study is then concluded with bringing together some general themes of the thesis in a discussion called 'Energy, vision and reality'.

Vision: a fossil-free city in 2030

In December 2009 a new Environmental programme for 2009-2020 and an Energy strategy was adopted by the City Council (City of Malmö 2009e; 2009d). A continued high level of ambitions in the field of environment-, energy- and climate policies is here proclaimed. In the Environmental programme the general challenge is depicted as keeping and developing a frontline position so as to reach a world leading position in urban sustainable development by 2020. It contains four overarching environmental objectives which are formulated in a popular language:[111] 1. In 2020 Malmö is Sweden's most climate smart city, 2. The urban environment of the future is found in Malmö, 3. A sustainable use of natural resources, 4. In Malmö it is easy to do the right thing.

The Environmental programme is to be seen as a platform for the municipality's directions and choice of priorities in the area of environmentally sustainable development. The overarching objectives will be translated into more detailed strategies among the municipality's different departments and companies who are all – and together – responsible for the implementation of the programme. The primary target group for the programme is the public bodies/actors connected to the City of Malmö but the programme declares the ambition to reach out to other

[110] Environmental programme of City of Malmö (2009e: 2).
[111] My translation. In Swedish: '1. Sveriges klimatsmartaste stad, 2. Framtidens stadsmiljö finns i Malmö, 3. Naturtillgångar brukas hållbart, 4. I Malmö är det lätt att göra rätt'. These very general and popularly formulated objectives will now be broken down into more formal and concrete targets according to interview persons I have spoken to with insight in the process. The reasons for putting the objectives in this way were, among other things, political signals pointing to the need for a more popularized version, the wish to broaden the scope (e.g. in relation to other types of planning documents) and not least to reach new target groups within as well as beyond the City's departments and companies.

actors such as business and residents/public as well. The Environmental programme of Malmö is now subject to a process of further planning and target setting including choices of key indicators to monitor and evaluate the implementation phase.

The Energy strategy was adopted in parallel to the Environmental programme and acts as a supplement to strengthen the important area of climate and energy policies. According to the municipality the purpose of the Energy strategy is to 'illustrate how Malmö can meet the demands and contribute to a more long term sustainable and safe energy system' (2009d: 24). Three main strategies are proposed to achieve this goal: higher energy efficiency, switch to renewable energy sources, and better planning, economy, safety and knowledge. The municipality then outlines a long term vision of the realization of a totally fossil-free energy system by 2030 (ibid.):

> The long-term vision for Malmö (year 2030) is for the energy system to consist of only renewable energy sources and be characterized by an effective and safe energy use which contributes to the long-term sustainability of the city.

Further, the City puts forward some concrete goals for 2020 concerning the city as a whole and especially the municipality's internal energy use in departments and companies (ibid.):

> In order to take important steps towards this vision, by the year 2020 the energy use should have decreased by at least 20 % per capita compared to the average annual use during the period of 2001 to 2005. The share of renewable energy should be at least 50 % of the total energy use. For Malmö municipality's own operation, more ambitious goals have been set as a part of the public sector's strive to serve as a role model and positive example to others. The energy use in the municipality's departments and companies should during the same period have decreased by 30 % and consist of 100 % renewable energy.

Even though I have not been able to make a comparative analysis of other Swedish municipalities' energy programmes, it seems safe to say that the Malmö goals are set at an ambitious level.[112] The energy goals for 2020 are summarized in table 5.

Table 5. Malmö's Energy goals for 2020

External goal **The whole city as a geographical entity**	*Internal goal* **The municipality's own activities, departments and companies**
At least 20% reduction in per capita energy use compared to the average level of 2001-2005	At least 30% reduction in total energy use compared to the average level of 2001-2005
At least a 50% share of renewable energy in the total energy mix of the city	100% share of renewable energy
100% renewable energy in public transports	Risk- and vulnerability analyses that supports prioritization in cases of interruption in energy supply
At least 40% reduction of greenhouse gas emissions compared to 1990	Lowered energy costs

[112] The participants in my interview study do not know many other municipalities with these kinds of energy goals, although recent activities of some cities such as Stockholm, Växjö, Lund and Trollhättan are mentioned. This does not mean that ambitions at this level, or above, do not exist. A comparative study, nationally but also internationally, would be a possible next step of research.

Background of the strategy

The background to the Malmö Energy strategy can be seen from at least two angles. First, there is the pushing force, the national legislation system, which states that municipalities *must* have an up to date plan on 'the supply, distribution and use of energy in the municipality' (ibid.: 4).[113] But besides this mandatory aspect, there are many external forces – from the regional, national as well as the EU-level – demanding or at least encouraging the City to see to their energy planning. As many of my interviewees have argued, there is also a strong internal need to grasp the energy issues at the local level, to coordinate the efforts of the different actors of the City, to support cooperation with other actors, and to become aware of the strong and the weak points of the city's energy system. Important to note, is that the Energy strategy does not only deal with the environmental and climate aspects but also with energy security, energy planning, knowledge capacity, and the costs of energy.

The process of preparations to accomplish the strategy can be summarized as follows. In Malmö there was already an older version of an Energy plan from 2000 and with a complement in 2005 (City of Malmö 2000; 2005). According to my interviewees there was a need to revise and update these plans due to reasons mentioned above and not least in light of the climate debate and the upcoming COP15 in Copenhagen in 2009. After the complementary plan of 2005 had been adopted a revision process started on behalf of the City Planning office which led to the appointment of a working group to plan for a new energy strategy. According to one participant with insight in the process there were clear signals from the political level that the City wanted the goals to be set at an ambitious level. Due to some delay, a preliminary strategy was submitted for consideration to the different bodies of the municipality in July 2009. In addition there was a long list of other local and regional institutions/actors to which the proposal was submitted for consideration. The new Environmental programme for 2009-2020 was submitted at the same time, and this was done in a conscious effort to unite these two processes thus covering energy issues as well as the broader area of environmental goals. Many of my interviewees were satisfied with this integrated way of handling the process, thereby not separating energy and general environmental/sustainability issues of the city.

Comments and approval

In the documents following the adoption of the Energy strategy, there is a general picture of approval and content among many actors giving their opinion to the July proposal (City of Malmö 2009f). One standpoint put forward by different bodies belonging to the public administration or to municipal companies concerns the goal of a total reduction in internal energy use by 50% until 2020. This goal, presented in the July version, was judged unrealistic considering the already high level of energy efficiency measures taken. In the final version of the Energy strategy the goal was decreased to 30%.[114] Further, in a comment by some

[113] With reference to the 'Municipal Energy Planning Act' ('Lagen om kommunal energiplanering', SFS 1977, my translation).
[114] There were comments given by for example MKB (municipal real-estate company) and SYSAV that the goal of decreased internal energy consumption was too high. MKB refer to its

opposition parties[115] the following critical remarks were made: 1. The actual competence to demand renewable district heating is heavily limited because of the monopoly held by E.ON, which means that the municipality's internal goal of 100% renewable energy in 2020 is ultimately determined by the production choices of E.ON. 2. The municipality doesn't do enough to support and encourage private house owners and landlords to implement small scale energy solutions and energy efficiency measures. In a separate comment, the Liberal party demanded a clearer statement on the issue of nuclear energy. According to this party, nuclear energy contributes to the national need of a secure, stable, climate- and environmental friendly energy system which is also less dependent on foreign energy production. Other critical comments belong for example to the County Administrative Board of Scania, which recommended that the municipality more firmly connects the energy goals to the actual trends and development paths of the energy sector in Malmö. Several actors wished the goals of the strategy to be made more concrete concerning measures and time plans, and some asked for more up to date figures than the energy balance of 2006 that is presented.

According to one participant involved in the accomplishment of the strategy, the reception of the proposal was much more affirmative than he/she had anticipated. 'I thought we would meet much heavier resistance', this person said. But there seems to be a positive attitude and a general commitment among many of the actors right now. 'Perhaps the time is ripe' for a strategy like this, this person thought. As both the Environment programme and the Energy strategy are approved, an intensive period of consultations, planning and negotiations are now taking place within the municipalities' different departments. According to my latest information, a cross-sectional steering group and a project group have been set up that will now work to establish an implementation plan with detailed goals, time schedules, and so on. One possible way for me to continue a work in this field would be to follow the work of these groups over a longer period and to evaluate/feed into the process of the realization of the Malmö Energy strategy.

Reality: a fossil-dependent energy system

Turning from vision to reality: What does the energy situation in Malmö look like? How much energy is flowing through the system, for what purposes, and from what sources? This section will give an overview of the city's contemporary energy system. The figures are generally from 2006 but will be complemented with information, when this is available, on more recent trends.[116] Of great help to get the big picture will be the graphs presented at the following pages and especially the energy balance of Malmö in figure 20. The data to a large degree relies on information from the City of Malmö and other local sources, but also on national and international energy agencies. The interview study, as described in the introduction of this part, will act as a valuable complement to the written and internet based sources.

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own goal of 20% decrease of energy use until 2020. However, the final goal in the City's Energy strategy was set to 30%.

[115] The Conservatives, the Liberal Party and the Swedish Pensioner's Party (in Swedish: Moderaterna, Folkpartiet liberalerna, Sveriges pensionärers intresseparti).

[116] 2006 is the reference year in the municipality's own background reports to the Energy strategy and the year in which I have been able to gather the most coherent view.

Overview

The total energy consumption of the Malmö municipality is shown in figure 17. As we can see, the trend has stayed quite stable around 7 TWh/year in the last 15 years (City of Malmö 2008c: 5 ff). As there has been a population growth of around 40 000 during this period, Malmö shows a decreased per capita energy consumption of nearly 20%. One interpretation is that Malmö has become more efficient in its energy use – at least relative to its number of inhabitants and in a local perspective. The per capita consumption was around 25 MWh/year in 2006, which is lower both than the Scanian average (33 MWh) and the Swedish average (46 MWh).[117] This should be no surprising figure though, as Malmö has a relatively mild climate, a concentrated (urban) structure and a large service sector in comparison to many other parts of Sweden. In a regional and national perspective, the Malmö per capita energy use is relatively low in the industry, agriculture and transport sectors. On the other hand, it can be noted that Malmö has a relatively high per capita energy use in the service sector, especially in the private sector such as offices, shops and other buildings. Applying the global perspective, the Malmö per capita figure of 25 MWh/year is only a little above the average world per capita use of 21 MWh (Swedish Energy Agency 2008a: 137). Given the historical background in chapter 2, I interpret this as a sign that Malmö belongs to the core regions of the world where deindustrialization and economic restructuring has taken place and where resources have been available for modernization and efficiency measures of the local energy system. However, in light of the discussion in chapter 3, we know that part of this impression of local and *relatively* high energy efficiency is counteracted by a shadow side of embodied energy consumption from a system based perspective.

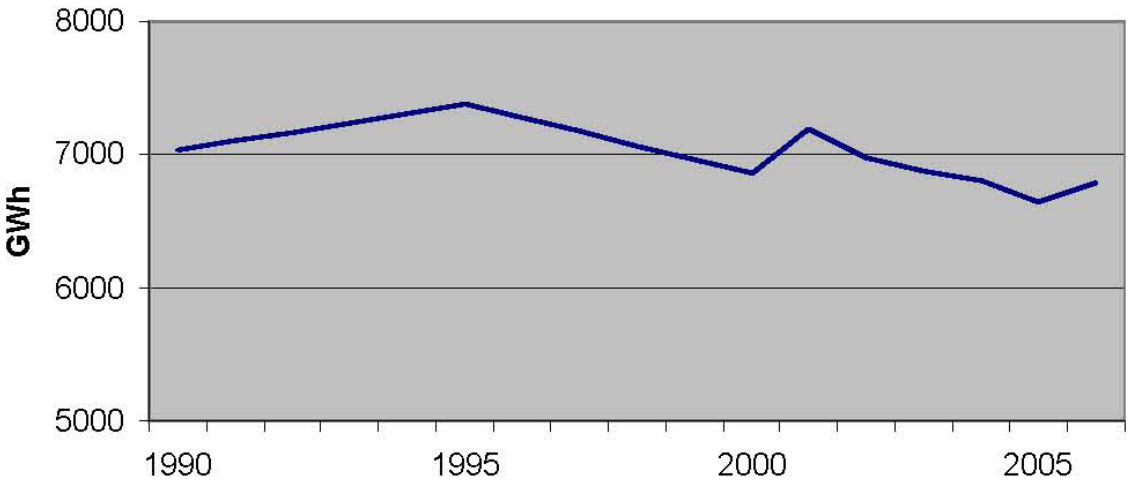

Figure 17. Total energy use in Malmö 1990-2006
(City of Malmö 2008c: 5)

[117] The exact Malmö figure from 2006 is 24,6 MWh/cap and year. The Scanian and the Swedish figures of 32,7 and 45,6 MWh/cap are from 2004 but a rough comparison can be made despite this. In the global comparison following below, the exact global figure is 20,7 MWh/cap (2005).

The energy types adding up to final energy use in Malmö 1990-2006 are presented in figure 18 below (City of Malmö 2008c: 6). All types show a quite stable or slightly increasing trend, except for fuel oils which was formerly a common source of heating but which has diminished rapidly in use (80%). The consumption of electricity, petrol and district heating energy have each increased by 4-6% during the period. The total energy use is distributed between some main sectors in accordance with figure 19. As we can see, households (33%) and transports (29%) are the two largest consumers followed by other services (19%), which consists of the private service sector, for example offices, shops and other buildings. The industry sector adds up to a relatively small share (10%) and public services to 9% of total energy use.

Some important trends may be detected from these diagrams. Following the restructuring of the Malmö economy, the energy use in the industry sector has been cut down with 1/3 between 1990 and 2006. The energy consumption of the households and the public sector also show a decreasing trend (11% and 21%), despite the above mentioned population growth. Transport shows only a very small change (-2%) and we see in recent years rather an *increase* in energy use, which is problematic as this sector is heavily dependent on fossil fuels. The largest expansion, however, is in the sector 'other services' which shows an increase as high as 49%. The per capita energy use in this sector is more than 70% higher than the Scanian and national average. This development may be interpreted as the other side of the coin of the deindustrialization and economic restructuring that has taken place in Malmö. If earlier industry was a large energy consumer it is today instead offices, shops, services and other activities connected the modern high consumption society.

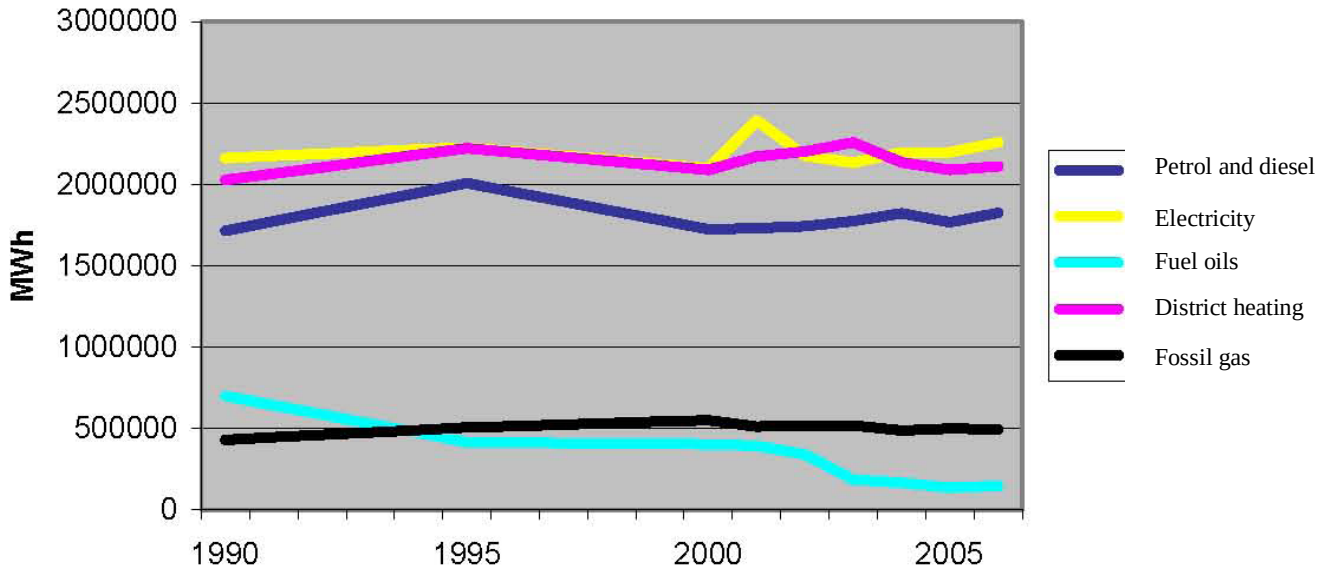

Figure 18.
Energy types used in Malmö 1990-2006
(City of Malmö 2008c: 6)

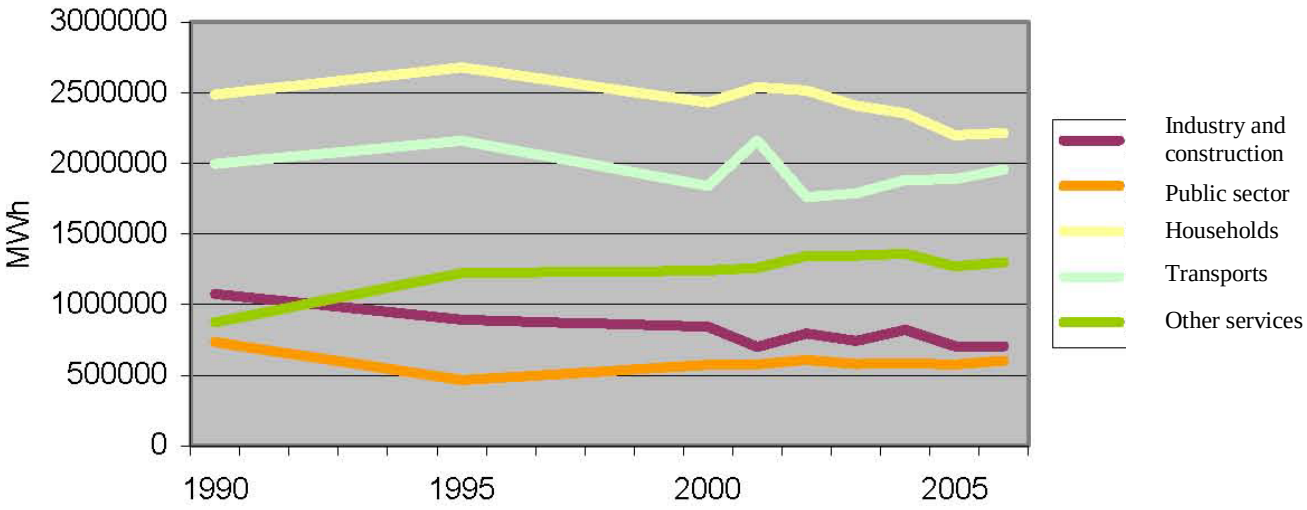

Figure 19.
Energy use in different sectors in Malmö 1990-2006
(City of Malmö 2008c: 7)

Energy balance of Malmö

Let's have a closer look at the energy system of Malmö as presented in figure 20.[118] The proportions of inputs of different energy types are shown at the upper side of the sankey diagram and the outputs as consuming sectors below. It is important to understand, that this diagram only catches one *part* of a more complex system of energy types and transfers. For example, the input of electricity is in turn produced by other energy sources, and the fossil fuel inputs are final products in a long chain of extraction and refinement. What we here gather is thus a rough picture of a system at one point in a series of energy transformations. As we can see, final energy use was 6,83 TWh with losses of around 5% in comparison to the primary energy supply of 7,74 TWh in 2006. These losses mainly belong to the production of electricity and district heating, but there are of course other losses along the chains which are not detected in this diagram.

The box in the middle demarks the amount of energy produced in units situated in the Malmö municipality. The share of locally 'produced' energy in this translation is 38%, but as we shall see this 'local' production heavily relies on non-local resources, for example fossil fuels and imported biomass. Of course is it not surprising that a contemporary urban structure will exhibit this feature; the potential of energy production from locally situated sources (solar and wind power, geothermal power, biomass, etc.) is still only modestly realized. While it is interesting to ask how Malmö municipality could make better use of local

[118] This energy balance is from 2006. The figures have recently changed since a new thermal power station, *Öresundsverket*, have started to produce electricity and heat water on a large scale (see below). Other recent investments in Malmö for example in wind-, solar power, and biogas will also, although to a smaller extent, contribute to a revised diagram. To illustrate these changes in detail may be subject to future work.

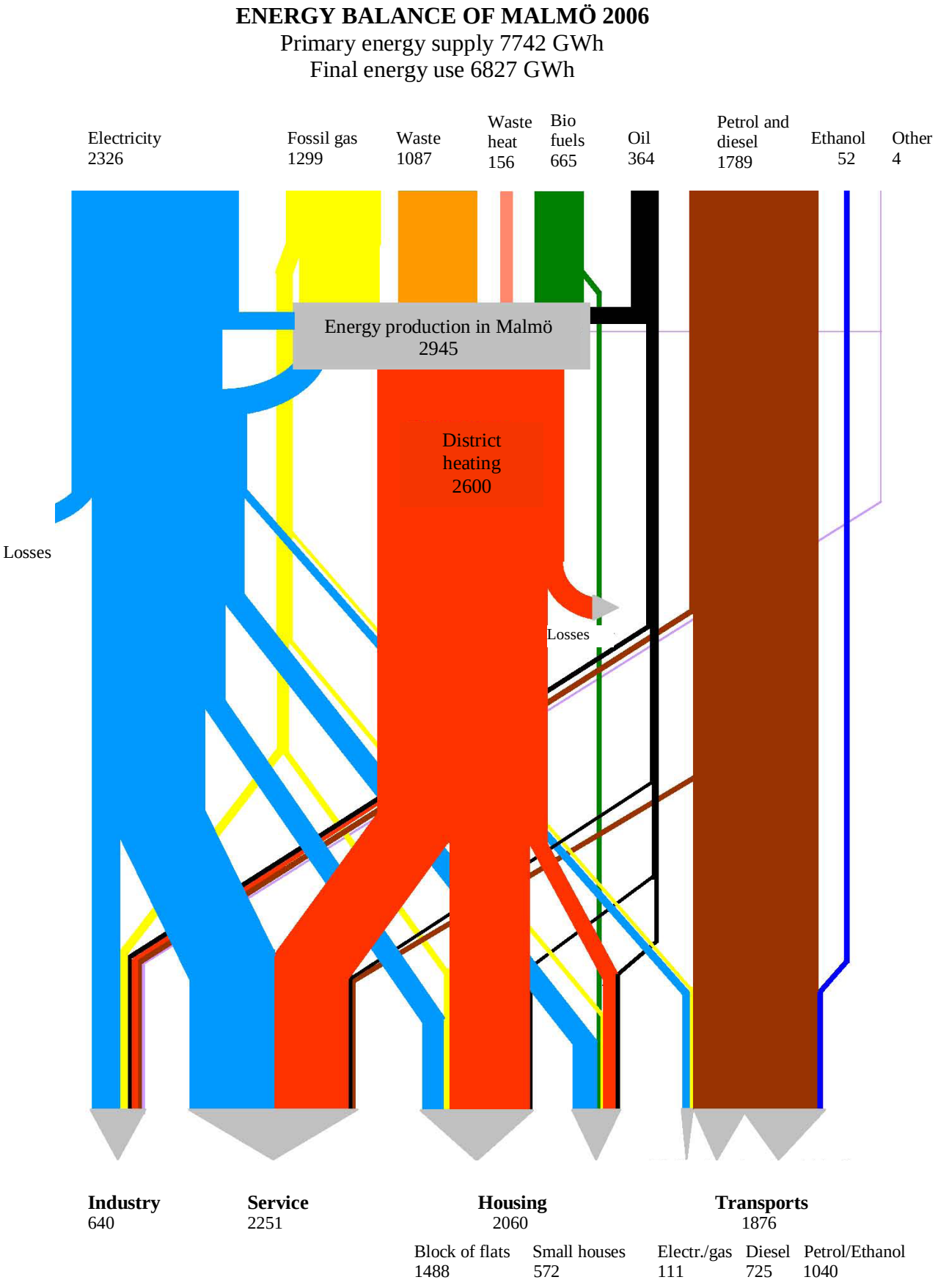

Figure 20. Energy balance of Malmö in 2006 (GWh)
(City of Malmö and Grontmij AB in City of Malmö 2008d)

Notes: The figures are adjusted to the climate of an average year (*normalårskorrigerade).* The consultants stress that there are some statistical limitations in the background material from which this diagram is constructed.

resources for energy production, it is simultaneously important to acknowledge that concentrated urban structures are, at least so far, primarily energy *consumers* and not producers. The main challenge for a city like Malmö may very well lie in the ability to build 'sustainable' relations in energy production on a regional basis rather than searching for solutions within its central urban structure.[119]

To better grasp the energy sources used in Malmö, let's now turn to the main groups a little more closely. Following the diagram of the energy balance, I will describe them in order from left to right, with some exceptions. Besides a brief presentation of each category, special attention will be given to discussing the renewable vs. the non-renewable part of the energy consumption. Following this inquiry, I will then estimate the total share of renewables in the Malmö energy system of 2006 so as to highlight the challenge of the Energy goal of the City for 2030.

1. Electricity

In the last decade the Swedish electricity market has been deregulated and integrated with the Nordic countries (except Iceland) on a common market called *Nord pool*.[120] Electricity is traded on an exchange and the price is influenced by for example the status of supply from hydroelectric and nuclear power stations, world market prices and current political measures. The Nordic market is especially influenced by the Northern European markets in for example Germany and Poland. Electricity is a product purchased by many different actors, from huge companies and public bodies to individuals and households. This creates different segments of the market, with different types of contracts and business conditions. For the average individual there is some degree of freedom, for example the right to choose power company and the possibility to earmark the contract demanding for example 'green' electricity (that is, electricity with a certain environmental brand). The market is heavily dominated by large suppliers, and even though there is a formal possibility for local actors to produce electricity and to connect the producing units to the grid, the conditions are disadvantageous and unprofitable for a small scale producer. The provision of electricity to Malmö thus belongs to a wider regional network and is the feature of a larger system, of which the local control is only indirect and partial.

In 2006 the input of electricity to Malmö amounted to some 2,3 TWh, corresponding to 30% of the total primary energy supply. One big user, as earlier noted, is the service sector. Around 345 GWh of electricity was produced from locally situated sources.[121] However, as we can see from the sankey diagram

[119] By this I do *not* mean that Malmö shouldn't try to enhance energy production within and nearby the city, only that the total demand for energy will likely require larger scale solutions which an urban structure like Malmö may have problems to solve on its own.
[120] Nord pool is owned by the Norweigean *Statnett* and the Swedish *Svenska kraftnät* (mains operation companies). More than 300 companies traded on Nord pool in 2006. See http://www.nordpool.com.
[121] To my understanding this figure should mainly belong to the production at the SYSAV plant and the Heleneholm combined power and heating plant (see below).

(local production-box in the middle), the energy-producing sector itself consumes some 2/3 of this electricity produced. In this year only a small net-fraction of the total electricity supply was thus of local origin.

Öresundsverket changes the context

The recent renovation of the huge combined power and heating plant *Öresundsverket* is a good example of how electricity belongs to a larger context. This plant is an investment of around 3 billion SEK by the energy company E.ON and is situated in the Northern harbour area of Malmö (eon.se 21/10/09). The investment should be seen in the context of the close-down of the nuclear power station at Barsebäck in southern Sweden and the argued need for a more balanced production capacity in the regional network. Further, placing it in Malmö was considered advantageous because the heat water generated in the process would thus have a market close by in a large city's district heating system.

Opening in 2009 Öresundsverket is one of the biggest and most modern plants in Northern Europe. It has a production capacity of 440 MW of electricity which can be compared to one of the nuclear reactors at Barsebäck of 600 MW. The plant also generates heat water with a production capacity of 250 MW. Öresundsverket is fuelled by fossil gas and will deliver around 3 TWh of electricity and 1 TWh of heating per year. This makes Malmö as a geographical area a net exporter of electricity and the city's district heating system will be covered by 40% only from this plant. As will be further discussed, it's no wonder that the establishment of Öresundsverket has caused much debate (e.g. kvp.expressen.se 21/10/09). First, it is 100% fossil-fuel based, something that really seems to contradict all talk about a sustainability transformation of the energy system. Second, the carbon dioxide emissions will radically increase at a local level due to the added emissions from this plant. The yearly emissions from Öresundsverket will amount to some 1,3 million tons of CO_2, almost doubling the emissions in Malmö.[122] In the eyes of an opponent, this plant could really seem to embody much of the traditional large scale and fossil based solutions that we are now supposed to get rid of.

There is however no easy truth. Taking a strictly place based perspective, the emission curve for the city of Malmö will certainly not look good with this new investment. However it is questionable to connect the whole production of the Öresundsverket to the geographical area of the Malmö municipality. Rather, it must be judged from the perspective of a regional electricity market and the production portfolios of some large companies. Not surprisingly, the advocators of the establishment adopt such a system based view. It is thus argued, that while local emissions increase, the total *regional* emissions will instead decrease by 1 million tons/year as the plant is able to replace old coal based production in the North European system.[123] The high level of efficiency in the way electricity and heat water is produced is also seen as an advantage of this investment. Further,

[122] In the City's Environmental Report (2009) the latest estimate of the emissions in Malmö amounts to 1,3-1,4 million tons.
[123] This replacement is actually already happening, according to one interview person, as two older Danish coal-powered stations are now closing down.

Figure 21. Öresundsverket
(E.ON photo by Berne Lundkvist)

what has been proposed as a 'sustainability' argument in favour of Öresundsverket is that the fossil gas system might be converted into biogas in the future. The infrastructure needed for these two gases are roughly the same. Talking to one representative of E.ON, such transformation of the *whole* plant is however completely unrealistic at least in the foreseeable future. What may be possible though, if the City of Malmö and other actors push the issue, is to supplement the input of fossil gas with a share of biogas to increase the renewable based heat water production. If we for a moment set aside all questions on the sources to produce this biogas – and the consequences of such a huge demand of biomass of one sort or another – such a transformation would be a radical contribution to the share of renewables in the Malmö energy system. It must be a crucial task to further investigate the broader socio-ecological conditions of this potential substitution.

To sum up, in the debate on Öresundsverket we see clearly the tension between a place based and system based sustainability approach, as well as those claiming the 'necessity' of this investment and those questioning it. In my own view, the main question should perhaps rather focus on the fact that huge fossil based

investments are still in fact the most profitable and favourable solution on the market. All this points to a general gap between the grand sustainability visions and the largely fossil based realities. Even if influential actors such as energy companies and governments at different levels articulate their devotion to renewable energy, we must not forget that this is still mirrored only modestly when it comes to the practical results. For example, the celebrated wind farm *Lillgrund*, placed in the Öresund outside of Malmö (see below), has a total production capacity of only around 1/10 of that of Öresundsverket (0,33 TWh). By this I do not mean that investments like Lillgrund is negligible, on the contrary, only that we must keep the right perspective and face that much still is required if fossil fuels are to be phased out of regional electricity production.

Other sources of electricity production

In the years following 2006, local and renewable based electricity production has grown, for example through wind power and solar power investments. In 2008 the large offshore wind farm *Lillgrund* was opened by the company *Vattenfall* (vattenfall.se 25/04/10). The wind farm includes 48 wind turbines with a total effect of 110 MW and a yearly production of around 0,33 TWh. Lillgrund is at the moment the biggest offshore wind farm in Sweden and large in an international perspective as well. Another wind turbine called 'Boel' and owned by E.ON is placed in the Northern harbour of Malmö. This middle-scale wind turbine produces around 6 GWh of electricity which is allocated to the 'sustainable city-project' of the Western Harbour (eon.se 25/04/10). There are currently ambitious plans connected to the development of wind power at a local and regional level. A network has been established called the *Scania wind power academy* with the City of Malmö and other actors as interested parties.[124] If successful, wind power may turn out to become one of the legs in realising the goal of 100% renewable energy in the municipality's internal activities in 2020.

Solar power is often mentioned as one of the alternative technologies to solve our energy crisis. Even though Malmö is the city with the largest area of solar cells and solar thermal installations in Sweden, the actual electricity production is still very small (solarregion.se 25/04/10). Covering an area of more than 3300 m^2 of photo voltaics in schools, museums, hospitals and industrial buildings, the total electricity production is estimated to around 0,37 GWh. Solar thermal collectors add up to another 3200 m^2 producing around 1,26 GWh for heating purposes.[125] Both these figures are negligible in comparison to the total needs of the city. To illustrate this fact we can turn to one of the most spectacular installations in Malmö namely the one in *Sege Park*. Here the roofs of two houses are covered with 1250 m^2 of solar cells in the form of two large 'wings' (figure 22). Even though this installation has received a lot of attention the fact remains that only around 15% of the electricity consumption of the houses is covered by these installations.

[124] More info at: http://www.vindkraftsakademin.se.

[125] These are rough estimates on municipal solar powered energy production based on oral communication with a representative from Solar Region Scania. Privately own solar power installations are not included. To put these figures in perspective, the solar powered electricity production today is around 0,7% of the estimated municipal internal need in 2020 and the heat water production around 1%.

The City has however profiled itself as a leading actor in solar power and is one strong partner in a network called *Solar Region Skåne*.[126] We must understand that solar power is still in an early phase of development (PV more so than solar thermal installations) and the market is dependent on subsidies, one representative of the network explains. Further, the potential of electricity production at this latitude is limited. Bigger however is the potential of heat water production, and solar thermal installations are now expanding in detached houses, according to this interview person. Even though solar energy thus to *some* extent may support the realization of the Malmö Energy strategy, it seems clear that solar powered electricity, although very interesting, is still mostly a question about eco-profiling and of supporting a developing technology. As the City of Malmö has declared its ambition to promote local and renewable based electricity production, I would find it interesting to further investigate the conditions for such an expansion at the small scale as well as the larger scale.

Concluding, even though there are ambitious efforts to increase local and smaller scale renewable electricity production, the big picture is still one dominated by large suppliers and the feature of a broader market. Further, neither the local power grid nor the main production units are owned or controlled by the municipality even though, of course, the public sector is an important client.[127] While there are certainly possibilities on the supply as well as the demand side, it will take some real efforts to realize the internal goal of 100% renewable based electricity consumption by 2020, not to say the 2030 goal for the whole city.

Figure 22. The solar cell installation at Sege Park
(Solar Region Scania)

[126] More info at: http://www.solarcity.se.
[127] For example, around 7% of the total electricity consumption in the city is demanded by the municipality (approximate figure from interview person).

The share of renewable energy

How much of the electricity used in Malmö is then to be classified as renewable energy? As we have seen, the electricity market has to be assessed in a broader context. I will here choose to use the assumption that the electricity used in Malmö mirrors an average Swedish mix of electricity production. This will not be totally accurate as there are certainly divergences from the national case due to specific local demands and broader market influences. An alternative would be to assess the market in a southern Scandinavian context, the general feature of the Nord pool market or, perhaps, by looking at the production portfolio of the largest company in action in the area namely E.ON.[128] We know that in the Swedish case, hydroelectric power and nuclear power are totally dominant with around 45% each (Swedish Energy Agency 2008a: 84). The remaining 10% is divided between electricity produced from fossil fuels, biomass and wind power. I will choose to follow these rough proportions and use an approximate figure for the Malmö case, not arguing that this is *exactly* the right figure but for the purpose of getting the big picture.

2. District heating

Continuing I will use district heating as the next main label of this account even if the energy inputs behind heat water production – fossil gas, waste, biofuels and industrial waste heat – are to some extent also directed to other purposes. District heating was introduced in Sweden in the 1950's with a large expansion phase in 1975-1985 (ibid.: 93). The district heating system in Malmö requires around 2,5 TWh per year (average) and covers over 90% of the households in the municipality. The district heating net is owned by E.ON and is currently in expansion. The heating supply in 2006 originated from the following plants with their share of total yearly supply in brackets (City of Malmö 2009d; SYSAV 2009; malmo.se 18/10/09):

- SYSAV waste management plant. Waste incineration generating heat water (around 50%)
- Heleneholm combined power and heating plant fuelled by fossil gas (80-90%) and oil to a smaller extent (heat water production covering around 25%)
- Flintrännan district heating plant. Heat water production from the combustion of biomass (around 10%)
- Evonik Norcarb AB. Waste heat captured from the production process of the company and transferred to the district heating net (5%)
- Sjölunda sewage treatment plant. Waste heat captured from sewage by heat pumps (5%).

[128] In the context of the Nord pool members, the Norwegian electricity mix is heavily based on hydroelectric power (98%), the Finnish system to some 30% on nuclear power and 40% on non-nuclear thermal power (which I assume is mainly fossil based); the Danish mostly on thermal power (72%) but also on wind power (around 18%) (Swedish Energy Agency 2008a: 85). The electricity production of E.ON Nordic in 2008 was based on nuclear power 59%; hydroelectric power 37%; other renewable based sources (wind, biofuels, etc) 2%; and fossil fuel sources (oil, coal, fossil gas, peat) 2% (eon.se 24/06/10).

Of these plants, Heleneholm and Flintrännan are owned by E.ON. SYSAV is owned by a group of municipalities in southern Scania. The heat pumps at Sjölunda sewage treatment plant are run by VA Syd, which is a statutory joint authority of the Malmö and Lund municipalities. Evonik Norcarb AB is a private company. The municipality of Malmö thus only has partial control of these plants such as by the part-ownership of SYSAV and Sjölunda and by political measures. As already noted, the system is now radically changing as Öresundsverket will be covering a large share of the heating provision (around 40%). The fossil gas segment will thus increase compared to the 2006 diagram in figure 20. In total, the district heating system will be dominated by energy from waste incineration and fossil gas combustion.[129] The control of the district heating system – and the connected electricity production – is one of the questions possible to feed into future studies. What are the incentives (and obstacles) for a transformation to a fossil-free and high-efficient heating system? I will now turn to each of the inputs to the district heating system looking at them a little more closely.

a. Fossil gas

Fossil gas is used on an increasing scale in the Malmö energy system. Fossil gas consists mostly of methane (CH_4) and is a cleaner fossil fuel than oil and especially coal. The carbon dioxide emissions using fossil gas may be reduced by 40% and 25% compared to coal and oil respectively (Swedish Energy Agency 2008a: 98 ff). Fossil gas has become an attractive alternative as the distributing system has been expanded in southern Sweden since the 1980's. While the total share of fossil gas in the Swedish energy mix is minor (1,7%), the municipalities connected to the gas distribution system has a much higher share, often around 20% (2006).

The estimation of the total fossil gas share is according to the sankey diagram from 2006 around 17%. As already noted, in 2009 these figures have changed as Öresundsverket now will be included. We will have reason to return to the fact that the fossil dependence of Malmö seems to increase rather than decrease at the moment. At this point one may only conclude that the different actors in control of the energy system have chosen to stick with fossil gas. The sustainability debate is solved by saying that fossil gas is a necessary part of a transition to a low-carbon system and, further, that it acts as a bridge in the conversion to biogas-driven systems. The complex of questions that opens up here may be subject to further studies. How possible is a full-scale transformation from fossil gas to biogas? And what socio-ecological consequences will this new system entail in terms of a place based and a system based sustainability assessment?

[129] The Heleneholm plant will then take on the role as a reserve capacity while the Flintrännan plant will probably be closed down.

b. Waste

In Malmö there is a large waste management plant where waste is collected from Malmö and the surrounding region. It is owned by the SYSAV-group consisting of 14 municipalities in southern Scania including around 660 000 inhabitants (sysav.se 18/10/09). The waste collected is either used in energy production (incineration), recycled (material recycling) or, but to a minor extent, deposited. In 2008 SYSAV received almost 850 000 tons of waste from households, industry and other sources. Over half of this volume was used as an input to the thermal power station in Malmö, generating around 1,47 TWh of heating and 0,26 TWh of electricity,[130] of which around half of the electricity was sold. According to SYSAV's own statistics, around 60% of the household waste is used in energy production, 24% is used in material recycling, some 11% is due for biological treatment and some 3% is deposited (SYSAV 2006: 15). The share of energy from waste in the Malmö district heating system amounted to around 40% in 2006. From 2010, with the new constellation of energy producing units, this share will increase to around 50% (City of Malmö 2008e: 5). It is thus evident that the Malmö municipality is quite dependent on waste as a source for heating.

How is one to judge the sustainability of this waste based energy production? Talking to one representative of the company, it is a highly efficient and reasonable system. Starting to use waste as an energy source instead of only depositing is a kind of *recycling*, not in materials but in the energy content of the waste. 'As the waste is already there, this person argues, the most sensible thing is to make use of it as a valuable energy source. This will substitute for other more harmful energy sources, not least the fossil-based ones. To extend the view of 'recycling' to hold for energy and not only for materials, which is how I would intuitively look at it, is not this person's own idea but a result of policy decisions taken a the EU-level.[131] Because of the expansion of the capacity to incinerate – in Malmö and in many other cities in Sweden – a wasteful and polluting system of depositing is coming to an end.[132] Further, the emissions from the SYSAV plant to air, soil and water is according to this person *very* low due to top-modern end-of-pipe technologies. Also, the rest products from the combustion phase are subject to several steps of recycling and safe management and storage technologies.

Taking a broader view, however, I think that the sustainability aspects of waste-based energy production is important to discuss and one which could be subject to further investigations in my work. Now I will only open up a few questions, of which one is: Is waste to be counted as a *renewable* energy source? From the website information by SYSAV it is argued that waste can be regarded mainly as a 'bio-fuel' as it consists of 85% 'renewable' resources counted in weight. This estimate is supported by the organisation Swedish Waste Management (*Avfall*

[130] These are the latest figures which I received on a visit at the plant 09/02/2010.
[131] I have not checked this statement in detail but according to this representative from SYSAV, the EU policies are defining a certain level of energy efficient waste incineration as 'recycling'. This implies, if I am correct, that EU in this sense 'jumps' the stages of the resource use hierarchy (referred to below) by seeing energy production as a kind of recycling.
[132] This is however ultimately connected to the fact that waste deposition has become heavily restricted by law and taxes.

Sverige), a stakeholder association in the field of waste management and recycling (avfallsverige.se 18/10/09). However, a lower share will be the conclusion if one instead of weight or volume focuses on how much the different origins of the waste contributes to the *energy content* when incinerated. In a recent national study from the Swedish Energy Agency (2010) it is assessed that a little less than 60% of the energy content stems from renewable energy sources. In another study on the Norwegian waste system this figure is lower, around 50% (Profu 2006).[133] In my view this line of reasoning is relevant, as what should be in focus is arguably the contribution to the *energy* production rather than the shares of volumes or weight. In the calculations to follow I will for the reason of getting a fairly balanced picture make the assumption that the average waste input to the Malmö system can be viewed as a 50% renewable and 50% fossil energy source. The reason for choosing this lower figure is that we will soon return to more critical arguments opposing the view that waste production of modern society at all should be judged in terms as 'renewable'.

The discussion on waste is an old one, but deserves continued attention. On the whole, I think it boils down to a more fundamental discussion of 'waste' as a 'resource' and especially as an energy source. In 1997 a 'Strategy on sustainable resource use' was presented by a Swedish government commission (Kretsloppsdelegationen 1997). In this report and with reference to an EU directive a resource use hierarchy is presented on how waste should be treated:[134]

1. Minimise the production of waste in the first place
2. Reusing instead of letting resources become waste
3. Recycling of materials
4. Energy production
5. Depositing

The contemporary society is a large waste producer and the trend shows no clear signs of decoupling from economic growth.[135] Instead, the general trend seen over a longer period has been one of steadily increasing volumes. In Malmö, the total collected waste volume from all types of sources amounts to over 500 kg per capita and year (City of Malmö 2009b: 41). From this level, around 50% belongs to some of the broad fractions such as cardboard, paper, plastics, glass, metals, wood, garden refuse, etc., which may be used for some kind of material recycling. But over 250 kg falls into the category of 'unclassified waste' out of which material reuse and recycling is more difficult. Based on the hierarchy of resource use, one must ask if the contemporary system is a long-term sensible and sustainable use of resources. Even if a (smaller or bigger) share of the waste may be regarded as renewable, it is nevertheless materials that could have alternative uses before final combustion. Further, if Malmö to such a large extent is

[133] Of course there may be differences in the waste content between the Malmö case and the Norwegian one. However, I can not see that it is inappropriate to use this study here for purpose of a general assessment.

[134] The directive referred to is EU-directive 91.156. In Swedish this hierarchy is called 'Kretsloppstrappan' or 'Avfallshiearkin' among other names.

[135] We are reminded of this relationship by the recent dip in waste levels, especially from the industrial sector, in the wake of the contemporary recession. To uphold its production levels, SYSAV has now started to import waste from Norway (around 30 000 ton in the first stage) (sydsvenskan.se 11/03/10).

dependent on waste incineration for its district heating, one must be aware of the risk that the *incentives* of securing a large supply of waste for combustion may override those in favour of reusing and recycling. As waste will certainly continue to be an input to the Malmö energy system in the foreseeable future, I think it will be crucial to find the right balance between a well-equipped system of material recycling and a smaller but high-efficient share of energy production if one is to fulfil the intentions of the Energy strategy.

c. Waste heat

Waste heat from the industrial sector is used as an input to district heating systems in many Swedish municipalities, although with still quite a small share (around 4-6% in recent years) (Swedish Energy Agency 2008b: 29). The same rough figure also counts for Malmö where waste heat is estimated to contribute with 5% to the total input (City of Malmö 2008c: 5). The waste heat is delivered mainly from *Evonik Norcarb AB*, a company producing carbon black which has a fossil-based raw material input to this process.

Is waste heat to be regarded as a renewable energy source? Given that many industrial processes today – including in the case of Evonik – are fuelled by fossil sources and/or electricity, waste heat is obviously not a self-evident renewable energy source. On the other hand, waste heat that is taken care of – and simply not 'thrown' away – must be appreciated as a valuable source in a more sustainable energy mix. The eco-efficiency is higher in an industrial process that reuses its waste heat than in one where all is lost. While the long-term goal must be an industrial sector that is high in eco-efficiency *and* run on renewable resources, one may still judge the use of waste heat as a good thing even in the contemporary and largely fossil-based system.

d. Biofuels

The use of biofuels in Malmö in 2006 belonged mainly to the production of heat water at the Flintrännan district heating plant (eon.se 20/10/09). This plant, owned by E.ON, is fired with a mix of different biofuels (rest products from sawmills and the wood industry; forest fuels such as chipped logs, branches, tops; energy forest products cultivated on arable land such as Salix; chipped wood waste from recovered wood products). The annual consumption of biomass is approximately 300 000 cubic meters of which around half is delivered by ship and the rest by road and rail. When Öresundsverket now is established the production at Flintrännan will likely be closed down.

3. Oil and petroleum products

The remaining part of the input to the Malmö energy system consists mainly of petroleum products, oil 5% and petrol/diesel oil 23%, resulting in a total petroleum share of 28% which is roughly around the Swedish average (32%).[136] If we assume that the import of petroleum products to Malmö mirrors average Swedish conditions, then around 1/3 is imported from Russia and a little less than 30% each from Norway and Denmark.[137] The use of oil has radically decreased in Malmö in the last 15 years. A small share was still used in the district heating system of 2006 as well as in the heating of private houses and as an input to industry. The bulk, however, belongs to the transport sector and the use of petrol and diesel. In the same vein as in rest of Sweden, despite huge attention only a very small share of total transports are driven by alternative fuels such as electricity, gas or ethanol. From the energy balance in figure 20, it is evident that the Malmö transport sector is *heavily* dependent on fossil fuels. To come to grips with the transport sector is certainly one of the most complex challenges in light of the 2030 vision of a totally fossil-free energy system.

Alternative fuels for transports

Farthest to the right in the sankey diagram there is a small share of ethanol in the Malmö energy input (less than 1%), which is mainly used as a motor-fuel. The national use of biofuels for transports have radically increased in recent years, but from very low levels (2,7% in 2007).[138] In Sweden around 85% of the ethanol used is imported from Brazil. As well known, there is a growing critical debate on the lifecycle of biofuels. One example is the reports from Fargione et al. (2008) on that biofuel production may not be that efficient in terms of net greenhouse gas savings as first believed. Further, severe socio-ecological consequences such as heavy landscape exploitation in the South, harsh working conditions for the people in primary production and a pressure on food prices caused by ethanol production competing with food production are now subject to intense debate (cf. Rathmann 2010; Berndes 2003; Gaia Foundation 2008; Grain 2007). One important issue must therefore be to critically reflect on the potential of various biofuels to substitute for fossil fuels in the transport system.

Following the recent debate on alternative fuels, biogas in addition to electricity seems to belong to the promising candidates. Biogas is a natural product in the fermentation process of organic materials in anaerobic environments (biogassyd.se 25/04/10). By using this natural process in a controlled way one can extract a gas from organic matter such as household waste, sewage, energy crops, manure and other rest products from agriculture and industry. Biogas consists mainly of methane (CH4) and carbon dioxide (CO2) and may be used directly in heat- and power production or, after an upgrading process, as a motor fuel in the same way as fossil gas. A rest product is also received that, if quality is secured,

[136] Swedish figure from 2007 (Swedish Energy Agency 2008a: 103 ff) and the Malmö one 2006.
[137] The exact import figures are: Russia 33%, Denmark 28% and Norway 27% (ibid.). A few percent of the import to Sweden stems from other countries such as Venezuela, Great Britain, Iraq and the Netherlands. The detailed feature of the oil imports to Malmö is not yet investigated, but is probably connected mainly to the ports of Malmö/Copenhagen and Gothenburg.
[138] Ethanol, biogas and FAME here included (Swedish Energy Agency 2008b: 20 ff).

may act as a fertilizer possible to return to agricultural or other biological production.[139] The contemporary production of biogas in Sweden is around 1,4 TWh and Scania is a forerunner in holding some 25% of this production.[140] There is a regional environmental goal in Scania aiming at a level of 3 TWh of biogas production in 2020. A network called 'Biogas South' (*Biogas Syd*) are also pushing for a national target together with other actors aimed at a radical increase of biogas in the Swedish energy system: '20 TWh in 2020' as the proposal goes (biogassyd.se 26/04/10).

While many questions remain on the sources and effects of such a radical increase in production levels, it seems reasonable to think that biogas will constitute a growing input to the Scanian energy system in the future. The public transport company is already working towards the goal of a fossil-free system by 2020, in where 'green' or similar types of environmentally labelled electricity[141] will run the trains and biogas will fuel the buses and other vehicles. To fulfil this, *Skånetrafiken* estimates the need of biogas to somewhere between 0,25-0,5 TWh in 2020.[142] If the regional production target and the goal of Skånetrafiken should be realized, public transports will demand up to some 17% of the total regional production in 2020. Turning to Malmö, there are currently several plans on establishing biogas production within the city. If we keep the demand of the current transport sector of almost 1,9 TWh in mind (2006), it seems obvious that biogas will not solve the whole issue but act as one contributing segment. With the recent municipal decision to build a tramway system, electricity driven transports will act as another substitute at least to the inner city traffic. Concluding, and in light of what has here been said about the transport sector, I suggest that rather than looking for substitutes to the *whole* current demand of fuels, something that is both difficult and potentially problematic from several sustainability perspectives, one should instead focus on the potential of an increased efficiency as well as a total reduction of the transports in Malmö.

The share of renewable and non-renewable energy

We have now analyzed the main inputs and users in the energy system of Malmö and it is time to put the pieces together and try to answer the question earlier outlined: How big is the share of renewable energy in the contemporary system? As we have seen, it is not easy to define the 'renewableness' of different energy inputs. The task obviously belongs not only to the scientific understanding of energy sources, but also to the outcome of social and political negotiations. As we have seen, electricity belongs to a broader production system and waste is both fossil and non-fossil in its origin. Waste heat from industry turned out a bit difficult to assess, as its contemporary origin is fossil but at the same time this

[139] The quality of this end product depends on the inputs and a large debate currently revolves around how to secure a clean and high-quality fertilizer from different sources of biogas production.
[140] According to one interviewee, the regional production level is today between 340-375 GWh.
[141] That is, electricity with a brand that guarantees that the amount consumed is produced from (certain) renewable sources.
[142] I have seen various figures for this estimated need ranging from around 250 to 500 GWh. Some degree of uncertainty is thus connected to these figures.

energy type constitutes a valuable input to a more efficient energy system. For reasons argued above, I will in the following choose to present the share of renewables *including* waste heat.[143] Based on assumptions elaborated in the previous sections and with the purpose of getting the big picture rather than going into detail, the calculation may thus be compiled:

Energy inputs to Malmö (2006)	**Total input in GWh**	**Assumption**	**Renewable share in (%)**	**Renewable share in GWh**
Electricity	2326	Average Swedish production mix (hydroelectric power 45%; nuclear power 44%; fossil fuels, biomass and wind power 11%) gives a rough estimate of around 50% renewable energy.	50	1163
Fossil gas	1299	Non-renewable	0	-
Waste	1087	I follow the assumptions of 50% renewable energy in waste for incineration based on arguments above.	50	544
Waste heat	156	Waste heat is a non-renewable energy source if originating from a non-renewable input. As argued above, I anyhow find it appropriate to include in the final estimate.	100	156
Biofuels incl. ethanol	717	Renewable	100	717
Petroleum products	2153	Non-renewable	0	-
Other[144]	4	-	0	-
Total	**7742**		**33%**[145] Waste heat incl.	**2580**

Table 6. The share of renewable energy, including waste heat, in the primary energy supply of Malmö in 2006

The share of renewables in the Malmö energy system, including waste heat, was thus around 33% in 2006. As a comparison, the direct input of fossil fuels (petroleum products and fossil gas) was around 45%. This estimate is not contradicted by what I have been able to gather from other sources. For example, in a collaboration project between seven Nordic cities the share of renewables in the Malmö energy mix was estimated to 30% in 2003 (Nordiskt storstadssamarbete 2006: 13). It is important to note that in several respects this is a favourable way of calculating. One could for several reasons claim that the share of renewable energy is exaggerated and the fossil-based share underestimated. The reasons for this mirror to some extent the discussion on place based versus system based considerations.

[143] As the input of waste heat is only a few percent of total energy supply (2%), the figures will not diverge much in any case. The share of renewables is 31% with waste heat from industry excluded, and 33% included.
[144] This category consists of very small inputs of different origin and is left out of this estimate as they are negligible in comparison to the large segments.
[145] This figure results from dividing the supply of renewables (2580 GWh) by the total primary energy supply of 7742 GWh.

The first and most obvious one is that the fossil-fuelled input at the moment is increasing as a larger part of the district heating system becomes fossil gas-based. Secondly, it is not evident on which system level one should assess the electricity consumption. Even though the share of fossil energy is relatively small in the Swedish production mix, which is the assumption I have here chosen to follow, it would increase if I instead took into consideration the broader region of the North European market, as this is more fossil fuel-dependent. I have chosen the Swedish electricity mix as it is not straightforward in which way the electricity consumption of Malmö is best to be assessed. Thus 50/50 seemed to me a balanced figure. Thirdly, even more complicated is the disagreement on *how* renewable different energy types actually are. As already argued, this discussion belongs not only to the sphere of science but to the one of social negotiations. While there are some who would claim that waste is an almost 100% renewable energy source and that nuclear energy ought to be included into the share of renewables due to its 'climate efficiency', there are others who would see this the other way around. While it is interesting in itself to think of how decisive our *perceptions* of different energy sources are, I will for a moment pursue the critical line of thinking. In that view, the fossil-based share is to be judged even lager if one takes into consideration the *indirect* fossil-dependence of the Malmö energy system. The reasons for this have been hinted at in the sections above and may be summarized as:

- *Waste heat from industry and other sources is dependent on fossil energy*, directly if the industry in question uses fossil sources as the major input, and indirectly by the fossil-energy dependent infrastructure of which these units are part.
- *Even behind the assumed 100% renewability of biofuels* such as wood products (chips, firewood, pellet, etc.), ethanol and biogas there is an indirect fossil 'footprint' stemming from the dependence on fossil fuels in the production and distribution of these products. Moreover, the concept of 'renewability' as such must be subject to critical scrutiny if it is allowed to include heavy (and unsustainable) exploitation of socio-ecological systems as put forward in for example the ongoing debate of biofuel production in the South.
- *There is an indirect input of fossil fuels behind the waste generated* in our society. Most kinds of goods consumed – that in a later stage of their lifecycle become 'waste' of one kind or another – have an indirect dependence on fossil fuel inputs. Without giving any exact figures here we can principally know that, as there is a heavy reliance on fossil energy in the global economy (over 80%) to which Sweden and other industrial countries are highly linked through trade. Further, we know that in all kinds of goods and services there is an embedded energy content, something that many researchers have noticed and tried to calculate (e.g. Odum 1996). One could in fact argue that this hidden share of fossil fuels is crucial for the upholding of the contemporary system of large waste production as such. In this view, the earlier statements on the 'renewableness' of waste is doubtful. Rather, the contemporary waste-intensive society must be seen as directly linked to a fossil-dependent economy on a larger scale.

Extending this view even further, one could of course take into consideration the *whole* extent to which indirect energy consumption is embedded in *all* kinds of goods and services that are consumed in Malmö (not only in the final stage of the life cycle, i.e. as 'waste'). As showed in chapter 3, the greenhouse gas emissions per capita will almost double when adding foreign emissions connected to average Swedish consumption patterns. That is, even if Malmö would get quite far in phasing out fossil fuels the fossil-dependence would so to speak sneak in through the backdoor as embedded in the goods and services that this urban structure imports. That does not mean that it is irrelevant to try to phase out fossil fuels at a local scale, only that we should stay aware that the urban metabolism is heavily connected to the feature of distant socio-ecological systems and a larger energy context.

Discussion: energy, vision and reality

In this thesis I have explored a wide horizon to understand the context in which urban sustainable development is embedded. This has been done by looking back in history to see what driving forces that have shaped Malmö to the city it is today. Then I investigated different approaches to urban sustainability and mirrored those against the discourse of local actors. In this part of the thesis I have proceeded with a real and actual case: energy. I chose energy for several reasons, the most important being its high actuality in the sustainability debate and in local policy making. The Energy strategy, with its ultimate vision of a fossil-free city in 2030, has been used as a springboard to the sphere of visions as well as to existing realities. I would now like to end with trying to bring together some themes in a discussion that is both critical and constructive and aimed at supporting an honest debate on energy and urban sustainable development.

A double strategy

First, this thesis has shown that the point of departure will bring about very disparate answers on urban sustainability. In chapter 3 I introduced some general examples of the tensions between a place based and a system based approach. In the case of energy, the inputs (e.g. fuels, electricity, waste) as well as the outputs (e.g. rest products, greenhouse gases, ultimately entropy)[146] are all linked to higher level systems. This leads me to say that assessing energy and sustainability will *certainly* require a system based approach. It is simply not reasonable to look at the city as an isolated entity when we know that energy to such large extent is imported (directly) as well as embedded (indirectly) in all kinds of goods and services that supply the citizens. This does however not mean that a place based approach is totally irrelevant. It would be a failure if consumption based assessments was taken as a kind of excuse (or explanation) for not working to reduce local and production based impacts. In the case of Malmö, this is as we have seen not an easy task in itself, as there are competing interests and limited public ownership/control of essential parts of the energy system (e.g. distribution network and production units). Summing up, a double strategy seems to be the

[146] The actual work accomplished by the energy carrier (e.g. heat, motion) is of course an 'output' as well. When talking about energy we should always remember the conditions as set by the thermodynamic laws (see p. 93).

right way to go ahead: to keep up a high level of local sustainability ambitions while intensifying the consumption based considerations in municipal policy making. *How* exactly a City like Malmö is to work with system based policies in the area of energy and sustainable development is an important question that will be left unanswered in this thesis, but which would certainly apply to future research.

Visions and realities

Turning now to the energy visions and the energy realities of Malmö. I have through this thesis returned to 'visions' and 'realities', as I think it is crucial to see that there is not *one* vision or *one* reality – but many, some converging and some conflicting. One can view the relationship between visions and realities in different ways: as tensions, as potentials, as conflicts and so forth. One can choose a viewpoint from the natural sciences, from where the realities of the biophysical system can be put forward as restricting or enabling factors. Or one can listen to a technologically oriented person who perhaps will point to promising energy solutions abound. Or one can turn to the social sciences, stressing for example how the outcome of negotiations and power relations will be decisive in setting the terms for an energy transformation.

As a human ecologist it is natural to take a middle position arguing that *all* of these aspects will matter. The outcome of the contemporary energy crisis, if one chooses that word, will be decided through the interplay of them all: a complex reality in where biophysical and technological as well as economic, political and cultural aspects will play a part. In the case of Malmö, I have through my interviews been presented to a whole range of technologies and social engineering solutions strongly believed in. Certainly, there is a wide range of possibilities: there is a large potential to increase the efficiency in basically all parts of the energy system; there is wind power and other renewable options in sight; there is a district heating system possible to transform and a transport sector open to improvements on functionality, efficiency, and sufficiency. Not least, there is a relatively large public sector that could take the lead as a client and actor in demanding and actively supporting renewable and sustainable energy solutions.[147]

By the interviews I have been especially reminded of the *relatively* accessible option of saving rather than substituting energy. In a background report to the Energy strategy (City of Malmö 2008c: 42), the potential of efficiency measures in different parts of the system has been estimated in the range of 20-40%.[148] In some sectors, such as in the housing and service sector, the potential may be over 50%. As one participant meant, in this way one can reduce the *size* of the whole problem and alleviate a great deal of pressure connected to the transformation.

[147] There is reason to stress the importance of the actions and demands of the public sector since it constitutes a relatively large part of the Swedish economy (compare at p. 60 where we learnt that some 1/5 of the consumption based CO_2 emissions originate from public consumption). Add to that a relatively large municipal self government and one could suggest this should imply some strength in pursuing local political goals.

[148] The figures vary from 15% (minimum) to 56% (maximum) for different energy sectors such as industry, housing, transports, the service sector and the public sector. It is stressed that the figures are all rough estimates and in need of more detailed investigations and local adaptation.

Connecting to the historical context, we can remind ourselves about the 'energy poverty' that characterised pre-industrial Malmö (cf. p. 30). At that time it was the fossil fuels that broke the limits and set Malmö in motion into a new era. Is it that we are again approaching a new era: the post-fossil economy? And how is this system to cope with the relative 'energy affluence' that we have built into our infrastructure, including our habits and expectations? Are we able to refit our structures, physical as well as mental, into an efficient and sufficient mode?

The technological and social engineering solutions, which lie at the heart of ecological modernization, give many a strong hope. As we have seen there are many seeds planted and hoped for in Malmö, among them projects on biogas, wind and solar power, and hydrogen gas. Even if these are still modest when it comes to their real output, their potential in combination with a breakthrough of efficiency measures can be seen as the solution that will lead modern urban cities into a new post-fossil era. If we keep these ecological modernization glasses on for a while, I think that for these efforts to grow and flourish a *strong* commitment among some key actors will be decisive, as well as general acceptance from the public opinion. What will happen when a series of wind turbines are proposed for the outskirts of Malmö? How will E.ON handle demands for change in the district heating system? And how will the public react to a transformation of the transport system? It is likely here, in the sphere of the social and political, that the real clashes between visions and realities will be laid bare. When concrete solutions are to be brought about, we can expect large conflicts to emanate from the contradicting interests we have found inherent in the discourse on urban sustainable development.

However, and returning to the battle between discourses, this reasoning lies totally within the realms of ecological modernization thinking (cf. p. 67). It takes implicitly the position that thorough change *is* possible within the current system. For the one who discards the framework and presumptions of ecological modernization theory, the view will of course be quite more pessimistic. Then these efforts, in Malmö and in other cities, are only on the marginal of a huge fossil-fuelled power complex which will deserve a whole other type of drivers to change. In this view, the whole problem is really about an economic system that undermines true sustainability transformations by its inherent logic. What Malmö, and other local communities should do, is instead to challenge the growth paradigm of contemporary society and to reshape local socio-economic structures in a mode that breaks with the logic of global capitalism. What this would mean in practice and in the context of Swedish municipalities is an extremely challenging thought. In any case, the very disparate views emanating from ecological modernization theory and its antagonists I think lead us to some core questions:

- What is the crucial role of local communities in a transformation towards global sustainable development?
- What is the best thing a municipality can do if it wants to contribute to real and effective change in the area of energy?
- Is the contemporary growth paradigm reconcilable with the demands for global sustainability? And if not, how is the conflict to be solved?

The power to change

One most pressing issue will concern the actual capacity of different actors to transform the complex feature of the city's energy system. *Who* is actually in power when it comes to realizing the energy goals of the City? Who are the key actors and what incentives and restrictions do they perceive? While one can praise the City of Malmö in its brave ambitions, daring to cover not only its internal activities but the *whole* municipality, it is at the same time important to question the actual capacity to influence this larger context. How can a City convey the message of an energy transformation to actors such as businesses, private landlords and, not least, to the citizens of Malmö? One could perhaps think that the answer is simply 'no'; the municipality will not be able to exert this influence. But I think there is no such one-sided answer. The role of the municipality is not totally fixed – although of course restricted by for example national law. My inquiries have pointed to a window of opportunity by a relatively large commitment shared among a wide range of actors, if only at the discursive level so far. Is this Malmö vision of an urban sustainable development to some extent preparing the actors for real change? The idea that the municipality should, and could, act as a driver to change the consumption patterns of many small actors in the municipality is, although opposed by some, suggested. The reasoning behind is that as sustainable development, and in this case the transformation of a fossil-based system, is not a private but rather a *public* issue, the public authorities have a responsibility to act. Further, it is suggested that large public bodies like the City of Malmö have an important role to act as a good example and to raise public opinion in favour of sustainable development policies.

A vision as an enabler?

In light of the actual feature of the energy system it is left without doubt that the vision of a fossil-free city is nothing but a tremendous challenge. As we have seen, Malmö today relies to at least 2/3 on non-renewable energy sources – compared to the 2030 goal of zero reliance – and as far as I can see there is at the moment no convincing sign of systematically increased use of renewable energy sources in proportions that can compete with the fossil-based ones. On the contrary, the fossil-based energy system seems to have quite a firm grip on Malmö. Even though there is some progress made in comparison to the situation in for example the 1970's, when the oil-based input was heavy, it must be considered problematic that such a vast part of the energy supply is still directly (and certainly indirectly) fossil-dependent. Especially problematic are some key-sectors such as transports and district heating. All this would certainly lead some to the conclusion that the energy vision of 2030 is nothing but quite unrealistic.

Is then a strong vision like this a positive contribution to the policy making on urban sustainable development? Is this vision to be seen as a lighthouse pointing in a desirable direction and thereby pushing and pulling actors towards change? Or, is an ambitious goal like this more of an illusion that obscures the real situation and obstructs a clear-sighted view? In the conversations I have had with a wide range of actors, the vast majority strongly approves such an ambitious level of target setting. This holds not only for officials within the municipality but for representatives from the private sector and others as well. The Malmö energy

vision is '*very* good' for us, one representative from E.ON perhaps a bit surprisingly stated. By that we have a clear policy statement and a declaration of intent from the City of Malmö. This creates a fundament of stability and incentives for the company to engage in long-term commitments and joint projects.

A common view among the participants is that a strong vision is in *itself* a driver of change. The Energy strategy is a kind of 'tool' which one can put on the table and say 'hey, now listen, this is what Malmö has decided!'. As in other processes of change, for example in the introduction of safety-belts or the abolition of smoking in public areas, the vision is first held as 'unrealistic' but then slowly, as changes begin to take place, becomes accepted and legitimized. Of course, energy is a whole other issue than safety-belts or smoking, but I think the general reflection is valid. In putting forward a strong vision one slowly, at least if backed up by actual efforts, alter the perceived reality. The unrealistic becomes realistic – the controversial becomes the natural. It now remains to be seen how the relationship between this strong vision and actual initiatives for change will play out in Malmö in the coming years.

Structure and agency

Finally, a reflection inspired by a friend of mine in discussing the energy future of Malmö. Being obsessed by the internal abilities to change or not to change the energy system, he said to me: 'Perhaps this will all solve itself until 2030 anyhow'. In this view, the strong external forces now amounting – changing energy prices, national and international policies, geopolitical tensions, and so on – will exert such heavy pressure that change will come irrespective of what the actors of Malmö say or do. This is an important reflection, as we have already seen how important external forces were during the former crisis of Malmö. It is reasonable to suppose that many key issues of the energy challenge will simply be solved (or at least dealt with) on a whole other level than the local one. Once again we are reminded of the heavy dependence on the surrounding world and a higher-level system of socio-ecological relations that Malmö is embedded within. This does however, as I see it, not take away the important local task of contributing to make change and to take responsibility. Even if the energy transformation, rightly, will to a large extent depend on decisions and actions taken by higher-level actors (such as transnational companies, governments and international bodies), I think the willingness and capacity of several small actors to engage in a process of change will be crucial. Once again, it may not be one of these polarities that will ultimately settle the issue – but the combination of them. And there is of course no guarantee that it will unfold in the way we would like it to.

Part IV. CHECKPOINT

Looking forward

I am now through the first phase of a research process. I have experienced the frustrations in trying to overview a broad field and to dare to step down somewhere and to begin to go in depth. In retrospect, I can see that I have followed a kind of explorative mode in my research. I have begun where I have felt it was most needed, or simply, where I found it most interesting. First by getting to know my field more closely, then by exploring what key perspectives would be suitable for me to use in a human ecological research project. Then I felt I had to get to the concrete and actual, and I chose energy for a deepened case study which I found rewarding as well as challenging. Last but not least, it has been an explorative process to try to connect all these perspectives into one report like this.

I would now like to end with some reflections on possible research themes in the work to come. Connecting to the case of energy, and following the close to the field, participatory and action-oriented intentions of mine, I'd like to scrutinize what efforts are needed to really come to grips with the challenges of transforming a system, which is at its fundaments still very fossil-dependent, into a more sustainable energy system. Based on my findings so far, I bring the following critical topics with me into future studies. These topics may act as research questions to feed into a continued PhD project, or of course, as potential research themes open to anyone:

More on the key perspectives…

- **Local versus global aspects of the energy challenge**

  Interconnections, conflicts as well as synergies, between the local and the global, or the place based and the system based energy challenge.

- **Discourse versus reality: tensions to pursue**

  The gap between discourse and reality, for example between policy making/public discourse and what indicators such as Ecological footprints, Carbon footprints, energy/material- and land use statistics reveal about the current state of affairs.

More on energy…

- **Renewable versus non-renewable energy**

  A scrutiny on the categories in use. The social construct of energy. For example, what is renewable energy, really?

- **Substitution versus reduction**

  Qualitative transformation versus quantitative reduction: efficiency, substitution, sources, users, consumption levels. To save, not only to substitute: but how is it to be done in the current system?
  Is the substitution of bio-energy for fossil energy a sustainable option?

- **Special attention!**

  Special attention to certain topics: biogas vs. fossil gas, renewable electricity, the feature of the district heating system, waste as an energy source, the heavily fossil-based transport sector, the growing service sector…

More on processes of change…

- **Control, power, agency**

  Control of the energy system: structure, agents, power, conflicts, driving forces, incentives, governance.

- **Processes of change**

  Transformation – stakes and stakeholders – the role of politics, the market, consumers/citizens, NGO:s, and other. How is the energy system to be changed, and by whom?

- **Local politics for 'sustainable' energy**

  What role does local policy making have in the transformation to a post-fossil society? What restrictions and opportunities do local actors perceive and how could city governance develop in the field of urban sustainable development? To what extend is a city like Malmö free or fettered when it comes to energy?

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Figures

1. Map above from City of Malmö with permission from Monika Månsson, Environment department. Map below from The European Commission, Directorate General for Press and Communication. © European Communities, 2004 at: http://europa.eu/abc/maps/index_sv.htm.

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7. City Planning office, City of Malmö. Photo: Ronny Bergström. Permission from Göran Rosberg.

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21. E.ON, photo by Berne Lundkvist.

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Tables

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Appendix 1

Interview questions, field study 1, spring 2009

Malmö and urban sustainable development

PRESENTATION

Presentation of the person and the researcher, the research project, the general purpose of the interview. Notice on anonymity.

I. INTRODUCTION

What do you mean by the concept of urban sustainable development (USD)?
What are your associations? What do you think of first, why …

II. QUESTIONNAIRE

Answer yes, no or don't know (or don't want to answer) to the following questions:

1. Do you think that Malmö has become a more sustainable city in the last 20-30 years?
2. Do you think that Malmö is moving in the direction of urban sustainable development right now?
3. Do you think that the infrastructure and metabolism of Malmö is connected to global sustainability issues?
4. Should the City of Malmö actively try to influence its citizens to adopt sustainable consumption patterns?
5. Should the City of Malmö actively try to influence its citizens to adopt sustainable lifestyles?
6. Should the City of Malmö actively try to decrease the throughput of material and energy in the city?
7. Should the City of Malmö try to radically increase the levels of Fair trade consumption in the city?

Please distribute the weight of 1-10 to the following statements (min-max agreement)

1. How close to urban sustainable development would you consider Malmö to be right now?
2. How worried are you about the local environmental problems such as urban air pollution, traffic volumes, and land use issues?
3. How worried are you about the global situation concerning sustainable development, for example climate change, poverty, resource conflicts?
4. How important is the concept of urban sustainable development for the strategic discussion of Malmö's future?

Please distribute 10 points between the following two statements (min-max agreement)

1. Malmö should prioritize to work with local and place based sustainability issues, such as urban air quality, the traffic situation, the waste system and the social dimension of sustainable development in the city.
2. Malmö should prioritize to work with global and indirectly connected sustainability issues, such as climate change, fair trade, global justice and Ecological footprints.

III. TOPICS FOR DISCUSSION

1. Which are the main sustainability challenges in Malmö?
The main problems, priorities, what you think should be in focus in the coming say 10-20 years.

2. What do you see as Malmö's strengths and weaknesses in the context of USD?
- Advantages, opportunities, what Malmö is really good at?
- Disadvantages, problems, where Malmö has been/is not doing well?

3. The connection between the local and the global
- Which are the main sustainability problems on a global level, do you think?
- In what ways do Malmö and its inhabitants affect the sustainability situation at the global level?
- And the other way around: in what ways do you see that the global situation affects Malmö?

4. Priorities
- Which are the most important sustainability issues to work with in the coming 10-15 years
- If you must decide: Give priority to one concrete topic!

5. The scope of local politics – place based vs. system based approach
A short introduction to the use of the concepts of a production or place based sustainability approach and a consumption and system based one.

Do you think that Malmö should prioritize to work with a local and place based sustainability approach, to so to speak concentrate on cleaning up at your own door first, such as by improving local urban air quality, the traffic situation, the waste system and the social dimension of sustainable development in the city.

Or the other way around; should we judge the local problems quite modest in comparison to the global challenges and therefore concentrate on more indirect sustainability issues such as climate change, fair trade, global justice and Ecological footprints.

If there is time …
Looking back 10-20 years

What would you like to point to as positive, or negative, examples of what has already been done in the context of urban sustainable development in Malmö?

Thank you!
Share material of interest + add person to sending lists for my working papers

Appendix 2

Interview portfolio, field study 2, winter 2009/spring 2010

Malmö and the urban energy challenge

This interview study on energy was done with a flexible portfolio of interview questions. The content of the interviews were developed over time and each interview were adapted in relation to the person/institution in question and the specific need of information at that stage of the working process.

I. INTRODUCTION

Presentation of the person/s and the researcher, my research project, the purpose of this meeting and a general introduction to the interview themes of interest. Notice on anonymity.

II. GENERAL QUESTIONS ON MALMÖ'S ENERGY SYSTEM

Examples of areas for clarifications and discussion:
- Some clarifications on the sankey diagram (see figure 20) for example on energy sources and production units in Malmö. Time aspect: why so old diagram as 2006?
- Specific questions connected to sectors and energy users. Example: the development of the energy consumption by the public sector and the private sector.
- The definition of 'renewable energy' in your view and compared to what I have gathered from different sources.
- Recent emission data? For example up to date figures of carbon dioxide emissions? Will the City manage to reach its Environmental objectives of the older Environmental program 2003-2008?

III. MORE IN DETAIL …

More specific questions related to different aspects of the energy system of Malmö. These questions were changed over time and adapted to each interview. Examples of topics:

Fossil fuels
- Oil, coal, fossil gas use
- Öresundsverket
- Transports as a case of a fossil fuel dependent sector
- Public transports
- Alternative fuels in the transport sector

District heating
- System, sources, units, consequences
- Biofuel use
- Waste heat
- Waste incineration

Electricity
- System, sources, units, consequences
- Production units especially Öresundsverket
- Wind power especially the Lillgrund wind farm
- Small scale vs. large scale production
- The regional electricity system
- The relation between E.ON and the City of Malmö

Alternative energy sources / energy carriers
- Biogas
- Solar energy
- Geothermal energy
- Hydrogen gas

IV. GOVERNANCE

Possibilities (opportunities) and problems (restrictions) in a transformation of the energy system to reach the goals of the new municipal Energy strategy. Examples of topics that were discussed in this context:

The Malmö Energy strategy
Background, process, content, evaluation.
Possibilities (opportunities) and problems (restrictions) in a transformation of the energy system.
Examples of what is already done or planned to be done.

Priorities
What do you see as priorities when it comes to realize the goals of the energy strategy? What is most important to concentrate on?
If you were able to take one political decision to make a change – what would that be?

Actors, power, control
Structure/agency – roles – the power to change – 'action competence'
Conflicts and antagonisms vs. cooperation and win-win situations
Power relations: Who is actually in charge when it comes to the crucial decisions connected to the energy system of Malmö? Who can make the changes needed?
Cooperation and/or conflict between public and private interests

Processes of change
Who pushes for change? Who oppose?
What is the role of the municipality in the area of the Energy strategy? Mandate, scope, restrictions?
How can the City of Malmö make a real and radical change (can it)?
Control measures, alternative ways of action
Windows of opportunities vs. obstacles
Elaborate on some creative ways in which different actors in Malmö could make real change!

IV. OTHER TOPICS

A place based versus a system based approach on the urban energy challenge
Examples of topics for discussion: indirect and embodied energy use, REAP, Carbon footprint, global environmental change (especially climate change). What is the role of the municipality when it comes to these system based considerations in the field of energy?

Some questions on national law and the municipality especially in the area of energy

Your vision of a 'sustainable' energy system in 2030
How would it look like? What has changed in contrast to the contemporary situation? How was it accomplished (looking back)?

Snowball method – possible interview persons!
Who would you go and talk to if you wanted to know all about the energy challenges of Malmö?

Thank you!
Give working paper + add to sending lists for my coming papers