



MAKING FUTURES

**On Targets, Measures & Governance
in Backcasting and Planning**

JOSEFIN WANGEL

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Backcasting and Planning for Sustainability

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**KTH Architecture and
the Built Environment**

Doctoral Thesis in
Planning and Decision Analysis
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The future is not a result of choices among alternative paths offered by the present, but a place that is created - created first in the mind and will, created next in activity. The future is not some place we are going to, but one we are creating. The paths are not to be found, but made, and the activity of making them, changes both the maker and the destination.

- John Schaar, futurist

Summary

This thesis is about the making of futures – in the sense of planning, through which the world of tomorrow is crafted, and in the sense of images of the future, developed through the futures studies approach of backcasting. The point of departure for the thesis is that more visionary and strategic forms of planning are needed if the challenges of sustainable development are to be met, and that backcasting, through its long-term, integrative and normative character, can be a helpful tool towards this end.

The thesis explores how backcasting can be used when planning for sustainability by looking into three areas of problems and possibilities. The first of these concerns target setting, for which was found that both backcasting and planning tend to use targets that are elusive, rendering it difficult to understand what is included in the target and what is omitted. As a way to rectify this, a framework of methodological considerations for target setting is presented (Paper I). There is also a need for further methodological development on how to set targets for environmental aspects other than energy and GHG gases.

The second area concerns the identification of measures and actors, where both backcasting and planning were found to have the problem of being techno-biased and/or taking a rather superficial approach to ‘the social’ which means that the socio-technical complexity of everyday life is left unattended (Paper II). This has consequences in terms of delimiting the scope of measures identified and proposed and of the potential of these to result in intended changes. Two approaches are suggested to deal with this: a methodology for developing socio-technical scenarios, in which an iterative identification of objects and agents of change is a central trait (Paper III), and a service-orientated energy efficiency analysis, in which the social logic of energy use is highlighted (Paper IV).

The third area concerns how backcasting can be used in a more explorative approach to the governance of change, instead of leaving this unaddressed and/or unaltered (Paper V). In relation to this, the institutional and political dimensions of planning for sustainability are emphasised, with the focus on path dependency, discursive power and critical junctures (Paper VI).

The connection described between the fields of backcasting and planning for sustainability study and practice is thus beneficial for planning by showing how this could be made more visionary and strategic, while also contributing to the theoretical and methodological advancement of backcasting. One of the main contributions of the thesis is the exploration of how backcasting studies could

benefit from including the question of 'Who?': Who could make the changes happen? Who should change (whose) lifestyle? Who (what group/s in society) benefits and who loses from the images of the future that are developed? And who is invited to take part in the making of futures and whose futures are being heard? Including the question of 'who' highlights the normative character of sustainable development and makes issues of environmental justice and equity visible.

The formulation of images of the future is also a question of resources and ultimately of power. In relation to this there is a need for groups of society besides those in power to be encouraged to develop their images of the (sustainable, desired) future, and to give room for these in policy-making and planning. The openness of the future renders desirability and ethics, and not probability, the basis on which the feasibility of images of the future must be assessed.

Sammanfattning

Denna avhandling handlar om att skapa framtider, dels genom samhällsplanering och dels i form av de framtidsbilder som skapas genom backcasting. Backcasting är en framtidsstudiemetod som används för utforska hur ett visst mål kan uppfyllas. I stället för att utgå i från nuet och blicka framåt så tar backcasting sin utgångspunkt i framtiden och blickar bakåt, för att på så sätt kunna undersöka vilka förändringar som skulle kunna behövas om det tänka målet ska uppnås¹. Avhandlingen tar sin utgångspunkt i att det finns ett behov av att göra planeringen mer långsiktigt strategisk och visionär om en hållbar utveckling ska kunna uppnås, samt att backcasting kan vara ett fruktbart verktyg för att nå detta mål. För att backcasting ska kunna användas för dessa ändamål krävs dock att även backcastingmetoden utvecklas.

I avhandlingen utforskas hur backcasting skulle kunna vara till nytta för planeringen med fokus på tre områden. Det första området handlar om målsättande där det konstateras att både planering och backcasting tenderar att använda mål som är tämligen svårgripbara. Detta kommer sig av att målen är formulerade på ett sätt som gör det svårt att förstå vad som innefattas av målen och vad som hamnar utanför. Som ett sätt att råda bot på detta föreslås i avhandlingen ett metodologiskt ramverk för målsättande. Ramverket är utvecklat specifikt för klimatmål men är till stor del tillämplbart även på andra områden. Ramverket innehåller ett antal olika slags avväganden som behöver göras när ett mål ska sättas: målets utsträckning i tid, målets geografiska utsträckning samt vilka aktiviteter som inkluderas i målet, om målet innefattar energianvändning och/eller växthusgasutsläpp, om energianvändning och växthusgasutsläpp tillskrivs producenter eller konsumenter, samt i vilken omfattning målet inkluderar energianvändning och växthusgasutsläpp ur ett livscykelerspektiv. I avhandlingen konstateras även att det finns ett behov av ytterligare metodutveckling för att sätta mål för andra miljöproblem än energianvändning och växthusgaser, framförallt för sådana områden som är svåra att kvantifiera.

Det andra området där backcasting kan bidra handlar om att identifiera de åtgärder som kan bidra till måluppfyllelse samt att klarlägga vilka aktörer som kan få förändringarna att ske. I relation till detta konstateras att både backcasting och planering tenderar att fokusera materiella lösningar så som miljöteknik, infrastruktur, och stadens fysiska utformning. Detta innebär att en stor del av de åtgärder och förändringar som skulle kunna vara möjliga utesluts. I den mån

¹ En mer utförlig introduktion till backcasting på svenska hittas i Höjer et al. (kommande).

förändringar av den sociala delen av samhället berörs så sker detta ofta endast i form av relativt ospecificerade idéer om beteendeförändringar eller nya livsstilar där ansvaret läggs på individen. Det sociala och det materiella relateras inte heller till varandra utan behandlas separat. Från ett sociotekniskt perspektiv, där det materiella och det sociala ses som sammanflätat och ömsesidigt strukturerande, är ett sådant förhållningssätt problematiskt då det medför en risk att de tänkta förändringarna inte infrias på grund av sociala dilemman eller sociotekniska inlåsningar. I avhandlingen ges två förslag på metoder som kan underlätta att identifikationen av åtgärder görs ur ett sociotekniskt perspektiv. Den första av dessa är en backcastingmetod för att utveckla sociotekniska framtidsbilder där grunden utgörs av en iterativ identifiering av *vad* som kan förändras och *vem* som kan förändra. Den andra metoden fokuserar på energieffektiviseringspotentialer och tar sin utgångspunkt i det faktum att människor inte använder energi för energins egen skull utan för de tjänster som energin används till. Genom att använda ett tjänsteperspektiv i energieffektiviseringsprojekt kan fler möjligheter identifieras än om fokus enbart ligger på att göra själva tekniken mer effektiv.

Det tredje området handlar om hur förändringarna kan gå till. Här diskuteras hur backcasting kan användas för att utforska alternativa sätt att organisera styrningen av planeringsprocesser. I relation till detta diskuteras även de institutionella och politiska dimensionerna av planering i form av stigberoende, diskursiv makt och de möjlighetsfönster som ibland öppnas och som kan användas för att bryta den diskursiva makten och styra in stigberoendet i en ny, mer hållbar riktning.

Ett av avhandlingens huvudsakliga bidrag ligger i att poängtera vikten av att inkludera frågan 'vem?' i backcastingstudier: Vem (vilka aktörer) kan få förändringar att ske? Vem ska ändra (vems) livsstil? Vem (vilka grupper i samhället) gagnas och vilka förlorar i de framtidsbilder som utvecklas? Genom att ställa frågan 'vem?' så kan även mångtydigheten i begreppet hållbar utveckling poängteras ur ett miljörettsperspektiv. I relation till detta så kan det konstateras att det finns ett behov av att låta även andra samhällsgrupper än de vid makten utforma framtidsbilder, samt att skapa utrymme för dessa i beslutsfattande och planering. Detta knyter väl an till de tankar om framtidsstudiernas tillämpningsområde som fördes fram i svensk politik under 1960 och 70-talet. Idag finns en stark trend av så kallade deltagande backcastingmetoder där allmänheten, företagare och tjänstemän involveras och uppmanas att utforma egna framtidsbilder. Den stora merparten av dessa studier är dock fortfarande initierade, ledda och rapporterade av backcastingexperter, som till största delen kommer från akademien. En förklaring

till detta är att det finns en generell omedvetenhet om framtidsstudier i allmänhet och backcasting i synnerhet. En annan och kanske underliggande förklaring är att det inte finns något intresse eller stöd från makthavarna för den sorts alternativa framtidsbilder som backcasting kan bidra till att ta fram. Att formulera framtidsbilder är en fråga om resurser, vilket i slutänden är en fråga om makt. Att förneka vissa framtider legitimitet och avfärda dem som långsökta, naiva och omöjliga är ett kraftfullt diskursivt maktmedel. Att framtiden är öppen och möjlig att påverka innebär dock att det är önskvärdhet och etik, och inte sannolikhet, som måste ligga grund då rimligheten hos en framtidsvision ska bedömas.

Förord

Du kan ärva en bok
men inte dess mening.
Finnandet ligger i sökandet.
Meningen uppstår
i dig.

(Svenbro, 2008)

Denna avhandling är resultatet av en lång resa. Var den resan började är svårt att säga. Allt sedan jag som barn insåg att världen inte är en rättvis plats, för varken människor, djur eller natur, så har jag velat ställa detta till rätta. Först som miljöaktivist. Vi ockuperade skogar, blockerade bilvägar och delade ut pepparkakor i tunnelbanan till kollektivtrafikresenärer. När jag som 17-åring insåg att miljöaktivism inte räckte till bestämde jag mig för att utbilda mig till miljö- och hälsoskyddsinspektör. Om bara jag hade en gedigen examen i ryggen så skulle nog beslutsfattarna börja lyssna. När jag sedan började arbeta, som naturguide i Tyresta, som koordinator för Grön Ungdom Stockholm, och sedermera som miljöinformatör i Hammarby Sjöstad så upptäckte jag efter hand att inte heller detta räckte. Framförallt insåg jag att trots att jag lärt mig nästintill allt om miljö (ur ett biogeoperspektiv) så var det två stora bitar som saknades: staden och människorna. Jag blev varse att det är i staden de stora utmaningarna finns. Under min tid i Hammarby Sjöstad grubblade jag även mycket över varför inga större förändringar skedde. Trots alla satsningar så var sjöstadbornas vardagsliv inte mer hållbart än gemene stockholmares. Trots att Hammarby Sjöstad var så uppmärksammat så fortsatte det mesta av stadsutvecklingen att följa samma gamla ohållbara hjulspår. Varför var det så? Sen en dag dök Örjan Svane upp med en grupp studenter och med ett uppfreskande kritiskt perspektiv på Hammarby Sjöstad. Kanske var det där avhandlingen egentligen började. Säkert är dock att jag har många att tacka.

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List of Papers Included in the Thesis

I. Kramers, A., Wangel, J., Höjer, M., Jonsson, S., Finnveden, G., Brandt, N. *Elusive targets - Methodological considerations for cities' climate targets. Submitted to Energy Policy.*

II. Wangel, J. (2011) *Exploring social structures and agency in backcasting studies for sustainable development. Technological Forecasting and Social Change* 78 (5): 872-882.

III. Wangel, J., Gustafsson, S. Svane, Ö. *Goal-based socio-technical scenarios: greening the mobility practices in the Stockholm City District Bromma, Sweden. Submitted to Futures.*

IV. Jonsson, D., Gustafsson, S., Wangel, J., Höjer, M., Lundqvist, P., Svane, Ö. (2011) *Energy at your service: Highlighting energy usage systems in the context of energy efficiency analysis. Energy Efficiency* 4 (3): 355-369.

V. Wangel, J. (2011) *Change by whom? Four ways of adding actors and governance in backcasting studies. Futures* 43 (8): 880-889.

VI. Svane, Ö., Wangel, J., Engberg, L., Palm, J. (2011) *Compromise and learning when negotiating sustainabilities: The brownfield development of Hammarby Sjöstad, Stockholm. International Journal of Sustainable Urban Development. Volume 3 (2): 141-155.*

Comments on my contribution to the co-authored papers

Paper I.

For this paper I am one of two first authors. I wrote the main parts of the introduction, methodology section, the literature review and the sections on time frames and activities.

Paper III.

I am the first author of this paper. The paper was written by me and is based on a research report of which I am the first author.

Paper IV.

The main part of this paper was written together with Daniel Jonsson and Stina Gustafsson. Daniel, Stina and I can all be considered first authors and contributed equally to the paper, but Daniel initiated it.

Paper VI.

When I was invited to co-author this paper it already existed, but in a rather different form. I am one of two first authors and my main contributions lay in developing the theoretical and analytical framework and applying these to the empirical data previously collected through interviews.

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1 Introduction

1.1 Making Futures

This thesis is about the making of futures – in the sense of planning, through which the world of tomorrow is crafted, and in the sense of the images of the future, developed through the futures studies approach of backcasting. The points of departure for the work are that there is a need for more visionary and strategic forms of planning if the challenges of sustainable development are to be met (Albrechts, 2010; Archibugi, 2008; Healy, 2009; Myers & Kitsuse, 2000), and that backcasting, through its long-term, integrative and normative character, can be a helpful tool towards this end (Dreborg, 1996; Robinson, 1990; Quist & Vergragt, 2006).

In short, backcasting can contribute to making planning for sustainability more visionary and strategic in three ways. The images of the future developed through backcasting serve an important role as counter-prognoses, challenging and altering what changes are conceived as possible, and how they could be initiated and managed (e.g. Dreborg, 1996; Höjer et al., 2011b; Robinson, 1988). Backcasting can also be used to problematise contemporary trajectories and to raise awareness of the tension between short-term gains and long-term targets, through showing that an image of the future in which environmental targets has been met cannot be reached without more radical changes than are proposed today. Furthermore, backcasting can be used to examine how the gap between the desired (sustainable) future and the present could be overcome and what potential conflicts or synergies for other societal targets or high priority issues this could imply (e.g. Höjer et al., 2011b; Robinson, 1982, 1990).

However, even though backcasting scholars rarely doubt the potential of backcasting to contribute to these ends, the question of how backcasting could

feed into the practice of planning is rarely touched upon. *The overarching aim of this thesis is therefore to examine how backcasting could be of use when planning for sustainability.* This exploration does not go beyond hypothesising, but focuses at providing a more thorough connection of backcasting to planning (related) theory and practice. The studies presented investigate how this connection can make planning more visionary and strategic and also how it can contribute to a theoretical and methodological advancement of backcasting. The exploration is not intended to be exhaustive but builds on and examines three areas of problems and possibilities encountered during my research in the fields of backcasting and sustainable urban planning.

The first of these areas concerned *target setting*. When setting a target there are a number of issues that need to be taken into consideration. Together, these issues constitute the system boundaries for what is included in the target. In practice, however, there seems to be a lack of awareness of these considerations and their implications, which points to a need to make them more accessible (Paper I). The second area concerns the identification of the *measures* needed to meet the target, and of the *actors* needed to realise these. In contemporary sustainability agendas a combination of technical fixes and behavioural changes is often the standard solution, but such an approach is problematic since it implies a separation of technology and behaviour, which renders quite much of the problems of socio-technical lock-ins and rebound effects unattended. From a socio-technical perspective a more fruitful approach is to acknowledge these as mutually structuring and, furthermore, to also pay attention to the agency of change (Papers II-IV). The third area concerns the *governance of change*. One of the most fundamental obstacles to overcome when planning for sustainability is that of path dependency, which occurs when a socio-technical system has grown strong and sufficiently self-reinforcing to prevent or obstruct any divergence from the *status quo*, i.e. the 'path'. To tilt this path in a new, more sustainable direction, there is a need to make governance more proactive. One way to do so is through a backcasting approach (Paper V), another is through meta-governance (Paper VI). This in turn calls for both planning and backcasting to be more apt at integrating the institutional and political dimensions of planning for sustainability (Papers V & VI).

These three areas are of high and equal relevance for both backcasting and planning for sustainability, although sometimes in slightly different ways. All three areas are also discussed or indicated in Papers I-VI, but to a varying extent and typically focusing either on backcasting or planning. Thus, addressing these in tandem provides an opportunity to not only bring together my research in

these fields, but also to take the discussions in Papers I-VI further. This is done both through relating the papers to each other and through discussing them in relation to a wider set of theories. Following this, the specific aims of the thesis were formulated thus:

- *To explore and discuss how targets for sustainable development can be set in backcasting and planning.*
- *To explore and discuss how measures can be identified and innovated through backcasting and in planning in a way that acknowledges and makes use of the socio-technical complexity of everyday life.*
- *To explore and discuss how governance can be addressed in backcasting studies, how this can be used to take a more proactive approach to the governance of change, and how this can be done in a way that highlights the institutional and political dimensions of planning for sustainability.*

In order to clarify the issues in the following text covered in Papers I-VI and the results of bringing these together in this thesis essay, the aims of the overall thesis and of the individual papers are presented in Figure 1.

Connection of thesis aims to those in Papers I-VI

The overarching aim of this thesis is to examine how backcasting could be of use when planning for sustainability. Specific aims are to:

Explore and discuss how targets for sustainable development can be set in backcasting and planning.

This builds on Paper I, which sought to develop a framework of methodological considerations of importance for setting climate targets for cities.

Explore and discuss how measures can be identified and innovated through backcasting and in planning in a way that acknowledges and makes use of the socio-technical complexity of everyday life.

This builds on Papers II-IV. The aim of Paper II was to explore to what extent backcasting studies for sustainability have incorporated social structures, agency and governance, that of Paper III was to devise and test a methodology for developing socio-technical goal-based scenarios, and that of Paper IV was to develop a conceptual model for energy efficiency projects in which the social side of energy use is acknowledged.

Explore and discuss how governance can be addressed in backcasting studies, how this can be used to take a more proactive approach to the governance of change, and how this can be done in a way that highlights the institutional and political dimensions of planning for sustainability.

This builds on Papers V-VI. The aim of Paper V was to develop a methodology for including actors and governance in backcasting studies, while that of Paper VI was to explore the role of meta-governance and discourses when actors negotiate how sustainable development should be interpreted and put to practice.

Fig. 1. Connection between the aims of the thesis and those of Papers I-VI.

1.2 Structure of Thesis

This thesis is structured as follows: In Section 2 a brief summary of Papers I-VI is provided as an introduction to the more extensive discussion of the papers provided in the remainder of the thesis. In Section 3 the overarching research strategy for these papers is discussed in terms of methodological development and empirical studies. Section 4 introduces the field of futures studies and in Section 5 the futures studies methodology of backcasting is presented and discussed. Sections 6-8 provide the main discussion of Papers I-VI through relating them to

each other and to a wider set of theories, based on the three areas examined in the thesis. Accordingly, Section 6 focuses on the question of target setting, Section 7 on the identification of measures and actors and Section 8 on how to change in terms of path dependency, critical junctures and governance. Section 9 presents the conclusions from the thesis.

1.3 Delimitations and Definitions

This thesis comprises a variety of concepts and theories. These are introduced more thoroughly in the actual discussions, but since many of them are ambiguous an initial definition of the more fundamental concepts can come in handy. Some of these definitions also serve as delimitations of the thesis.

A Local, Urban and Swedish context: The only delimitation that is not based on a definition concerns the level and scale of society considered. Most of the discussions and concrete examples in this thesis relate to the urban and local context. It is also good to bear in mind that many of the examples used in this thesis are situated in a Swedish context. Unlike the case in many other countries, the municipal authorities in Sweden are powerful actors when it comes to planning, especially when considering spatial planning, where they have a monopoly. They also have substantial financial resources, to a large extent derived from income taxes. However, most of the theory and methodology presented here are general enough to be applicable to other areas and scales of planning and governance.

Sustainable development: Sustainable development is recognised as an essentially ambiguous and contested concept (Connelly, 2007). Drawing on Esty et al. (2008) and WCED (1987), in this thesis sustainable development is understood as development that sustains viable ecological systems and human health, in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs. The focus in this thesis is on the environmental dimension of sustainability.

Planning and Governance: This thesis focuses on planning performed by local public authorities. Planning is not addressed in terms of the art of drawing plans, but at a more overarching strategic, long-term level. Planning at this level is in some respects quite similar to governance. In this thesis, planning is seen as a tool for governance, through which an overarching and long-term agenda – including targets, measures and ways of implementation – is elaborated and concretised. Governance, on the other hand, is seen as the dimension of planning that concerns actors, partnerships, legitimacy, steering, conflicts and negotiations, and

everything else that concerns the formal and informal institutional aspects of planning. Some scholars use governance as a synonym to governing or steering, while others give it a more specific meaning (Evans et al., 2005; Pierre & Peters, 2005; Treib et al., 2005). In this thesis the concept governance is used in the wider sense.

Backcasting and Images of the Future: Backcasting is another concept with many meanings. Drawing on Robinson (1990) and Höjer et al. (2011b), this thesis recognises the central elements of backcasting to be: (1) The formulation of a demanding target which cannot be reached without major societal changes; (2) the development of one or more images of the future in which this target has been met; and (3) an analysis of these images in relation to e.g. other societal goals and/or the present state. Together, these three elements constitute how backcasting is understood in this thesis. Backcasting and other types of futures studies are seen as tools for planning. The term ‘images of the future’ is sometimes used to specify that the scenarios referred to are: (1) Of a more elaborate kind; and (2) the result of a futures study. In this thesis the two terms images of the future and scenario are used synonymously, which means that the term scenario is also to be understood in the way specified above.

2 Summary of Papers

As an introduction to Papers I-VI, they are summarised below based on their individual abstracts. Each paper is more thoroughly presented and discussed in Sections 6-8.

Paper I

The climate targets of cities are dependent on system boundaries and methods of calculation. Paper I describes a study identifying, exploring and presenting the methodological considerations of importance when setting climate targets in cities, with the overall aim of facilitating the understanding, comparing and setting of such targets. A framework was developed based on a review of existing GHG accounting protocols, three major sustainable city frameworks and a selection of scientific papers reporting on accounting methodologies. In the framework, the methodological considerations identified are arranged in four main categories: temporal scope, object for target setting, unit of target, and range of target. Paper I also comprises a survey of how eight European cities have set their climate targets, clearly showing the need for more transparent targets and more informed target setting procedures.

Paper II

Paper II examines how social structures and agency have been included in backcasting studies for sustainable development. For this purpose an analytical framework was developed, based on the objects of change, measures and change agents that have been included in the scenario studies, and to what extent these are approached in an explorative way. Through reviewing a number of backcasting studies, Paper II showed that these are typically built upon and elaborated with a predominant focus on the questions of *what* physical/technical aspects could change and *how* these could change. Social objects of change and

explicit representation or analysis of the question of *who* could change are rarely included in the analysis. This has a number of implications. Not including social structures and agency obstructs the development of socio-technically consistent and comprehensive scenarios, while not addressing the questions of how to change and change by whom in an explicit and explorative way results in social structures and agency being represented only implicitly and/or maintained according to the *status quo*.

Paper III

Paper III presents a methodology for developing goal-based socio-technical scenarios. The methodology comprises three separate but interconnected parts: the Scenario Content, the Scenario Process, and the Scenario Outcome. In the Scenario Content, the questions of *what* could change and by *whom* are explored through an iterative identification of the objects and actors of change. In the Scenario Process, the question of how to develop and represent a scenario in terms of a process of governance is explored. The Scenario Outcome examines the question of how to assess the potential contribution of these changes, through modelling the scenario in terms of energy usage systems. Paper III focuses the first of these parts, the development of Scenario Content, and also presents a scenario study of green mobility in the Bromma district of Stockholm city (Sweden) conducted using this methodology. The experience and results from this scenario study indicate that by way of supporting an explicit inclusion of actors and ‘the social’, the what-who iteration also encourages the identification of potentials and obstacles of a social character, thus contributing to socio-technically more consistent and comprehensive scenarios.

Paper IV

Increasing energy efficiency has long been identified as an important means of mitigating climate change. However, the full potential for energy efficiency has seldom been fully exploited. The traditional approach in energy systems analysis and policy is still largely supply-orientated, i.e. focusing on the management of energy conversion and distribution, and final use of energy in the form of energy carriers. Paper IV contributes to previous discussions on how to highlight and explore the user side in the analysis of energy systems in an efficiency context. The energy usage systems approach, including end-use technologies and the production of services demanded by a human activity system, is used to promote a dynamic bottom-up perspective on energy use. Paper IV also emphasises the social logic of energy use through determining that the demand for energy should not be considered synonymous with the demand for energy carriers or measurable

service volumes (such as kilometres travelled, square metres of air-conditioned floor space, etc.), without considering the socio-cultural context in which the service is being used or called upon. In other words, Paper IV argues that the predominant paradigm dealing with the energy system as a technical system managing resources and providing energy carriers needs to be complemented with the view of a socio-technical system facilitating and/or managing the services.

Paper V

Paper V builds on Paper II in that it takes its starting point in recognising the lack of actors and governance in backcasting studies. Given that such studies are typically used to explore and promote change, the absence of change agents and their institutions is a drawback. Paper V presents four approaches to include actors and governance as objects of study in backcasting studies. Two of these are bottom-up in the sense of starting with an identification of discrete actors. These are the stakeholder analysis approach, and the social network approach. The other two are top-down in the sense of taking their starting point in an 'ideal type' of governance or a theory of policy and change. These are the governance model approach, and the policy and change approach. In Paper V the same scenario study as presented in Paper III is used to exemplify the differences that (could) arise depending on the approach chosen.

Paper VI

Paper VI examines the environmental management of Stockholm's large brownfield development Hammarby Sjöstad through the concept of negotiating sustainabilities. An Environmental Programme injected exceptional aims into an ongoing, ordinary planning process involving developers, consultants, contractors and other stakeholders. In parallel, a project team was established and given the task of realising aims through governing, networking, negotiation and persuasion. Discourse theory is used to analyse the epistemological disagreement between actors on how to operationalise the aims. Theories on governance networks and meta-governance facilitate the understanding of the project team's role in negotiations. The analysis is divided into two parts; one which focuses on how the aims were negotiated between actors involved in the project, and one that highlights how negotiations were conditioned from the outside. The results indicate that negotiations on, for example, development contracts were circumscribed by a prehistory of institutional and interactive positioning, thus leaving only a small imprint on the actual outcome. Negotiations during events unburdened by path dependency affected outcomes more. The main general

lessons learned include the need for introducing exceptional aims and project organisations early in the project, and the potentially positive effects of active networking to increase actor collaboration and thus the project's field of options.

3 Research Strategy

3.1 Methodological Development

All papers in this thesis comprise some kind of methodological development (including development of conceptual models and analytical frameworks). In Papers III, IV and V methodological development was the main aim of the study, while in Papers II and VI the methodology developed was a tool – an analytical framework – to fulfil another aim. In Paper I the methodological development was intended to provide an analytical framework, while at the same time constituting one of the main results of the study.

Methodological development can be understood as an issue-driven, heuristic and iterative process in which creative and critical/evaluative phases succeed each other. The issue at hand can be a recognised real-life problem (such as in Paper I), a perceived shortcoming of a theory or methodology (such as in Papers II-V), or a recognised opportunity to combine theories and/or methodologies (such as in Papers IV and VI). In the research reported in this thesis the critical/evaluative phases consisted of relating the (draft) methodology to relevant literature on theories, methodologies and applications and testing it in (research) practice.

As discussed by Robinson (2008), issue-driven research aimed at taking on real-life problems is quite different from research based on problems arising in theory and methodology (i.e. science-driven research). While theory and methodology are (usually) framed and constituted by disciplinary thinking, research driven by real-life problems (often) requires elements from different disciplines to be combined. However, as described above, issues arising from theory and methodology can also have this effect. Drawing on Robinson (2008), the main difference between these two types of research is that while interdisciplinary research based on theoretical or methodological problems tends to focus on, and

result in, 'better' theories and methods or new disciplines, research based on real-life problems instead focuses on the hands on application and outcome of research. There is also a difference in the knowledge base used. While the science-driven research can often rely on scientific knowledge only, research that aims at taking on a real-life problem may need to include other types of knowledge, such as tacit, informal and experience-based knowledge (Robinson, 2008).

3.2 Empirical Studies

Papers I, III and VI are also empirical papers, in the sense of comprising research based on the observation of historical or contemporary objects of study². According to Teorell & Svensson (2007), the three main purposes of (social, empirical) science are: (1) To describe; (2) to explain; and (3) to value. In this thesis all of the empirical papers are (partly) aimed at describing something – how cities set their climate targets (Paper I), how backcasting studies have included social structures and agency (Paper II), and how the meta-governance of the Hammarby Sjöstad project was enacted (Paper VI). All of these papers are also aimed at valuing, in the sense of proposing how the phenomena under study (climate targets, backcasting and meta-governance) should be dealt with. Of these papers, only Paper VI aims at explaining the phenomena. Paper II discusses some potential explanations for why backcasting studies do not include social structures and agency, but this is not an aim of the paper.

The empirical part of Paper I concerns how cities set their climate targets. Data about this were obtained from public policy documents and reports and through e-mail conversations and telephone interviews with people who had been, or were, involved in the target setting process. The data were sorted in a template consisting of a draft framework of methodological considerations of importance when setting climate targets. The study described in Paper I also included a literature review of GHG accounting protocols and methodologies. Findings from this review were used to further refine the template and the framework, which in turn allowed for reconfiguration of how the empirical material was categorised and interpreted. This method of working, in which the analytical framework and the empirical material are used to iteratively develop the understanding of one another, is sometimes described as a 'hermeneutic circle' (Alvesson & Sköldberg, 1994; Teorell & Svensson, 2007).

² This understanding of empirical research differs from the more narrow interpretations used in natural and some cultural sciences in which only direct observation of the phenomena studied are seen as empirical work.

In Paper II the empirical data were taken from scientific articles reporting on backcasting studies. To analyse the data, an analytical framework (Figure 2) was developed based on if and how these studies included reflections on the socio-technical character of objects of change, how these changes came about, the actors involved, and the mode(s) of governance.

Approach to object of change (<i>what</i>)	Approach to measure for change (<i>how</i>)	Approach to agents of change (<i>who</i>)	Summarising description of ideal types
Explorative	None	None	1. Doesn't mind how or who? Backcasting studies elaborating what in an explorative way
Explorative	<i>Status quo</i>	None	2. Knowing how and doesn't mind who? Backcasting studies elaborating also on how, but not who, and based on existing structures
Explorative	<i>Status quo</i>	<i>Status quo</i>	3. Knowing both how and who? Backcasting studies elaborating on how and who, but based on existing structures
Explorative	Explorative	<i>Status quo</i>	4. Knowing who and wanna know how? Backcasting studies elaborating on how in an explorative way and who based on existing structures
Explorative	Explorative	Explorative	5. Wanna know both how and who? Backcasting studies elaborating on how and who in an explorative way

Fig. 2. The analytical framework developed and used in Paper II.

When performing this study an analytical framework for the collection and analysis of data was developed. In the third empirical paper (Paper VI), the data used were obtained through interviews conducted for the purpose of another paper. In Paper VI these data were re-analysed using another analytical framework specifically developed for the analysis.

4 Futures Studies

4.1 There Is No Future

In its most basic sense the future is one of three time modalities, the past and the present being the other two. The future is not what has or has not happened. Unlike the present and the past, the future is that which has or has not happened *yet*. The future is the time modality for what may and may not happen. It is the abode of expectations, of desire, hope and fear. Once realised, the future is no longer future but has shifted modality to the present or the past. This places the future beyond the scope of observational descriptions (Bell & Olick, 1989; Karlsen et al., 2010). According to this secular Western philosophy, the future is a subjective and/or social construct, existing only in our imagination.

Seeing the future as a mental construct is not incompatible with seeing change as to some extent path-dependent, or with acknowledging that the future is possible to influence. We know from experience that both small and large decisions (usually) influence what tomorrow will be like; i.e. there are future implications of present decisions. As these decisions are typically made with some kind of future in mind, this also means that (ideas about) the future influence the present. Indeed, futures studies and planning could even be said to constitute each other's *raison d'être* (Aligicia, 2005; Myers & Kitsuse, 2000; van Asselt et al., 2010). Without an idea of what future to strive for, or what to avoid, there is nothing to plan for. Conversely, without the ambition and power to plan, influence or adapt to development in an intended way, there is no reason for considering the future at all.

We also know that there are always smaller and larger elements of uncertainty and surprise. The need for managing uncertainty is one of the main reasons for using futures studies. The overarching aim of futures studies does thus not point

to the future, but to the present. It is in the present that the knowledge is used; to render planning strategies robust or adaptable if the future should not turn out to be as anticipated, or to point out a new direction for societal action.

However, since the future is not a historical or present object to study, this gives rise to the fundamental epistemological problem of what knowledge of the future means, and how this knowledge can be justified (Bell & Olick, 1989). As discussed in the following, knowledge of the future can be understood as knowledge of uncertainties and possibilities.

4.2 A Brief History of Futures Studies

The close connection between futures studies and planning becomes even more evident when looking at the origin of futures studies³. Futures studies were originally developed as a tool for long-term planning and policy analysis, building on the previously developed techniques borrowed from military operations analysis and systems analysis (Asplund, 1986; Bell, 2003; Kaijser & Tibergh, 2000; Wittrock, 1980). Drawing on Wittrock (1980), the real breakthrough for futures studies in (long-term) planning in Sweden came in the 1960s, when it was proposed that the focus on a singular future, achievable through a predetermined and linear chain of decisions, should be replaced by more adaptive planning which recognised a multitude of possible futures. Fundamental to this adaptive planning was to retain or create freedom for future action. As a support for this, futures studies were proposed to be used to explore a number of possible futures and to use these as a basis to identify the kinds of potential future changes that needed to be considered in decision making in order to avoid decisions that would create potentially problematic 'lock-ins'. Alongside this ambition, futures studies were also seen as a way to engage people in public debates about what the future should be like (Bell & Olick, 1989; Wittrock, 1980). However, in the end none of these ambitions were realised. Wittrock (*ibid.*) puts forth one reason for this being that the political interest in futures studies was not as much based on an ambition of using these in planning as on a perceived need to grasp what futures studies was about.

³ The history of futures studies is not a subject that this thesis elaborates upon to any great extent, but the interested reader should see the comprehensive introductions to the history of futures studies provided by e.g. Ehliasson (2005), Bell (2003), Asplund (1986) and Wittrock (1980). The historical relationship between futures studies and public planning is best described by Wittrock (1980).

4.3 What Is Futures Studies?

When trying to define and demarcate the field of futures studies, one can either develop a number of criteria of what futures studies should be and then see what studies meet these (the normative approach). Alternatively, one can start by looking at what kinds of studies are typically denoted futures studies and develop a definition according to this (the descriptive approach). For instance Karlsen et al. (2010, p. 59) describe the futures studies field as “committed to methodologies, almost as an end in themselves, with scenarios being the hegemonic approach.” However, since the criteria developed are heavily influenced by the type of futures studies one has encountered, these two approaches cannot be easily separated. Moreover, the criteria used can never be objective but are always selected based on a number of more or less conscious and well-argued types of bias. Compared with other more well-delimited fields of study, the need to define the field of futures studies arises not only because of the desire to explain it to those who are not familiar with the concept, but also to indicate to other futurists how the field is understood.

According to Bell (2003, p. 73), futures studies is a field of research that aims to “discover or invent, examine and evaluate, and propose possible, probable and preferable futures”. If, as previously argued, futures studies are to be understood as a future-orientated way to inform, understand, and/or control the present, a crucial question to ask is what distinguishes futures studies from other approaches with similar aims. For instance, policy analysis, weather forecasts, planning, transport modelling and impact assessments such as strategic environmental assessment are typically not viewed as being part of the field of futures studies, in spite of their focus on the future. The following discussion aims at explaining why this is so through sketching a number of differentiating characteristics.

A fundamental characteristic of futures studies is the way they deal with uncertainty. According to Svenfelt (2011) and Svenfelt and Höjer (forthcoming), there are three main types of uncertainty: epistemic uncertainty, ontological uncertainty, and ambiguity. Epistemic uncertainty arises from knowledge gaps that, at least theoretically, can be filled with more research or data. Ontological uncertainty is of a more fundamental character. The openness of the future implies that we never can know for sure what will happen. Ambiguity points to the fact that different concepts can have different meanings, but it can be discussed whether ambiguity should be seen as a specific type of uncertainty or as a part of the ontological uncertainty. When demarcating the field, Svenfelt and Höjer

(*ibid.*) argue that futures studies do not deal with epistemic uncertainty, but with uncertainty of the ontological and ambiguous types.

Thus, firstly, it can be argued that futures studies do not deal with phenomena solely or mainly governed by natural laws or ecosystem dynamics, such as the weather, tectonic activity, the population of bees or the strength of a bridge, but that a futures study must incorporate one or more societal aspects. This argument excludes rather much of the predictive modelling and some impact assessments from the field of futures studies. However, if these models or their results are used in an exploration of what consequences the weather, the bee population or the tectonic activity could have for the wider society, then that might be a futures study. In other words, futures studies do not deal with epistemic problems of science but with problems of society (see Robinson, 2008).

Secondly, Bell (2003, pp. 55-56) and Wittrock (1980) propose that futures studies use longer time frames than other types of policy analysis and impact assessments. However, as Wittrock (*ibid.*) argues, the time frame in itself is unimportant, the important consideration being that the futures study spans a period of time that is long enough to allow for major changes, so that the field of possible futures dealt with does not become circumscribed by present states, trends and decisions. The reason for choosing a long time frame is thus to explore uncertainty and freedom of action. The time frame considered near or distant depends on the object of the study (Ehliasson, 2005) and can be anything from five to one hundred years.

Thirdly, and related to the long time frames, Bell (2003), Svenfelt and Höjer (*forthcoming*) and Wittrock (1980) argue that futures studies (should) also have an explicit aim of opening the future up, through pointing at the inherently uncertain character of the future and the wide range of possible futures. However, futures studies do not leave uncertainty and ambiguity hanging in the air but deal with it through organising and bounding it by way of creating multiple, contrasting scenarios. In this way uncertainty can be specified across, rather than within, scenarios (Schoemaker, 1993). This differs from the other future-orientated disciplines, which usually present one result only, with uncertainty and ambiguity incorporated into it (Aligica, 2005; Schoemaker, 1993). Since there are numerous examples of futures studies in which only one scenario is being produced, merely looking at the number of scenarios in the end-result is an insufficient way of distinguishing a futures study. Instead, one has also to look at the ambition and aim of the study together with the methods used. A futures study embraces and highlights uncertainty and ambiguity in a way that renders the (potential) long-term consequences of present choices explicit.

Svenfelt and Höjer (forthcoming) also mention a distinguishing factor of futures studies as being that they always (should) elaborate one or more images of the future. In doing so, futures studies provide an alternative ‘reality’ from which the actual reality can be viewed. Futures studies thus allows us to perceive the present from outside the present, and to distinguish what parts of the present seem crucial to be maintained or changed for societal (or private, or corporate) goals to be achieved. In this way a futures study can also function as a counter-prognosis.

Based on this discussion, futures studies can be described as being a *multi-disciplinary field of study that develops images of the future for a selected phenomenon or problem in a way that highlights uncertainty, ambiguity and choice, and that renders the (potential) long-term consequences of present decisions explicit.*

4.4 Different Types of Futures Studies

This interpretation still gives room for quite a variety of applications. Bell (2003) proposes distinguishing different futures studies depending on whether the aim is to study probable, possible or preferable futures. Dreborg (2004) instead distinguishes between three modes of thinking about the future: the predictive, the eventualities, and the visionary. In respect of the previous discussion of the openness of the future, this way of denoting the field of futures studies has a benefit in that it does not imply a characterisation of the future *per se* in one way or another. A third, perhaps intermediary, approach is presented by Börjeson et al. (2008), who propose using the aim of the scenario to distinguish between three different types of futures studies. These are presented in the following.

Predictive scenarios are aimed at providing answers to the question of *what will happen*. Such scenarios are often based on contemporary structures and trends, which are extrapolated into the future. Predictions can thus be used to see where minor or major trends are heading, and if, in relation to these trends, any actions need to be taken. The usability of a predictive scenario depends on the phenomenon under study being characterised by both low complexity and low uncertainty and, related to this, having a predictive model that can be trusted (Dreborg, 2004). As shown in the previous discussion, predictive scenarios are sometimes not seen as belonging to the field of futures studies (also see Bell & Olick, 1989). However, even though a predictive scenario study as such might not qualify for being considered a futures study, Bell and Olick (1989) conclude that the use of predictive scenarios is fundamental to many (other) types of futures studies but emphasise that these must be understood as predictions of *a* future, and not of *the* future.

If there is a lack of a trustworthy predictive model, one can instead make use of *explorative* scenarios. In explorative scenarios, uncertainty is managed through creating a number of external or internal scenarios answering the question of *what could happen*. Explorative scenarios are typically used to explore how plans and strategies can be made more robust in relation to their external environment, for instance for the purpose of strategic business planning, or climate change adaptation (see e.g. Carlsen & Dreborg, 2008; van der Heijden, 1996). Explorative scenarios can also be used to explore the prerequisites for different policy and planning strategies to succeed, through analysing these in respect of different future political landscapes (Nilsson et al., 2011; Svenfelt et al., 2010).

The third category, the *normative* scenarios, explore *how a certain target could be reached*. To do so, scenarios – or images of the future⁴ – in which the target has been met are developed. If the target can be met within the existing structures of the system, then the scenario will be developed as a *preserving* normative scenario. If not, the scenario will need to be created as a *transforming* normative scenario exploring what a future could look like in which the target has been fulfilled. Transforming normative scenarios usually have quite a long time span to render the illustration of major changes possible. Transforming normative scenario studies are often conducted through backcasting. Since backcasting is the type of futures studies focused upon in this thesis, it is described in detail in Section 5.

Normative scenarios are sometimes equated to studies of desired or preferable futures. This is problematic since it hides the fact that the result of a normative scenario study may not be desirable at all, or may be desirable only for some actors or from some perspectives. A second problem is that the results from a predictive or explorative futures study can be more or less desirable. It can also be argued that the denomination of only one type of futures studies as normative is problematic since all futures studies, including predictive and explorative, are in some sense normative. Thus it is important to understand that what the term normative scenario conveys is not desirability, nor an understanding of other types of futures studies as ‘objective’, but that a normative futures study is explicit in its ambition of exploring the desirability of a future in which a certain target has been met.

⁴ As stated in Section 1.3. the term ‘images of the future’ is sometimes used to specify that the scenarios referred to are (1) of a more elaborate kind and (2) the result of a futures study. In this thesis images of the future and scenario are used synonymously, meaning that the term scenario should be understood in the way specified above.

5 Backcasting

Backcasting was developed in the 1970s as an alternative way of energy planning (Robinson, 1982; Quist & Vergragt, 2006). The prognoses of that time pointed at a future with an accelerating energy demand and a need for a substantial increase in energy production⁵ capacity. With the risk of energy crises in mind and a growing environmental awareness such a future was conceived as highly problematic and undesirable. In contrast to the traditional predict-and-provide approach of energy planning, backcasting enabled taking the starting point of what a desired future level of energy use would be, and designing policies accordingly (Robinson, 1982, 2003).

Indeed, as with other types of normative futures, an image of the future produced through backcasting need not be a desirable future, for everybody and in all respects. In this thesis, with its focus on sustainable development, an alternative term to ‘desirable futures’ could be ‘sustainable futures’. This is a term used in many backcasting studies. However, this term too suffers from the problem of ambiguity: Sustainable for whom? Sustainable from what perspective? Thus, in this thesis the images of the future developed through backcasting are denoted as ‘target-fulfilling’ futures.

⁵ Of course, according to the first law of thermodynamics energy cannot be produced – or consumed. In this thesis the term energy production is used nevertheless, as there is no obvious alternative. By energy production is meant the process of converting resources into electricity, heating, cooling, or fuels. The term ‘energy consumption’, on the other hand, can quite easily be replaced by the term ‘energy use’.

5.1 Different Types of Backcasting

Since backcasting (here understood in a wider sense) was first developed, energy systems as such have remained quite a dominant object of study, especially in connection with climate change but backcasting has also been used to explore more sustainable futures in terms of transport and mobility, food, water, land use, buildings, cities, and household activities such as cooking⁶. The method's way of encouraging thinking 'outside the box' has also led to numerous applications that can hardly be considered backcasting in a methodological sense. Quist (2007) proposes denoting these as 'backcasting approaches', unlike the more stringent 'backcasting methods'. For those familiar with backcasting methods, this division could work well as a pointer, for others the intelligibility is questionable. Paper II in this thesis distinguishes four 'ideal types' of backcasting, based on the main purpose of the backcasting study:

- Target-orientated backcasting emphasises the importance of developing the images of the future as target fulfilling
- Pathway-orientated backcasting focuses on exploring the gap between the image of the future and the present, and sees target-fulfilment as less important
- Participation-orientated backcasting sees the potential procedural gains of a backcasting study as being more important than any resulting image of the future or pathway.
- Action-orientated backcasting aims at providing a basis for real life policy-making and planning, which renders both the elaboration of pathways and stakeholder participation an important trait.

This plethora of backcasting studies is sometimes seen as problematic. However, while each of these approaches has its drawbacks, it also has its benefits. What is far more problematic is that there seems to be a general unawareness of the variety of backcasting approaches, and what these imply in terms of procedures

⁶ For studies on energy systems and climate change see e.g. Anderson et al. (2008); Giurco et al. (2011), Hisschemöller & Bode (2011); Krewitt et al. (2007), Mander et al. (2008), McDowall & Eames (2007). For studies on transports and mobility see e.g. Geurs & van Wee (2000), Robèrt (2005), Åkerman (2005), Åkerman & Höjer (2006), Vergragt & Brown (2007). For studies on food see e.g. Wallgren & Höjer (2009). For studies on water see e.g. van der Graaf et al. (1997) and for land use see e.g. de Graaf et al., (2009). For studies on buildings see e.g. Svenfelt et al. (2011). For studies on sustainability in cities and households see e.g. Carlsson-Kanyama et al. (2008), Green & Vergragt (2002), Höjer et al. (2011b, 2011c), and Vergragt (2002).

and outcomes. The variety of backcasting approaches is only a strength if it is used for careful consideration of which (combination) to choose.

5.2 A Four-Step Backcasting Methodology

As mentioned in the introduction to this thesis, backcasting is understood as being constituted by three central elements: (1) The formulation of a demanding target which cannot be reached without major societal changes; (2) the development of one or more images of the future in which this target has been met; and (3) an analysis of these images in relation to e.g. other societal goals and/or in relation to the present state. In relation to the four ideal types, this definition comes close to target-orientated backcasting. These three elements draw on the four-step methodology⁷ presented by Höjer et al. (2011b), which reflects previous work by Steen & Åkerman (1994) and Höjer & Mattson (2000).

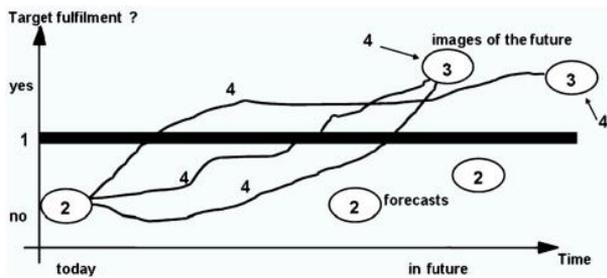


Fig. 3. The four steps of backcasting. 1. Choice and definition of target. 2. Forecasts to see whether the target is supported or obstructed by contemporary structures. 3. Development of target fulfilling images of the future. 4. Analysis of images of the future. From Höjer et al, (2011b, p. 821).

In the first step of a backcasting study one or more targets are defined and formulated. In order to facilitate evaluation of whether the subsequent image of the future meets the target, it can be beneficial to formulate this in quantitative terms. Indeed there are many important aspects that are difficult to define quantitatively, but this does not mean that such aspects – or targets – should be avoided. Instead it points to the need to further develop ways to define and assess targets for such aspects. The target can be set either by the researchers, who may

⁷ A three-part definition drawing on a four-step methodology might seem to be lacking a part. However, the first defining element ‘The formulation of a demanding target which cannot be reached without major societal changes’ includes both step one and two in the methodology.

develop it themselves or adopt it from a policy document, or it can be set through a participatory approach in which stakeholders, experts or other actors are invited.

The second step comprises forecasts to see whether the target can be assumed to be met without major changes to societal structures and trends. If the forecasts point to no major changes being needed the backcasting study is terminated, otherwise the study continues. Sometimes there can be good reasons to continue the scenario study even when the target is estimated as being fulfilled, for instance to see whether target fulfilment risks having negative consequences for other societal targets. The study would then not be a backcasting study but would result in a preserving normative scenario.

In the third step one or more images of the future in which the target has been met are elaborated. Depending on the emphasis placed on target fulfilment, this step might comprise several iterations. The images of the future do not need to describe the entire future society, but are better delimited only to include aspects that are considered of higher relevance for the scenario objectives. How to develop and represent images of the future is further introduced in Sections 5.3-5.7. Since the development of images of the future is a common trait to all futures studies (as defined in Section 4.3.), the discussions in these sections are not entirely delimited to backcasting studies but are of a more general character.

The fourth step in a backcasting study includes analysing the images of the future, for instance in relation to other societal goals, or in relation to environmental justice and equity. The fourth step can also comprise an analysis of the image of the future in relation to the present situation. This is thus where the 'backwards looking analysis' takes place, through which the so-called pathways of transition can be developed.

5.3 Developing Images of the Future: From Facts to Fiction

It has been argued that scenarios should be the result of 'informed imagination' (Aligica, 2005; Sondejker et al., 2006). In other words, a scenario should be based on facts, which are altered to and/or complemented with fiction. The main argument for this is that a factual basis is needed to convey the relevance of the scenario for the stakeholders of today. Another related argument is that a factual basis also increases the possibility of the scenario being conceived as plausible and realistic, which, it should be noted, is not the same as saying that this needs to be desirable or probable.

For the factual part of a scenario, historical and present states, trends and correlations play a central role. Explorative and normative futures studies often make use of predictive scenarios as a basis for assumptions regarding e.g. technological development, climate change or economic growth. To estimate how these phenomena evolve when projected into the future, some kind of knowledge or assumption about these in terms of constants, variables and their relations is needed. Information about this is commonly derived from empirical and statistical studies. However, when trying to distinguish what is causing what (and when), it is important not to misinterpret historical relations and effects of path dependency as causality, since this would impose unnecessary delimitations on what changes are seen as possible.

History can also serve as a source of inspiration by pointing out that societal systems and household practices have not always functioned in the same way as today. Examples of other ways of doing can also be found in alternative communities of practice⁸. These need not have an explicit green ambition, but could have developed more sustainable ways of cooking, washing and commuting due to constrained resources, cultural taboos or local traditions. A related way to identify measures is to look at Niche Technologies or Best Available Technologies and denote these as commonplace regime practices and technologies instead of alternative ‘niches’. Dahlbom (2002) describes the search for subject matters to a scenario as an ‘archaeology of the future’: “Just as archaeologists describe societies based on the artefacts left behind, we can describe societies in terms of more or less fictional artefacts – and, conversely, identify the artefacts that would enable us to realise a desired society.” (ibid., p. 182, my translation).

5.4 Where and When, What, Who, How and Why?

A scenario is a representation of a future state or process. According to Asplund (1986), the basic set of entities needed to describe this are *a scene* (where and when?), *objects* (what has changed?), *agents* (who made the changes happen?), *acts* (how were the changes made?), and *purpose* (why were the changes made?).

In a backcasting scenario the scene is typically not transformed when it comes to the location of the imagined changes. The time, however, is usually changed to

⁸ A community of practice “describes a group of people who share an interest, a craft, and/or a profession. The group can evolve naturally because of the member's common interest in a particular domain or area, or it can be created specifically with the goal of gaining knowledge related to their field” (Lave & Wenger, 1998, *cit.* Prinet et al., 2011, p. 12)

somewhere in the future. The scene can be micro-scale, such as in Design Orientated Scenarios (DOS) where the changes are explored at the level of end-users, or macro-scale, such as in Policy Orientated Scenarios (POS) where changes are explored at the level of larger societal systems (Green & Vergragt, 2002). The time horizon can, as previously described, be anything from five to a hundred years.

The objects in a scenario can be (seen as/depicted as) technical (including all types of material entities), social, or socio-technical. Combining these two characteristics gives rise to six different ideal types of objects:

	Technical	Social	Socio-technical
Micro-scale (individual, household)	Micro-scale technical e.g. bikes, washing machines, radiators	Micro-scale social e.g. individuals' habits, values	Micro-scale socio- technical e.g. social practices comprising meaning, materials and skills
Macro-scale (societal)	Macro-scale technical e.g. the energy system from a technical point of view, urban density	Macro-scale social e.g. organisations, government, rules, regimes, the economy, and other macro-scale formal and informal institutions	Macro-scale socio- technical e.g. the energy system including also system owners, managers and suppliers alongside the material aspects.

Fig. 4. Six types of objects that can be included in scenario studies.

From a socio-technical point of view it might seem self evident that objects should be both seen and depicted as socio-technical. However, as shown in Paper II this is not always the case.

The agents in a scenario can be discrete individuals, groups or organisations. In the same way as the objects, agents can also be included from a micro- to a macro-scale point of view. The relevant agents to include are usually those that can be considered as stakeholders, comprising both those with the power to influence the situation at hand, and those that are influenced. As well as objects, agents can be transformed in a scenario study. Paper III proposes applying an iterative identification of objects and actors – what can change and by whom – in order to increase the cohesiveness these two entities.

In the context of backcasting the acts that are included are usually intentional acts that serve a predetermined purpose. Such acts can be understood as measures. Common types of measures that are used to transform objects and agents are different kinds of policy instruments: legislation, economic incentives, information and spatial planning. A measure type of act that is transformed in a scenario can also be understood as an object, but an immaterial object.

Purposes serve a role in rendering meaning to the intentional changes in the scenario. Intentional changes are the acts imposed on objects. Purposes can also be used to elaborate the scenario in terms of socio-psychological drivers and obstacles for change, in this way abating the rather superficial approach to 'behavioural changes' that in many (if not most) backcasting studies seems to appear from nowhere.

The particular entities that are relevant to include in a scenario study depends on the type and purpose of the study. A scene is always needed. The character of the scene in terms of where and when is usually based on the objects or agents considered as being of key importance. The scene is however more than a 'backdrop' but provides important contextual characteristics for the scenario study at hand. For an explorative scenario study looking into the potential future development of objects such as fuel prices, the scene can be global. For a backcasting study focusing more sustainable ways of doing cooking the scene is local. Objects typically play a central role in most scenario studies, while agents, acts and purposes might be less relevant to include, at least in an explicit manner. Instead, these are internalised into the object of change. As shown in Paper II this is also true of backcasting studies, but compared with other types of futures studies, the implications of such an implicit internalisation are more problematic. These problems have consequences both for the socio-technical consistency of a scenario and for the ability to address the scenario's social implications. These implications are more fully addressed in Paper II and are further discussed in Section 7.2.

5.5 A Note on Pathways and Process Scenarios

One (potential) output from a backcasting study is an analysis of how the images of the future elaborated relate or could be connected to the present. It should be mentioned that the development of such pathways has its critics. One argument against developing pathways is that this risks moving the focus from the image of the future as a counter-prognosis to a discussion on whether certain measures are feasible or not (Höjer et al., 2011b; Höjer et al., forthcoming). Another argument

put forth is that elaboration of (detailed) pathways is an unnecessary or even doubtful effort due to the inherent uncertainty of the future (Åkerman & Höjer, 2006). Indeed for those backcasting studies directly aimed at creating action plans, this call for caution is important. However, the argument of the future being too uncertain to develop pathways (for action) is equally valid for the feasibility of developing images of the future, if these are intended to be used to inform policy – the uncertainty of the future is not dependent on whether the future is represented as an image of the future or a pathway. The degree of uncertainty is decided rather by the object of study and the time frame used.

However, as pointed out and exemplified in Paper VI, pathways do not necessarily need to be viewed or used solely as blueprints for action, but can just as well be viewed and used as a scenario, outlined in terms of a process. This type of pathway should thus not be seen as any more real, probable or implementable than the snapshot, end-state types of scenarios in which the images of the future are typically elaborated. It can also be argued that treating the image of the future and the pathway as inherently separate parts is somewhat strained, since the development of an image of the future by necessity implies exploring a number of societal changes, which thus indicate both the direction and content of the pathway(s).

As described in Papers II, III and V, the benefit of this type of process scenario is that the otherwise implicit assumptions about how changes come about are made explicit. This not only facilitates discussion and reflection on e.g. power structures, synergies and conflicts, but also enables the explorative approach of backcasting to be used to look into how institutional arrangements and other aspects of the governance of change could be altered. This is further discussed in Section 8.

5.6 Sustainability Assessment

As previously argued, analysing how an image of the future relates to governance and other institutions is one important part of the fourth step of backcasting. However, it is equally important to assess the consequences the image of the future could have for other environmental and societal goals, as well as for environmental justice and for equity (Gunnarsson-Östling, 2011; Gunnarsson-Östling & Höjer, 2011). In practice, based on the 22 backcasting studies discussed in Paper II, such analyses tend to be either lacking or rather superficial. While the field of urban sustainability assessment is extensive (Holman, 2009), finding literature on environmental and social assessments of scenarios proves to be a

harder task. This does not mean that sustainability assessments of scenarios are not carried out; one plausible explanation could be that this kind of assessment is done in a qualitative and/or rather unstructured way, i.e. in the concluding discussion of a study rather than as a separate part. Another explanation is that assessments are made to a wider extent than is reported in scientific papers, which could be seen as indicating that this part of backcasting is considered less important to report on than subsequent phases and results. One of a few examples of more comprehensive sustainability assessments in the literature is the SusHouse methodology reported by Green and Vergragt (2002, also referring to Bras-Klapwijk, 2000). In that study a more in-depth environmental assessment of the image of the future is made. Another example is a futures study on hydrogen futures, in which the participating stakeholders assess the images of the future from an environmental, economic and consumer preference perspective (McDowall & Eames, 2007). The three studies reported by Quist et al. (2011) also seem to have incorporated a more thorough sustainability assessment, but in order to confirm this one would need to dig deep into the research reports from these projects.

Drawing on Paper III, one way to assess the social implications of a scenario is through personas. A persona is a concept used in marketing and can be perceived as a demographic profile and lifestyle turned into a fictional character. Creating a number of personas and placing them in the scenario is one way of addressing who would benefit and who would lose from the scenario at hand. Is this scenario for middle-class nuclear families only? What happens to elderly people? How would this scenario be for a person whose job is dependent on car travel? As shown in Paper V and as pointed out by Hillman and Sandén (2007) and Ehliasson (2005), assumptions not only about society and technology but also concerning what actors to include and what 'attitudes' these are associated with can have a major effect on the resulting scenario.

It is these types of assessments that render it possible to address whether the image of the future developed is to be considered desirable or not, for whom and for what parts of the socio-ecological system. This does not mean that the images of the future need to be iterated until they are flawless. This, I would argue, is impossible. Instead, such assessments contribute through making conflicts and trade-offs clear and through raising awareness of the ambiguous and contested nature of sustainability (Gunnarsson-Östling & Höjer, 2011). Of course this does not by itself solve the problem of marginalised environmental interests, but could be used to put pressure on policy makers and other (key) actors.

5.7 Representing Futures: Narratives, Graphics, Props, Living Labs

An image of the future is often described through a combination of quantitative and qualitative statements. The quantitative part of an image of the future can be described as a fictitious statistic, telling the reader about demographics, precipitation, the number of electrical vehicles per person, or other information seen as relevant or illustrative. The qualitative part of an image of the future is typically made up of a narrative through which the future state is described by words instead of numbers.

In futures studies, narratives or stories can be used to bring some ‘flesh and blood’ to the scenario skeleton of tentative ideas and wish-lists, in this way contributing to an increased sense of identification and fascination (Rasmussen, 2005). It has also been argued that a central value of stories is that they bring “order and meaning to events – a crucial aspect of understanding the future possibilities.” (Schwartz, 1996, cit. Myers & Kitsuse, 2000, p. 227). Through forcing the scenario elements into a story, inconsistencies, synergies and conflicts can more easily be spotted and addressed. Furthermore, “storytelling illuminates the whole of a problem by forcing problem setters to identify the key actors and the chain of events that lead to the circumstances perceived as problematic” (Myers & Kitsuse, 2000, p. 229). Rasmussen (2005) acknowledges the importance of including driving forces and actors into the storyline. Stories can also be used to diversify and challenge understandings and practices through re-narrating everyday life habits in an unfamiliar way (Eckstein, 2003; Rasmussen, 2005), thus contributing to activate creativity and stimulate discussions.

Visualisations are also used in backcasting studies to present the resulting scenario. Visualisation includes a variety of tools, settings and procedures such as freehand sketches, infographics, sophisticated computer-aided modelling and computer games such as the I-pad game ‘2021’⁹ and the Mine Craft application ‘My Blocks’¹⁰. Through being visualised, complex issues can be made easier to grasp. Visualisations can thus also be used as a tool to increase participation,

⁹ The Ipad game ‘2021’ is one of a series of visualisation software applications focusing on urban futures developed by Mistra Urban Futures. Learn more at: www.mistraurbanfutures.se/avslutadeprojekt/urbanaspel

¹⁰ ‘My Blocks’ (‘Mina Kvarter’) is an application to the game Mine Craft. The application was developed by Svensk Byggtjänst as a way to involve young people in the future of their neighbourhood. Learn more at <http://brakvarter.se>

facilitate deliberation and spur imagination (Al-Kodmany, 1999; Hundhausen, 2005; Robinson et al., 2011).

An even more tangible way to represent futures is through using design approaches to create prototypes, fictitious props (Johansson, 2005; Mazé & Önal, 2010) or 'Living Labs' in which the future is experienced as an alternative present (Scott et al., 2012). One recent Swedish example of a Living Lab is the One Tonne Life¹¹ experiment in which a family of four tried to get their CO₂ emissions down from 7 to 1 tonne per capita and year. This project, it should be said, was not the result of a backcasting study, but could well have been, considering the demanding target set. The family participating in the experiment was provided with an energy-smart building, an electric car, renewable energy and a panel of experts to give them further advice. The experiment showed that – at least for this family – cutting the emissions down to 2.5 tonnes was quite an easy task, as this could largely be achieved through the technology provided alone, without major lifestyle changes. In the last weeks of the six-month-long project the family managed to force their emissions down to 1.5 tonnes through changing their diet to vegetarian food only (no dairy products), closing off one of the rooms in the house, not watching TV and not going out to cafés or restaurants. Compared with the first 4.5 tonnes, the last tonne was much more of a challenge as the lifestyle changes needed were perceived as being extreme and hard to bear. One of the main benefits of the Living Lab approach is thus the integration of testing both the technological and the social feasibility of proposed changes.

The reason for bringing up these examples here is to show that there are many ways that can be used when performing and communicating backcasting research. Whether aiming at engaging people in the development of an image of the future or only at disseminating results, the content of a backcasting study must be represented in a way that makes it interesting and accessible for the intended target groups. From this perspective it also becomes important to develop the scenario to such a level of detail that it can be expressed in a tangible way. Paper III reports on the development and testing of such a scenario approach, as further discussed in Section 7.3.

5.8 Altering Expectations

Most backcasting scholars agree that one of the main reasons for using backcasting is to develop images of the future that can function as alternatives to

¹¹ <http://onetonnelif.se>

the futures provided by prognoses, in this way opening up ideas of what changes are possible. Robinson (1988) denotes this as a process of unlearning and relearning. Two central concepts in relation to this are experiences and expectations. In his lecture memo on 'Visibility'¹², Italo Calvino writes "[a]t one time the visual memory of an individual was limited to the heritage of his direct experiences and to a restricted repertory of images reflected in culture." (Calvino, 1993, p. 92). The historian and philosopher Reinhart Koselleck (2004) conducts a similar line of reasoning through denoting our "field of experience" (that which we have experienced) constitutive for our "horizon of expectations" (that which we can expect). In other words, we cannot expect something of which we do not have any experience. Calvino and Koselleck both argue that once upon a time each person had a delimited set of experiences and an equally delimited set of expectations. This was before literacy, industrialisation and globalisation gained momentum. Everyday life did not change to any appreciable extent over the period of time a person's could encompass and long-distance trips outside the person's home parish were uncommon, as were books and newspapers. Books and newspapers are mentioned here to point out that experiences need not be gained through events in which we are directly involved, nor do they have to be real events. Education, art, music, literature, news, the global entertainment industry, advertisements, chats with friends and social media such as Facebook and Twitter – all these contribute to enlarging, or at least changing, our pool of experiences and thus also our expectations.

Our pool of expectations is not only a direct result of our pool of experiences, but also the result of our imaginations. The continuation of the above-cited text by Calvino reads "The possibility of giving form to personal myths arouse from the way in which fragments of this memory came together in unexpected and evocative combinations" (Calvino, 1993, p. 92). There are many theories on why people have the ability to imagine. Some claim that imagination is central for empathy, and thus also for the ability to be part of social life. Others view imagination as central for human thought. No matter whether the purpose of imagination is to support empathy or cognition (or both), through imagination experiences can be reconfigured and combined in new and unexpected ways: "The imagination is a kind of electronic machine that takes account of all possible combinations and chooses the ones that are appropriate to a particular purpose, or are simply the most interesting, pleasing or amusing." (Calvino, 1993, p. 91). To gain even further insight into how scenarios contribute to this, Aligica (2005)

¹² 'Visibility' is one of six planned lectures published posthumously in the book 'Six Memos for the Next Millennium' (Calvino, 1988, republished 1993).

proposes using theories of thought experiments and conceptual blending. Backcasting is a way to facilitate this reconfiguration and to focus the imaginative power in a desired direction. This direction is pointed out by the target focused in the study but can also be further elaborated through the formulation of a focus question such as that used in the scenario study presented in Paper III: “Imagine you are in 2030 and that private mobility practices in Bromma have changed so as to provide the same services, but with a minimum of energy use. What changes have happened, and how and by whom were they brought about?”

Experiences and expectations, as well as other types of tacit or informal knowledge, are of fundamental relevance for futures studies (Aligica, 2003), but the relationship is mutual. Our expectations concerning what futures we consider probable, possible and preferable are not only the result of personal taste, beliefs and imagination, but are socially mediated (Asplund, 1986; Edwards, 2008). It is also important to point out that expectations are not ‘innocent’ mental constructs, but are constitutive to what actions we take (or do not take) when planning for sustainability (Albrechts, 2010; Healey, 2010; Sandercock, 2003). Accordingly, the potential of learning, both in the sense of deliberation and to widen the experienced (and expected) field of options amongst developers and users of the scenarios is a commonly heard argument for the use of backcasting when planning for sustainability (Carlsson-Kanyama, 2008; Robinson, 1988; 2003; Quist & Vergragt, 2006). In this sense participative backcasting can be seen as a way of collaborative conceptual blending.

6 Change towards What?

Setting the Targets

Targets can be quantitative or qualitative, short-term or long-term. They can be relative or absolute, and directed to activities, such as the number of people commuting by public transport, impacts/pressures, such as the amount of GHG emissions, or states, such as a sustainable fish stock in the Baltic Sea. They can be set on a specific problem or on a part of the socio-ecological system. To deal with the complexity of sustainable development, targets are often developed as tiered and/or coupled to a number of indicators by which progress (or the lack of it) is tracked. One example of this is the Swedish Environmental Quality Objectives which comprise 16 overarching targets, each of which is further concretised by a number of more specific objectives (see Naturvårdsverket, 2011a). An even higher level of detail is provided by the environmental indicators used. In practice, environmental sustainable development thus becomes defined according to indicators, i.e. that which can be and is assessed.

This section *explores and discusses how targets for sustainable development can be set in backcasting and planning*. This is done through discussing the methodological considerations that need to be taking into account when setting targets. These are equally relevant for both planning and backcasting. This is followed by a discussion focusing on backcasting and targets. The section concludes with a discussion on rebound effects and their implications for target setting.

6.1 Setting Targets on Energy Use and GHG Emissions

Paper I discusses how cities could and should set climate targets, which is to be understood as targets on energy use and/or GHG emissions. Aimed at contributing to more transparent climate targets, Paper I proposes and discusses a number of methodological considerations of importance when setting climate

targets for cities. These are based on a review of a number of accounting protocols and methodologies for allocating and calculating energy use and GHG emission, none of which was found to be comprehensive and flexible enough to meet the varying needs, capacities and commitments of different cities. The methodological considerations are arranged in a framework (Figure 3) consisting of four main categories, each of which comprises two considerations. The first category, the *temporal scope of target*, points at the importance of deciding whether the target is to be set in relation to any reference year or not, and when in the future the target should be achieved.

1. Temporal scope of target

1.1. Reference year

Is the target absolute or set in relation to some reference year?

1.2. Time frame

For what year is the target set?

2. Object for target setting

2.1. Defining and delimiting the spatial boundaries

What are the geopolitical boundaries for the city or city district?

2.2. Defining and delimiting what activities to include?

Should all or a selection of the activities within the boundary be included or not?

3. Unit of target

3.1. Should the target be formulated in terms of GHG and/or energy use?

3.2. Should the target be set for the city, or per person living in the city?

4. Range of target

4.1. Consumer or producer perspective?

Should emissions from production or consumption within the geographical boundaries be the focus, or is a combination recommended?

4.2. Life cycle perspective or not?

Should emissions from the whole life cycle of the product/service be included?

Single process or production chain?

Fig. 5. Overview of methodological considerations of importance when setting climate targets for cities. Adapted from Paper I.

The second category, the *object for target setting*, emphasises the need to take into consideration to what activities and within what spatial boundaries the target applies. The third category, the *unit of target*, concerns firstly, whether the target is to include GHG emissions and/or energy use, and secondly, whether the target is to be set at a city level (or whatever spatial boundary is used) or per person living in the city (area). The fourth category, the *range of target*, highlights the need to decide whether the target includes emissions and/or energy use from production processes or consumption in the chosen area, and, related to this, how much of the upstream life cycle of these is to be accounted for. A more elaborate discussion of the methodological considerations can be found in Paper I.

Paper I also comprises a review of how eight European Green Capital Award candidates have set their climate targets. Based on this review, the paper concludes that the variety of system boundaries used, together with the lack of awareness and information about these, are problematic as this makes it difficult to understand and to compare the areas, activities and emissions actually accounted for. The review also shows that this elusiveness is more than a matter of inferior external communication; not even the administrations responsible for developing the targets knew for certain what was included and what was left out.

6.2 Backcasting and Climate Targets

What is not discussed in Paper I is the levels of energy use and GHG emissions that can be considered sustainable. Today there is an international agreement to abate global warming so that it does not exceed 2°C over pre-industrial levels. In order to do so, the amount of greenhouse gas emissions must decrease, which in turn calls for decreased use of fossil fuels. Seeing climate change as a global challenge, energy resources and the amount of GHG emissions permitted must be seen as global commons. When it comes to deciding how these are to be distributed the agreement ends. Should the ‘developed’ world be granted a larger proportion of these resources to support their established economies and lifestyles or should a larger proportion be granted to the ‘developing’ countries to give room for an increased resource use, economic growth and prosperity? Or should they be equally distributed?

A globally equal distribution of energy is the basis for the 60% decrease in energy use target set in the scenario study presented in Paper III. This target is based in the vision of a 2kW society in which a sustainable level of energy use and CO₂

emissions is defined as 2kW¹³ per person (primary energy outtake) and 1 tonne CO₂ equivalents per person and year (Jochem, 2004a, 2004b). Compared with current Swedish levels of approx. 10 tonnes CO₂ emissions per person and year (calculated from a consumption based perspective, see Naturvårdsverket, 2012a), the 2kW target would mean a decrease in CO₂ (e) emissions of 90%. Similar targets are used by e.g. Höjer et al. (2011b, 2011c) and Krewitt et al. (2007), who set a 60% reduction target for energy use according to a globally equal distribution of energy resources and based on the two-degree target. Concerning CO₂, Krewitt et al. (2007) also set a CO₂ (e) target to around 1 tonne per capita and year. This is comparable to the 85% reduction in GHG stated in Åkerman et al. (2007) and the 70-95% reduction proposed by Söderholm et al. (2011).

Until climate issues started to gain ground in society, demanding climate targets such as those above were rarely seen outside scientific forums. Then backcasting served a role also as a proponent for demanding targets. Today there seems to be a tendency for what were once radical targets indeed to become mainstream policy at international, national and local levels. Many environmental policy documents also comprise strategies to meet the targets. In the context of climate mitigation these are often called road maps. However, this does not mean that the question of how to meet these targets is solved, and thus these targets are still outside the scope of what can be reached with contemporary structures and strategies. Thus, the presence of such targets, strategies, and road maps does not mean that the need for backcasting studies in these areas has decreased. On the contrary, more demanding, long-term targets indicate that backcasting might never have been of more immediate relevance than now.

As shown in Paper I, setting climate targets is quite a complicated process involving numerous methodological considerations. This is probably one reason why also the climate targets used in backcasting studies tend to be rather non-transparent. Accordingly, the methodological framework for and discussion about

¹³ 2kW per person and year is equivalent to 17.5 MWh per person and year. Using the same production-based allocation of primary energy use that seems to be the basis for the 2kW society calculations made by Jochem (2004a, 2004b), current primary energy use in Sweden is 68 MWh/person and year (Energimyndigheten, 2011, Table 6). Thus, in order for Sweden to become a 2kW society, a 75% decrease in primary energy use is needed. However, since the scenario methodology presented in Paper III focuses on changes that can decrease the end use of energy, it was decided to use the Swedish end use of energy carriers as a basis for calculating the reduction needed. According to Energimyndigheten (2011, Table 6) this amounts to 46 MWh/person and year, which implies a reduction in the end use of energy of approx. 60%.

setting climate targets presented in Paper I can be of good use when developing and setting targets for backcasting studies.

6.3 Rebound Effects and Targets

One of the main benefits of using a target such as the 2kW society when performing an energy efficiency analysis or scenario study is that this way of working, by which each household is attributed certain amounts of resources, takes away the risk of rebound effects leading to higher amounts of resource use in another service category.

Rebound effects occur at all scales in society, from individual households to global markets. In households, energy efficiency measures usually imply a decrease in household energy costs. These savings are typically 'taken back' through increased use of energy services (direct rebound effect), or are used to increase other types of consumption (indirect rebound effect) (Herring & Roy, 2007). Yet another type of rebound effect occurs when appliances and cars are exchanged for newer, 'greener' technologies. Although the new items may be more energy efficient or constructed and fuelled by more environmentally friendly resources than those they are intended to replace, the environmental cost of producing them might still make the total resource use higher than if the old ones had been kept for some more time. Moreover, many of the new products bought by consumers do not replace but add on to existing items, so that households end up with two or three TV sets, computers, cars and refrigerators. There is also a risk that investments in new, greener products will convince people that they have freed 'room' in their ecological footprint for continuing or increasing less environmentally friendly activities. Estimations of the direct rebound effects have shown that these can amount to significant levels: 10-30% as regards space heating, 10-30% for car travel and 5-12% for lighting (Herring & Roy, 2007). The magnitude of is difficult to estimate, partly because it is impossible to know what the levels of energy use would have been had no efficiency measures been taken at all, and, when it comes to indirect rebound effects or of effects at a societal scale also because of the long time frames and the complexity of the societal changes involved.

For a target such as 2kW to be an efficient way of abating the risk of rebounds leading to an overall increase in energy use, it is important that the entire life cycle of a product or service is allocated to the user (household). It is also crucial that all activities are accounted for. One of the main drawbacks of the scenario study presented in Paper III is that it does not comprise any quantitative follow-

up on to what extent the measures proposed contribute to the 2 kW target. However, it is easy to draw the conclusion that the measures in this scenario alone are not sufficient to meet the target. Today transport represents 23% of Swedish energy use (Energimyndigheten, 2011) and 30% of GHG emissions (Naturvårdsverket, 2011b). Thus, even if all transport were to be included in the scenario study (which is not the case) and the energy use and GHG emissions originating from these were to be set to zero (which is not the case either), this would still be insufficient to meet the 2 kW society target. Indeed, as stated in Paper III the ambition was that measures from not one but three scenario studies should result in the 2 kW target being met. However, this would still require quantification of the potential contributions of the measures, something that still remains to be done. An excellent example of a backcasting study in which all household activities are included, all embedded energy is accounted for, and target fulfilment is quantified is the backcasting study of a sustainable future Stockholm presented by Höjer et al. (2011b, 2011c). However, such quantifications take considerable efforts to produce and, due to constraints on time and resources, are not always possible. Thus, one important area for future research is to develop some kind of simplified quantification methodology for backcasting studies.

6.4 Setting Targets on Other Environmental Issues

Even though climate change may be seen as one of the highest priority issues to address, there are still many other aspects that need to be taken into consideration when aiming for (environmental) sustainable development. For example the environmental performance index (EPI) published by Yale University distinguishes seven policy categories of ecosystem vitality, one of which is climate change, the other six being agriculture, air, biodiversity and habitat, fisheries, forests, and water resources (Esty et al., 2008).

Looking at the Swedish Environmental Quality Objectives, only one¹⁴ of the 16 is estimated to be reached within the timeframe of 2020, and 10¹⁵ are estimated as being reachable only if additional measures are taken. The remaining five

¹⁴ A Protective Ozone Layer

¹⁵ Clean Air, Natural Acidification Only, A Safe Radiation Environment, Zero Eutrophication, Flourishing Lakes and Streams, Good-Quality Groundwater, Thriving Wetlands, Sustainable Forests, A Varied Agricultural Landscape, and A Magnificent Mountain Landscape

objectives¹⁶ are seen as very difficult to achieve even if additional measures are taken. The target concerning climate is the worst off; not only is it considered very difficult or impossible to reach within the time frame even with additional measures, but the trend is considered to be going in the wrong direction (Naturvårdsverket, 2011a). Rather than merely concluding that the targets are out of reach with the strategies and measures given, a backcasting study could contribute by identifying how these strategies could be altered (Höjer et al., 2011c).

Compared with other sustainability aspects, energy use and GHG emissions are quite well-covered by both data and accounting methodologies. When aiming at addressing a wider (or another) set of sustainability issues the situation is more problematic, especially when including impacts from the entire life cycle of products and services. Due to the globalised trade system these life cycles have become increasingly geographically fragmented. This means that large parts of the environmental footprint of products and services are allocated outside the cities and countries where these are consumed or used. For instance the Swedish EPA (Naturvårdsverket, 2011b) has estimated that between 30 and 50 % of all land needed to produce the food consumed in Sweden lies outside the country's borders. It also found that about 50% of the water needed to produce goods used in Sweden comes from other countries.

In order to address other environmental issues as well as energy use and GHG emissions, there is a need to develop methodologies for tracking and calculating these, and to gather reliable data. This is a challenge that concerns backcasting and planning alike.

¹⁶ Reduced Climate Impact, A Non-Toxic Environment, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos, A Good Built Environment, and A Rich Diversity of Plant and Animal Life

7 Changing What and By Whom?

Identifying Measures and Actors

In planning and in backcasting, once the target has been set the next step is to identify the measures needed to meet it. By measure is meant here an act intended at changing something, performed by somebody. This somebody does not need to be an individual; it may as well or even probably be an organisation of some kind. Measures can be used to influence the environmental burden from people's everyday lives directly, through altering their practices, or indirectly, through being directed at the producers or providers of goods and services consumed, for example if the municipality adopts a green building code. Measures can also be directed towards the municipality or planning authority itself, for instance through making changes in the planning organisation. This type of measures is discussed in Section 8. Measures aimed at altering the practices of people can be enabling and supportive, such as free parking lots for people driving 'green' cars, promotion campaigns for waste recycling, or the installation of persuasive technologies, discouraging, such as congestion charges and information campaigns about the negative effects of chemicals, or obstructive, such as proclaiming an area to be free of cars.

This section *explores and discusses how measures can be identified and innovated through backcasting and in planning in a way that acknowledges and makes use of the socio-technical complexity of everyday life*. The section is prefaced by a discussion of some of the theoretical foundations for taking a socio-technical approach to the identification and design of measures, which is of relevance for backcasting and planning alike. Thereafter methodology for developing socio-technical scenarios is presented and discussed, following which a service-orientated approach to the identification and development of energy efficiency measures is introduced.

7.1 Planning Measures for Consumers or Social Agents?

When looking at the environmental impact generally and at energy and climate issues in particular, transport, housing and food stand out as the most significant activities (Brolinson et al., 2010; Naturvårdsverket, 2011b). The majority of measures implemented have been directed at transport and buildings. Together with the current focus on climate change as the most important environmental issue to address, this has resulted in an abundance of measures aimed at decreasing energy use – through promoting energy efficient buildings, reducing the need for transport through developing dense, mixed use neighbourhoods, and increasing (local) production of renewable energy. However, the possibility of realising these measures and the effect of their implementation on sustainability issues are being questioned in numerous studies (see e.g. Campbell, 2006; Williams, 1999). In other words these measures have been found to be insufficient to change the present course of societal development to a more sustainable trajectory. However, as Campbell (2006) points out, “action on climate change is first dependent on problem definition [which] constrains the scope for action or the extent of the options and possibilities considered. There may just be more scope for action than appears possible at first glance.” (ibid., p. 201). This is true not only for climate change but also for the entire spectrum of sustainability issues; action for sustainable development is ultimately decided by how – from which discursive perspective – this is interpreted.

How planners and policy-makers perceive citizens and behavioural change is decisive for the measures proposed and implemented (Berglund & Matti, 2006; Feichtinger & Pregernig, 2005; Palm, 2010). In current sustainable development agendas, technological fixes and behavioural change often make the standard pair of solutions (Gyberg & Palm, 2009; Shove, 1998). While technological development (i.e. efficiency) is left to market forces or promoted through supra-national or national standards, unwanted behaviours are typically tackled through economic incentives and educational campaigns to “empower citizens, as consumers, to make sustainable environmental choices” (EC, 2007, p. 3). This is because “only consumers who are aware of the benefits of energy efficiency and are empowered to make informed choices can be drivers for change” (EC, 2009, p. 50).

Through constructing sustainable development as a matter of consumer choice, the agency and responsibility for achieving this are transferred from government bodies to individuals (Stø et al., 2006). With the growth of the global consumer

class¹⁷, addressing consumption is undeniably important (Assadorian, 2010; Gardner et al., 2004), but framing this as a responsibility of consumers only is problematic, and severely delimits the measures seen as feasible. Indeed, consumers do have power, but it is a circumscribed power as the possibilities for going green are highly dependent on the technical and time-geographical structures provided by policy and planning and the communities of practice in which they are part (Ellegård, 1999; Ellegård & Palm, 2011; Gyberg & Palm, 2009; Timmer et al., 2009).

It has repeatedly been shown that both information and incentives have an effect, but it is also clear that the extent of change is limited concerning the number of people influenced, the scope of the change, and for how long it persists (e.g. Gram-Hanssen, 2010, 2011; Gyberg & Palm, 2009; Robinson, 1991). Such shortcomings are typically explained by a deficiency in knowledge, understanding or commitment. Hence, paradoxical as it might seem, the lack of (expected) results is met by another wave of incentivising and campaigning (Bucchi & Neresini, 2008). This ‘deficit model’ is typically based on the assumption that if people only knew better they would change their attitude (A), and their behaviour (B) and the (consumer) choices (C) they make. However, this ABC model of policy intervention¹⁸ (Shove, 2010) gains little support in empirical studies on how information affects behaviour (see e.g. Bartiaux, 2008; Robinson, 1991; Shove et al., 1998; Tukker et al., 2008).

Putting the deficit model aside, the first step to understanding the inhibitory structures that lie behind inert consumption patterns is to acknowledge the ‘irrational’ responses to change projects as both rational and legitimate. Taking the starting point that people do what makes sense for them makes it possible to more openly address the question of *why* this makes sense, and to design measures accordingly. As has been shown, people’s ways of doing and their related consumption need not be an expression of deliberate ‘rational’ choice, but are sometimes better understood as the result of a social dilemma (Hardin, 1968;

¹⁷ The global consumer class can be distinguished by its purchasing power parity (PPP) which together with a culturally embedded consumerism leads to a personal material accumulation in terms of consumer goods that are related to convenience, entertainment and self-realisation (Assadorian, 2010).

¹⁸ A highly recommended introduction to this ABC model is the Extraordinary Lecture held at the British Library on January 17th, 2011. The lecture was produced and performed by Elizabeth Shove and members of the ESRC-funded social-change climate-change working party: www.lancs.ac.uk/staff/shove/lecture/filmedlecture.htm

Svensson, 2008) or other type of socio-technical lock-in (Shove, 2003; Warde, 2005). Numerous studies have shown that to understand patterns of consumption, technical, social, cultural and institutional dimensions also need to be taken into consideration. (e.g. Owens & Drifill, 2008; Mont & Plepys, 2008; Tukker et al., 2008; Shove et al., 1998; Robinson, 1991). Rayner and Malone spell out the challenge thus: “So long as social scientists and policymakers continue to treat wants as private appetites, they cannot understand how wants come to be standardized in society and how those standards change. (...) Only by understanding the essentially social character of needs, wants, and their satisfaction through consumption can analysts and policymakers lay the basis for behavioral change” (Rayner & Malone, 1998, p. xxiii). This not only involves a rethinking of the social, but also calls for a shift in focus from addressing the social and the technical as separate elements to acknowledging the socio-technical constitution of everyday life.

7.2 From Techno-Biased to Socio-Technical Backcasting

The need to adopt a socio-technical approach to sustainable development is highly relevant for backcasting too. As previously described, backcasting has been used to explore areas such as transport, mobility, food, location and density in cities – all of which incorporate changed prerequisites and contexts for everyday life activities. Some of these studies go one step further and in addition to the changed socio-technical context also spell out some changes in the actual ways of doing these activities¹⁹. However, such studies are quite uncommon. Instead, and in spite of an almost omnipresent recognition that a reliance on ‘technical fixes’ alone is insufficient to meet the sustainability targets, backcasting studies for sustainable development have to a great extent been found to be techno-biased (see Paper II). This means that there is little elaboration of the social side of the proposed changes, either as driver or enabler of the technical changes, or in terms of social implications.

Paper II comprises a literature review of backcasting studies for sustainable development aimed at examining to what extent and how these studies include representations and reflections on social structures and agency. The paper concludes that even though there are some exceptions, there is a general lack of explicit, explorative and reflexive approaches to the question of agency and social structures. Based on that observation, Paper II then identifies a number of arguments for why this should be amended: Firstly, such an approach invites

¹⁹ See e.g. how Wallgren and Höjer (2009) discuss altered ways of doing cooking.

construction of socio-technical scenarios – and measures – from the start and throughout the scenario study. Secondly, related to this, including questions of agency and social structures enables reflections upon the socio-political context in which the scenario is embedded (is this supporting or blocking?) and what implications this has for the scenario's internal and external consistency. Thirdly, through an explicit and open-minded inclusion of social structures and agency in backcasting, these too can be approached as objects of study and explored in an unprejudiced way. Thus, needs, wants and practices can be approached in an explorative way instead of being seen as given. This also enables the exploration and prototyping of different modes of governance, which otherwise tend to be retained and/or perceived according to the *status quo*. Fourthly, techno-biased scenarios risk hiding away or hindering reflections on power structures and social impact – technology is not objective. Fifthly, if the backcasting study is being used for a real planning project, by including actors the scenario study can be used to identify and assign agency for the changes sought.

Most of these arguments apply to other types of futures studies too. As stated in Paper II, the point is not that all backcasting or futures studies need to include elaborations of social structures and agencies, but that an increased awareness about whether and how these are identified and included can contribute to making assumptions about these explicit. The what-who approach presented in Paper III, and discussed below, is one step towards this end.

7.3 Developing Socio-Technical Scenarios

Paper III presents a methodology to develop socio-technical, goal-based scenarios. The basis for this is an iterative identification of objects and agents of change (what-who), where the objects of change are sought in formal institutions, physical/technical structures and citizens' everyday life. The methodology is thus aimed at supporting an identification of measures. The methodology comprises the following main parts: (1) Identification and formulation of a problem to solve or an opportunity to exploit through the scenario study; (2) development and specification of the scenario in terms of objects and agents of change; (3) evaluation of the scenario in terms of the potential for a decrease in energy use and CO₂ emissions; (4) elaboration of the scenario in terms of processes of change, and (5) assessment of the scenario in terms of feasibility and impacts on the wider set of (socio-ecological) sustainability issues. Paper III addresses the first two of

these questions. In the following, this methodology is referred to as the SitCit methodology²⁰.

As previously described, methodological development is an iterative process in which creative and critical/evaluative phases succeed each other. When developing the SitCit methodology the critical phases consisted of trying the methodology out in (research) practice by using it to develop socio-technical scenarios. In Paper III one of these scenario studies is presented, a study that explores how the mobility of inhabitants in the Stockholm City district Bromma could be made less energy- and fossil fuel-dependent. The other scenario studies that have been conducted with the methodology include projects by Master's students (e.g. Lewakowski et al., 2010; Sølgaard Bang et al., 2010) and a Master's thesis (Løbner & Sølgaard Bang, 2011). Here I focus on the Bromma study.

The first part of the SitCit methodology comprises the identification of a problem to solve or an opportunity to exploit. With the aim of addressing sustainable development at the local level, and an ambition of the methodology to be useful also in planning practice, it was decided to use real problems or opportunities situated in real city districts as the basis for the scenario studies. In order to provide heterogeneous 'test beds' (Figure 6) for the methodology, a variety of different problems/opportunities and a number of city districts with varying urban morphological and demographical characteristics were used.

Test bed I: Low-energy alternatives to private transport in Bromma City District -

What if the City of Stockholm decided to put sustainable transport at the top of the agenda in an urban development project? What if the residents of Bromma started a successful car pool scheme?

Test bed II: Persuasive and automating ICT for decreased energy use in residential buildings and private transport in Södermalm City District -

What if innovative ICT applications were widely installed in residential buildings and transport systems in Södermalm?

Test bed III: Energy efficiency through planned refurbishment of multifamily buildings in Rinkeby-Kista City District -

What if energy efficiency were put at the top on the agenda when refurbishing the stock of multifamily buildings in Rinkeby-Kista?

Fig. 6. The three test beds used in the SitCit methodology. Adapted from Paper III and Wangel and Gustafsson (2011).

²⁰ SitCit is the name of the research project in which the development of the scenario methodologies has been conducted.

To emphasise the normative and fictitious character of the scenario study, the postulated opportunities/problems were formulated in terms of ‘What if?’ questions²¹.

This way of using a normative futures studies approach to explore alternative futures for specific city districts makes the methodology rather similar to the transition management approach (Loorbach, 2010; Geels & Schot, 2007). Transition management is a governance model which “actively aims to influence the regime, using niche experiences and alternative visions to influence the cognitive frames of regime actors” (Schot & Geels, 2008, p. 542). However, the focus on regime actors has been criticised for not acknowledging the interests of users and other interest groups and for being too rationalistic and superficial an approach to the behavioural changes sought (Hendriks, 2009; Shove & Walker, 2007; Stirling, 2011). The transition management framework’s emphasis on new products and the inertia to change amongst producers, providers and policy makers is thus problematic, since it fails to recognise that there is also a substantial inertia amongst users to changing their practices. From a social practice approach, Shove and Pantzar (2005) argue that “products (‘things’) alone have no value. They do so only when integrated into practice and allied to requisite forms of competence and meaning” (ibid., 2005, 57). The SitCit methodology is aimed at avoiding these problems through supporting an unprejudiced approach to the actors viewed as being of relevance to address and include, and by way of acknowledging the social logic of everyday life practices.

A central part of the SitCit methodology is iterative identification of objects and actors of change. This ‘what-who iteration’ is based on a recognition that all intentional change depends not only on having objects that can be changed, but also actors to change them. As shown in Figure 7, the scope for change of the objects and the scope for influence of the actors together make up the field of potential measures. However, these should not be seen as fixed. One aim of the methodology is to support the discovery or innovation of some untapped potential in these scopes, with the aim of increasing the resulting field of options.

²¹ An in-depth discussion on the role of such postulations, or posits, in futures studies is presented in Bell & Olick (1989).

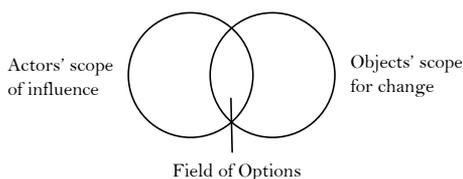


Fig. 7. Change is seen as possible only where and when the actors' scope of influence overlaps with the objects' scope for change. From Paper III and Wangel and Gustafsson (2011).

Through addressing objects and actors of change in an iterative way, the methodology supports the identification of technical but also of social and socio-technical changes, together with the actors needed to make this happen. The what-who iteration is one of the bases for the proposed ways to add actors and governance to scenarios as reported in Paper V.

In the Bromma study the what-who iteration was conducted by structured brainstorming in the research team and through a focus group consisting of non-stakeholder experts on green mobility. The focus question was formulated thus: *“Imagine you are in 2030 and that private mobility practices in Bromma have changed so as to provide the same services but with a minimum of energy use. What changes have happened, and how and by whom were they brought about?”*

The resulting ideas were clustered into a total of six themes, which were then elaborated into partial scenarios, each with its object and agents of change. To emphasise that these individual but interrelated (partial) scenarios were to be used as building blocks for creating the full scenario, they were denoted scenario elements. Figure 8 shows two examples of scenario elements from the Bromma study. Instead of going directly from ideas and data to a narrative of the entire scenario, the intermediary development of scenario elements forces reflection on how these are interrelated and how they could be combined and/or arranged in time. This way of working also makes it evident that one and the same pool of ideas could give rise to a multitude of scenario narratives. All scenario elements and the full scenario narrative can be found in Appendix B in Paper III.

As can be seen, the scenario study resulted in the identification of a number of socio-technical ideas, each connected to one or more actors. However, it was concluded in Paper III that few of these ideas are radical novelties. In fact, an urban morphology that supports green mobility, user-friendly travel planning

tools for public transport, and solutions for teleworking can be regarded as the usual suspects in the green mobility discourse. However, backcasting is not as much about innovation as about showing how existing solutions could contribute to target fulfilment. As described in Section 5.3, this could be done for instance through presenting an image of the future in which niche technologies or practices have become commonplace.

Planning for Green Mobility A major urban development project in Bromma is proclaimed as car-free. New inhabitants provide an especially good opportunity for marketing more sustainable transport alternatives before travel habits have been settled. Some of Bromma becomes denser, but to a large extent the suburban character is kept, to provide this sort of living close to the city core.

Object	Actors
Walking & bicycle paths	City, Developer, Public Transportation Company (SL), County Administration Board
Parking plots and fees	City, Landlord, Homeowners' association
Bus stops, tracks, bus lane, park & ride	City, SL,
Transport habits – travel advice	City, Landlords, GoSthlm, Households
Local service	City, Landlord, Service providers

Café Office The establishment of local working cafés with good internet access provides an attractive alternative to working from home or from a business hotel, resulting in more people working from a distance than before. This in turn decreases the need for transportation and also contributes to making the neighbourhoods livelier. This trend is further strengthened by changes in the physical organisation of companies and by mobility management tools.

Object	Actors
Café Office	Café Entrepreneur, ICT company
Mobility management (parking cash out)	Employer

Fig. 8. Two examples of scenario elements, each comprising a number of objects and actors of change. From Paper III and Wangel and Gustafsson (2011).

7.4 External scenarios

Two of the identified themes could scarcely be seen as local changes or changes stemming from the local context only. Thus, if the aim is to develop a scenario with measures that can be designed and implemented by local actors, these themes

fall outside what the scenario should address. Still, since these themes could have a major effect on the change process and its outcome, rather than discarding them they were denoted *external* scenario elements. With inspiration from Churchman (1968)²², three questions were used when distinguishing between internal and external scenario elements:

1. *Does the change matter to the outcome of the scenario in terms of decreased energy use?*
2. *Does the change take place within the locality?*
3. *Do local actors have the agency to influence the change?*

Themes/scenario elements that received a yes to all three questions were considered internal to the scenario, while those which received a yes to the first two but a no to the third were considered external to the scenario. Through distinguishing between internal and external scenario elements, the scenario *per se* does not need to include all aspects of relevance. Instead, these can be brought up in terms of external opportunities or challenges to which the scenario can be related. The external scenario elements can thus be used to create contexts for which the scenario's feasibility and robustness can be evaluated. This way of working has much in common with the explorative scenario approach looking into 'What could happen?'. A main difference from other approaches in which explorative and normative scenarios are combined is that the variables in this case are derived from the same material that formed the basis for generating the (normative) scenario, and not from a subsequent step. Thus the context is directly related to the scenario. Indeed, this is not only a benefit as there might be other variables of a potentially higher relevance that are not identified. Thus, if an exploration of external variables is seen as a crucial part of the scenario study, there are good reasons to make an additional round of explorative scenario analysis. As mentioned earlier, this type of explorative scenario has been quite commonly used in planning, for instance to deal with uncertainties of climate change.

In the Bromma study two external themes were identified. The first of these included the degree of environmental awareness and concern in society and was labelled Green/Grey. The second concerned the economy in terms of whether economic growth is withdrawn as increasing income or decreasing working hours

²² Churchman (1968) proposes using two questions when delimiting a system from its surroundings: (1) Does it matter to my objectives? (2) Can I do anything about it? If the answer to question 1 is yes, and the answer to question 2 is no, then it belongs to the surroundings.

and was labelled Pulse/Slow²³. Through combining these, four contexts for the scenario study could be developed, each implying different conditions for the changes proposed (Figure 9).

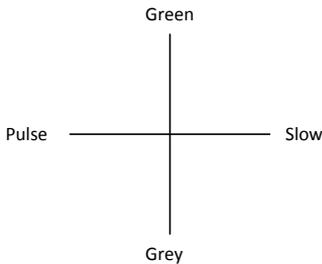


Fig. 9. Through combining the dimensions Green-Grey and Pulse-Slow, four different contexts of the surrounding world, are created. From Paper III and Wangel and Gustafsson (2011).

Reflecting upon what changes are within the scope of influence of local actors (or whatever system level used) is an important step when planning for sustainability. However, it is equally important not to delimit this scope without due cause. This means that when striving to increase the field of options, the basis for what is considered feasible solutions must be questioned and the idea of what is feasible must be treated as a variable instead of a predetermined condition. This, in turn, might call for changes not only in the type of measures that are proposed and implemented, but also in the governing institutions in charge of these.

7.5 Service-Orientated Energy Efficiency Analysis

A different or complementary way to increase the scope of measures is to use a service-orientated approach when planning for energy efficiency projects. Like other measures, energy efficiency measures have been criticised for being too focused on making technical and economic sense while disregarding the social logic of energy use (e.g. Crosbie, 2006; Gyberg & Palm, 2009; Robinson, 1991; Shove, 1998). Paper IV discusses the shortcomings of traditional supply side-orientated perspectives on energy efficiency analysis and presents a conceptual model in which the user side of the energy system is emphasised. As pointed out in the paper, this social logic has very little to do with energy as such, since it is the services provided by the energy system that are demanded. Through letting

²³ The Fast/Slow dimension draws on Höjer et al., (2011c).

go of the idea that services such as lighting, ventilation and heating must be provided through using electricity, district heating or cooling, the scope for potential changes is widened. The conceptual model developed also provides a bridge between more traditional energy efficiency analysis and social science explorations of the relationship between social practices (the Human Activity Systems, see e.g. Ellegård, 1999) and energy use.

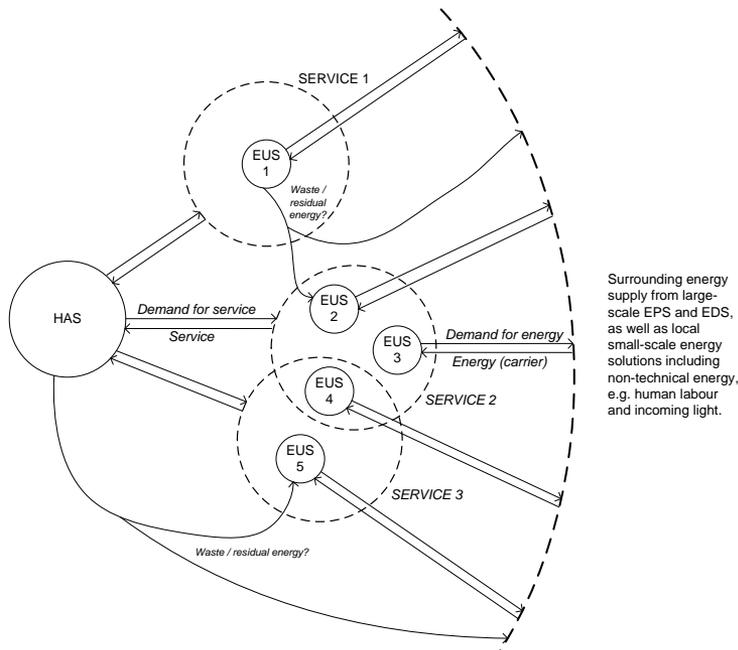


Fig. 10. Conceptual model of energy use in terms of human activity systems (HAS), which are performed to support a household function (integral in the HAS). The HAS are supported by services (S), which are provided by energy usage systems (EUS). One HAS can make use of one or more S, which in turn can be provided by one or more EUS. A decrease in energy use can thus be achieved through: 1) Making the EUS used more energy efficient; 2) changing EUS (e.g. from car to public transport); or 3) changing S (e.g. from transport to telecommunicating). From Paper IV.

Even though most studies on social practices to date have focused on understanding these relationships in a historical and/or contemporary context, this conceptual model provides a promising starting point for examining the possibilities and obstacles for future, less energy demanding/dependent practices. Such an exploration could be done through a backcasting scenario, through design interventions, and/or in a living lab setting such as the aforementioned ‘1 tonne life’. It would be interesting to see how the house in that experiment would

perform if modelled in terms of energy usage systems compared with a more typical house, and what could be learned concerning the inhabitants' social practices.

The underlying purpose of developing the conceptual model was to create a basis for a qualitative and quantitative modelling of backcasting scenarios in terms of energy usage systems, thereby estimating the potential decrease in energy use and CO₂ emissions achieved in the scenarios. In this way Paper IV can be seen as a contribution to the field of backcasting. However, the paper's emphasis on energy usage systems and the social logic of energy use could also be a fruitful contribution, given the techno-bias of backcasting scenarios discussed in the following.

8 Changing How?

Path-dependency, Governance & Critical Junctures

The call for more visionary and strategic approaches to planning for sustainability not only concerns target setting and measures, but also implies a more strategic and proactive approach to governance. To do so, it can be fruitful to use a backcasting approach to explore the aptness of different contemporary governance modes to implement the measures and achieve the target. However, as established in Paper II, to this date backcasting studies have rarely included any explicit or exploratory approach to the governance of change.

This section *explores and discusses how governance can be addressed in backcasting studies, how this can be used to take a more proactive approach to the governance of change, and how this can be done in a way that highlights the institutional and political dimensions of planning for sustainability.* This is done through first discussing path dependency and three path dependency enforcing factors: the fragmented governance system, the reliance on prognoses in planning, and the power of discourses. Following this, the notion of critical junctures is introduced as a way to break or tilt path dependency. Thereafter a case study showing the importance of meta-governance is presented. The section concludes with a discussion on how an explorative approach to governance could be included in backcasting studies, and how this could contribute to a more proactive approach to the governance of change.

8.1 Path Dependency

Many of the obstacles to overcome when planning for sustainability can be framed as path dependency. According to Kay (2005), path dependency does not by itself

constitute a theory but is an empirical category, distinguished by the occurrence of self-reinforcing or positive feedback processes that grow strong enough to prevent or obstruct any divergence from the *status quo*, i.e. the ‘*path*’ (Pierson, 2000). Path dependency should not be misinterpreted as determinism, but viewed as a socio-technical process in which economic, technical and socio-cultural factors combine to create a ‘logic of practice’ which conceptually curtails the “future choice set (...) and link decision-making through time.” (Kay, 2005, p. 553). Path dependency is thus a way to explain why some alternative actions seem more, or less, appropriate than others and by extension why changing the course of societal development is such a difficult task to accomplish.

The social side of path dependency can be divided into formal and informal institutions, which are regarded here as rules, organisational structures, and procedures that are formally acknowledged and regulated through policy documents. Informal institutions can be further divided into cognitive and normative rules (Nilsson et al., 2011, drawing on Scott, 1995). Cognitive rules concern understanding and perception, i.e. the problems and solutions that catch our attention and what we see as feasible to do, while normative frames concern values and culture, i.e. what we see as being the right thing to do or the right way to act. Another word for informal institutions is discourses. A discourse is a specific set of informal institutions – “shared ways of apprehending the world” (Dryzek 1997, p. 8). Discourses shape what is considered a problem, how this problem should be formulated, what is considered a feasible solution, and what is prioritised. A discursive struggle is thus not so much a matter of rational argument as an argument over what can be considered rational. The meaning of sustainable development is not only a matter of a written definition but is also constituted through the way this is put into practice. Accordingly, the targets, measures and agency proposed in a planning strategy are very much a matter of the discursive power structures and politics of sustainable urban development (Bulkley & Betsill, 2005; Holman, 2009; Marvin & Guy, 1999). The power of different discourses depends to a great extent on how well they are connected to, or manifested in, formal institutions and materialities. What discourse that gets the final say is thus highly dependent on the actors (representing what formal institutions and what materialities) that take the side of a particular perspective (Dovlén, 2005; Lundqvist, 2001, 2004). Formal institutions can be seen as an operationalisation and manifestation of a specific set of informal institutions, but when trying to assess what is causing what, it is not always easy to separate these. Cognitive and normative rules, and informal and formal institutions, are mutually structuring and thus they often converge. However, it can be said that there is usually (always?) a greater variety in the informal institutions than in the formal.

Only a few sets of cognitive and normative frames can be in power at the same time, at least in a centralised governance system.

Formal institutions influence the informal institutions that are given room and promoted. They can also be obstructive. It has been argued that the way in which Western societies are being steered today reflects a fragmentation and transfer of power and responsibility from governments and public bodies of the representative democracy to private interests, NGOs and lay people (Bogason, 2000). The more networked types of governance²⁴ involve a number of potential benefits such as increased legitimacy, the creation of social capital, citizen empowerment and stakeholder buy-in (see e.g. Sørensen & Torfing, 2007, pp. 4-5), but are also questioned in the way these modes of governance influence democratic concerns such as accountability, representation and transparency (Bogason & Musso 2006; Sørensen 2006; Nyseth, 2008). In the context of urban (spatial) planning, since the 1970s and 1980s, the focus of planning practices has been shifted from plans and strategies to regulations and shorter projects (Healey, 2006). This fragmentation has had clear, negative effects on the possibilities of pursuing more long-term and organisationally and spatially integrative planning agendas (Sehested, 2009). Through a focus on regulations and shorter-term projects, immediate or short-term gains are emphasised, while effects in the more distant future are undervalued (Adams, 2004; Bell, 2003). The fragmentation of the governance system is also a plausible explanation why planning and policy making tend to treat what people do as given, and to use this as the basis for prognoses by which contemporary structures and trends are projected into the future: People travel by car and (hence) will continue to travel by car and thus we have to provide them with motorways. Isserman (1984) describes this as “planners have adopted quantitative techniques of projection as if they described the most probable future (truth) and as if that were desired (ideal).” (ibid. in Myers & Kitsuse, 2000, p. 224). It has also been noted that, at least in planning, another factor strengthening path dependency is a reported lack of time before decision making (Throgmorton, 2003).

²⁴ That governance is enacted through networks and not by well delimited organisational bodies has been recognised at least since the 1970s (see e.g. Wittrock, 1980, p. 19). The concept network governance, or the understanding of governance as something other than traditional governing, builds on the recognition that there has been a substantial enforcement of the networked character of governance. This shift is proposed to result from a number of mutually reinforcing processes, i.e. the global financial decline, a breaking of state autonomy, the rise of neo-liberalism and its New Strategic Management, but also from the participative turn in policy and planning (Bogason, 2000; Bucchi & Neresini, 2008; Cass, 2006).

The material side of path dependency comprises physical structures, technologies and other material resources. In the same way as the formal institutions, the materialities such as physical structures and technology can also be seen as manifestations of informal institutions. It should be noted that neither formal institutions nor materialities need be the manifestations of those informal institutions that are currently in power. They could also be residuals of the past. This does not mean that such residuals are obsolete. A technology or formal institution that does not fulfil any function at all does not stay in place for long. As long as the technology or formal institution can fulfil the needed function, and does not get challenged by an alternative, better way to deliver the same function, the original solution can remain quite safe. One reason for this is that many materialities are inert to change. Looking at the physical presence and the economic investments in materialities such as the built environment and its infrasystems, this inertia is quite evident. However, most of the inertia does not originate in the physical, technical or economic aspects as such – theoretically speaking there is no hindrance to tearing down the building stock and replacing it with more energy efficient buildings, to replacing the waste-fuelled district heating system with solar panels, or to rebuilding the underground with wider tracks so that underground trains can carry more people than they do today. Instead, the inertia is a result of what the informal institutions (in power) acknowledge as feasible and the resources that are made available and allocated to different parts of society.

8.2 Making Use of Critical Junctures

Path dependency does not mean that things do not change, but that the scope and direction of change are circumscribed. However, major changes sometimes occur. It has been said that there basically are only two ways in which the path dependency of a large socio-technical system can be broken, both of which function through making the system obsolete. The first example is when the system proves to be incapable of dealing with a severe problem and the second is when another, rival system manages to become more attractive (Kaijser et al., 1988; Kingsley & Urry, 2009). Since socio-technical systems can be viewed as being discourses or part of discourses, these mechanisms are relevant for altering predominant discourses too. The breaking or tilting of path dependency might sound quite dramatic, but major changes can and often do originate in rather small events that, more or less consciously, are used to challenge the system and tilt the path in a new direction (Kingdon, 1995; Pierson, 2000): “Specific patterns of timing and sequence matter; a wide range of social outcomes may be possible; large consequences may result from relatively small or contingent events;

particular courses of action, once introduced, can be almost impossible to reverse; and consequently, political development is punctuated by critical moments or junctures that shape the basic contours of social life.” (Pierson, 2000, p. 251).

There are a number of competing or complementary theories on how and why such critical junctures occur. Some examples are theories on Windows of Opportunity (or Policy Windows) (Kingdon, 1995), Large Technical Systems theory (Hughes, 1983; Ingelstam, 2002; Kaijser et al., 1988), Transition Management Theory (see e.g. Geels & Schot, 2007), and Situations of Opportunity (Weingaertner et al., 2008; Weingaertner & Svane, 2006). Drawing on these and Pierson (2000), critical junctures can be understood as delimited periods of time when there is a greater possibility than usual to bring about change with major and long-term implications. Hence, creating and/or exploiting such junctures could be an efficient way to put sustainable development into practice, should they result in the new path being more attuned to sustainability principles (Geels & Schot, 2007; de Graaf et al., 2009; Poulter et al., 2009).

As described in both Policy Window theory and Transition Management theory, these junctures function through providing an opportunity for technologies/policies that challenge the predominant system to be recognised and, if this turns out successful, to start creating those self-reinforcing or positive feedback processes that can lead to a new path, in favour of the technology/policy. Depending on the origin of the juncture, the discursive openness can be of varying scope and character. In the case of the origin being a problem, this and the proposed solutions are typically coupled so that a technological problem makes room for other technological solutions, and a political problem makes room for alternative policies. A juncture can also arise from other events and processes that create an opportunity for new technologies or policies to be recognised, e.g. through planned investments, competitions or lobbyism.

From a discursive perspective critical junctures can also be said to create a discursive openness. This does not mean openness in the discourse *per se*, but an opening for other discourses to gain power. One example of this, as discussed in Paper VI, was the decision to make Hammarby Sjöstad a central part of the Olympic Games application in terms of an environmentally friendly Olympic Village. This created an opportunity for changing the planning discourse in a way that promoted concerns for sustainability issues. There are also other opportunities which, since they are not framed in terms of environmental sustainability, are less evident in their potential for contributing to such an aim. Such opportunities could still be used as leverage for promoting environmental considerations.

A juncture does not automatically lead to a tilting or breaking of the path dependency, but could result in continuation of the *status quo*. The final outcome is highly dependent on what actors, representing what discourses, manage to take control of the situation: “at these critical junctures policy actors create institutions to deal with the unforeseen event, and these institutions in turn shape the policy behavior of subsequent actors.” (Levin-Waldman, 2009, p. 674). Often these actors will be part of the predominant discourse. One reason for this is that the presence of a problem is typically recognised first by the system in which it occurs. Thus, these actors have a head start in defining the problem as something that can be solved with the system intact and devising solutions accordingly. This means that the discursive openness created through these junctures typically remains for only a short period of time, which in turn implies that learning to identify and anticipate these is an important part of more strategic planning for sustainability.

The potential for increasing awareness of this is one reason why Paper III suggests using critical junctures as the basis for backcasting studies. The inclusion of critical junctures in a backcasting study also holds the potential of opening the future up even further: Through pointing at the existence of critical junctures and including these in the scenario, ideas diverging from business-as-usual can be more easily conceptualised and accepted.

8.3 Meta-Governance and Sustainable Development as Discourse

Paper IV explores the meta-governance of the urban planning project Hammarby Sjöstad through the concept “negotiating sustainabilities” defined as “[t]he negotiating of specific interpretations – in a given situation and by that situation’s actors – of the epistemological content and practical consequences of the term sustainability, in a strategic process that legitimises these actors’ specific interests in and understandings of sustainability in practice.” (Paper VI, p. 143). Meta-governance is typically described as a way of indirect steering, a regulation of the (presumed) self-regulation of governance networks (Sehested, 2009; Sørensen, 2006). The paper focuses on the freedom and power of action of the Hammarby Sjöstad Project Team that was appointed by the City and how this influenced the practical outcomes of the planning process. Based on the empirical findings in the paper, an understanding of governance and meta-governance as multi-level and sequential is confirmed. The implications of this are highlighted through discussing meta-governance in terms of either *staging the game*, in which the Project Team had sufficient agency and power to frame the negotiation situation, or *playing the game*, in which the Project Team’s freedom of action was

circumscribed by decisions made on other levels or in previous stages in the planning process.

From a normative perspective there are at least four ways in which meta-governance could be beneficial when planning for sustainability, and why this function should be performed by an urban planning authority. Firstly, it has been shown that without connections to formal institutions, it is difficult for governance networks to make a change (Lundquist, 2004; Nyseth, 2008; Sehested, 2009). The planning authority as metagovernor provides such a connection. Secondly, when aiming for overarching goals such as sustainable development there is a recognised need for a 'spider in the web' that can manage complexity and coordinate activities. Thirdly, proponents of advocacy planning see urban planners as having a role as "advocates for the sustainable city; (...) [telling] persuasive stories about how sustainable places can and should be created." (Throgmorton, 2003, p. 136). This role also includes recognising and empowering the discursively weak environmental sustainability (Dovlén, 2005; Healey, 2006; Redclift, 2005) and acting as a spokesperson for the voiceless stakeholders of nature, cultural heritage or the future generations to come.

It is important to acknowledge that a 'good' process does not necessitate a 'good' outcome (Larsen & Gunnarsson-Östling, 2009). In the context of network governance, the emphasis on communication and integration might seem evident, but from the perspective of sustainability this has been shown to be problematic, at least when integration is interpreted as consensus (Connelly & Richardson, 2008). Dovlén (2005) expresses this as that "the traditionally held desire to reach a consensus can legitimise the marginalisation of perspectives at the beginning of or during the planning process. The discourse of consensus seems to cement existing values and positions of power in planning. It also prevents more detailed discussion of sustainable development issues. An avoidance of conflict in planning practice seems to prevent the development of pedagogical situations." (Dovlén, 2005, p. 11).

It has been argued that in the entire Hammarby Sjöstad project, the project team was the most successful of all innovations when it came to influencing the area's environmental performance. The integration of the City of Stockholm's different administrative bodies created a powerful meta-actor, which, in comparison with the traditional, more fragmented ways of working, could coordinate its activities and claims in a way that rendered it more discursive power, which was favourable when negotiating with other actors. This was substantially enforced by the Environmental Programme, which also worked (was used) as a lever for otherwise often marginalised environmental interests. However, the power that was

attributed to and acknowledged in relation to the Environmental Programme varied substantially during the project, depending both on the power of the environmental discourse in society in general, and on the political coalition that was in control (Green, 2006). The Programme also lost considerable power when it became clear that the Olympic Games in 2004 would not be granted to Stockholm. It is clear that in examining the potential role and influence of meta-governance on planning projects, one needs to address the wider institutional setting and include both formal and informal institutions in the analysis.

8.4 An Explorative Approach to Governance

The call for more visionary approaches to planning (for sustainability) implies more strategic management of urban development in terms of taking an explorative and proactive approach to governance. In doing so, it can be fruitful to use a backcasting approach to explore the aptness of different contemporary governance modes to achieve the explored target(s). Different models of governance have been characterised by e.g. the degree of public control and formalisation, whether they are elitist or pluralist, open or closed, and depending on when in the process participation takes place (Arnstein, 1969; Cass, 2006; Hajer & Wagenaar, 2003; Nyseth, 2008; Pierre & Peters, 2005; Sehested, 2009; Treib et al., 2005). Each mode has its benefits and drawbacks. However, as established in Paper III, backcasting studies to date have rarely included any explicit or exploratory approach to the governance of change or to the institutional frames in which the image of the future is embedded (Nilsson et al., 2011).

As a response to the lack of explorative approaches to governance and agency in backcasting established in Paper II, Paper V presents a number of theoretically based ways of adding actors and governance to such scenarios. The theories used are stakeholder analysis, social network analysis, governance theory, and theories on planning, policy and change. The four approaches developed are: (1) The stakeholder analysis approach; (2) the social network approach; (3) the governance model approach; and (4) the policy and change approach. Approaches (1) and (2) are bottom-up generative in that they take their starting point in the identification of stakeholders and actors and use this to develop a representation of governance. Approaches (3) and (4) are top-down generative in that they take one or more models or theories of governance, policy and change processes as their starting point and then use these to identify stakeholders and actors. Paper V uses the same scenario study as presented in Paper III to exemplify how these approaches can influence the resulting scenario, both in terms of findings and ways of

representing these²⁵. Paper V also builds on Paper III in proposing that the stakeholder analysis be conducted through the aforementioned what-who iteration.

From a planning perspective the type of process scenarios elaborated in and proposed by Paper V require more governance-aware and strategic urban planning, in other words, the governance of transitions needs to be assessed and planned. Through its explorative approach this also encourages and provides scope for testing different varieties of governance. Through prototyping different configurations and reconfigurations of governance, backcasting could also be used to explore modes of governance that go beyond the contemporary.

²⁵ For concrete examples see Paper V, pp. 883-888.

9 Backcasting and Planning for Sustainability

Concluding Comments

This thesis explored how backcasting could be of use when planning for sustainability by looking into three areas of problems and possibilities. The first of these areas concerned target setting and it was concluded that both backcasting and planning tend to use targets that are elusive, which makes it difficult to understand what is included in the target and what is omitted. As a way to rectify this, a framework of methodological considerations for target setting was presented. It was also concluded that there is a need for further methodological development on how to set targets for other environmental aspects as well as energy and GHG gases. The second area focused on identification of measures and actors. It was found that both backcasting and planning have the problem of being techno-biased and/or taking a rather superficial approach to 'the social' which means that the socio-technical complexity of everyday life is left unattended. This has consequences both in terms of delimiting the scope of measures that are identified and proposed and for the possibility for these to result in the required changes. Two approaches were suggested to deal with this: a methodology for developing socio-technical scenarios, in which an iterative identification of objects and agents of change was a central trait, and a service-orientated energy efficiency analysis, in which the social logic of energy use was highlighted. The third area concerned how backcasting could be used to take a more explorative approach to the governance of change instead of leaving this unaddressed and/or according to the status quo. The institutional and political dimensions of planning for sustainability were also emphasised, with the focus on path dependency, discursive power and critical junctures.

In conclusion, this thesis shows that backcasting has good potential as a tool when planning for sustainability but that this will require some methodological advancement of backcasting. One of the main contributions of the thesis is the exploration of how backcasting studies could benefit from including the question of whom: Who could make the changes happen? Who should change (whose) behaviour? Who (what group/s of society) benefits and who loses from the images of the future that are developed? And who is invited to take part in the making of futures and whose futures are being heard? This way of working emphasises that sustainable development is not only a matter of technical fixes or behavioural change, but that this needs to be supported by the institutional organisation of society.

For backcasting studies to have an effect, they need to feed into policy-making and planning. It is through these formal 'structuring' governance dimensions that the intended changes can manifest in altered materialities and institutions (Albrechts, 2010; Healy, 2009; 2006; Quist et al., 2011; Robinson, 2003). In order to be transformative, i.e. to have an effect on the shaping of the future, the image(s) of the future and the related planning strategy must gain sufficient discursive power and momentum to overcome the institutional resistance of the predominant discourses. These stakeholders required to deliver the desired outcomes need to approve of both the short-term and long-term implications of steering towards this future. In light of the radical changes needed to achieve sustainable development this approval is problematic, as the stakeholders in power tend to favour continued path dependency. One way to escape this vicious cycle is through participative backcasting, which is beneficial for participative approaches due to its potential for co-production of knowledge and higher order learning (Quist & Vergragt, 2006; Svenfelt et al., 2011; Robinson et al., 2011). In a study of the effects of three participatory backcasting studies²⁶ in the Netherlands, Quist et al. (2011) found numerous follow-up and spin-off activities, including new research programs, network and niche formations, altered policies, and other types of institutionalisation. Participative approaches can also be used to enable discussions on norms, values and rationality, through which values and presumptions can be made visible and contested (Street, 1997). However stakeholder participation can also contribute to a retained path dependency in backcasting due to the participants safeguarding their vested interests and being reluctant to propose more radical solutions (Hisschemöller & Bode; 2011; Larsen

²⁶ The studies reported in Quist et al. (2011) make use of a backcasting approach in which target fulfillment is defined less strict than in this thesis. As many other backcasting studies in the Netherlands these can be defined as pathway orientated backcasting.

& Gunnarsson-Östling, 2009; Wiek et al., 2006), or to attribute themselves with any kind of agency (Svenfelt et al., 2011).

The decision on whether to use a participatory approach and what stakeholders or other participants to include must thus be based on the purpose of the study. If the primary purpose is to affect policy or practice, then inclusion of stakeholders and end-users might be worthwhile due to the increased potential for buy-in, social learning, empowerment and increased legitimacy of the process and/or outcomes. In such a situation the risks of safeguarded interests diluting the result can be seen as less important. On the other hand, if the purpose is to explore more radical images of the future, stakeholder participation can be more of a hindrance than a help, at least in the initial phases of scenario creation. When (if) using backcasting as a tool in planning for sustainability these somewhat conflicting purposes must be combined: Stakeholders (key actors) must buy into both the process and the outcome if this is to have any effect, at least those outcomes that would influence their objectives. At the same time, the outcome must be allowed to be more challenging than these stakeholders might deem convenient.

Including the question of 'who' highlights the normative character of sustainable development and makes issues of environmental justice and equity visible (Inayatullah, 1990; Masini, 2009; Gunnarsson-Östling, 2011). In relation to this there is a need for groups of society besides those in power to be encouraged to develop their images of the (sustainable, desired) future, and to give room for these in policy-making and planning; not only in a responsive way, such as in public consultations, considerations or other types of participation where frames and contents are already defined, but in an open, generative manner. This might seem radical, but was viewed as one of the main roles of futures studies back in the 1960s (Kaijser & Tiberg, 2000; Wittrock, 1980). There has since been an upheaval of participatory backcasting studies in which 'non-experts' are included and allowed to elaborate their futures quite freely, but most of these studies are initiated, managed and reported by experts, generally academics. Thus, it can be argued that backcasting is still an art mostly performed by experts for other experts. One reason for this is probably because of general ignorance of the existence of alternative, normative futures studies; another is the lack of interest or support for these from those in power. The formulation of alternative images of the future is also a question of resources and ultimately of power. Denying certain futures legitimacy and calling them far-fetched, absurd, naive or impossible is a powerful discursive tool. However, the openness of the future renders desirability and ethics, and not probability, the basis on which the feasibility of images of the future must be assessed.

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