



## Backcasting images of the future city—Time and space for sustainable development in Stockholm

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### ABSTRACT

This paper presents and discusses a backcasting study for Stockholm 2050. The focus is on developing images of a future where Stockholm citizens have sustainable energy use—here defined as a 60% reduction per capita over a 50-year period. The perspective is that of households, so all energy is allocated to individuals' activities rather than being discussed from a sector perspective. Six images of the future are developed by combining a space dimension (three versions of changes in urban structure) and a time dimension (two versions of people's life tempo). Added to this is technological development, so that the images of the future illustrate how combinations of planning, behavioural change and technological development could lead to sustainable energy use.

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### 1. Introduction

What would a city look like that has reached the aim of sustainable energy use? This paper investigates possible visions of cities and city life that successfully address the climate change challenge.

Climate change is caused by excessive emissions of greenhouse gases (GHG). Therefore, targets relating to climate change are often formulated in terms of reductions in GHG. The IPCC assessment of the risk of harmful climate change has led to a recommendation that the mean global temperature must not be allowed to rise by more than 2 °C above pre-industrial levels. The EU climate policy objectives are also based upon the two-degree figure. The EU emissions targets include a 20–30% reduction in GHG emissions by 2020. The Swedish GHG target is a 40% reduction on 1990 levels by 2020 and a vision of 100% reduction (no net emissions of GHG to the atmosphere) by 2050 [2].

There is a close relationship between energy use and GHG emissions, since the use of energy is the cause of most CO<sub>2</sub> emissions. However, from a geographical, Sweden-centred perspective, the difference between energy use and CO<sub>2</sub> emissions is quite large. Sweden is a sparsely populated country, land is plentiful and there is a large amount of hydropower. Therefore, reducing GHG emissions to a globally sustainable level would be much easier for Sweden as a nation than for most other countries, although it would still be a challenge. However, a world with sustainable use of energy would still need extensive trade in energy. Therefore, in a Swedish context, sustainable use of energy is a tougher criterion than sustainable greenhouse gas emissions.

The aim of this paper is to show that future visions of a sustainable city of Stockholm can be fruitfully formulated in terms of spatial and temporal dimensions. The research question is how a combination of spatial city planning and changed use of time can be an effective tool for strategy development towards a transition to a low-energy city, where total energy use by its citizens is sustainable. The paper also aims to show how target-fulfilling backcasting can be used to develop a number of images of the future, thus showing how certain targets could be achieved in different ways.

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The main justification for a study of this kind is that it can connect short-term and long-term targets, identify potential conflicts between measures needed to achieve various targets, and display the consequences of actually achieving set targets. All these three benefits are very important for developing long-term and short-term policies.

## 2. Scenarios and backcasting

Finding ways to organise cities and devise urban lifestyles that do not further increase climate change is very much a long-term issue, but it needs to be reconciled with short-term policies. Such challenges are typically dealt with in futures studies, a field of research characterised by a view of the future as something that becomes, or is created, rather than something that exists and only needs to be predicted and accommodated. For an overview of futures studies categorisations see e.g. Tapio and Hietanen [3] and Börjeson et al. [4]. These categorisations are sometimes a way of trying to organise the field [3]. A slightly different approach is adopted in Börjeson et al. [4], where the perspective of scenario users is taken rather than that of scenario creators. The purpose for which a scenario is built then becomes evident. Börjeson et al. make a distinction between three categories: Predictive, Explorative and Normative scenarios. To each of those, they allocate one question. Predictive scenarios respond to the question ‘What will happen?’, Explorative scenarios respond to ‘What could happen?’ and Normative scenarios deal with the question ‘How can a specific target be reached?’. All those scenarios can be used for the same object, e.g. energy use in Stockholm 2050, but because of their different initial question, they would produce quite different results. If one scenario makes a prediction based on anticipated trends while another paints a picture of a desirable future, they might lead to entirely different conclusions.

Normative scenarios are most suitable in this paper, since we are interested in exploring how to achieve a specific target, rather than dealing with predictions or more unspecified explorations of future developments. Using the term ‘Normative’ for the third category described above does not mean that the other categories are purely prescriptive or objective. Instead, it denotes the fact that the scenario starts out from some kind of norms in the form of explicitly stated targets. Scenarios in the other two categories can also be seen as normative, e.g. in their choice of scenario team, scenario focus or the way the studies are presented. Predictive and Explorative scenarios may even be used to get a better understanding of the opportunities to achieve certain targets. However, what distinguishes the normative scenarios is that they explicitly try to illustrate how a certain target can be reached. Moreover, the fact that the normative scenarios start out from a target does not mean that the target needs to be seen as desirable by those working with the scenarios. Instead, the normative scenarios can be used to evaluate broader consequences of targets set by others.

Börjeson et al. [4] define two different kinds of normative scenarios, namely ‘preserving normative scenarios’ and ‘transformative normative scenarios’. The difference lies in how challenging it is for existing institutions and structures to achieve the targets. If the targets can be met without structural change, preserving normative scenarios are sufficient. However, if structural changes seem to be needed to reach the targets, as is the case with climate change, transformative normative scenarios are appropriate. Börjeson et al. view backcasting as transformative normative scenario work, and others have noted that backcasting is suitable when current trends counteract a desirable target, see e.g. [5–7]. The Stockholm 2050 scenarios presented in this paper are transformative normative scenarios, i.e. backcasting, and we consider those two terms to be interchangeable.

There are a number of different views on backcasting. Summaries of various backcasting approaches can be found in e.g. Quist et al. [8], and Quist [9]. Some common characteristics are that backcasting approaches tend to be more goal-orientated than other approaches in that they often start out with a goal instead of trying to find solutions that perform as well as possible in terms of some specified criteria. A long-term perspective and an attempt to think beyond contemporary trends while searching for ways of achieving the target seem to be common features of most backcasting approaches. There is also often an ambition to help today’s decision makers include long-term considerations in their daily work.

There are differences in approach between various backcasting studies. Four of the most important are as follows:

- Participatory backcasting, or backcasting with a greater emphasis on participatory approaches, has become more common in recent years [10–13,16]. There may be different reasons for adopting a participatory approach—in order to improve the scenarios, to increase learning among participants or as a democratic endeavour to give participants influence over the scenarios.
- In path-orientated backcasting, pathways to images of the future are emphasised. This focus on pathways is important by tradition and the very notion of ‘backcasting’ comes from the idea of leading the mind to think in terms of following a path backwards from a desired future [5,14].
- Backcasting from principles is a concept mainly advocated by the organisation The Natural Step. Here, four overarching long-term principles are used as a basis for decision making. Thus, there are no images of the future or descriptions of paths. Instead, the idea is for the principles to guide decision making and lead to adaptive planning [15].
- This paper’s approach is here named target-orientated backcasting, where targets and descriptions of target fulfilment are heavily emphasised (see e.g. [17–19]). This version of backcasting is further described below.

The difference between the different approaches should not be exaggerated, but some purposes of developing backcasting scenarios can be difficult to combine. For example, an emphasis on participation can clash with an aspiration to generate target-fulfilling images of the future, since the ideas of the participants are sometimes simply not radical enough. Similarly, Larsen and Gunnarsson Östling [10] highlight the tension between the actual content of sustainability scenarios, e.g. required measures, and more process-orientated qualities, e.g. legitimacy and collaborative learning. Too much emphasis on the process qualities may not

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