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Sustainability goals combining social and environmental aspects

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Abstract

Emissions of greenhouse gases (GHG) and other environmental issues such as loss of biodiversity, land system change and eutrophication of freshwater and marine coastal ecosystems are major challenges to humanity. For these planetary boundaries, we have already exceeded critical levels, which may threaten Earth System stability. Nationally, out of the 16 Swedish environmental goals for 2020, only one – the goal concerning the ozone layer – is expected to be reached. Furthermore, although the UN Millennium Development Goals have shown substantial progress in some areas, e.g. gender equality in education, many disparities between and within regions remain, e.g. with respect to socio-economic or gender aspects.

This thesis examines how to take into account both environmental and social sustainability goals to be used in scenarios or in policymaking.

In paper I, we use a literature review and interviews to gather background information on 11 social priorities and 9 planetary boundaries and then select, in a transdisciplinary setting, four sustainability goals. These goals have to be fulfilled by 2050 in normative future scenarios - backcasting - for Sweden in a degrowth or low-growth context. Two goals address ecological challenges, climate change and land use issues specifically. The other two goals address social issues and deal with participation and influence in society as well as resource security and distribution. The environmental goals will require significant reductions in greenhouse gas (GHG) emissions and land use compared to today's levels. The social goals are within reach today, although the degree of fulfillment differs across different groups in society.

In paper II, a qualitative content analysis is made to gather information from scientific literature and reports from environmental NGOs on existing as well as suggested climate and energy targets at a global, national and local scale. We also search for justice perspectives in existing climate and energy targets and for proposals for such perspectives in suggested targets. We find that the justice aspect is not explicitly formulated in existing climate and energy targets. Using a framework on social justice that distinguishes between the community of justice, the principles of distribution and the currency of justice, we also find that for most suggested targets, an egalitarian approach is used, such as global per capita GHG emission allowances. The community of justice, in our reviewed examples, is limited to human beings, thereby excluding all other living beings.

In paper III, we assess how four different backcasting scenarios for land use in a Swedish context, all of which fulfill a climate target of zero CO2 emissions in 2060, impact on other sustainability goals. Using a compatibility matrix, we conduct a goal conflict analysis between the chosen climate goal and the other Swedish environmental goals, the gender equity goals and the public health goal with its 11 associated objective domains. We find that there are more potential goal conflicts in scenarios with no global climate agreement. This is mainly due to the fact that some environmental issues have to be dealt with at a global level and that the mitigation of the environmental impacts will depend on actions taken not only in Sweden but also on a global scale.

From the results of all three papers, I then discuss several aspects that have to be taken into account when setting goals. As sustainability goals are long-term and characterized by major uncertainties, I discuss the need to set "cautiously utopian goals", i.e. goals that may be impossible to achieve but possible to approach. These goals could trigger the profound changes needed for a sustainable and just future while remaining acceptable for the involved stakeholders. Goals are however often elusive as to what is included or not, e.g. whether emissions from trade are included in climate targets or from which reference year a specific emission reduction should be based upon. These delimitations should be made visible at the least but ideally reflected upon as to how they may impact for instance other countries' emission reductions.

There is also a need to separate goals from the means to achieve the goals, as this will facilitate the process of setting goals than can allow for different pathways on how to meet a certain goal. Economic growth is often seen as a goal in itself, such as in the recently adopted UN Sustainable Development Goals, SDGs, whereas it should be regarded as a mere tool to achieve goals relating to, e.g., welfare or prosperity.

Goals are also normative and reflect both different cultural and ethical perspectives of what a good level of healthcare or housing standard may be. The underlying values should also be made visible and challenged. Both inter- and intragenerational justice perspectives should be made more concrete and explicit in goal setting so that such issues can also be monitored. A good start could be to systematically start using a consumption perspective as well as a territorial perspective when setting climate or land use goals, as the impact of our consumption on other countries' environment and health has been increasing over the last decades.

Keywords: Sustainability goals, goal conflicts, trade-offs, environmental justice, backcasting, future scenarios, climate and energy targets.

Sammanfattning

Utsläpp av växthusgaser (GHG) och andra miljöproblem, såsom förlust av biologisk mångfald, markanvändning och övergödning av sötvatten och marina kustekosystem, är stora utmaningar för mänskligheten. De planetära gränser för dessa områden har redan överskridits. Av de 16 svenska miljömålen för 2020, vars syfte är att lösa dessa ödesfrågor, bedöms bara ett – "Ett skyddande ozonskikt" – uppnås i tid. Vad gäller sociala mål på global nivå fram till 2015 – FN:s Milleniemål – har visserligen betydande framsteg gjorts på en del områden, t.ex. jämställdhet i utbildningen, men utfallet skiljer sig mellan länder och inom länder med avseende på socioekonomisk grupp och kön.

Denna avhandling undersöker hur man kan ta hänsyn till både miljömässiga och sociala hållbarhetsmål som ska användas i framtidsscenarier eller som underlag till beslutsfattande.

I artikel I väljs fyra hållbarhetsmål i en tvärvetenskaplig process. Målen ska uppfyllas 2050 i s.k. normativa framtidsscenarier (backcasting) för Sverige i en kontext av nedväxt eller låg tillväxt. De två första målen handlar om klimatförändringar och markanvändningsfrågor. De två andra är sociala mål och omfattar delaktighet och inflytande i samhället samt tillgång till resurser och fördelning av dessa. För att uppnå de valda miljömålen, kommer drastiska minskningar av växthusgasutsläpp (GHG) och markanvändning att behövas, jämfört med dagens situation. Båda de sociala målen är inom räckhåll i dag, även om graden av uppfyllelse skiljer sig mellan olika grupper i samhället.

I artikel II genomförs en kvalitativ dokumentanalys för att samla information om befintliga och föreslagna klimat- och energimål på global, nationell och lokal nivå. Vi letar också efter rättviseperspektiv i befintliga klimat- och energimål samt förslag till sådana perspektiv i föreslagna mål i den vetenskapliga litteraturen liksom i rapporter från miljöorganisationer. En slutsats är att rättvisa inte är uttryckligen formulerat i befintliga klimat- och energimål. Vi använder en teoretisk ram för social rättvisa som skiljer mellan vem som ger och får det som fördelas, vad som fördelas (rättvisevaluta) och hur det fördelas (distributionsprinciper). Utifrån vår analys fann vi att en egalitär princip används för de flesta föreslagna målen, exempelvis för globala mål om utsläpp av växthusgaser per capita. Samtliga av de granskade målen omfattar endast rättvisa mellan människor och exkluderar därmed andra levande varelser.

I artikel III analyserar vi hur fyra olika backcastingscenarier för markanvändning i ett svenskt sammanhang år 2060 påverkar andra hållbarhetsmål när ett klimatmål om noll CO2-utsläpp är uppfyllt. Med hjälp av en matris gör vi en målkonfliktanalys med de övriga svenska miljömålen, jämställdhetsmål och mål för folkhälsan med dess 11 tillhörande målområden. Analysen visar att de potentiella målkonflikterna är fler i scenarier utan globalt klimatavtal. Detta beror främst på att vissa miljöfrågor måste behandlas på global nivå, samt att minskningen i miljöpåverkan kommer att bero på åtgärder som inte bara vidtagits i Sverige utan också globalt.

Utifrån dessa tre artiklar diskuterar jag sedan olika aspekter som måste beaktas vid fastställandet av mål. Eftersom hållbarhetsmål är långsiktiga och kännetecknas av en hel del osäkerhet diskuterar jag behovet av att sätta upp "försiktigt utopiska mål" (cautiously utopian goals), det vill säga mål som kan vara omöjliga att uppnå, men möjliga att närma sig. Sådana mål kan få till stånd de djupgående förändringar som krävs för en hållbar och rättvis framtid samtidigt som de är acceptabla för de intressenter som berörs. Mål är ofta otydliga vad gäller vad som ingår eller inte. Vad gäller klimatmålen, exempelvis, är det ofta otydligt huruvida utsläpp från handel är inkluderade eller ej och vilket referensår en viss utsläppsminskning baseras på. Sådana avgränsningar bör synliggöras och

helst diskuteras med avseende på hur de kan påverka till exempel andra länders utsläppsminskningar. Det finns också ett behov att skilja mål från medel för att uppnå målen, eftersom det gör det möjligt att formulera mål som kan uppnås på olika sätt. Ekonomisk tillväxt ses ofta som ett mål i sig, såsom i FN:s nya hållbarhetsmål (SDGs). Tillväxt borde dock betraktas som ett rent verktyg för att uppnå egentliga mål rörande, exempelvis, välbefinnande. Mål är också normativa och återspeglar både olika kulturella och etiska perspektiv på vad en god hälso- och sjukvård eller bostadsstandard bör vara. De underliggande värdena bör därför också synliggöras och ifrågasättas. Både inter- och intragenerationella rättviseperspektiv bör göras mer konkreta och tydliga så att sådana frågor kan följas upp. En bra start kan vara att förutom ett territoriellt perspektiv börja använda ett konsumtionsperspektiv vid upprättandet av klimat-eller markanvändningsmål, då effekten av vår konsumtion på andra länders miljö och hälsa har ökat under de senaste årtiondena.

Nyckelord: Hållbarhetsmål, målkonflikter, miljörättvisa, backcasting, framtidsscenarier, klimat och energimål.

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List of papers

Paper I: Fauré, E., Svenfelt, Å., Finnveden, G., Hornborg. A. (Submitted) Four sustainability goals in a low-growth/ degrowth context.

Paper II: Svenfelt, Å., Höjer M., Fauré E. (To be submitted). Social justice perspectives on energy and climate targets.

Paper III: Svenfelt, Å., Edvardsson Björnberg, K., Fauré, E., Milestad, R. (To be submitted) Potential goal conflicts related to climate change mitigation strategies generated through backcasting scenarios.

Comments on co-authored papers:

Paper I: I am the main author of this paper together with Åsa Svenfelt. Göran Finnveden and Alf Hornborg were co-authors. I specifically wrote the abstract, the main parts of the background, the method, the climate goal, the goal on distribution of power and influence in society and contributed to the discussion and to the goals on land use and welfare/resource security. I was responsible for the process of gathering information about the doughnut areas and about the selection process of the goals. I also conducted interviews with experts on security and health issues.

Paper II: I am a co-author of this paper. I was mainly responsible for the review of energy and climate targets. I also contributed to the analysis of justice perspectives

Paper III: I am a co-author of this paper. I was responsible for conducting a literature review and collecting information on potential goal conflicts or synergies for different environmental and social areas. I also made a preliminary analysis of the goal conflicts, which was later discussed and developed together with two of my co-authors.

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1 Introduction

Emissions of greenhouse gases (GHG) and other environmental issues such as a loss of biodiversity, land-system change and eutrophication of freshwater and marine coastal ecosystems are major challenges to humanity (Rockström et al. 2009, Steffen et al. 2015). For these planetary boundaries, we have already exceeded critical levels, which may threaten Earth System stability (Ibid.).

On a national level, the Swedish parliament has agreed on a set of 16 environmental goals covering different areas and one generational goal including issues of inter- and intra-generational justice, which in most cases are to be fulfilled by 2020 (Gov. Bill 1997/98:145; 2004/05:150). However, only one goal "A protective ozone layer" is expected to be met by 2020, and another, "A safe radiation environment", may be met. All other goals are far from being met with today's agreed policies. For five goal areas, the situation is not improving, but getting even worse, this concerns, for example, climate impact and biodiversity loss (Swedish EPA, 2015a).

When it comes to social issues globally, the United Nations set eight Millennium Development Goals for the end of 2015. Although significant progress was made in some areas such as e.g. gender equality in education, many disparities between and within regions or between, e.g. socio-economic or gender groups remain, and these issues have yet to be resolved (UN 2015a). For instance, in Latin America and the Caribbean, although the region's poverty rate has been decreasing, the ratio of women compared to men subject to poverty has increased (from 108 women to 100 men in 1997 compared to 117 women per 100 men in 2012). (Ibid.)

Setting goals for sustainability is important, as it can create a common understanding for the parties committing to the goals of the direction that has to be taken. However, many aspects have to be considered when setting goals.

Social and environmental issues are interrelated in social-ecological systems. Human wellbeing is highly dependent on the well-functioning provision of ecosystem services, i.e. "the benefits people obtain from ecosystems" (Millennium Ecosystem Assessment, 2005) and reversely; human activities are driving direct and indirect changes on ecosystems (Ibid.).

The human impact on the global earth system has increased so significantly that a new geological period, the Anthropocene, has been suggested by scientists (e.g. Crutzen, 2000, Steffen et al. 2011). Barnosky et al. (2012) underline the need to take biological instability into account when aiming at securing human wellbeing in the future, as ignoring this relation may hamper any attempt to sustain wellbeing for humanity.

Raworth (2012) has stressed the need for simultaneously considering environmental and social issues when introducing the "doughnut economy" (Fig.1), a framework designed to ensure basic needs for all within the planet's carrying capacity. The doughnut includes eleven "social boundaries" covering the most pressing social issues identified by governments at the Rio+20 conference, such as food, jobs, social equity, thereby complementing the Planetary Boundaries framework mentioned above and building "a safe and just operating space" (Raworth, 2012).

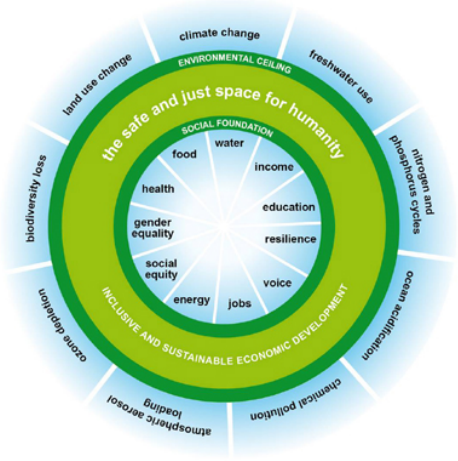

Figure 1 The doughnut economy, illustrating a "safe and just space for humanity" with the planetary boundaries in the outer circle and the social priorities in the inner circle. Raworth, K. (2012) A safe and just space for humanity: Can we live within the doughnut? Oxfam Discussion Paper, Oxford: Oxfam International.

Kanie et al. (2014) also advocate the need to integrate "both human and planetary wellbeing in a goal" and also highlight the importance of addressing the scale issue and formulate goals at multiple scales, from global to local.

The new 17 Sustainable Development Goals (SDGs) decided by the world's governments and proposed by the United Nations also address this need of combining environmental and social goals (UN, 2015b).

However, not only do we need to consider social and environmental goals simultaneously, but we also need to identify the potential trade-offs that may arise. Many goal conflicts or synergies can emerge between different environmental goals, between different social goals or between both. Conflicts or synergies may depend on how goals are formulated. Some researchers question, for instance, the possibility of having indefinite growth, especially in high-income countries on a planet with finite resources (Daly 1996, Victor 2008, Jackson 2009). The SDGs address this dilemma by emphasizing the need for promoting "a sustained, sustainable and inclusive growth" (UN, 2015b, goal 8). This will however, require a significant decarbonisation of

the economy in order to decouple economic growth from environmental degradation and ensure that human activities remain within the ecological limits of the planet.

The prospects for such a decoupling are as yet highly uncertain, according to e.g. Jackson (2009). Jackson questions how much decoupling is actually achievable, especially when it comes to absolute decoupling, i.e. not only the “decline in the ecological intensity per unit of economic output" (Ibid. p.67), but also the total "decline of resource impact in absolute terms” (Ibid. p. 67). He illustrates this by using Ehrlich’s IPAT equation (1), where I stands for the environmental impact, P for population, A for affluence and T for the technological factor or how resource intensive production is, the latter being relative decoupling (Ibid. p 77-79).

$$I=P*A*T \qquad (1)$$

For absolute decoupling to occur, however, and for the environmental impact to decrease in absolute terms, T has to compensate for the increases in both population and affluence. Jackson (Ibid.) argues that, considering the global annual increase rates in population and per capita income since 1990 and the UN’s forecasts for population increase by 2050, and in order to achieve the carbon emission reductions required to achieve the 450 ppm stabilization target from the IPCC’s Fourth Assessment report, the technology factor, i.e. the carbon intensity, would need to decrease by 7 per cent annually or ten times faster than the current annual rate of decrease globally.

Apart from the formulation of goals, the emergence of goal conflicts can also depend on what strategies are chosen in order to achieve the goals. For instance, choosing either wind or bioenergy in order to become fossil-free may have different implications for the possibility of reaching other goals such as e.g. land-use goals.

Griggs et al. (2013, 2014) have suggested integrating goals as a way to manage conflicts and trade-offs and have addressed both the environmental impacts and socio-economic needs as an input to the UN process of setting a post-2015 agenda. Griggs et al. (Ibid.) updated the social priorities of the MDGs and the planetary boundaries framework developed by Rockström et al. (2009) and combined those into six goals, named SDGs, for areas such as food, water or energy and associated targets. These specific SDGs were chosen in order to have a manageable number of goals and subsequent targets and to focus on long-term issues so as to secure Earth System stability (Ibid.). In this framework, the integrated targets are set at a global level, so the issue of scaling down the targets is not addressed.

Another issue that needs attention when setting sustainability goals is the fact that some groups of people are disproportionately affected by environmental problems, and both the benefits

and burdens are unevenly spread between and within countries (e.g. Agyeman et al., 2003, Walker, 2009). Oxfam (2015) describes, in a briefing release prior to the 2015 United Nations Climate Change Conference in Paris, how climate change is "a crisis that is driven by the greenhouse gas emissions of the 'haves' that hits the 'have-nots' the hardest". The organization has assessed the lifestyles and consumption patterns of rich and poor citizens in a wide range of both emerging and OECD countries, and estimates that the richest 10 per cent in the world account for approximately 50 per cent of the global emissions as a result of individual consumption, whereas the poorest 50 per cent in the world are responsible for only 10 per cent of the global emissions, and a majority of these citizens live in countries that are affected the most by climate change (Ibid.).

In order to aim for a just and sustainable future, there is, therefore, a need to discuss how to set goals that both acknowledge these pressing environmental and social issues and address justice perspectives. In so doing, it is also necessary to identify possible trade-offs.

This thesis gathers three papers that all combine environmental and social goals and attempts to address the issue of how to handle them simultaneously in order eventually to facilitate long-term planning and decision-making. It also highlights the need to consider distributional issues and justice principles in a goal setting.

2 Aim of the thesis

The overall aim of the thesis is to examine how to simultaneously take into account both environmental and social sustainability goals to be used in scenarios or in policymaking.

The main objectives of the papers included in the thesis are the following:

- To select, operationalize and discuss a set of sustainability goals in a Swedish context by choosing the most relevant goals to explore and how they could be operationalized at a national level (Paper I).
- To explore types of justice principles that are discussed in relation to, and could be applied to different energy and climate targets (Paper II).
- To highlight the potential goal conflicts or synergies that could emerge from four already defined future scenarios all fulfilling the same climate target, zero CO2 emissions in 2060, but in different ways. (Paper III)

3 Background

This licentiate thesis in Environmental Strategic Research is focusing on the interconnections between environmental issues and societal change in order to develop solutions for, knowledge of and a debate about these strategic issues.

3.1 Goal and goal setting

All papers analyse sustainability goals from different perspectives. A goal "specifies an end-state to be achieved" (Edvardsson and Hansson, 2005: p. 348). Successful goals are "achievement-inducing", either because they are, through preciseness and evaluability, a good support to achieve a desired end-state, or because they motivate the agent to work towards the desired end-state through "approachability and motivity". (Ibid; p. 343–361)

Goals are set on many different scales in order to guide action towards a more sustainable society. They can be set at a global level with the Planetary Boundaries and the Doughnut earlier introduced as examples, or on a national scale, such as the Swedish Environmental goals, Health or Gender Equity Goals or at a local level, such as the climate goals set for the city of Stockholm or Malmö analysed in Paper II. Although goals serve as a direction or an end-state to be achieved for different actors to gather around, there are several difficulties in setting goals. First, goals are often set one by one, but acknowledging them together can unveil both goal synergies but also conflicts and trade-offs. Secondly, goals set on a certain scale are often difficult to translate into another scale. Nykvist et al. (2013) have attempted to downscale the nine planetary boundaries (Rockström et al. 2009) and suggested four tentative national planetary boundaries for Sweden, although the authors call for a cautious use of those due to uncertainty on data and assumptions made. Finally, goals always include and exclude different aspects, such as e.g. the issue of equity that is often excluded in environmental goals and which groups in society may benefit or may be affected by a certain goal or measure to reach that goal.

Wandén (2007) distinguishes four types of objectives or goals:

- System objectives: i.e. goals pertaining to society as a whole
- Production objectives i.e. goals pertaining to specific domains of society, such as education;
- Consideration or transversal objectives, i.e. goals covering different governmental or other fields such as the environment
- Process objectives i.e. goals pertaining to how different outcomes could or should be conducted: e.g. efficiently and effectively, under the rule of law, transparently and democratically

A goal conflict emerges when a measure taken to achieve one goal makes it more difficult to achieve another goal (Wandén, 2007). A synergy between two goals is, on the contrary, when a measure taken to achieve one goal at the same time helps achieve another goal (Ibid.). Wandén (Ibid.) distinguishes between internal goal conflicts and synergies i.e. conflicts between the same category of goals e.g. between two environmental goals and external goal conflicts or synergies i.e. between different categories of goals, e.g. between environmental goals and other societal goals. In this thesis, I will discuss both internal and external goal conflicts/synergies.

Wilensky (1983) and Locke et al. (1994) distinguish two other types of goal conflicts: interpersonal and intrapersonal. Interpersonal goal conflicts arise between goals that are set by different decision-makers, institutions, whereas intrapersonal goal conflicts arise between goals set by the same agent. (Ibid.). As environmental or gender equality goals are transversal (Wandén, 2007), i.e. goals that cut across different governmental fields and are, therefore, set by different agents or sometimes the same agent, I will, therefore, examine both interpersonal and intrapersonal goals in this thesis.

Wandén (Ibid.) also makes a distinction between substantive and procedural goal conflicts. In a substantive goal conflict, goals are incompatible; i.e. one goal is achieved at the expense of other goals. In a procedural goal conflict, on the contrary, the substantive goals to be achieved are not in contradiction with each other, but the actions or strategies chosen are. It is a conflict between process objectives, i.e. the actual implementation can make it difficult to achieve a substantive goal.

As an example of a procedural goal conflict, Wandén (Ibid.) discusses a strong central control for climate policy that could discourage local involvement or local initiatives and eventually could cause problems for substantive goal fulfilment such as the climate goal.

In Paper III, internal and external goal conflicts and synergies are made visible in an analysis of four scenarios all fulfilling one goal. In Paper I, the intent is to select several goals to be fulfilled in future scenarios as an attempt to make goal conflicts and synergies more apparent at an earlier stage in the scenario process. This, we believe, may be a strategy to handle goal conflicts. The analysis of potential goal conflicts or synergies will, however, be carried out in a subsequent paper at a later stage of the "Beyond GDP Growth" project.

Munda (2009, p.307) states, “any social decision problem is characterized by conflict between competing values and interests and the different groups and communities that represent them”. These values and their different dimensions can contain conflicts within themselves and with each other (Martinez-Alier, 1998), and any decision will favour some groups at the expense of others both in time and space. It is, therefore, important to address the question of social justice and consider the distributional impacts of any decision or goal setting.

3.2 Social justice

There are different perspectives on justice, and in this thesis and in Paper II, the framework of Dobson (1998) further developed by Page (2007), is used, as it offers a well-structured way to discuss social justice.

Dobson (1998) combines environmental sustainability and the question of social justice and addresses three questions that have to be considered when looking at inter-and intragenerational justice:

- Who are the providers and receivers, respectively, of justice, the "community of justice"

- What is distributed, i.e. the environmental goods and bads or benefits and disadvantages that are distributed

- How it is distributed, i.e. the principles of distribution, e.g. needs, equality, utility

Page (2007) further developed what is to be distributed as "the currency of justice", with a focus on intergenerational justice, adding the notion of capabilities introduced by Sen (1990). This approach (Ibid.) views life as "a set of beings and doings", also referred to as "functionings". "Functionings" are e.g. the opportunity to live long and to be well nourished (Sen, 2005). Quality of life is therefore seen as the capability to function where capabilities are "the opportunity to be able to have combinations of functionings" (Ibid.). According to Sen, the same capability or opportunity might require different amounts of primary goods depending, for instance, on the physical or mental variations between individuals.

In Paper II, we apply the principles and currencies of justice mentioned above to energy and climate targets.

3.3 Future studies

When we are dealing with socio-ecological systems and sustainability goals, we need to take into account the long-term character of the issues at stake and their uncertainty.

Sustainability issues require long-term planning and a way to anticipate change and uncertainty. Futures studies can offer an approach that can be both flexible and visionary.

Bell and Olick (1989, p.119) refer to Eleonora Masini's description of the role of futures research, which is rather "to reveal the alternative possibilities, and analyse the risks concomitant of these possibilities and their consequences than predict the future".

Future studies are, according to Amara (1981), the study of possible, probable or desirable futures. Börjeson et al. (2006) distinguish between three main categories of future scenarios:

- Predictive scenarios addressing the question "what will happen", e.g. forecasts
- Explorative scenarios addressing the question "what can happen", e.g. strategic scenarios
- Normative scenarios addressing the question "how can a specific target be reached" e.g. backcasting.

Backcasting is a normative type of scenario, which Börjeson et al. (2006) qualify as transformative, which means scenarios that will require profound changes in society in order to reach a set goal. Robinson (1990) describes backcasting as an analysis of how to attain desirable futures. For Dreborg (2004, p.32), the aim of backcasting is "to find ways to shape the future in accordance with visionary goals." Another important aim, in the Swedish tradition of backcasting studies, is "to provide different actors in society with a better foundation for discussing goals and taking decisions to act or to seek further knowledge" (Dreborg, 1996, p.824).

Typically, backcasting studies produce images of the futures all of which fulfil a certain goal and where the time frame is between 20 to 100 years (Robinson, 1990). Such scenarios facilitate the exploration of alternative futures that may be more desirable than the most likely future usually depicted in forecasting studies (Ibid.). Backcasting facilitates a breaking of trends as opposed to forecasting, which is often based on the extrapolation of current trends (Dreborg, 1996).

In Paper I, the process of selecting four goals is for use in backcasting scenarios (Svenfelt et al., 2015). In Paper III, backcasting scenarios had previously been developed by two of the paper's co-authors and another researcher. We carried out a goal conflict analysis for these scenarios.

4 Method

The research methods used in the thesis are mainly qualitative. There are many differences between quantitative and qualitative research: however, the divide has been debated and is not clear-cut.

Qualitative research can be defined as "be(ing) construed as a research strategy that usually emphasizes words rather than quantification in the collection and analysis of data" (Bryman, 2016, p.694).

One main research method used in this thesis was the collection and qualitative analysis of texts and documents through a literature review, a document analysis, and a goal conflict analysis. Qualitative interviews with experts were also conducted, as well as workshops involving different stakeholders.

4.1 Literature review

Fink (1998, p.3) defines a literature review as a "systematic, explicit, and reproducible design for identifying, evaluating, and interpreting the existing body of recorded documents".

In Paper I, a literature review was first conducted in order to identify policy goals and suggestions for goals for a vast array of sustainability aspects including those in Kate Raworth's doughnut introduced earlier (Raworth, 2012). The aim of this review was to gain an overview of what goals are currently set or proposed for each area of the doughnut, such as the issues of jobs or health, and to assess whether they could be used in our context or further developed. The literature review comprised policy documents at the Swedish, European, and international level, scientific literature, scenario projects, and reports from non-governmental organizations and was used as a base to discuss goals in a participatory setting.

In Paper II we reviewed examples of suggestions and options for incorporating justice perspectives in energy and climate targets in the literature.

In Paper III, I gathered information regarding possible goal conflicts and synergies using a literature review of scientific papers, reports and policy documents.

4.2 Qualitative content analysis

Qualitative content analysis is a method to identify different underlying themes in selected documents or texts (Bryman, 2016).

Paper II is based on a review of official documents about climate change mitigation goals at different levels (international, European, national, and municipal), as well as examples of peer-

reviewed articles about climate change mitigation goals, reports from environmental NGOs dealing with climate goals, as well as peer-reviewed articles about justice principles in climate goals. The selection does not claim to be exhaustive. The search words, in the scientific database Web of Science, were climate targets, greenhouse gas emission levels, fairness and climate as well as justice and climate. We divided the climate and energy targets into different categories depending on the level of decision and the way in which the targets are expressed (see Table 2 below).

We have used a purposive sampling, i.e. not on a random basis (Bryman, 2016), in order to get a sample relevant to our research question, but also to get a variety of sources.

For the peer-reviewed articles, we used the Web of Science database and then further related articles were found through snowballing, i.e. by looking at the references used in the initial articles or at the related articles suggested by Web of Science. We also searched for suggested climate and energy targets in reports from the main Swedish environmental and environmental justice NGOs.

We then analysed the data collected through 1) reviewing examples of energy and climate targets, existing and desired, 2) reviewing examples of allocation principles between countries or groups of individuals, and 3) mapping which allocation principles are or could be implied in the reviewed energy and climate targets.

4.3 Participation and transdisciplinarity

Transdisciplinarity is “a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge” (Lang, 2012, p.26-27). Several academic disciplines as well as non-academic knowledge are usually combined. Such processes have been used in sustainability science since the 1990s with the aim of discussing sustainability challenges and coming up with solutions by “bridging the gap between science and society” (Ibid.).

In Paper I, we describe the process of selecting goals and goal areas, based on the literature review mentioned above, in a participatory process of transdisciplinary character. An overview of these aspects was presented in workshops and discussed with two different stakeholder groups: the “Beyond GDP growth” project group included 15 researchers from various disciplines, and the project’s reference group was composed of societal actors such as representatives of municipalities and ministry officers. The selection of areas and goal formulation was done with respect to both groups’ comments.

Mayer (1997, p.250–251) distinguishes seven types of participation in the field of policy analysis. The degree of participation varies depending on the aim of the participatory process, which can range from information only to co-production. According to Mayer (Ibid.), participation can be a strategy to:

- Inform or educate stakeholders in order to increase their awareness
- Consult groups or individuals to obtain input for problem solving
- Anticipate future developments, if the aim is to develop long-term goals and future policies
- Mediate, in case the aim is to deal with strong conflicts of interests among the stakeholders
- Co-ordinate, if the aim is to create interdisciplinary knowledge and relate issues from different sectors or policies
- Co-produce, if the aim is to develop common actions and shared responsibilities
- Learn, if the aim is to change core knowledge and attitudes

Mayer (ibid.) adds that a mix of these different strategies is often used.

In Paper I, the selection of sustainability goals was made in two participatory settings, within a research group representing different disciplines and within a reference groups with experts from different sectors and local decision-makers.

Regarding the research group, I would qualify the participatory process as an attempt to anticipate the future, coordinate between different sectors or disciplines, consult groups or individuals and co-produce knowledge.

With the reference group, I would qualify the participatory process as a way to anticipate the future and consult groups and individuals to gather their views and an attempt to co-produce knowledge.

4.4 Interviews

Kvale (1997) defines interviews as an interaction between two persons where a common area of interest is discussed and where knowledge is the outcome of this dialogue. The aim of these interviews was to acquire richer knowledge of issues where our project and reference groups and I myself lacked sufficient knowledge, at the same time as we had limited time to gather

such information. Kvale (Ibid.) distinguishes between different categories of interviews, open, semi-structured and structured. In semi-structured interviews, which were used in Paper I, some questions are pre-defined to cover specific topics, but it also allows for questions to arise throughout conversation (Ibid.). According to Alvesson and Sköldberg (2003), proponents of interviews often highlight the advantages of the method when it comes to gathering information, knowledge, ideas or impressions. Interviews were used both with selected members of the project groups and with external experts in order to gain insight in specific goal areas included in the Doughnut (Raworth, 2012) or other issues deemed relevant for the Swedish context, e.g. some issues covered by the Swedish environmental goals such as "a good built environment" (Government Bill 1997/98:145).

4.5 Goal analysis

In Paper III, the analysis was conducted using existing scenarios and conflicts, and synergies were identified based on knowledge from scientific papers, reports and policy documents. For each goal, aspects of the goal were compared to the content of the scenarios, first individually by one of the authors, and later as discussed and adjusted by three of the authors together in a workshop format. We focused on aspects that were described explicitly in the scenarios and/or could be deduced from the scenario descriptions. Not all aspects of the goals could be analysed because not all aspects were sufficiently described in the scenarios due to the focus on land-use in the scenarios and the broad spectrum of goals that we considered in the analysis. This analysis is summarized using a compatibility matrix (UK Department for transport, 2009) (Table 4 and 5), included in Chapter 5 in order to document (in)compatibility between different environmental and social goals.

The goals chosen for the analysis were the Swedish environmental objectives, gender equity objectives and public health goals. The analysis of conflicts and synergies between the climate goal that all scenarios had to fulfil and the remaining goals was first carried out in a systematic way by the author of this thesis, through:

1. Selecting the aspects in the description, specification and interim goals of the Swedish goals that were relevant to scenarios, i.e. where scenarios were descriptive enough in order to analyse whether there was a conflict or a synergy.

2. Analysing against the content of each scenario whether there could be a synergy or conflict between the selected goals.

In Paper II, a similar exercise was carried out. Examples of existing and suggested climate and energy goals were analysed against justice principles using a theoretical perspective of justice

regarding who is the receiver, what is distributed, and according to what principle (as described above in Chapter 2, in the section about social justice).

5 Summary of papers I-III

In Paper I, we take a first step towards conducting a multi-target backcasting study by selecting four goals, two environmental and two social, to be fulfilled in future scenarios.

Paper II specifically addresses the issue of justice, and attempts to interpret which justice principles may apply to already existing and proposed climate goals.

In Paper III, we conduct a goal conflict analysis between the climate goal, which the backcasting scenarios have to fulfil and other environmental goals, public health, and gender equity goals.

Both Papers I and III are about sustainability goals for use in future scenarios. They look at goals for Sweden, but in a global context.

5.1 Paper I

The aim of this paper is to select, operationalize, and discuss a set of sustainability goals for Sweden. These goals are used in backcasting scenarios for building and planning in a context of degrowth or low growth.

Our starting point for the selection and operationalization of goals was Raworth's (2012) doughnut, introduced in section 1.1, including both environmental and social aspects.

The aspects of the doughnut were used as a basis for selecting the most relevant sustainability goals and operationalising the latter in a Swedish context. The work was carried out in a transdisciplinary process involving 15 researchers from various disciplines, e.g. sociology, environmental strategic research, and economics, as well as a reference group comprising representatives from 11 actors in different sectors in society, from Swedish municipalities to government agencies.

The research group agreed on the selection criteria that guided the process. This resulted in the selection by both the research and reference groups of four sustainability goals: two environmental, climate and land-use, and two social goals, fair distribution of power and participation in society and welfare and resource security. The goals selected were found to be central to sustainability as well as relevant for Sweden and to the context of degrowth/low growth. These are formulated in Table 1 below.

Table 1. List of the selected goals for backcasting scenarios (paper I)

<table>
<tr><th>Environmental goals</th><th>Social goals</th></tr>
<tr><td>Climate change</td><td>Distribution of power, influence and participation in society</td></tr>
<tr><td>Sweden is fossil-free by 2050, i.e. no fossil fuels are used as fuels or in industrial processes.</td><td rowspan="2">All residents in Sweden, regardless of, e.g. gender, gender expression, sexual orientation, ethnicity and religious affiliation, age, disability, class or income level, should be entitled to participate in and influence political choices and decision-making that affect their lives.</td></tr>
<tr><td>A maximum amount of 0,82 tons CO_2 equivalents (GHG) consumptive emissions per capita per year in Sweden</td></tr>
<tr><td>Land use</td><td>Welfare/resource security</td></tr>
<tr><td rowspan="2">The per capita land area used for final consumption does not exceed global biocapacity</td><td>Residents in Sweden should have sufficient access to resources and services that can create opportunities for housing, education, social care and social security, as well as favourable conditions for good health.</td></tr>
<tr><td>The distribution of the same resources and services should be made according to fairness principles.</td></tr>
</table>

The climate goal consists of two sub-goals, one regarding the type of energy supply and use of energy in production in Sweden, and one for emissions from Swedish consumption. Several studies have underlined the fact that, in recent decades the effects of national emissions reductions have been cancelled out by an increase in consumptive emissions in Sweden (Isenhour 2014, Brolinsson et al. 2012). While the domestic emissions have decreased by 30 per cent over the past 20 years, the emissions abroad as a result of Swedish consumption have increased by 50 per cent during the same period, even though the emissions from Swedish consumption have decreased by about 8 per cent from 2010 to 2013 (Swedish EPA, 2015b). As the emissions were even lower than that in 2009 (Ibid.), it is, however, difficult to say at this stage whether the trend is likely to continue.

The goal of a fossil-free Sweden 2050 aims at reducing the territorial CO2 emissions and avoiding a situation where Swedish industries with a large export share could continue to use fossil fuels. The goal to limit emissions from Swedish consumption is derived from a pathway to keep global warming under 1.5 degrees Celsius by 2100 with at least a 50 per cent likelihood (UNEP 2015), divided by the estimated global population in 2050 (UN 2015c, medium variant), which results in a quota of 0,82 tons CO2 equivalent per capita.

The second environmental goal is about land-use. The need for both renewable energy and food production to address the global population increase may place severe strains on land resources. We chose a consumptive measure for land use so as to add a justice perspective. This means that Sweden should not use more than its equal share of land, as land used abroad for Swedish consumption will be accounted for, and land areas in Sweden will have to be accessed by other countries on an equal share basis.

The first social goal is about the distribution of power, influence, and participation in society, and is adapted from one of Nussbaum's ten capabilities (Nussbaum, 2000) regarding "the control over one's political environment", but broadened to encompass all relevant decision contexts.

The second social goal is about welfare and resource security. It encompasses both what is to be distributed, e.g. access to resources in order for each to get similar possibilities and shares, i.e. a fair distribution, which can mean different things in different scenarios.

These four goals are challenging. In 2013, the emissions from Swedish consumption amounted to 11 tons CO2 equivalent per capita (Swedish EPA, 2015b). Thus, Swedish inhabitants would need to reduce the emissions from consumption by 92 per cent in order to reach the 0.82 tons CO2 equivalent per capita goal.

In 2014, 53 per cent of the energy used in Sweden came from renewable energy sources (Swedish Energy Agency, 2016, tab. 13.1).

When it comes to land-use, the goal implies that the amount of land used per capita for Swedish residents, measured in global hectares, should be decreased by 50% in relation to 2015.

The social goals are almost achieved in some areas, but differences remain e.g. depending on the socio-economic group considered. For instance, regarding the distribution of power, influence and participation in society, women usually have less power and influence than men in the private business sector. In state-owned or partly state-owned companies, women are better represented than in listed companies (Statistics Sweden, 2012).

Regarding welfare and resource security, the goal is to a large extent within reach although there are significant differences between different social groups. For instance, there are differences in health between different socio-economic groups (Burström et al., 2007). Socially

vulnerable groups have poorer health and are using healthcare services to a greater extent (Ibid.).

5.2 Paper II

Paper II reviews a selection of official and desired climate and energy goals at different scales (ranging from a Swedish municipal to an international level) and analyses whether they include justice perspectives, or whether such perspectives could be applied.

Desired climate and energy goals are defined in the paper as suggestions put forward in research publications and by non-governmental actors at different levels.

There are different ways of setting goals in order to address climate mitigation. In the examples of official goals reviewed, we found seven different approaches. The goals are summarized below in Table 2 according to the category they fall into, as well as at which level the goals are set (i.e. global or EU).

Table 2. Official and suggested climate and energy goals categorised by decision level and way of setting goals. (Paper II)
Targets with an explicit justice perspective in the document are indicated with a grey colour.

	Research	NGO	Global	EU	National	Regional	Local	Local
Prevention of negative interference with the climate system			"prevent dangerous anthropogenic interference with the climate system": UNFCCC, Article 2		"prevent dangerous anthropogenic interference with the climate system": Swedish Government (2009) Government Bill 2008/09:162			
Average global temperature increase	No further increase: Hansen et al., 2013	1.5°C: SSNC, 2011	Well below 2°C, striving for 1.5°C: UNFCCC Paris Agreement	<2°C: European Commission, 2007				
		<2°C: Teske et al., 2012						
Concentration of GHG in the atmosphere	450 ppm CO2e (for keeping within 2°C) and 430 ppm CO2e (within 1.5°C): IPCC, 2014	350 ppm: SSNC, 2011			400 ppm CO2e: Swedish Government, 2009, Government Bill 2008/09:162			
	350 ppm: Rockström et al., 2009; Steffen et al., 2015							
	<350 ppm: Hansen et al., 2013							
Radiative forcing	+1.0 W m-2 relative to pre-industrial: Steffen et al., 2015							
	2.6 W/m2 in 2100: van Vuuren et al., 2011							
Total emissions of GHG	41–47 Gt CO2e/ year in 2020: Rogelj et al., 2013	1 ton CO2 per capita per year: Friends of the Earth, 2007						
	Not exceeding 290-350 GtC from 2000 Steinacher et al, 2013							
	Not exceeding 4440 - 3670 GtCO2 since 1870: IPCC, 2013							
	1.15 tons CO2e per capita Åkerman et al. 2007						3 tCO2e/capita and year by 2015: City of Stockholm, 2012	

Table 2 - Continued

	Research	NGO	Global	EU	National	Regional	Local	Local
Percentage reductions of GHG	40 % to 70 % lower global GHG emissions in 2050 than in 2010: IPCC, 2014	By 2020: 40% reduction of GHG in industrialised countries in 2020 compared to 1990 and 15-30% compared to projected growth in developing countries: Greenpeace, 2012		40% by 2030 and 80% by 2050 compared to 1990: European Commission 2014	40% in 2020 for non CO2 trading activities compared with 1990; Swedish Government, 2012	Fossil independent in 2030: Region Västra Götaland, 2009	Fossil-free by 2050, City of Stockholm, 2012	<40% by 2020 and zero emissions by 2030, City of Malmö, 2009
	70% reduction of global CO2 emissions in 2050 compared to 2000: Stern, 2006 and EEA, 2005	Near zero emissions in Sweden 2030: WWF, 2015			Zero net emissions by 2050 (vision): Government Bill 2008/09:162			
	Reduction of Sweden's total emissions by 85% in 2050: Åkerman et al., 2007							
	Zero emission of GHGs in 2050 in Sweden: Milestad et al 2014							
Reduction in energy use/energy efficiency	Max 14 MWh/capita and year: Höjer et al, 2011	50% in end use in 2030, SSNC, 2011	Doubled energy efficiency imrovement by 2030: UN General Assembly, 2015	27% increased energy efficiency by 2030: European Council, 2014	20% improvement in energy efficiency by 2020: Government Bill 2008/09:162		10% decrease by 2015, in own buildings: City of Stockholm, 2013	20% decrease per person by 2020 and by another 20% by 2030, City of Malmö, 2009
Share of renewable energy	100% renewables, Milestad et al. 2014 Close to 100% renewables, Gustavsson et al. 2011	80% renewables in Sweden 2030: WWF, 2015	Substantially increased by 2030: UN General Assembly, 2015	27% by 2030: European Commission 2014	50% by 2020: Government Bill 2008/09:162	>80% of heating energy and 75% of transports by 2016; 100% of heating energy and 100% of transports by 2020: Region Skåne, 2009		100% in 2020: City of Malmö, 2009

The results in Table 2 indicate that there is a wider consensus for targets at a global level that cannot be broken down to the national level, e.g. radiative forcing or atmospheric concentrations of greenhouse gases, where it is not explicitly formulated who has to make the reductions. Besides, for targets at a national or local level, several difficulties occur, such as the boundary used for the target and whether it accounts for trade (Kramers et al. 2013), or the reference date for the emission reductions. Therefore, targets are also difficult to compare.

For our analysis of how a justice perspective could be applied to official and desired goals, we use the framework introduced by Dobson (1998) and further developed by Page (2007) (who, what, and how?) introduced in Chapter 2.

In general, the justice aspect is not explicitly formulated in existing climate goals, particularly on a sub-EU level, and often remains vague, when even mentioned at all. In the scientific literature and NGO reports, it was easier to find more concrete suggestions regarding justice perspectives.

We find that most desired targets for climate are based on an egalitarian approach, either an equal distribution of rights to emit (Mattoo and Subramanian, 2012; Kanitkar et al., 2010, Tavoni et al. 2012, Teske et al. 2012) or to access energy (Höjer et al., 2011), or the distribution of responsibilities (e.g. to reduce emissions). In political philosophy, "(a)n egalitarian favors equality of some sort: People should get the same, or be treated the same, or be treated as equals, in some respect." (Arneson, 2013, p.1).

Targets are often expressed as a per capita measure at a national level. Such a target is easy to calculate, but also includes some severe drawbacks. A per capita measure is an average for a country, and does not account for inequalities between, for instance, different socio-economic groups or genders within a country and, therefore, it ignores such issues. Besides, it does not account for how the access to natural resources or land availability differ between countries, making it relatively easier for some countries, abundant in land or natural resources such as hydropower and forests, as is the case for Sweden, to reach the target if a territorial perspective is used. Having only a focus on GHG reductions rather than on the actual energy use per capita may also fail to address the issue of the limited amount of fossil-free energy potentially available globally and of a fair distribution of this available energy, regardless of a country's energy potential, as e.g. Swedes could maintain a relatively high-energy use as long as it is fossil-free.

Some targets do not, however, focus on the equal distribution of resources, but on the opportunities these resources give. For example, Costa et al. (2011) link the need for emissions with the Human Development Index (HDI)[1] of a country, where countries with a low HDI get a

[1] The Human Development Index includes aspects such as life expectancy, education level and GDP.

larger share of emissions, something we interpret as an example of a capabilities approach to justice (e.g. Sen, 1990; Nussbaum, 2000), even if it encompasses a limited number of issues compared to Nussbaum's more extensive list of 10 capabilities (Nussbaum, 2000).

Finally, some targets follow a different egalitarian approach, which we have qualified as Rawlsian, as they allow for inequalities in the distribution of resources if those who are worst-off benefit from this inequality. This principle allows for compensating for circumstances those that are worst-off in society do not have the power to control. As an example, Den Elzen et al. (2013) have reviewed the Council of the European Union's 2009 proposal of emission reductions ranging from 80 to 95%, compared to the 1990 level for "developed countries", the Annex I Parties of the Kyoto Protocol.

They argue that "developed" countries should aim at reducing their emissions by more than 85% below the 1990 level, in order to spare "developing" countries very harsh CO2 reductions (Ibid.).

Finally, we found that the community of justice, when it comes to the receivers of justice, was restricted in the reviewed goals to human beings. Non-human animals were thereby excluded.

5.3 Paper III

Paper III is the one where we go the furthest when it comes to the analysis of possible conflicts and synergies between goals used in backcasting scenarios, both between social and environmental goals, but also within the set of environmental goals. The goals we analysed were the Swedish environmental goals, gender equity goals, and the public health goal and 11 associated objective domains.

The backcasting scenarios (Milestad et al. 2014), used as a case, had to fulfil a goal of zero CO2 emissions in Sweden by 2060. However, they differed in two aspects, which the targeted actors could not influence. The first one is an external scenario element, whether there is an international climate treaty or not. The other aspect is a normative target-fulfilling scenario element, whether decision power is centralised or not. The main characteristics of the scenarios are shown in Table 3.

Table 3. Main characteristics of the four backcasting scenarios, (Milestad et al. 2014).

	No international climate treaty (Case A)	An international climate treaty (Case B)
Centralised power (Case 1)	- *Energy from biomass* - *Differentiated land use* - *Large-scale food production* - *Intensive forestry* - *Road transport of goods* - *Population in urban centres* - *A world in turmoil* - *Global energy crisis* - *Severe climate changes*	- *Investment in production of electricity* - *Differentiated land use* - *Large-scale food production* - *Environmentally friendly forestry* - *Rail transport of goods* - *Population in urban centres* - *A stable world* - *No global energy crisis* - *Less severe climate changes*
Localised power (Case 2)	- *Energy from biomass* - *Multifunctional land use* - *Small-scale food production* - *Intensive forestry* - *Local self-sufficiency* - *Population close to food and energy production* - *A world in turmoil* - *Global energy crisis* - *Severe climate changes*	- *Investment in production of electricity* - *Multifunctional land use* - *Small-scale food production* - *Environmentally friendly forestry* - *Local self-sufficiency* - *Population close to food and energy production* - *A stable world* - *No global energy crisis* - *Less severe climate changes*

In Paper III, we analysed what the consequences could be in the scenarios when all the focus was put onto one single goal. The question asked was: How would the way of fulfilling one goal in a specific scenario impact on other goals? Does it imply that other sustainability goals will be fulfilled or be easier to fulfil or would it, on the contrary, make it more difficult to achieve other goals, thereby making the scenarios unsustainable?

In this paper, we found that there were more potential conflicts between the backcasting goal (zero CO2 emissions in Sweden 2060) and other environmental and social goals (gender equality and public health) in scenarios with no global climate agreement, i.e. scenarios A1 and A2 in Table 4 & 5 below.

Table 4. Synergies and conflicts between environmental goals and mitigation of climate change in scenarios (Paper III)

Objective	Critical aspect of the goal	A1	B1	A2	B2
Clean Air	Emission from traffic				
	Small scale wood burning				
	Ground level Ozone				
	Emission of NOx				
Natural Acidification only	Sulphuric deposition from abroad				
	Emission of sulphurdioxid				
	Emission of NOx				
A non-toxic environment	Pesticide use				
	Supervision and control				
Safe Radiation Environm.	Closure of nuclear plants				
Zero Euthrophication	NOx emissions from traffic				
	Distances in food systems				
	Ploughing of agricultural land				
	Catch crops and buffer zones				
	Small scale sewage systems				
	Meat production and import				
Flourishing lakes & streams	GMOs				
	Conservation of assets				
	Ecosystem services				
	Small scale hydro-power				
Good-Quality groundwater	Pesticide residues				
	Water protection areas				
	Decreased ground-water levels				
	Use of salt on roads				
A Balanced Marine Env.	Oil spills				
Flourishing Coastal Areas &	Recreational values (noise..)				
Archipelagos	Flourishing coastal areas				
Thriving wetlands	Protect and reestablish wetlands				
	Forestry methods				
Sustainable forests	Forestry methods effect				
	Protected areas				
	Sulphur/nitrogen deposition				
	Climate change				
A varied agricultural landscape	Agricultural landscape diversity				
	Energy forests/open landscape				
	Sustenance of Swedish land races				
A magnificent mountain landscape	Exploitation (mining)				
	Exploitation (tourism)				
	Forest expansion, climate change				
	Noise				
A good built environment	Traffic noise				
	Public tranportation				
	Green areas close to residential				
A rich diversity of plant and animal life	Safeguard habitats & ecosystems				
	Wind turbines?				

Synergies are marked as green, conflicts as red and question marks as white.

The higher occurrence of conflicts in scenarios without a global agreement was mainly due to the fact that some environmental problems are global such as oil spills or air pollution and are, therefore, dependent on what actions other countries are taking against climate change. An underlying assumption was that the use of fossil fuels globally would continue to develop as "business as usual" in a future with no climate agreement. This has implications for Sweden, even though Sweden has its own trajectory towards a zero CO2 emissions future. These issues are, therefore, difficult to deal with and resolve at a national level other than by advocating a global agreement.

Another result is that, if there is a global failure to reach a global climate agreement, several conflicts may arise in scenarios A1 and A2 due to more land-intensive activities and, therefore, tougher competition over land. Indeed, in these scenarios biomass was chosen before electricity from wind and solar power as an energy source, being more readily available in times of recession but putting more strain on land use.

More conflicts and synergies could be established between the climate goal (backcasting goal) and the remaining environmental goals compared to gender equality and public health goals. This had to do with the fact that environmental goals had more relevance to the context of the paper, i.e. land use, as more information needed to assess the goal conflicts or synergies with other environmental goals was depicted in the scenarios. The table listing potential conflicts and synergies between the climate goal and social goals presented below (Table 5) was ultimately removed from Paper III. The assessment was deemed too difficult, as the scenarios failed to fully describe the necessary aspects for that assessment, which in itself was a learning outcome of Paper III that I will develop further in the discussion part.

Table 5. Synergies and conflicts between policy goals and mitigation of climate change in scenarios.

Gender Equality Goals	**Critical aspect of the goal**	**A1**	**B1**	**A2**	**B2**
Distribution of power and influence	Representation of women				
Economic equality between the sexes	More expensive food				
Equal distribution of unpaid care and	Unpaid household work				
household work.	Other unpaid work				
Men's violence against women	Violence due to less social control in rural areas?				
must stop	More prostitution in an unsecure ecomy?				
National Health Goals	**Critical aspect of the goal**	**A1**	**B1**	**A2**	**B2**
Participation and influence in society	Democratic engagement				
	Social and cultural participation				
Economic and social security	Employment				
	Economic standards				
	Living environment				
Healthier working life	Use of machines to avoid work injuries				
	Working conditions for climate migrants?				
Environments and products	Transparency and control of products				
	Urban heat island effect				
Increased physical activity	More daily exercise (bicycles, walks)				
Eating habits and food	More vegetables and less meat				
	Risk for lack of vitamins during wintertime				

A1, centralised power and no international treaty, B1, centralised power and an international treaty, A2 localised power and no international treaty, B2 localised power and an international treaty. Synergies are marked as green, conflicts as red and question marks as white.

6 Discussion

The overall aim of this thesis is to examine how to simultaneously take into account both environmental and social sustainability goals to be used in scenarios and/or in policies.

The thesis is based on three papers all focusing on sustainability goals, both social and environmental and several recurrent themes are emerging from these papers. Sustainability goals have a long time frame and are, therefore, characterized by high uncertainty. When environmental goals are set at a global level, even if there are diverging views on e.g. what maximum temperature rise we should allow, there is a relatively strong agreement. As soon as the goals are downscaled, however, new issues arise such as what should be included or not in the goals, or who should be doing what. The issue of boundaries is, therefore, important. A chosen strategy to achieve a goal may have proved useful in the past to such an extent that the line between the means and the goal in itself has become blurred. Another important aspect is, therefore, to distinguish between goals and means to achieve goals. As the goals are global, many actors from different countries, disciplines, or sectors have to gather around these goals. Goals are value-laden regarding what level of risk we are prepared to take, or what view we

have of justice, i.e. who will benefit or will be affected by goals, whether it is specific socio-economic groups or species. Therefore, different strategies can be applied when setting goals, as the process will require trade-offs between different actors. Making these trade-offs and goal conflicts visible is a first step in being aware of the different implications that goals will have. Reflections on the need for further methodological developments are also included.

6.1 Uncertainty

Long-term sustainability goals are characterised by a high level of uncertainty. In Paper I, when setting the climate goal and the land use goal, we based our calculations on the best available knowledge at present, for instance regarding the maximum temperature increase for the climate goal but also regarding world population estimates for 2050. If global population were to increase further, the per capita goals should be modified.

In Paper I, in order to calculate how many tons GHG per capita would be compatible with a goal of a maximum 1.5 degrees increase in global temperature, we use the scenarios suggested by Rogelj et al. (2015) for this more stringent temperature goal. For these scenarios, the likelihood of staying below 1.5 degrees Celsius is at least 50 per cent. However, I find that a 50 per cent likelihood implies such a great risk, considering the potential impacts on the environment and society, that this is not a safe level. Even if there is more than a 50 per cent chance that we may stay under a 1.5 °C temperature rise if emissions are reduced at a certain pace and to a certain extent, there is almost the same probability that we may not. If I were told that the chance of avoiding a plane crash was at least 50 per cent, I wouldn't dare getting on board any plane. This comparison may seem somewhat far-fetched, as the risks with a global warming above 1.5 °C are not lethal, at least not for everyone. However, the consequences are serious enough to instil caution, especially for many island nations that literally risk disappearing due to a sea level rise, or for countries affected by desertification. Risk, according to Hansson (2013), is characterized by "undesirability" compared to uncertainty. A risk is usually defined as both the consequences of actions and the probability that these consequences will actually occur. Global warming is associated with a high level of undesirability, considering the possible consequences on ecosystems and on specific places (e.g. island nations) that a temperature increase may imply. If the whole functioning of the Earth System is at risk, and accordingly the future of humanity, then at least a 50 per cent likelihood of avoiding such consequences can be regarded as too low. Probabilities are often determined by experts, such as in this case, but they are highly uncertain. On the other hand, using an even lower per capita goal for GHG emissions from Swedish consumption, which could have been advisable to be on the safer side, would also be arbitrary, as there is not enough scientific basis to know when a higher likelihood may be reached. A pathway with a least 50 per cent likelihood was therefore the best available choice we could

make. At the same time, the goal of 0,82 ton CO2 eq. per capita per year, based on the 1.5 °C consistent scenarios, is already a very significant decrease considering today's level of about 11 tons of CO2 eq. per capita per year, and the aim of these scenarios may not be to give an exact figure but to give an indication of where we need to be heading and the magnitude of the changes needed.

In Paper II, we also found that, for targets regarding temperature level or radiative forcing, the uncertainty was due to the climate models used, the relation between climate effects, or uncertainty about the technology that will be available in 2050 such as Carbon Capture and Storage (CCS) techniques, for instance.

Social goals are also characterized by uncertainty, especially if they are long-term goals. What will people value in 2050? As we cannot interview future generations, we can only make assumptions about what might be desirable in the future.

Walker et al. (2003) distinguish different types of uncertainties. Epistemic uncertainty is due to a lack of knowledge (e.g. measurement error, limited data), whereas variability uncertainty, sometimes referred to as ontological uncertainty, is due to inherent variability, for instance of socio-ecological systems. Both types of uncertainty are sometimes difficult to separate from each other.

Walker et al. (Ibid.) identify three subcategories of variability uncertainty: behavioural uncertainty, societal uncertainty, and natural uncertainty.

Behavioural uncertainty is about the "non-rational behaviour or discrepancies between what people say and what they actually do" at an individual level (Ibid. p.14). Societal uncertainty is about the difficulty of predicting societal processes such as social or economic dynamics or "macro-level behaviour" (Ibid.p.14). According to Baard and Edvardsson Björnberg (2015, p.190), "desires can change as a result of goal setting."

Both these types of uncertainty may imply difficulties in setting social goals.

The often-posited rationality of individuals has been heavily questioned. Hargreaves (2008) argues that, contrary to conventional approaches to pro-environmental behaviours, assuming that behaviours are the result of rational and individualistic decisions, "pro-environmental behaviour change is a fundamentally social process involving power struggles and collective negotiations over what should count as appropriate behaviour in specific contexts" (Ibid. p.3). Future preferences, values, or actions are difficult to assume, due to these uncertainties.

Natural uncertainty is about the unpredictability of nature itself due to the non-linearity of the responses in ecological systems to pressures, whether they are human-induced or natural. For the global climate targets reviewed in Paper II regarding the level of atmospheric concentration

of GHG or radiative forcing, uncertainty is both epistemic and due to the inherent randomness of nature.

According to Baard and Edvardsson Björnberg (2015), long-term goals are characterized by a temporal discrepancy, i.e. a long time period between the point in time when goals are set and when they are implemented. This temporal discrepancy affects the epistemic uncertainty, as the knowledge of the means to achieve a certain goal is more likely to evolve over a long period of time and our knowledge of nature is likely to improve.

Climate goals may have to be more ambitious with time, as new knowledge becomes available. Due to the delay between human activities that lead to GHG emissions and identified changes in ecosystems, the impact of past emissions may move the goalposts.

Methodologically, because of social and other types of uncertainty, it is also crucial, in backcasting scenarios, to formulate goals that are as broad and overarching as possible, so that different pathways to achieve the goals are feasible. For social goals, for instance, what will be desirable in the future could change with new prevailing norms. For the goal of participation in society, in Paper I, the decision forum could differ between the different scenarios. It might be traditional political institutions in one scenario, but other decision-making processes that prevail in another scenario. Having broad goals, on the other hand, can make the sustainability assessment more difficult, as it may be more difficult to measure or qualitatively assess when goals are more loosely formulated. In the scenarios themselves, however, the goals can be translated into measures and strategies, and these can be evaluated more easily.

Edvardsson & Hansson (2005) argue that the dichotomy between realistic goals and utopian goals fails to address goals that are impossible to achieve but are known to be possible to approach, according to the beliefs of the goal-setter. Setting short-term goals in order to hopefully reduce the uncertainty due to time discrepancy may lead to a sub-optimisation of the measures taken to achieve a goal, according to Baard and Edvardsson Björnberg (2015). They take the example of a 50 per cent emission reduction for a specific branch of industry over a period of 30 years and argue that dividing it into step-by-steps goals of a few per cent every two years may entice industry to focus on too modest measures and not on the radical changes that may be needed in order to reach the initial long-term goal (Ibid.). Setting utopian goals on the other hand may imply difficulties in getting support from stakeholders. Baard & Edvardsson Björnberg (2015) suggest setting “cautiously utopian” goals, as a way to manage long time frames and the resulting ontological and epistemic uncertainty. “Cautiously utopian goals are believed, but not certain, to be achievable and to remain desirable, but are open to future adjustments due to changing desires and/or factual circumstances” (Ibid, p.193.) In Paper I, we had to find a balance between the need to have goals that were specific enough to be relevant to policy and planning, but at the same time broad enough to avoid lock-ins, i.e. constituting a barrier to other possible developments than the most likely one. For instance, Oxfam (2014) and

Cole et al. (2014), in their adaptation of the doughnut to a Scottish or a South African context, use current notions and indicators such as full employment without questioning whether these notions might be challenged in the future.

In paper III, we use the Swedish Environmental Goals for our goal conflict assessment. Baard and Edvardsson Björnberg (2015) qualify these goals as "cautiously utopian goals".

6.2 Goals and means

As mentioned earlier, another relevant question is how we formulate goals and how to separate a goal from the means to reach a goal.

In Paper I, notions such as work and income were left out during the process of formulating goals. The main reason was that they were considered more as means than as ends. Having the possibility to achieve “beings and doings” (Sen, 1990) gives more flexibility to the scenarios and allows us to explore different ways of achieving that goal.

Economic growth is not an assumption in the backcasting scenarios, which are further described in Svenfelt et al. (2015). The scenarios have to fulfil four different environmental and social goals, and these might be attained in several different ways. There may be no growth or low growth in the scenarios but economic growth itself is not in focus.

Otherwise, economic growth is often considered as a goal in itself. In the newly adopted Sustainable Development Goals Framework (UN, 2015b), goal number 8 stipulates “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.” But is growth for its own sake really what we want to achieve? Victor (2008, p.18) underlines that economic growth has been a top policy priority in most countries ever since the last quarter of the twentieth century. According to Jackson (2009, p.4), a great deal has been written about how to achieve growth, whereas much less has been written about why we need economic growth in the first place. What do human beings need in order to flourish?

The SDGs contain many social goals, such as ending poverty and hunger, which are priorities that should be addressed. According to the UN's Millennium Development Goals report (UN, 2015a), the hunger target was reached in some regions such as Eastern Asia, or Latin America, mainly because of the rapid economic growth in these regions in the past two decades.

Jackson (2009, p.5), on the other hand, argues that "growth has delivered its benefits, at best, unequally" and the signification and implications of the attribute "inclusive" used to qualify growth remains to be defined. But there may be other goals to address when such basic needs as food and shelter are met. Jackson (2009, p.35) uses the term “prosperity,” drawing on Sen’s distinction (Sen, 1984) between opulence, utility, and the capability to flourish. Jackson defines

prosperity as the "possibility that humans can flourish, achieve greater social cohesion, find higher levels of wellbeing and still reduce their material impact on the environment."

Prosperity may have material dimensions, but also others. Central is also the ability to "give and receive love" and the ability to participate meaningfully in social life (ibid.). Growth should, therefore, merely be seen as a tool to achieve prosperity, not a goal in itself. Having economic growth as a policy goal, whether it is sustainable, inclusive or not, has been questioned by other researchers as well. According to Kallis et al. (2015), "[degrowth] calls for the decolonization of public debate from the idiom of the economism and for the abolishment of economic growth as a social objective." It remains to be seen whether and how economic growth could be made inclusive and sustainable.

Backcasting scenario methodology can, in my opinion, be helpful in the exercise of separating goals from means. The aim of scenarios is to suggest alternative futures to the "business as usual" one. However, if a backcasting scenario is to fulfil a goal that is rather a means than a goal, it could create a lock-in, i.e. constitute a barrier to considering other possible developments than the most likely one, and the confusion between goals and means would be apparent.

6.3 The issue of boundaries

Formulating goals means specifying a desired future state of affairs," according to Baard & Edvardsson Björnberg (2015, p.188). Setting goals is a way to find concrete and common targets to work jointly towards, but targets can be set in many different ways, and may sometimes fail in doing what they are intended to. In Paper II, for instance, there are many examples of goals which may not be concrete enough. Different geographical boundaries or time frames can make it difficult to be specific and to compare different targets.

Different reference dates are used, e.g. when it comes to emissions reductions. Stern (2006) and EEA (2005), cited in Paper II, both use the year 2000 whereas IPCC (2014) uses 2010, and 1990 is otherwise widely used as a reference year. It makes it then difficult to compare different emission reduction efforts as the emission level, used as a reference value, highly differs across time.

The question of a system boundary is crucial when examining non-global targets. What activities are included in the target may vary. Kramers et al. (2013) highlighted the fact that most non-global targets do not take trade into account, making it possible to export emissions outside the area encompassed in the target.

As mentioned earlier, the exercise of downscaling global goals to national ones is not straightforward (Nykvist et al. 2013). For both environmental goals, we have therefore used

consumption goals derived from a global level, divided by the expected Swedish population in 2050. Such targets could be used globally.

Goals always include and exclude different aspects such as e.g. the issue of equity, which is often excluded in environmental goals, and which groups in society may benefit or be affected by a certain goal or measure to reach that goal. There is, therefore, a need to be transparent about what is included or not and to reflect upon how this may lead to potential conflicts.

6.4 Goals are value-laden

The analysis in Paper II shows that targets for maximum temperature increase and CO2 concentrations differed less than, for instance, targets for emission reductions. These targets are global. Uncertainties for these targets are of a scientific nature, e.g. insufficient knowledge about the relation between the level of GHG emissions and temperature rise. However, according to Baard (2014), "defining safe boundaries evokes both descriptive and normative challenges." There are also different views of what maximum global temperature rise we should allow. A maximum 2°C increase in temperature has been a widely accepted level of temperature increase above pre-industrial levels (UNFCCC 2010, IPCC 2014), but several organizations have been advocating a lower level, a maximum of 1.5°C (Swedish Society for Nature Conservation 2011) or even lower (Greenpeace International together with European Renewable Energy Council (EREC) and the Global Wind Energy Council (GWEC), Teske et al. 2012), arguing that a level of 2°C would pose too high a risk of ecosystem damage. At the Paris Climate Conference, governments pledge to work towards a more ambitious long-term goal, i.e. to "hold(ing) the increase in the global average temperature to well below 2 °C above pre- industrial levels and pursue (ing) efforts to limit the temperature increase to 1.5 °C above pre- industrial levels" (UNFCCC, 2015).

On the other hand, the World Bank (2014) has been pointing to the fact that the Earth is already locked up in 1.5 degrees Celsius above the pre-industrial level, due to past and predicted emissions, and in another report (World Bank 2012) warned about the risks posed if the temperature increase were to reach 4 degrees Celsius by 2100.

Being more specific and discussing targets such as e.g. emissions or energy use reductions generates even more differences. Such targets identify the main GHG emitters or main users of energy, and therefore who needs to change.

In Paper II, we discuss capabilities as a currency of justice, and in Paper I, our social goal regarding participation and influence in society is adapted from Nussbaum's list of capabilities. Using capabilities has proved useful in our attempt to separate goals from means and to try to single out what society would need in order to flourish. But can we make an objective list of

human needs? Nussbaum (2000) has developed a list of universal capabilities as a way to address social justice and gender inequality. This is something Sen is reluctant to do, as, in his view, a list of capabilities could not be exhaustive and is also dependent on the cultural context (Sen 2005). Such a list of priorities should also, according to Sen, taking the example of human rights, be able to "survive open public scrutiny" across national borders (Sen, 2005). This is something we should be aware of when setting goals. In Paper I, we are setting goals in a Swedish context, and I would argue that using pre-defined capabilities could be justified as, even though there are e.g. cultural differences, values can be seen as relatively more homogeneous. At a global level, however, a discussion of whether we can agree on a set of goals and on the meaning of "prosperity" might be needed, and should perhaps permeate global goal setting processes such as the SDG process.

In Paper I, we also question whether there really is a "safe and just space for humanity" (Raworth, 2012), as what is "just" and "enough" may be based on what a minimum of social prosperity entails according to the general consensus in Europe and North America, shaped by two centuries of economic growth. It may turn out to be impossible to stay within ecological limits if, for instance, the levels of health care or housing standards that we are used to in Sweden become universalized. These issues may, therefore, need to be discussed and perhaps revised.

The normativity of goals can also become apparent when goal conflicts and synergies are made visible. Wandén (2007) argues that, when a goal conflict occurs, ethical issues arise. Parties may have differing views on whether nature should be protected for the good of human beings (anthropocentrism), for the sake of life (biocentrism) or for its intrinsic sake (ecocentrism). In Paper II, when discussing who the receivers of justice, i.e. the receivers of the benefits or burdens that are distributed, were in the context of climate or energy goals, the focus was on human beings and thus anthropocentric.

Because of the ethical issues that arise both when setting goals and analysing goal conflicts, one discipline that I found to be missing in our participatory process for selecting goals in Paper I is philosophy. A philosopher with a focus on environmental ethics would probably be a good complement to the project research team.

Goals are normative and we therefore need to reflect on the underlying values and make them visible in order to facilitate decision-making processes and for the sake of the transparency of the process itself.

6.5 Justice

As we have seen in Paper II, justice perspectives are not often applied to official climate and energy targets. However, inter- and intragenerational justice is mentioned in many guiding documents. The Brundtland Report (UN,1987), for instance, defines sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The Paris Climate Agreement (UNFCCC, 2015) also emphasizes the need to consider inter- and intragenerational justice issues.

Sustainability goals should not only deal with environmental issues, but also consider the possible implications for different socio-economic groups or geographical areas, which may suffer disproportionately from a warmer climate.

Justice perspectives thus need to be considered when formulating goals and addressing past or potential distributional effects of environmental policies and goal setting.

Intragenerational perspective

The purpose of selecting a consumptive goal for land use and climate in Paper I is to address intragenerational justice, as the impact of Swedish consumption abroad is thus accounted for. However, it is still based on an equal share for all, something that could be questioned, e.g. by allowing higher levels of emissions for poorer countries.

Sweden has adopted a so-called "generational goal" (Gov. Bill 2009/10:155) to guide environmental action at all levels of society, and to indicate the societal transformations required to achieve the desired environmental condition. It addresses both inter- and intra-generational justice. The generational goal is fundamental to all Swedish environmental policy. The ambitious but broadly formulated goal is "to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders." It thus establishes that Swedish consumption should not give rise to increasing environmental and health impacts elsewhere, but does not specify what reference year should be used and may, therefore, need further concretisation. As the goal stipulates that such emissions should not increase, another issue is whether the current level of GHG emissions resulting from Swedish consumption, may not be sustainable enough in the first place, and whether we may rather need to reduce our emissions, with regards to the magnitude and urgency of the climate challenge.

For Swedish territorial GHG emissions, Sweden has a vision of zero net emissions by 2050 (Gov. Bill 2008/09:162). This vision is currently under revision and the Swedish Cross-Party Committee on Environmental Objectives suggests that this objective should be brought forward from 2050 to 2045 and further specified at 85 per cent gross GHG emission reduction compared to 1990

(Swedish Cross-Party Committee on Environmental Objectives, 2016). The emissions abroad as a result of Swedish consumption have increased by approximately 50 per cent since 1993 (Swedish EPA, 2015b). However, the only goal addressing the GHG emissions abroad resulting from Swedish consumption is the generational goal, and it is neither quantified nor specific enough, as we have argued above. And according to the above-mentioned statistics regarding the GHG emission increase from Swedish consumption, the goal is not achieved so far. On that note, the Swedish Cross-Party Committee on Environmental Objectives (2016) also stresses the need to address GHG emissions in other countries as a result of Swedish consumption, with additional strategies and measures for mitigating these emissions.

Intergenerational justice

Intergenerational justice is an apparent but not explicit consideration in the climate and energy targets reviewed in Paper II.

In Paper I, we use the lowest temperature increase suggested in the emissions trajectories in the scientific literature, and thus implicitly cover intergenerational justice, as 1.5 degrees is a safer level than the otherwise widely used 2 degree target. However, the goal aims at staying under 1.5 degrees Celsius in 2100 and the allocation of emissions reduction may therefore vary. In the scenarios consistent with 1.5 degrees that we used, negative emissions are assumed at the end of the period. Steeper emissions reductions at an earlier stage might otherwise have been suggested and may lessen the burden on future generations.

Intergenerational justice is not, however, included in the selected land use goal. In Paper I, we calculate the global land availability per capita, but we do not stipulate how much land may be exploited or kept as a nature reserve, which may be of benefit to future generations.

These perspectives need to be made visible in goal setting, if the goals are to be in line with a sustainable development according to the Brundtland definition (UN, 1987).

Once the goals are set, there are also different ways to implement them and different consequences that may occur. When it comes to distribution principles, for instance, we saw in Paper II that equal per capita cumulative emissions would give a different result from a globally cost-effective distribution (Höhne et al. 2014). The second option would benefit OECD countries. There is, thus, a need to discuss who the winners and the losers are in the formulation or implementation of a goal.

Justice among different groups within the same country is another consideration lacking in the reviewed climate and energy targets in Paper II.

In Paper I, we use per capita goals for climate and land use. However, such goals are just an average of the emissions per person per year in a specific country. It does not take into account

how this may differ depending e.g. on gender (e.g. Räty & Carlsson Kanyama, 2009) or income (Pachauri & Spreng, 2002; Reinders et al., 2003).

Martinez-Alier (2012) emphasizes the fact that there are also huge differences within the North and the South. "Some people annually use 300 GJ (gigajoules) of energy, most of which comes from oil and gas, while other people manage with less than 20 GJ, including their food energy and some wood or dried dung for cooking" (ibid.). The North–South divide, reveals global inequalities between countries but disregards other important patterns such as differences depending on e.g. gender or social class. Therefore, per capita goals may need to be further downscaled and individualized rather than just showing an average per country.

As mentioned by Nykvist et al. (2013), for a relatively long time the issue of justice has been discussed in relation to climate goals, but as we show in Paper II, it is still lacking in most official climate and energy targets. There may, also, be a need to include justice perspectives in goals for land use as well (Ibid.).

One issue to consider is that there are diverging views on what is just, so that avoiding justice perspectives may be a way of reaching an agreement between different political parties or countries. In Paper III, we propose that there would be fewer goal conflicts in the scenarios where a global climate agreement is reached. However, this may depend on the content of the agreement or of a specific goal. If the agreement is too watered down, or the goal is too vague, they could be used as a way to justify insufficient environmental action.

Procedural justice - who is represented?

In Paper II, procedural justice perspectives addressing other species' rights to a decent environment are not addressed, but this may be due to our search criteria, as we did not look specifically at the issue of other species in relation to climate targets. The inter- and intragenerational justice principles that we discuss are limited to human beings.

In Paper II, we briefly reflect on the issue of who is setting the agenda on environmental issues, and on the fact that we could not find such aspects of procedural justice perspectives in our review. This may either be due to our selection of examples of targets, or because such perspectives are implicit and a prerequisite for the outcomes. Different groups in society are mentioned in global agreements, but not in the Swedish context.

For the selection of the goals in Paper I, we worked in a participatory process with a research group representing different disciplines and a partner group including municipalities and governmental agencies. However, other stakeholders could have been involved, for example, youth organisations or an "ombudsman" representing future generations, who might have had an impact on the climate and land use goal by advocating more substantial and earlier

reductions of GHG emissions or more land allocated to nature reserves. These generations will be the one experiencing the effects of a warming climate due to current actions or non-actions and it could be argued that they should be involved in the process of setting goals. However, finding a suitable "ombudsman" that could represent future generations may be a difficult task. Other examples of stakeholders we could have included in our reference group include representatives of disadvantaged groups in society. This could be developed in a continuation of the project.

According to Sikor and Newell (2014), it is fundamental to examine whose knowledge is included and who participates in agenda setting, as "the discursive power concentrated around a few organizations has profound implications for the generation of knowledge about environmental issues."

As decisions and policies based on research will affect many stakeholders, both present and future, Funtowicz and Ravetz (1993) suggest the notion of "extended peer community" (EPC) for issues characterized by a high level of uncertainty and decision stakes such as sustainability issues. EPC presupposes a broader societal participation or rather a genuine involvement in the research process, a new type of science as "the problems are set and the solutions evaluated by the criteria of the broader community" (Funtowicz and Ravetz, 1993: 742). Funtowicz and Ravetz (1993) present it as a way of democratising science. They use a reverse metaphor, originally from Latour, when they depict "nature as reinvading the lab" to illustrate the new tasks and methods of science (Funtowicz and Ravetz, 1993:742). Perhaps we could also argue that society is reinvading the lab with the concept of extended peer community.

Procedural justice would need to be considered in climate change policy in order to achieve climate justice (Forsyth, 2014) and increase the legitimacy of climate change policy (Paavola et al. 2006). However, focusing too much on the legitimacy of the process could also imply difficulties in actually achieving sustainability (Larsen and Gunnarsson-Östling, 2009) as the handling of both content and process values, i.e. emphasizing that the outcome is sustainable and legitimate, respectively, is often a difficult balancing act in participatory processes (Ibid.).

In our own participatory process for the selection of four sustainability goals described in Paper I, we had two stakeholder groups, a research and a partner group. The research group has been a co-creator of the work with sustainability goals, making suggestions on how to formulate goals. However, when it comes to the partner group, it varied between different stakeholders. I think that in our contacts with the reference group we have given slightly more priority to content values than to process values. This may be due to the fact that we had fewer meetings with the reference group because partners, for practical reasons, had less time to participate in the project than the research group. The specific role of the partners was perhaps also not as well defined as that of the research group, and different stakeholders may, therefore, have had

different understandings of their role in the project. This, however, is something that we may need to assess further on.

Compensatory justice

A goal conflict or an equity issue may in some cases be resolved by compensating for the negative effects through monetary or non-monetary means. As discussed in Paper II, Den Elzen et al. (2013) provide an example of restorative justice when discussing the level of emissions reductions that the OECD countries should achieve and the implications of different reductions levels. The conclusion of the paper was to advocate either achieving a minimum of 85% emissions reductions in order to benefit non-OECD countries, or compensating with substantial side-payments.

In Paper III, one finding was that, if measures were taken to financially compensate single mothers affected by a rise in food prices due to a specific mitigation strategy in order to avoid a conflict with gender equity goals, this could give rise to other potential conflicts. Indeed, this financial compensation could deprive another vulnerable group of funding.

6.6 Making trade-offs and possible conflicts visible

In Paper III we use backcasting scenarios as a basis for a goal analysis. Störmer et al. (2009) claim that taking into account a maximum range of uncertainties helps identify major trade-offs and future conflicts of interest associated with the implementation of a specific system design. Mouffe (2005, p.104) asserts that all decisions produce costs and benefits, which are unevenly distributed, and that the question of who is deciding and on what ground should be highlighted and decisions should be "open to contestation" (Ibid.)

In Paper III, we also argue that several goals should be set in backcasting scenarios, so-called multicriteria backcasting. In this way, part of the goal conflict would be integrated into the process of building and analysing the different scenarios.

This is what we aim to achieve in the backcasting project, where Paper I is the first step, suggesting four goals for such multicriteria backcasting scenarios (Svenfelt et al. 2015). The goals are challenging, as the environmental goals will require significant reductions from today's levels of emissions and land use, and the social goals are met today in some aspects but not in others. When combined, these four goals become even more challenging, and conflicts and synergies may emerge between them and in relation to other sustainability goals that were not selected to be included in the framework of the backcasting scenarios but that Sweden is committed to fulfilling. Conflicts and synergies will be evaluated in a subsequent step of the project.

One methodological challenge, when analysing goal conflicts in backcasting scenarios, is, as we experienced in writing Paper III, that we could not assess all the aspects that we planned to address, especially regarding the gender equity and health goals, as the scenarios did not provide sufficient information to make such an assessment feasible.

If scenarios are to focus on one area, as in Paper III, the necessary descriptions to establish whether there could be potential goal conflicts or synergies are typically lacking. There may, thus, be a need for richer descriptions of some relevant aspects of societies in order to assess possible goal achievements. Scenarios focusing on one single goal are difficult to assess from the perspective of other sustainability goals, and may even be counter-productive, as they could falsely be labelled "sustainable" when possible negative impacts on other sustainability goals may remain invisible. On the other hand, for practical reasons, scenarios cannot depict all aspects of society, and some assumptions may still need to be made when performing a sustainability assessment.

In Paper I, the goals have been selected and formulated in a participatory setting and the scope has been wider, with several working groups focusing on depicting the daily life of Swedes in the different scenarios, their mobility patterns and habits, and their use of work and leisure time. There may be a greater chance that in this project we can come up with a more complete analysis of goal conflicts and synergies than we did in Paper III. This can be evaluated when the analysis is carried out of how the different goals the scenarios have to fulfil impact on each other and on other goals.

In Paper III, we argue that the exercise of highlighting and analysing conflicts and necessary trade-offs is highly relevant for supporting decision makers and anticipating challenges which they may face when drafting policies. Conflicts may arise not only in the long term, but also already with regard to current policies. Goal conflict analysis may, therefore, also be valuable for current or short-term policies.

Goal conflicts may sometimes be unavoidable and require trade-offs. However, other goal conflicts may be only illusory, and a change of strategy to achieve the goal could alter the result.

In Paper III, the choice of energy type was decisive. Opting for electricity from wind turbines, hydropower or sun means putting less strain on land resources, which may be scarce in the future, as competing needs from food and energy production may increase with a growing population. However, choosing that option may have impacts on other goals. Placing wind turbines in the mountains may, for instance, conflict with the goal of "A magnificent mountain landscape," due to the noise of wind turbines. Ultimately, a prioritization between sustainability goals may be needed.

In Paper III, we only analyse goal conflicts between environmental, health, and gender equity goals for Sweden. Using Wandén's (2007) categorisation of goals introduced earlier, the health

goals (as described in the target areas of the public health goals), the environmental goals, and the gender equity goals can all be considered to be transversal goals, covering several governmental fields. Analysing goal conflicts with other societal goals or with international agreements may, therefore, be needed as well.

The Swedish Environmental Protection Agency, in an assessment of the Swedish generational goal (Swedish EPA 2012), estimates that the scope for measures at a national level in order to facilitate the goal's achievement is substantial. However, world trade prices or agreements set limits on some areas, for instance regarding under which conditions products are manufactured in other countries.

Wandén (2007) quotes a German study by Oberthür and Gehring (2006), in which about 20 cases of goal conflicts were found, mainly due to the World Trade Organisation's global free trade rules or EU directives regarding free movement within the EU. Half of those rules were in conflict with environmental conventions (Ibid.).

An improvement of the goal conflict analysis performed in Paper III would have been to analyse the impact of international trade agreements on sustainability goals and to assess potential conflicts and synergies.

7 Conclusions

This thesis explores how to take into account both environmental and social perspectives in setting sustainability goals in a Swedish context and apply a justice perspective.

In Paper I, we selected four goals, two environmental and two social for backcasting scenarios in a context of degrowth and urban planning in Sweden.

The environmental goals imply large reductions in GHG emissions and land use for consumption in Sweden. Regarding the social goals, these are in many aspects reasonably well fulfilled in Sweden today, although many challenges remain in order to ensure similar opportunities for all Swedish residents. The main challenge, however, is to ensure that the social goals are met even with environmental constraints and with no or only limited economic growth.

In Paper II, we reviewed existing climate and energy targets at the global, national, and municipal levels, as well as targets suggested in the scientific literature and by Swedish environmental organizations. We found that there were fewer differences in the reviewed goals for global, indivisible targets such as atmospheric concentrations than for national, divisible targets such as GHG emissions reduction, as the latter bring up the sensitive issue of who has to make reductions.

We also attempted to identify or apply justice principles to the reviewed targets and argue that the justice aspect is not explicit in the sample of existing climate and energy targets reviewed. For the suggested targets, the main justice approach is egalitarian.

In Paper III, a goal conflict and synergy analysis is carried out using four backcasting scenarios for Sweden, all fulfilling a climate goal of zero net emissions by the year 2060. The goals analysed are the Swedish environmental goals, public health goals, and gender equity goals. We found that most conflicts occurred in scenarios without any global climate agreement, as some environmental problems have a global impact and affect the local environment but also, for instance, health. The higher occurrence of conflicts in scenarios without agreement was also due to the measures chosen to achieve the climate goal, using more readily available biomass instead of electricity from wind and thus creating a tension with the land use goal.

As sustainability goals are long-term and characterized by a great deal of uncertainty, they need to trigger the profound changes required for a sustainable and just future but remain acceptable for the stakeholders involved.

Goals are often elusive as to what is included or not, whether it is emissions from trade in climate targets, or on which reference year a specific emission reduction should be based. These delimitations should be made visible and ideally also reflected upon, not least with regard to how they may impact other countries' emission reductions.

There is a need to distinguish the goals from the means to achieve the goals, as this will facilitate the process of setting goals that can allow for different pathways regarding how to meet the goals. Taking the example of economic growth, which is often seen as a goal in itself (as in the SDGs): it should be regarded as a mere tool to achieve other goals such as welfare or prosperity.

Goals are also normative and reflect both different cultural and ethical perspectives on what a good level of health care or housing standard may be. I argue that the underlying values should be made visible and challenged.

Both inter- and intragenerational justice perspectives should be made more concrete and explicit in goal setting, so that such issues also can be monitored. A good start might be to systematically use a consumption perspective as well as a territorial perspective when setting climate or land use goals, as the impact of our consumption on other countries' environment and health has been increasing over the last decades.

Having concrete goals, highlighting the underlying values, and bringing forward justice perspectives and the impact of goals on different socio-economic groups or species may reveal goal conflicts. This may lead to an increased resistance from different stakeholders to the adoption of goals, but could also contribute to a constructive debate, if the process is perceived as legitimate.

Sustainability goals can guide our actions towards a sustainable and just future, but there may be a need to be more specific and more transparent in order to be open to scrutiny. There is also a need to reflect upon the critical question of who is setting the agenda and whose voice is heard in the goal setting process, whether it is non-human species, future generations, or deprived communities. Goal setting should, in my view, be discussed in a broad context in order to allow for discourses other than the prevailing one to influence the outcome.

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