Sustainability Assessment of Scenarios: Beyond GDP growth

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Hållbarhetsbedömning av framtida scenarier: Bortom BNP-tillväxt

Degree project in Strategies for sustainable development, Second Cycle
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Abstract

The creation of futures scenarios is a tool to address challenges towards sustainability in planning and the built environment. Scenarios in the project *Beyond GDP growth* explore futures where priority is given to social and environmental aspects and economic growth is regarded as uncertain. When futures are used as an input to planning, there has to be an awareness of the possible consequences of those. Sustainability assessment for futures scenarios aims to give a comprehensive assessment of how different scenarios can affect relevant aspects.

This thesis gives an overview of current methods for sustainability assessment of futures scenarios. It also proposes improvements to one of them and tests it on the *Beyond GDP growth* scenarios. SAFS (Sustainability Assessment Framework for Scenarios) is the method selected. SAFS considers environmental and social aspects providing qualitative results and uses consumption perspective and life cycle approach.

Improvements to SAFS are proposed in two directions. First, the Doughnut developed by Raworth (2012) is integrated in the method. It gives a graphic representation, putting each aspect in context with the others and facilitate the communication of the assessment results. Second, an alternative approach is suggested to evaluate the consequences of environmental deprivation on social conditions. This alternative approach can also help communicate uncertainties.

Keywords

sustainability assessment, futures scenarios, futures studies, assessment methodology, degrowth

Titel

Hållbarhetsbedömning av framtida scenarier: Bortom BNP-tillväxt

Sammanfattning

Att skapa framtidsscenarier är ett verktyg för att adressera utmaningar relaterade till hållbarhet inom samhällsplanering och samhällsbyggnad. Projektet *Bortom BNP-tillväxt* utforskar i ett antal scenarier olika framtider där sociala och miljömässiga aspekter får prioritet och ekonomisk tillväxt betraktas som osäker. När framtidsscenarier används som input i samhällsplanering behöver det finnas en medvetenhet om dessa framtiders möjliga konsekvenser. Hållbarhetsbedömning av framtida scenarier utgör en omfattande utvärdering av hur olika scenarier kan förväntas påverka relevanta aspekter.

Den här uppsatsen ger en översikt över befintliga metoder för hållbarhetsbedömning av framtidsscenarier, den applicerar en av dessa metoder - SAFS (Sustainability Assessment Framework for Scenarios) - på scenarierna inom *Bortom BNP-tillväxt* och föreslår förbättringar till metoden. SAFS väljs därför att den som metod tar hänsyn till såväl miljö- som sociala aspekter, ger kvalitativa resultat och utvärderar scenarierna ur ett konsumtions- och livscykelperspektiv.

Två förbättringar av SAFS föreslås. Den ena är att integrera Raworths "Doughnut" (2012) eftersom den erbjuder ett sätt att grafiskt representera alla utvärderade aspekter tillsammans och underlättar att kommunicera resultatet från bedömningen. Den andra förbättringen innebär ett annat angreppssätt för att utvärdera konsekvenserna av miljöförstöring för sociala aspekter. Det föreslagna angreppssättet kan även underlätta att kommunicera metodens inneboende osäkerheter gällande resultaten.

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The imagination of the future is necessary to act now if aiming to meet sustainability targets. In order to imagine the future, a holistic perspective is needed. Social and environmental issues cannot be separated and they should be addressed in an integrated way, together with their relation to the economy. This way, when futures are imagined, the outcomes of a future society can be considered, facilitating strategic decisions-making today. Often, for the creation of futures scenarios, economic growth is an aim or a common assumption. However, growth is uncertain. Setting growth aside, there are a number of social and environmental goals that should be met in a preferable future. Futures should be imagined where there is human well-being and where environmental depletion is tackled regardless of if there is economic growth or not.

Beyond GDP growth - Scenarios for sustainable building and planning is a research project that explores future scenarios in Sweden. In those scenarios, social and environmental targets are met regardless of economic growth. The focus of the scenarios is on strategies that can be used to implement more sustainable urban planning and buildings. When producing those futures and using them for decision-making, there has to be awareness of their risks and opportunities for the different social and environmental aspects. A scenario can hardly deal with all the problems at once. That is why a sustainability assessment is necessary. Sustainability assessment of the scenarios can make explicit the risks and opportunities in them. This is a first step to try to avoid risks, create synergies between opportunities or to negotiate priorities and trade-offs. A framework for the sustainability assessment of the scenarios in *Beyond GDP growth* will be done in this study, and the scenarios will start to be assessed.

This thesis presents a sustainability assessment framework for futures scenarios and tests it. The framework departs from a previous method and suggests improvements to it through the inclusion of relevant perspectives and through the test. The test takes the scenarios created in *Beyond GDP growth* as object of assessment. It is done in form of a framework, covering the whole assessment process but not necessarily solving every part of it. Among the aspects selected in the framework, gender equality, social equality and the built environment are assessed in the scenarios.

BACKGROUND

Sustainability aims to tackle problems that can, in the short and long term, make life on Earth unbearable (Steffen et al. 2015, Raworth 2012, Hansen et al. 2013). In order to do this, efforts are done in many levels. Climate negotiations within the United Nations Framework Convention on Climate Change are an international ground of discussion. In the national (SEPA 2013, Folkhälsomyndigheten 2008) and local (Stockholm 2016) levels, objectives are set aiming more sustainable practices. At the same time, due to the complexity and scale of the problems, there is a need to deal with them in many parcels of society, from legislation or trade agreements to plans for different sectors such as transport, agriculture or waste (Therivel 2010:11-12). The effects of climate change and other sustainability problems are already visible, which also makes it necessary to consider them in long term planning (e.g. IPCC 2014, von Oelreich et al. 2015).

Sustainability is a wide concept that can overarch very diverse discourses with different points of view that can be divergent. The literature often divides sustainability in three aspects: ecological sustainability, social sustainability and economic sustainability. Some authors argue that the economic perspective is not an end itself rather that the goal of economy is to drive society into ecological and social sustainability and well-being (Raworth 2012:8). From this point of view, economic sustainability can be considered a tool.

But the application of sustainability in society is not easy. Despite the fact that there is a good number of tools to influence and give input on unsustainable practices that takes place in society (particularly regarding environmental sustainability) they can be hard to influence. In society and for policy and planning application, sustainability is very often weighed against other social priorities.

Questioning growth
According to Schmelzer (2015) the dominance of economic growth as an imperative is tremendously widespread. Not only growth statistics are common on media and crucial in economic analyses, but the notion of growth pervades in political discussions across the whole political spectrum and in all countries. It is argued that the idea of economic growth has been at the core of the ideologies of the main socio-economic and political systems on the twentieth century (ibid.) and nowadays is regarded of exceptional importance in policy-making.

Economic growth has been described by several scholars and historians as a *fetish*, an *obsession*, an *ideology*, a *social imaginary* or an *axiomatic necessity* (Schmelzer 2015:263). Still, "there are strikingly few accounts on how economic growth became self-evidently regarded as the key goal of economic policy-making by social scientists, politicians, and the general public" since it became common knowledge in the 1950s (ibid.:263).

Schmelzer (2015) discusses the hegemony of the 'growth paradigm' finding its core values. The term is used to describe "a specific ensemble of societal, political, and academic discourses, theories, and statistical standards that jointly assert and justify the view that economic growth as conventionally defined is desirable, imperative, and essentially limitless" (ibid.:264). In the growth paradigm four assumptions are found. First, that the Gross Domestic Product (GDP) despite all its reductions, assumptions and exclusions is an adequate measure of economic activity. Second, that growth is a panacea for a wide array of socio-economic challenges, even if some of them might change overtime. Third, growth is an equivalent or at least a mean towards progress, well-being or national power. And fourth, that growth is essentially unlimited, given the *right* policies (ibid.:264-269).

Currently, GDP growth it is regarded as panacea and universal yardstick and considered to have no limits (Schmelzer 2015) however, there are numerous good reasons to question the desirability or even the possibility of it. From the environmental point of view, it can be stated that economic growth has initiated environmental depletion that threatens life today and even more the life of future generations (Taibo 2014:30, Schmelzer 2015:263-264). Climate change and other ecological challenges disable the promise to raise living standards of the population to Western levels through GDP growth. At the same time equitable modes of living in the global South are only possible through a drastic reduction of ecological impact of the countries in the global North (Schmelzer 2015:264).

From the social point of view, there is no consensus on the link of GDP growth with human well-being. On one side, evidence has shown that beyond a certain threshold (reached by most OECD countries in the 1970s) growth does not translate into improvement in human well-being nor alleviates poverty (Offer 2006, Waring 1999 and Wilkinson & Pickett

2011 in Schmeltzer 2015:263). Other sources claim the contrary, finding evidence that correlates life satisfaction with GDP per capita (Deaton 2007). This happens even if the evolution of GDP is more linked to life satisfaction in poor countries than in rich ones (ibid.:16-17). Piketty does not discuss this link. Instead, Piketty claims that economic growth is "essential to counter capitalism's tendencies to increase inequality" (Schmeltzer 2015:263). This is because when growth is slow, wages tend to grow way slower than returns of capital (ibid.)

At the same time, other factors such as equity are more important to human flourishing, for which growth is not a prerequisite (Schmelzer 2015:263). Taibo (2014:30) discusses how growth is not necessarily linked to social cohesion and employment, while the social and environmental costs of it cannot be overlooked. This becomes critical if aiming to global social justice and to pay the ecological debt of the rich countries (Schmelzer 2015:263-264), especially if the growth of rich countries is based on exploitation of the poor ones (Taibo 2014:30). D'Alisa, Demaria & Kallis (2015:xx) further state the belief that a truly egalitarian society cannot possible be achieved within the logics of capitalism.

The limitless notion of growth can also be criticized. The possibility of further and stable growth becomes more uncertain. This uncertainty has to do with the exhaustion of basic resources and internal systemic problems (e.g. over accumulation, financialization) that have led to declining or stagnating growth rates. This trend might prolong in the future (Taibo 2014:30, Schmelzer 2015:264, D'Alisa, Demaria & Kallis 2015:xx). Alfredsson & Malmaeus (2017) have explored different expectations for economic growth during the present century. They concluded that that policy-making "based on the assumption that economic growth will continue is unwise and risky" (ibid.:81). They highlight how some models estimating similar rates of growth in the coming century do not consider potential effects of climate change or resource constraints (ibid.:80).

The very core notion of GDP as a social indicator can also be questioned. GDP does not distinguish between positive and negative activity. Expenditures that could be considered positive, such as government investment in education, contribute as much as those that could be considered negative, such as the spending on cleaning of an oil spill. At the same time, it leaves out many positive activities, such as house-

hold and volunteer work (O'Neill 2015:104). GDP as a goal can also be a self-reinforcing problem. If all sorts of policies are oriented towards growth as a way to tackle other problems (poverty, inequality, social tensions, or even undermining of democracy) do not succeed, they may reinforce the very problems they were aiming to solve (Schmelzer 2015:264). Taibo (2014:30) further identifies a growth society with a lifestyle that assimilates happiness with devotion to labour, as a mean to economical earnings and consumption. D'Alisa, Demaria & Kallis (2015:xx) confront this lifestyle with the thinking of those who make the active choice to live away from consumerism and in a low resource intensive way.

There is a necessity to question growth and imagine other futures. The lack of this questioning in policy making can lead to dangerous a "societal lock-in continuously reproduced" (Flipo & Schneider 2015:xxv). There is still a debate whether if degrowth should become then a new objective or if growth indicator should be just ignored. However, in this process of imagining other futures outside growth different perspectives can be helpful. These perspectives might share concerns and diagnoses, or that aim to tackle problems in a different way. Those can go from social-ecological justice (Gunnarsson-Östling & Svenfelt in press) to feminist economy (Pérez 2014), Buen Vivir (Gudynas 2015) and others (see D'Alisa, Demaria & Kallis [eds.] 2015).

Beyond GDP growth

The research project *Beyond GDP growth - Scenarios for sustainable building and planning* aims to study possible futures that achieve sustainability targets besides traditional GDP growth. Doing this, implications of these developments for policy, planning and decision making can be identified. One ultimate goal is to elaborate strategies and action programmes that can be used to implement more sustainable urban planning and buildings (Svenfelt et al. 2015).

It is a cross-disciplinary project with researchers coming from fields as environmental systems analysis, futures studies, sociology, urban studies, political science, social anthropology, economics and human ecology. The project counts with nine social partners (municipalities, initiatives and national and regional agencies) and an international reference group consisting of three researchers.

The project builds on the necessity to explore paths where sustainability objectives are achieved, despite the fact that today's trends might indicate otherwise. At the same time, it investigates alternative paths after the uncertainty of economic growth. In the project, growth stagnation or reduction could be a future choice, a consequence of a financial crisis or the result of unsuccessful growth policies. Growth is not seen as an end itself, the goal is the qualities society might want to achieve. Four scenarios have been created in the project. Those scenarios take place in Sweden in the year 2050, and all of them involve major social changes. For their creation, futures studies theory is used, particularly normative backcasting.

Futures studies

The field of futures studies is commonly dated to start after World War II. According to Cornish (1977), two different branches of the discipline evolved in Europe and the United States of America. Whereas in Europe a bigger emphasis was put on democratic elements and radical changes in society, in the USA technological forecasting with military background got bigger attention (Börjesson et al. 2005:6-7). Within this second group, most introductions of the field mention the establishment of Project RAND (Research ANd Development), which started studying the intercontinental non-surface warfare in 1946 as a major event in the foundation of it. In 1948 the institution turned into RAND Corporation and expanded their study field to start exploring national policies (ibid.)

The steady economic growth of the 1950s and 1960s put the focus on forecasting methods as a good tool to explore the future. This happened both in East and West countries. In the Western OECD countries, policies were directed towards overcoming social problems by increasing national incomes and stronger welfare states (Schmelzer 2017:29). In East socialist countries, *prognostiks* would be a part of economic planning (Andersson 2006:282). This approach was put into question in the 1970s, when unforeseeable events like the oil crises came into the picture, together with more and more social changes in Western societies. These social changes were reflected into a transnational phenomenon that criticized war, racism and conservative values as well as the drawbacks of capitalist growth. An array of movements contributed to this. Among those, the ecological movement portrayed a weak planet endangered by uncontrollable technological and economic developments (e.g. *Silent spring*, by Carson [1962]; *The cost of economic growth*, by Mishan [1967]) (Schmelzer 2017:29-30).

It was in this climate when *The Limits to Growth* was published. In this report, a computer model predicted the "overshoot and collapse" of the global system, raising the awareness that continuous growth would make a finite planet eventually run out of resources. This report was published by the so-called Club of Rome. The Club was founded by a reduced group who "shared a 'vision of global dangers that could threaten mankind such as over-population, environmental degradation, worldwide poverty and misuse of technology'" (Schmelzer 2017:34). They were an elite group of industry representatives and leading statesmen, frustrated about governments' incapacity to tackle long-term and complex ecological problems. The group originated within the OECD institution. All key actors until the release of the report were also key actors in the OECD's secretariat or science committee. In the end, the report caused hostile reactions within the institution and after debate led to a revitalization of the defence of growth (Schmelzer 2017).

As advanced earlier, in the 1970s, the social and political climate together with oil crises made forecasts no longer reliable. It was then necessary to come up with new methods to explore the future. If it was not possible to make reliable projections of the future, a different approach could be choosing a future and analyze how to get there. Normative backcasting emerged early in the 1970s as a way to explore futures where certain targets would be met despite forecasts indicated otherwise, including the exploration of what could or should lead to the meeting of those targets (Börjesson et al. 2005:7).

In Sweden, in 1971, a group was appointed by the social democrat government with the single purpose of studying the future. The social democratic conception of the process of change had been put into question by the first signs of exhaustion of natural resources, social problems derived of a competitive society and growing differences between the rich and the poor. At the same time, technological advances could make the worst conceivable scenarios sound possible (*mega deaths, mutually assured destruction, ecocide*). In this climate, it was argued that futures studies should be based on the public interest, seeing it as a tool for national policy issues and including the shaping of long-term society with a social democrat vision. One of the main advocates for this vision was Alva Myrdal (Andersson 2006).

The government was aware that it was a risk for a small country like Sweden to leave the imagination of the future to a small number of powerful interest groups. Among those groups, one could precisely find the Club of Rome. The Club's intentions and moral standards were severely questioned by Myrdal, to the point of describing them as "a kind of sophisticated neofascism" after their opinions regarding the management of *developing* countries (Andersson 2006:284). The Club was formed by a selected group of highly educated largely white men coming from the global North that reproduced the "tradition of upper-class gentlemen's clubs" (Schmelzer 2017:37). This logic contrasted with the environmental movements' at the time by targeting elites directly with "top-down techno-fix solutions" (Schmelzer 2017:39).

Opposed to this, it was important to put forward democratic values and not only consider *what* the future would be but also whose would it be and *whose* interests would shape it. The group appointed to study the future in 1971 was chaired by Myrdal, who was a radical defendant of equity, feminism and would become a major actor in the defence of disarmament programmes (Andersson 2006).

The group also questioned the idea of growth as the hegemonic definition of progress and GDP as a relevant indicator for a good society. The aim of the group was to place the human being and its limits in the centre. They talked about the human being as "the elementary particle" of society. They considered how people had time to work, but also for unpaid labour (care, domestic work, etc.) and to rest, both of which were essential to life and to the existence of society. They considered that planning a society with a constant expansion of economic productivity was an anomaly. This anomaly would cause the "particle" to be constantly expanded and pulled to its limits (Andersson 2006:291-292).

The discipline of futures studies is described as a "very fuzzy multi-field" (Marien 2002) and there is no consensus on how to categorise the discipline (Börjesson et al. 2005:6). However, definitions or descriptions often mention the exploration of possible, probable and preferable futures (Amara 1981). Bell (2003:73-74) also mentions Toffler's definition, which describes futurist's work as to develop "new alternative images of the future–visionary explorations of the possible, systematic investigation of the probable, and moral evaluation of the preferable".

AIM

The aim of this master's thesis is twofold. First, it develops a sustainability assessment framework based on the work of previous sustainability assessment methods. This is done through a review of current assessment methods for futures scenarios, which will be used as a starting point. There is room for combination of different methods and the inclusion of other relevant perspectives. Second, the framework is operationalized and tested in the test scenarios of the project *Beyond GDP growth - Scenarios for sustainable building and planning*. This requires the framework to be adapted to the specificities of the project.

Adaptation to the specificities of the project will be done in two different ways. First, by reviewing different sustainability assessment methods for futures scenarios, analysing their strengths and weaknesses and finding the most suitable for this task. Second, by reviewing the normative goals used in the project. This review will make a division between two different tasks in the further use of the framework: assessment against sustainability aspects and the assessment against normative goals.

In order to operationalize the framework, the assessment will be initiated with a few selected aspects in all four scenarios. Those aspects will be *gender equality*, *social equality* and *a good built environment*. The first two are selected for being rather general and widely discussed in society, apart from being personally accessible. The last one is considered of especial importance because the scenarios are focused on sustainable building and planning.

Research questions
The aim can be summarized and made explicit in four research questions:

· What assessment methods for scenarios exist and what is the most suitable assessment method for the scenarios described in *Beyond GDP growth*?

· Can this method be improved? How?

· What are the advantages of the assessment framework developed compared to previous versions? How can it be useful for practitioners?

· When testing the framework, what could be the risks and opportunities of the scenarios for the assessment aspects gender equality, social equality and a good built environment?

THEORETICAL FRAMEWORK

This section will draw on the specificities of the discipline of futures studies, partly describing the process behind the formation of the future scenarios. This will be helpful in the coming sections. It will as well introduce concepts that will be necessary for the analysis. Futures studies theory has been chosen as it is used in the object of study, the project *Beyond GDP growth*. The scenario format in futures studies will be explained as it is the format in which the scenarios are communicated. Knowledge on how scenarios are built will be useful to put the task into perspective and result in a more efficient assessment. Sustainability assessment and scenario assessment will serve as a background to introduce the method.

The scenario format

The scenario format is a common ground for presenting explorations of the possible, the probable and the preferable. Scholz & Tietje (2002:79-80) state: "[a] scenario describes a hypothetical future state of a system and provides information on its development up to this state". The same authors also include that scenarios can be formed by both qualitative and quantitative elements. Even though early approaches distinguish between the exploration of sequences of events where the attention is put on causal processes and decision points (scenarios) and exploration of different final states (alternative futures), most practitioners would nowadays have a wide conception the term scenario (Börjesson et al. 2005:7-8).

There is a wide array of scenario categorizations in futures studies. According to Börjesson et al. (2005:14-24), scenarios can be arranged in three main categories: predictive, explorative and normative. Predictive scenarios are oriented towards answering the question of *what will happen?* Explorative scenarios have to do with *what can happen?* And normative scenarios try to answer *how can a target be reached?*

Two subcategories are presented for each. Predictive scenarios can be forecasts if they aim to describe what will happen if all variables develop as usual, whereas what-if scenarios describe how the future would be given a specific variable or event. They are often made within the prevailing structures of current society, but both can raise awareness of problems that might have to be faced in the future. Within this category, it is important to keep in mind that predictions can be self-fulfilling: actions support-

ed by a forecast can facilitate the realization of that forecast.

Explorative scenarios can be divided in external and strategic scenarios. Those external explore what could happen beyond the control of relevant actors, while strategic scenarios are used to describe the possible consequences of an array of decisions made by a given actor. Given that explorative scenarios aim to investigate and cover different possible developments, it is common to develop sets of scenarios. They tend to have a longer horizon than predictive scenarios and consider more profound changes.

Normative scenarios, which aim to reach a specific target, can also be divided in two main categories; preserving and transforming scenarios. The main difference between them is that while preserving scenarios aspire to reach a target with adjustments to the current situation, transforming scenarios are used when prevailing structures are an obstacle to reaching the target and a trend break is necessary.

Some argue that most scenarios can only explore one of the following options: possible, probable and preferable (which can be analog to predictive, explorative and normative). Others argue that complex methodologies can result in scenarios that combine different categories and approaches (Börjesson et al.:2005:21-24).

The scenarios developed in the project are categorized as normative transforming scenarios, in particular, backcasting scenarios. This category is chosen because within current structures and dynamics, it is impossible to imagine futures in which society does not necessarily strive for economic growth (Svenfelt et al. 2015). In the case of the project, trends are considered to develop in the wrong direction. According to theory, in cases such as this where a trend break is desired, modelling the structure of the current system is often rejected (Börjesson et al. 2005:21). Backcasting can sometimes also involve thinking backwards from a desired future until today in order to identify the steps that are necessary to arrive at that desired future (Dreborg 1996:814).

Typically, backcasting studies present a number of target-fulfilling images of the future. Being target fulfilling means that they present a solution to the given problem. They can also include a discussion regarding how to achieve those future images.

Different authors put the focus on detailed images of the future as a basis for discussing goals and evaluating decisions in policy-forming processes, others tend to think of backcasting as a way to expand the number of possible paths future can develop (Börjesson et al.:2005:21-24). The latter reasoning can be followed, arguing that in this kind of scenarios, the differentiation between external and internal factors is not a priority. This can help to reach the targets. In backcasting studies, it is important to keep all options open, given that defining some factors as external would mean restricting the scenarios (Börjesson et al.:2005:21-24).

When developing backcasting scenarios, the difference between them and optimising scenarios is clear: optimising ones put the focus on finding efficient solutions, while backcasting ones look for options accomplishing long-term targets. A drawback of backcasting can be then that decisions taken based on them can result expensive in the short run. In the long run, the number of possible options, or the target itself can be changed or reformulated.

Scenario construction

Börjesson et al. (2005:25-33) identify three different tasks or stages in scenario studies. The first task is the generation of ideas and gathering of data. The second task is the integration of different parts into a single whole scenario and the third task is a consistency check.

On the first step, experts, stakeholders or others might be able to provide a useful input to the scenarios. Different ideas, knowledge, insights or views can be helpful to develop useful and accurate scenarios. Suggested methods here are surveys, Delphi methods and workshops, interviews can be a possible element in all of them (Börjesson et al. 2005:25-26). A specific Backcasting Delphi method for backcasting scenarios exists (Höjer 1998). It starts, as regular backcasting studies, with the formation of scenarios that are desired in some sense. On the following step, the path design to the desired images is disregarded. Instead, experts are asked in a Delphi-like process to evaluate and improve the scenarios regarding their feasibility and with respect to the defined targets.

In the second step, integration, Börjesson et al. (2005:28-29) talk about modelling as a group of techniques that can help combine parts into wholes. One advantage of a model structure is systematiz-

ing the collection of data. This can help to create consistent descriptions in the different parts of the system. These techniques are often based on mathematical models. Their aim is to project some kind of future given some more or less explicit constraints. Those constraints can range from the mere extrapolation of a variable to the definition of complex relationships between variables. Time series analysis, explanatory modelling and optimising modelling are three suggested methods. However, the authors do not suggest any integration method for normative transforming scenarios.

The last step suggested is the consistency check. Börjesson et al. (2005:31) explain this step as useful to secure consistency between or within scenarios. Cross-impact analysis and morphological field analysis are two suggested methods. The authors insist on how the main advantage of these methods is consistency, even though they could also be used in the previous steps. Morphological field analysis is a suggested consistency method for normative transforming scenarios.

To sum up, when it comes to normative transforming scenarios such as backcasting studies, the main focus is put on generation techniques (Börjesson et al. 2005:43-44). As mentioned, the involvement of stakeholders is sometimes included in backcasting studies, and it is frequent in studies with a sustainability focus (Carlsson-Kanyama et al. 2003, Svenfelt et al. 2011). This is helpful not only for information gathering, but also for other of the nine purposes of futures studies identified by Bell (2003): *integrating knowledges and values for designing social action, increasing democratic participation in imagining and designing the future* and *communicating and advocating a particular image of the future*. Passed the first most intensive generation phase, workshops can be used for integration and consistency can be tested in a qualitative way, gathering a panel of experts who can criticize and suggest improvements (Börjesson et al. 2005:43-44).

Scenario assessment

Despite many futures scenarios are built following those three steps, there are arguments for not letting the development of futures scenarios end here. After the construction of scenarios, these could be assessed in different ways. Some consider consistency an assessment on its own to give feedback in the scenario construction (Weik et al. 2013) resulting in more solid scenarios.

The plausibility of scenarios can also be object of assessment. Weik et al. (2013:136) put forward the discussion about what plausibility and probability might mean as criteria to evaluate and measure futures scenarios, mentioning some of the different points of discussion yet insisting in the importance to use them for assessment. They do it while presenting their own method for this kind of test (Weik et al. 2013). When thinking about the development of plausibility criteria for scenarios, it is important to keep in mind the vision of futures scenarios they work with. The standpoint exposed in their paper aims to present futures scenarios used in a way that can be close to predictions. Plausibility assessment might not be the most useful evaluation of backcasting scenarios.

Plausibility assessment could be, however, relevant for the scenarios developed in the Beyond GDP growth project. In it, four scenarios are presented aiming to fulfil the same specific targets but considering different drivers to do it (collaborative economy, self-sufficiency, etc.). In this regard, they can be considered *what-if* scenarios, making it possible and somehow useful to assess plausibility of those. If thinking of them as backcasting scenarios, backcasting can be about finding new paths along which development can take place (Börjesson et al. 2005:21-22) which can make it harder to justify a plausibility assessment. Since the project defines them as backcasting scenarios, plausibility will not be matter of assessment here.

Another kind of assessment can be related to desirability. Desirability evaluation can be especially useful when working with explorative scenarios. It can be used either to investigate how positive are different events in external scenarios or, more importantly, to discuss preferability when considering strategic scenarios. Predictive scenarios can of course also be tested against desirability, but predictions main aim is to be accurate against what is likely to happen, therefore if that future is preferable or not has less importance. As for normative scenarios, the objective is to fulfil the goal or goals set, usually it makes sense to think that the goals set would be preferable. There, an assessment against desirability could help to evaluate the different pathways. At the same time, in the case of normative scenarios, a common assessment could be discussing it the goals are fulfilled or not.

Sustainability assessment

Sustainability assessment of scenarios is particularly relevant for the construction and evaluation of possible and preferable futures. According to Arushanyan et al. (2017:23-24) sustainability assessment of scenarios is currently not common practice. However, there are a number of examples where some kind of sustainability assessment was done. These range from evaluating sustainability implications of policies or introducing a new technology to addressing society as a whole. Arushanyan et al. (2017) also claim that most of the studies mainly focus on environmental issues and few assess social impacts.

The *body* of Sustainability Assessment (SA) has processes and methods that can be useful to evaluate futures scenarios. There is a variety of them that are commonly used in different situations. Some of those are Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Life Cycle Assessment (LCA) and Social Life Cycle Assessment (S-LCA). Many others can be used in futures scenarios, as well as complex methodologies combining them (Höjer et al. 2008).

Among those studies that focus on both social and environmental facets of sustainability, methods directly taken from Sustainability Assessment are often performed on the scenarios (e.g. Ren et al. 2010 and Foolmaun & Ramjeawon 2012). Arushanyan et al. (2017:24) claim that "there are no established frameworks for assessing a future society, in a broad sense, from both an environmental and social perspective". After a review of the literature on the field, three remarkable examples of sustainability assessment of futures scenarios could be found. All three have two things in common. They assess sustainability considering at least both the social and environmental side and they use a method that is specific for futures scenarios. The first one was presented by Nijkamp & Vreeker (2000), the second one by Sheate et al. (2008) and the third by Arushanyan et al. (2017). The last example was suggested by researchers involved in *Beyond GDP growth*. The other two examples were referenced in an article describing a plausibility assessment method for futures scenarios (Weik et al. 2013).

All three are applied on qualitative scenarios. The first two dedicate long time to explain the context of the project in which the assessment was applied, which makes them appear tailor-made. The last two call themselves methodologies, while the

first one calls itself "applicable evaluation framework for assessment" (Nijkamp & Vreeker 2000:7). The last two derive their methods from traditional SA methods. All the scenarios and assessments are qualitative.

Nijkamp & Vreeker (2000) had three explorative strategic scenarios as an object of assessment. Those included policy objectives and measures applied to a specific area. The objective of the assessment was to investigate the consequences of different paths that policy makers and experts had shown interest for. In their case, the scenarios were formed by the same researchers in order to be assessed later. They were done after guidelines received by policy makers and experts. They present their scenarios in the form of tables: one table per scenario. In those, they translate the directives for each pathway into concrete policy measures that could be applied. For their evaluation, critical threshold values of selected indicators have great importance. This enables easy communication and presentation via a flag model (green, yellow, red and black).

They perform an unorthodox assessment specifically designed for the problem in question however, the process can be useful in other assessments. There is an intention of making the scenario assessment user friendly by the flag system, which can be positive. The unavailability of quantitative data is stated several times, and pointed out as the reason that forces them to perform a qualitative assessment. In case of having enough quantitative data and if they were able to build more certain scenarios, they could have been considered predictive what-if scenarios.

More space is given to drawing conclusions than to the explanation of a thorough assessment. The third step, which is capital, is totally opaque. Despite the indicators are said to be obtained by "tracing the consequences of a policy measure, step by step through the whole of the complex system designed" (ibid.:18), the connections between the policy measures of each scenario and the assessment result are completely obscure. At the same time, in the fourth step, the criteria for the critical value thresholds is only argued for putting indicators into two categories: cost and benefit. At the same time, despite the uncertainty of baseline information is discussed, there is no such discussion about the uncertainty of the scenarios.

Sheate et al. (2008) also perform their assessment in three different explorative strategic scenarios, those scenarios describe three "possible results of specific assumptions about policy trends and drivers of change" (ibid.:285). In their case, the purpose of the assessment was twofold. They used it to easen interaction, understanding and communication between the environmental and socio-economic group that took part in the construction of the scenarios and to understand the implication of the scenarios, including identifying changes that would have preferable consequences. It is important to keep in mind that here the assessment was blended with the scenario construction and other parts were done in collaboration with the rest of the project partners.

They present four main steps. First, *definition of sustainability objectives*. They gather overall objectives, coming from international, regional, national instances. Indicators were found for each objective. This was done by the SA group together with the rest of the partners. Second, *stakeholder engagement*. It was done at two different stages. Once to gather information about stakeholders priorities when it comes to sustainability, once when objectives had been chosen to gather stakeholder feedback on them and on the indicators linked to them. Third, *assessment of the scenarios*. This was, by far, the most extensive step, as it comprehends big matrices with many objects of assessment per scenario, and was divided in sub-steps. The fourth and final step was *the sustainability reports*. These reports were specific per study area in each scenario, including suggestions for the final scenarios working as some kind of summary, as well as including information about the baseline information and the scenarios.

This method is described as a strategic-level assessment (Sheate et al. 2008:286-287). It can easily be compared to others of this kind, such as SEA, to which it holds similarities. It puts a great emphasis on the effects of different drivers on the assessment areas. The creation of the chain flow diagrams is a critical step of the assessment. When doing it, it has to be kept in mind that those diagrams, in a specific scenario, might have logics that could appear counterintuitive, as a future scenario might apply different logics, especially when dealing with normative scenarios.

Arushanyan et al. (2017) assess five scenarios, four of them are explorative and one is normative, they "describe society as a whole, including all process-

es and activities" (ibid.:27). The objective of their analysis is the potential sustainability implications of a specific technology in society (including the reasoning that leads there) and the role of that technology in the implications. Their assessment gives qualitative results using a consumption perspective and life cycle approach. They present their assessment process as a methodology, including the process for the construction of that methodology. Some of the steps of the assessment could be done hand in hand with the scenario building, but the assessment could perfectly be performed independently.

They present a detailed four-step method called SAFS. The first step is called *scoping*. It consists of both defining a general goal and scope for the assessment and defining the specific environmental and social aspects to be assessed. The second step is an *inventory analysis*. It encompasses collecting baseline data on the aspects to be assessed and the definition of contextual factors. Later, the gathering of relevant information from the scenarios description aggregated by contextual factors. The mentioned contextual factors contain information from the scenarios that is useful for the assessment. They can be general issues (e.g. energy use) and have sub-factors (e.g. household use, industrial use). Third, the *assessment of risks and opportunities*. As it happened in the previous example by Sheate et al., this is the most complex and demanding step. It will be explained in more detail later. The last step

is called *interpretation*. It clarifies the results while discussing different aspects of the assessment: goals, data gaps, uncertainties or assumptions.

The third step, the most time consuming, starts with an *interrelation analysis*. There, for each scenario, contextual factors are matched with environmental and social aspects of assessment. There, aspects of assessment in each scenario are compared with today in isolation, considering the rest of the factors remain unchanged. The authors insist this is a very time consuming step. Afterwards, the individual results are aggregated, looking for opportunities for improvement and risks of negative developments. Finally, a loop tries to find risks and benefits of the aggregated aspects for the social aspects (e.g. considering the access of different groups of people to ecosystem services or health).

This method also comes as an application of Sustainability Assessment, being inspired by Life Cycle Assessment methodology (ibid.:25). It is presented in a quite systematic way, first as a method and later with an example, which is very useful for its application. Conflicts might appear in its application due to the fact that consumption perspective might require exploring effects that go beyond the initial scope of the assessment. The emphasis on identifying risks and opportunities beyond the mere assessment of aspects makes the assessment richer and more useful in certain instances.

METHOD

For the assessment of the scenarios, the last of the three methods presented (Arushanyan et al. 2017) is the most adequate. One reason is that system structure construction is often rejected in backcasting studies such as the ones to be assessed. System construction does not play a major role in that method, but it does in the other two (Sheate et al. 2008, Nijkamp & Vreeker 2000). SAFS also has a bigger focus in the identification of risks and opportunities which is more helpful in backcasting scenarios that focus on a few normative goals but might not put so much emphasis on other aspects. At the same time, SAFS, unlike the other two, has been tested in normative scenarios. The assessment in SAFS, can be done after the scenario construction, independently from it, which suits this thesis. It suits it because the scenarios were already written and the time frame was limited. SAFS also incorporates consumption perspective and life cycle approach, which provides more accurate results and goes in line with the work developed in *Beyond GDP growth*. Another important aspects is that SAFS only considers social and environmental sustainability in an integrated way. It excludes the economic dimension from the framework and portrays economic issues as a mean to achieve social and environmental sustainability (Arushanyan et al. 2017:24). This view is shared in *Beyond GDP growth*. Finally, SAFS is, in its presentation, explained as a method followed by an example of it application. This makes it more accessible and easy to follow.

The other two methods presented have drawbacks that make them less suitable for this task. The "evaluation framework for assessment" (Nijkamp & Vreeker 2000:7) presented by Nijkamp & Vreeker (2000) is not presented as a method. On the contrary, it is a very unorthodox process, hard to replicate. Some vital parts of the assessment are very opaque. The lack of transparency makes the assessment hard to follow and apply again. At the same time, it is simpler than the other methods and could lead to a too simplified assessment. Still, the effort to try to develop user-friendly and intuitive results presentation can be useful. In contrast, the sustainability assessment presented by Sheate et al. (2008) is easier to follow and replicate. However, it heavily relies on the creation of chain flow diagrams reflecting the system structure. Those can be hard to elaborate in normative transforming scenarios. Also, they used the assessment as a communication method between different teams and agents. This made the engagement of stakeholders important. Their method was also used during the construction of the scenarios, which was not suitable here but could have been suitable in an earlier stage of *Beyond GDP growth*.

SAFS

A short presentation of the main steps in SAFS has been presented in the theoretical framework. A new description with a more thorough explanation will follow. A table adapted from Arushanyan et al. (2017:26) gives an overview of the process and makes it more understandable (see Fig. 1).

(1.1) Defining goal and scope of the assessment: a set of questions are to be answered. These questions delimit the task in different ways (e.g. geographical and time boundaries, comprehensiveness). They are also used to make explicit the intended audience and actors, stakeholders and interested parties. These are based in LCA methods (Arushanyan et al. 2017:25).

(1.2) Defining environmental and social aspects to be assessed: the selection of aspects has to be relevant to the scope, understandable for all parties of the assessment and not redundant to each other. Examples of different sets of aspects are presented. A remark is made highlighting the importance of consumption perspective and life cycle assessment for the selection.

(2.1) Collecting data on the current state: in the assessment, the information of the scenarios will be compared with current situation for each aspect of assessment.

(2.2) Defining contextual factors: these mean information that is requested from the scenarios description for the assessment. Contextual factors might cover broad issues (e.g. transport) and thus need contextual sub-factors (e.g. public/private transport share).

(2.3) Gathering relevant information from scenario descriptions: the information should also be aggregated per contextual factor. When crucial variables might have been left open by the scenario, it might be necessary to work with different alternatives.

(3.1) Interrelation analysis: contextual factors are matched with environmental and social aspects. Direct interrelations are identified. In those interre-

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 (1.1) Defining goal and scope of the      (1.2) Defining environmental and social            |
             assessment                          aspects to be assessed                       |
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 (2.1) Collecting data on the current state   (2.2) Defining contextual factors    (2.3) Gathering relevant information from
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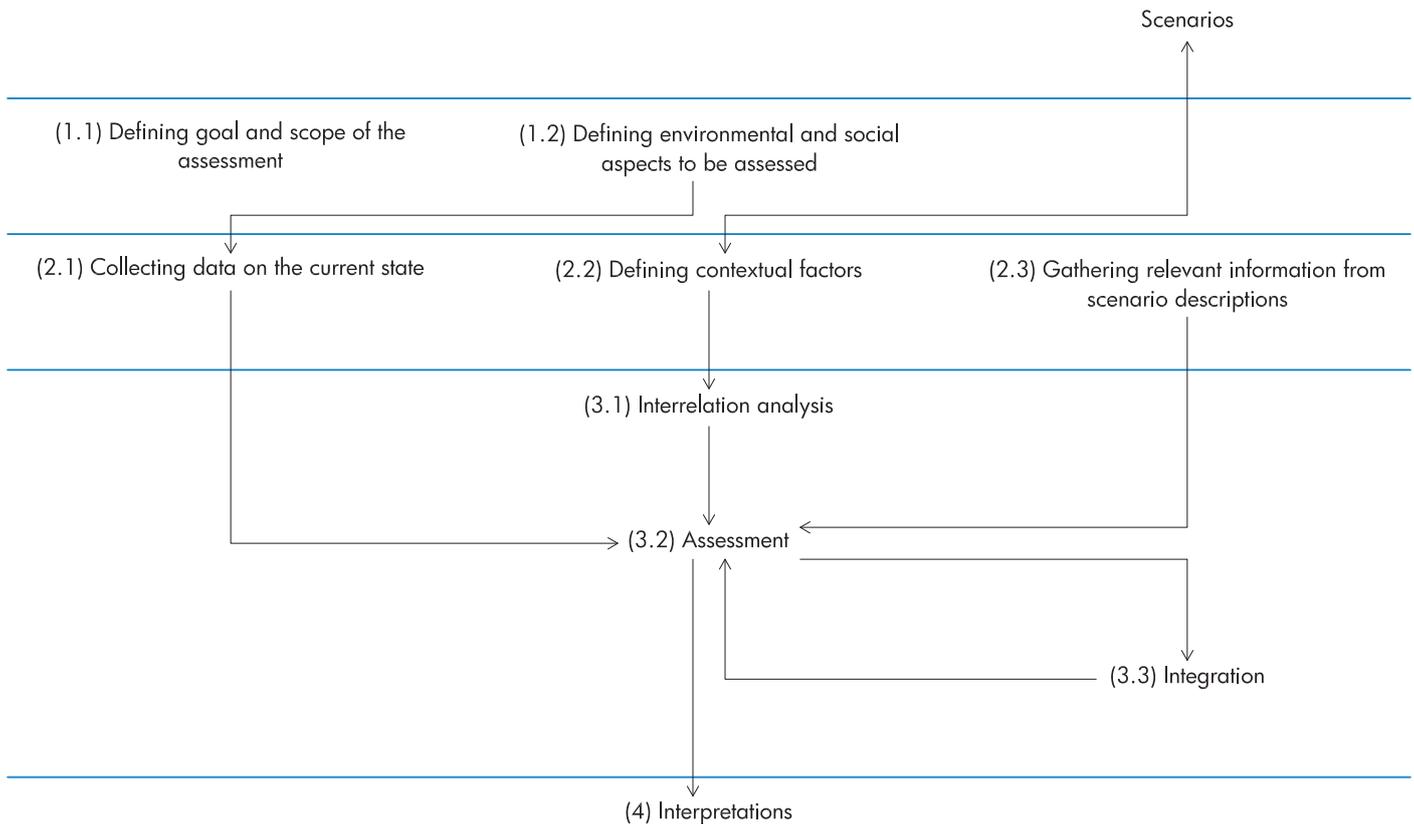
Figure 1. Overview of SAFS. The main steps are iterative. Based on Arushanyan et al. 2017.

lations, aspects are considered in isolation and compared to today, assuming the rest of the aspects remain unchanged.

(3.2) Assessment: results are aggregated into qualitative results per aspect. They are presented through opportunities for improvement or risks of negative developments.

(3.3) Integration: environmental and social factors combined. New contextual factors combining environmental and social aspects are created in order to perform a second loop of assessment. They mainly discuss access to natural resources.

(4) Interpretations: includes a broad discussion regarding goal fulfilments and selection, data gaps, uncertainties and assumptions.

Integrating the doughnut

In order to better reflect and communicate the results of the assessment, a modification to SAFS is introduced. The selection of aspects and the presentation of results will be done in the format of a doughnut (Raworth 2012). This format is a powerful and intuitive representation of a good number of aspects that all together give a thorough overview of sustainability.

The doughnut comes as an adaptation of the previously presented planetary boundaries (Rockström et al. 2009). The planetary boundaries define an environmental ceiling for humanity. This ceiling is composed by the thresholds that "should not be transgressed if we are to avoid unacceptable global environmental change" (ibid.:para. 2). The space within the thresholds represents the safe operating space for humanity. Raworth (2012) adds a social foundation to this. The foundation is composed by fundamental human rights that enable the people "to lead lives of dignity and opportunity" (Ibid.:9). What is left between the social foundation and the environmental ceiling is the "safe and just space for humanity" (Ibid.:15). It was initially discussed in an international level, but examples also exist of the application of this formal in smaller, national levels (e.g. Sayers, Trebeck & Stuart 2014) (see Fig. 2).

The doughnut contemplates only social and environmental aspects. It looks upon economics as a tool and not an end itself (Raworth 2012:8), which is shared by the assessment method (Arushanyan et
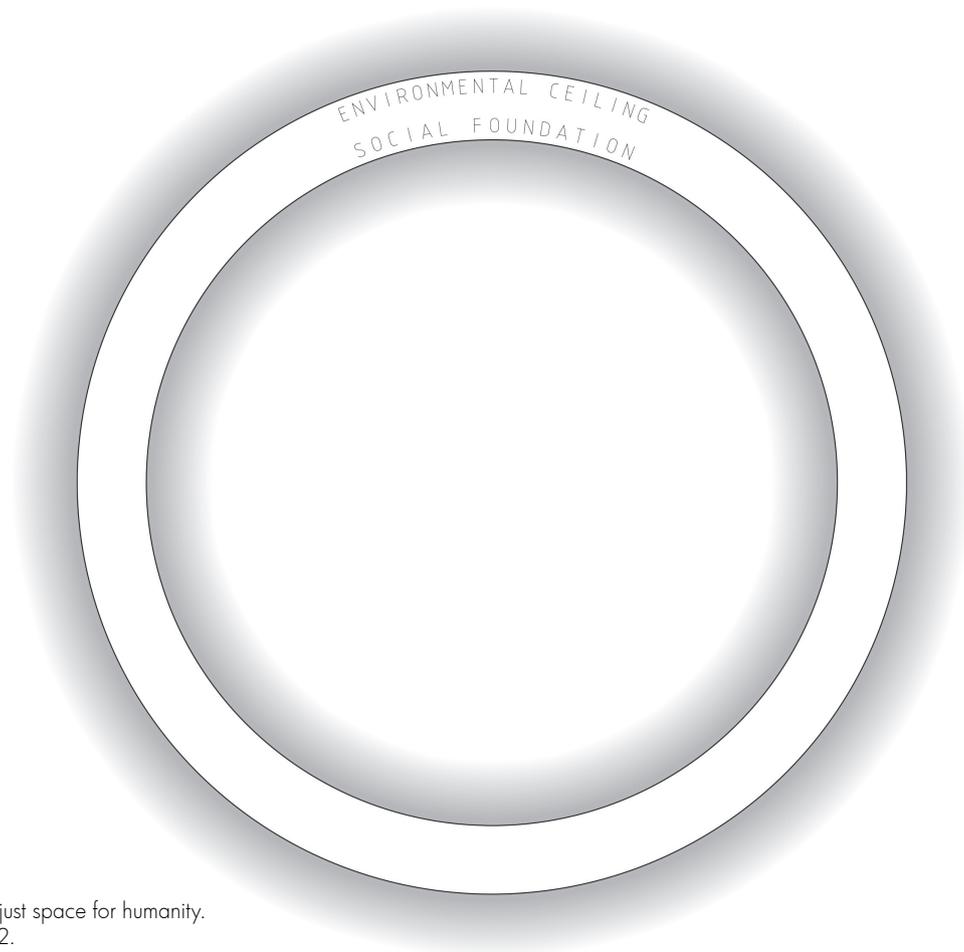
Figure 2. The safe and just space for humanity.
Based on Raworth 2012.

al. 2017:24). The fact that the doughnut is based on thresholds makes it very intuitive to the reader, similarly to the flag model used by Nijkamp & Vreeker (2000). Yet the doughnut format is more complex. It does not only inform if the threshold is trespassed or not, but also gives an idea about how far the thresholds are from current state.

This modification affects one of the initial steps of SAFS, the definition of environmental and social aspects to be assessed (numbered 1.2). It improves it by providing an overarching graphic representation. This representation puts the individual aspects in a context, among others, and it gives an intuitive image of the current state of that aspect. Displaying the dimension of the challenges in every aspect side by side with others provides an easy understanding of the relative size of the challenges. It also helps to discuss possible priorities. Modification also takes place in the last step: interpretation (numbered 4). Here, the risks and opportunities can be discussed

keeping into consideration the size of the problems and the relation of the currents state with the thresholds. This can help discuss trade-offs, synergies and give an overview of the possible consequences of the scenarios for different assessment aspects. Current state of the problems in every area are kept in grey and pushed to the background. The risks and opportunities are displayed within the space every assessment aspect has with a colour code in order to make it more accessible. The assessment for every aspect is summarized in *opportunity, slight opportunity, unclear, slight risk* and *risk*. The interior of the circle is only displayed green when the opportunities clearly outweigh the risks (*opportunity*). When the opposite happens (*risk*), the space outside the current state area is displayed red. Yellow is used for *unclear* assessment. Gradients are used for *slight risk* and *slight opportunity* situations. Due to uncertainties and lack of data, some aspects of assessment are displayed differently. Adaptations should be made for those situations.

ANALYSIS: SCOPING

This is the first step of the assessment, according to SAFS methodology. It is divided in two parts. The first one consists in setting the goal and delimiting the scope of the analysis. To do so, a set of questions are to be made explicit. The answer to some of these questions can be done in parallel with the scenario creation or it can be predetermined by the scenarios if they are written before the assessment. The latter is the case here. The scenario creation can be an iterative process. In that sense, the input from a sustainability assessment could be useful to improve and refine the scenarios. The second step consists in the selection of aspects that will be assessed.

Goal and scope of the analysis
Here, the set of questions suggested by SAFS and inspired by ISO (2006) guidelines for LCA methodology will be presented and answered:

· *What is the goal of the study? What questions is it aiming to answer?*
Perform a sustainability assessment of qualitative future scenarios. These scenarios explore "what could happen in Swedish society when growth is not seen as an end in itself, but the goal is instead the qualities that society might wish to achieve" (Svenfelt et al. 2015:3)

· *What is the intended audience for the results presentation? Who are the actors, stakeholders and interested parties?*
In the first place, those involved or interested in the project. Both researchers and social partners, the latter including four municipalities, two initiatives with a focus on sustainability and three agencies or regional entities. On a broader sense, the results could be of interest to citizens, planners and decision makers in Sweden. Finally, to a lesser extent, practitioners and researchers interested in scenario assessment, particularly of multi-target scenarios.

· *What level of comprehensiveness is necessary?*
The comprehensiveness level is marked by the given scenarios.

· *What environmental and social aspects should be assessed?*
This question will be answered in the next stage.

· *What are the geographical and time boundaries for the study? For example a specific region/country/city, 20/50/100 years in the future. This can only be defined if done in parallel with scenario generation; otherwise, this is pre-defined by the scenarios to be assessed.*
Predetermined by the scenarios. The scenarios are limited to Swedish borders even though there is a short description of the development outside them, and take place in the year 2050.

· *Is there any specific focus area to be considered (e.g. ICT societies, transport planning, eating practices)? Even though the assessment is performed for a whole society, different angles can be taken for a more in-depth discussion regarding the special focus.*
One of the ultimate goals of the scenario creation is to "develop strategies and action programmes that can be used for sustainable urban planning and building in Sweden" (Svenfelt et al. 2015:4). The understanding of sustainable planning and building includes general description of the interplay between the built environment and society. This is particularly relevant, as to achieve the normative goals, it can be argued that general changes in society are needed.

Considerations for the selection of aspects of assessment
For the selection of *aspects for the assessment*, the fact that sustainability is itself a very wide concept cannot be overlooked. The aspects of assessment are the different topics to be assessed, in this case, separate aspects that are necessary to sustainability. Examples of these could be greenhouse gases (GHG) emissions, biodiversity or social equality. The selection should be wide enough to be able to claim it is sustainability assessment. At the same time, operationalization is an important factor: a too wide array would make the assessment task unreasonably time consuming. It is important to select an array of aspects that is wide enough to *cover* sustainability, but precise enough to keep the weight of the task within reasonable levels.

The aspects should be selected taking into consideration that they have to be particularly relevant for this specific assessment. First, they should respond to the location of the assessment. In this case, as described before, within Swedish borders. Second, they should also be relevant in time. It is possible that aspects that are relevant today might not be relevant by the time of the scenarios. Finally, they should be relevant in the scenario itself. This is particularly important for normative transforming sce-

narios. Two examples of assessment in explorative strategic scenarios have been described (Sheate et al. and Nijkamp & Vreeker). In those, there were no major trend breaks and current logics and dynamics applied. This can imply that aspects of assessment selected thinking in current time could be adequate in the scenarios. On the contrary, the scenarios assessed here have different logics, which will be necessary to consider. However, other perspectives in this regard should be acknowledged. It could also be argued that the topics that are relevant for society today are at least interesting to look into in futures scenarios (Finnveden & Fauré 2017), but this is not the approach taken here.

Normative goals for the scenarios

The normative goals are the point of departure of the scenarios, they are the goals the scenarios aim to fulfil. The set of goals for the scenarios were a set of "sustainability goals in a Swedish degrowth/no-growth context" (Fauré et al. 2016), keeping in mind the horizon year at 2050. These normative goals were selected in a participatory process and further discussed in the article mentioned. Four goals resulted of it, two social and two environmental. They will now be exposed:

Climate change goal:
· Sweden is to be fossil-free by 2050, i.e., no fossil fuels are used as fuels or in industrial processes.
· A maximum of 0.82 tons CO_2 equivalents (GHG) consumptive emissions per capita per year in Sweden.

Land use goal:
· The per capita land area used for final consumption does not exceed the global biocapacity.

Distribution of power, influence and participation in society goal
· All residents in Sweden, regardless of, for example, gender, gender expression, sexual orientation, ethnicity and religious affiliation, age, disability, class and income level, should be entitled to participate in and influence political choices and decision-making that affect their lives.

Welfare/resource security goal:
· 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.

· The distribution of the same resources and services should be made according to some fairness principle.

The authors noted the "tricky but important discussions about the merits and disadvantages of dividing sustainability issues into [...] distinct parameters" (Fauré et al. 2016:12). This separation might give the impression of different compartmentalized and disconnected problems. This is far from reality and also conceals the connections between the different parameters. Still, this separation will be necessary to operationalize the concept.

Top-down sets of aspects

The review of some established sets of aspects can be useful for the selection of the aspects of assessment. Five sets are included. The reason for this selection has been either their relevance, being put forward by important actors, or being recommended in the SAFS method.

The United Nations released the Sustainable Development Goals (SDGs) in 2015 (UN 2015), which cover sustainability in a wide perspective, including social, environmental and economic aspects in a global perspective. This global perspective makes them rather general, making it necessary to bring them down to a more site specific state and local level (UN 2015). In the level of the Swedish state, The Swedish Environmental Protection Agency - Naturvårdsverket also has their own goals: the Environmental Quality Objectives (EQOs) (SEPA 2013). In this case the perspective is already state specific. This translates into a cautiously cherry-picked array and to goals that develop from the current state and possibilities of the Swedish state. As indicated in their name, these are not sustainability goals, only considering environmental aspects. Both of these are mentioned in the top-down approach in SAFS (Arushanyan et al. 2017:26).

A different set of aspects can be Raworth's doughnut (Raworth 2012), which has a global perspective, proposing a social foundation and an environmental ceiling. This is adequate given the author's perspective, where economics are looked upon as a tool for environmental and social goals (Raworth 2012:8). This is also in tune with the scenarios assessed, where economic growth as a social priority is put out of the equation (ibid.), and with SAFS, where the economic dimension is excluded from the assessment framework (Arushanyan et al. 2017:24).

SAFS also suggests two more sources in the social side. Regarding human well-being, the Guidelines for Social Life Cycle Assessment (S-LCA) of Products (Benoît & Mazijn 2009) is recommended. Unlike the previous, which presented bold goals (SDGs and EQOs) or thresholds that should not but are currently trespassed (doughnut), this document has a different more specific perspective. It deals with the assessment of products and to do so, identifies the different stakeholders in the life cycle of those. For each stakeholder, a number of subcategories are named. Those subcategories are described as "socially significant themes or attributes" (ibid.:44), and can be linked to different indicators or units of measure. Even if sometimes wide or in need of further elaboration or definition by the user, these subcategories can be useful when aiming to build an own set of goals.

For equality and justice aspects, SAFS' recommendation is a revision of themes and assessment methods for social sustainability, dividing them into traditional and emerging. The article where the revision is made departs from the different definitions of social sustainability. Social sustainability is described as a topic that has gained attention recently but on which there is no consensus, as it is being approached from many disciplines at the same time (Colantonio 2009:865-868). The paper gives also a review of the implementation of those themes.

A comparison of these sets of aspects with the normative goals can be useful. This comparison can first, reflect how the normative goals are quite comprehensive, as they can possibly be tied to many aspects in different sets. And second, give a further interpretation of those sets of aspects. To do this, five charts are elaborated.

These charts have been produced by reading the descriptions of the different aspects in each set and elucidating if they could be related to any of the normative goals. It does not necessarily mean that the fulfilment of the normative goals would turn into the accomplishment of the goals in the aspect tied to it. This direct connection could be the case sometimes, but in other occasions, it could mean the normative goal would be a big but not a definite step towards the fulfilment of the aspect. This kind of link has been represented with a straight line. While the charts were produced, it was also the case that the aspects were wider than the definition of the normative goals. In those cases the link was represented with a dotted line. Sometimes, it has been hard to make a link between them, because they are formulated in different levels. Some of them are pressures, other discuss states and other talk about impacts (Finnveden & Fauré 2017).

As the chart shows (see Fig. 3), some of the SDGs cover at the same time social and environmental aspects (e.g. Goal 7: Affordable clean energy) however, most SDGs could be prominently placed into either of those. At the same time, it has been argued that the SDGs strongly link the reduction of poverty and inequalities (Goal 1: No hunger, Goal 10: Reduced inequalities) to economic growth when being implemented (Hedström 2016), which is relevant to this assessment since economic growth is uncertain in the scenarios.

The EQOs address primarily environmental sustainability with an (at least partly) anthropocentric perspective. This can be exemplified on the discussion of the effects of environmental deprivation for humankind (e.g. relating climate impact to food supply in the first EQO). The chart shows (see Fig. 4) how some of the objectives refer as well to social aspects. At the same time, the second normative goal (linked to global biocapacity) can be linked to many objectives.

Raworth's doughnut makes the distinction between environmental and social aspects. This division matches with the social and environmental goals (see Fig. 5). In the former, the second normative goal, linked to global biocapacity, can be related to many aspects. In the latter, the first part of the fourth normative goal can also be linked to many aspects. The subcategories in the guidelines for S-LCA of products, address only social aspects (see Fig. 6), and again, the first part of the fourth normative goal can be linked to many aspects. Still, it has been hard to find a link for the subcategories under the actor categories *consumer*, *society* and *value chain*. Finally, the compilation made by Colantonio also addresses only social aspects (see Fig. 7). Stronger links can be drawn to traditional themes, while links to emerging themes are less. This might have to do with the fact that the emerging themes are quite abstract. The traditional themes can be defined more easily and, for instance, indicators for some them are common.
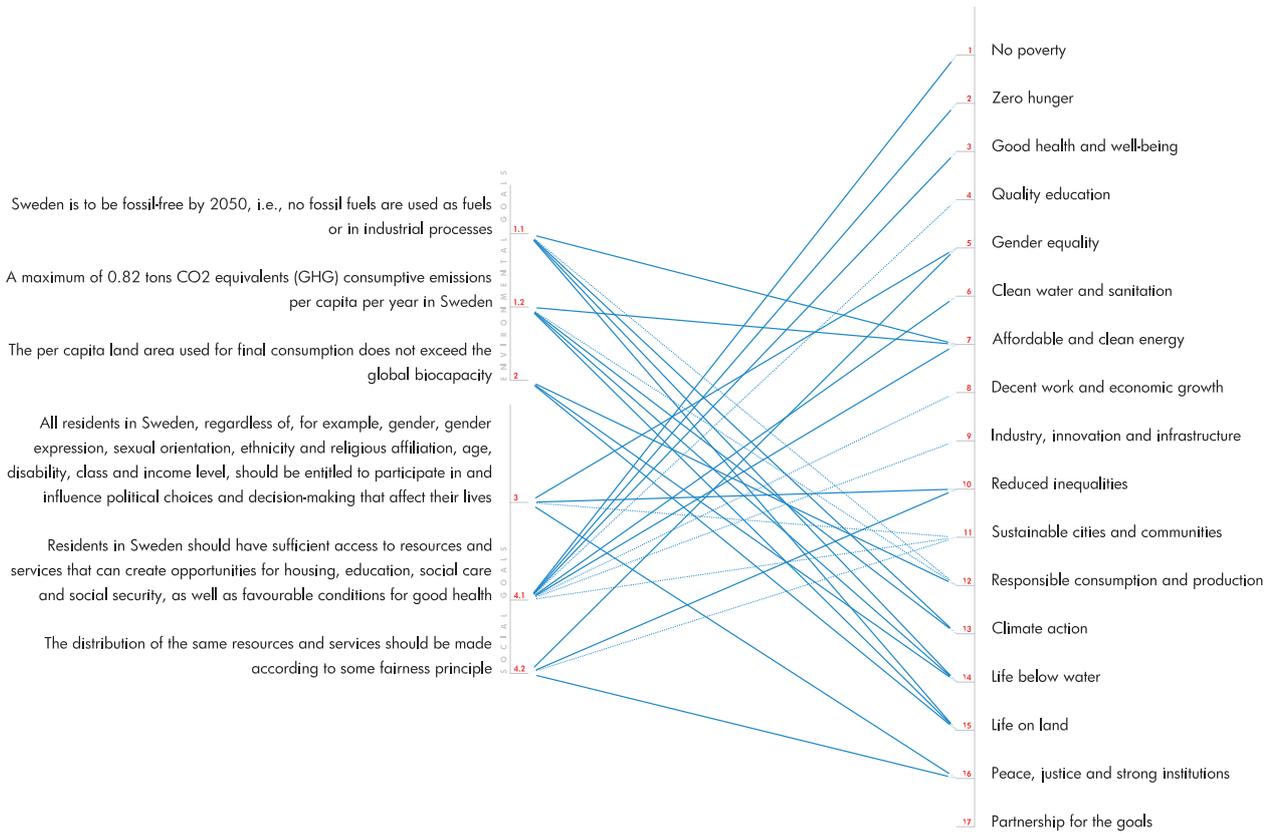
Figure 3. Normative goals compared with UN's
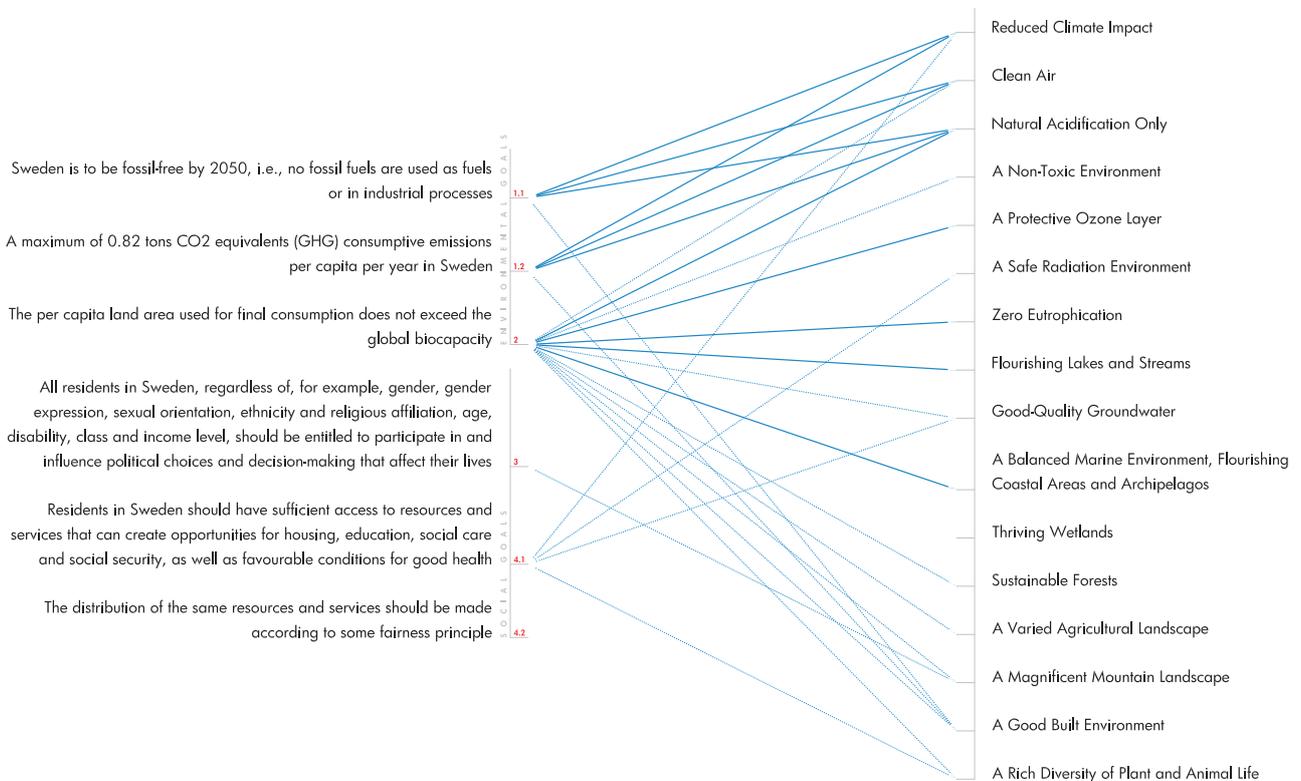Sustainable Development Goals.

Figure 4. Normative goals compared with SEPA's
Environmental Quality Objectives.

In the charts, only the names of the possible assessment aspects are shown. During the elaboration of these, it was noted that under the same name, different definitions could take place. At the same time, a definition could be broader than one would initially expect by the title. This sometimes made the aspects overlap and be related to other aspects within the same set. The necessity to summarize one aspect under a title also affected the construction of the charts: different definitions under similar names make the link to the normative goals appear in some sets of aspects but not in others. However, the normative goals can be linked to many aspects of assessment in the different sets. This means that the normative goals are really comprehensive despite being only four.

Building the doughnut

The doughnut format can be divided in two parts: the *social foundation* and the *environmental ceiling.* Each of them composed by a number of social or environmental aspects. For this assessment, the Environmental Quality Objectives (SEPA 2013) form the environmental ceiling. They are a comprehensive array of aspects that respond in space to the scenarios and have a long term perspective. All the parameters are relevant on the scenarios. Operationalization can be facilitated by a continuous follow-up on them (compiled in miljomal.se) and they are precisely defined, discussing the goals and main challenges within each aspect of assessment.

Regarding the social foundation, there is no clear set of aspects that could be taken, analogue to the EQOs. This might have to do with the fact that "[e]nvironmental and economic issues dominated the sustainable development debate at its beginning whilst it is only in the late 1990s that social issues were taken into account within the sustainability agenda" (Colantonio 2009:865). The most comprehensive set of aspects proposed by national institutions that are related to social sustainability are the Folkhälsopolitiska mål (eng. public health goals) (Finnveden & Fauré 2017). Still, they are not comprehensive enough to form the social foundation.

An own social foundation is created for this assessment. This is done departing from Raworth's doughnut (Raworth 2012), which can be seen as a comprehensive description of social sustainability. However, the aspects there focus on a global scale. To complement this, the Scottish doughnut (Sayers, Trebeck & Stuart 2014) will also be taken as a

reference. The creation of a social foundation in this case narrows down the aspects to a national scale in a country that can be argued to have similar conditions to Sweden. To do so, involvement with different social actors took place, introducing new relevant aspects (Sayers, Trebeck & Stuart 2014:17-18). Aspects of assessment are selected from those two sources, but two more sets are used as a reference. These are helpful when putting forward a precise definition and aiming to operationalization. They are the Folkhälsopolitiska mål (Folkhälsomyndigheten 2008) and different Swedish Government goals in specific areas.

The first six aspects of Raworth's and the Scottish doughnut coincide and therefore are included (*food security, income, healthcare, education, energy* and *voice*). Four of them can also be tied to different Folkhälsopolitiska mål (see Table 1). In order to better suit the logic of the scenarios, income is renamed to *poverty. Gender equality* is considered relevant to explore in the scenarios because deep changes in society such as those in the scenarios can affect current gender inequalities, either towards equity or bigger inequalities. This is supported by the governmental objective on gender equality. *Social equality* does not appear in the Scottish doughnut; however, it is selected for similar reasons. Deep societal changes can affect current inequalities. *Jobs*, on the contrary, appears in both compilations. Despite of this, this is not selected as a parameter. The logic of employment as a mean to social security and prosperity is not valid in the scenarios (based on Ringenson 2014), where these ends are met by other means. The formulation of this aspect in the Scottish doughnut could be a hint to reformulating this aspect in a way that could be relevant in the scenarios. There, it is described as "people lacking a satisfying job" (Sayers, Trebeck & Stuart 2014:21), which could be reformulated as "people lacking satisfying labour" to make it fit into the scenarios. However, this would make paid and unpaid labour be considered, which would be too broad for this assessment. *Water and sanitation* is not selected as an aspect. It only appears in Raworth's doughnut, where it is formulated as a matter to access to those. Access to good quality groundwater could be an aspect worth considering in the scenarios, but it is already included as an EQO and therefore would be redundant here. *Resilience* does not appear in the Scottish doughnut, and its formulation and operationalization in Raworth's is unclear. For these reasons, it is not included as an aspect of assessment. *Connectivity,*
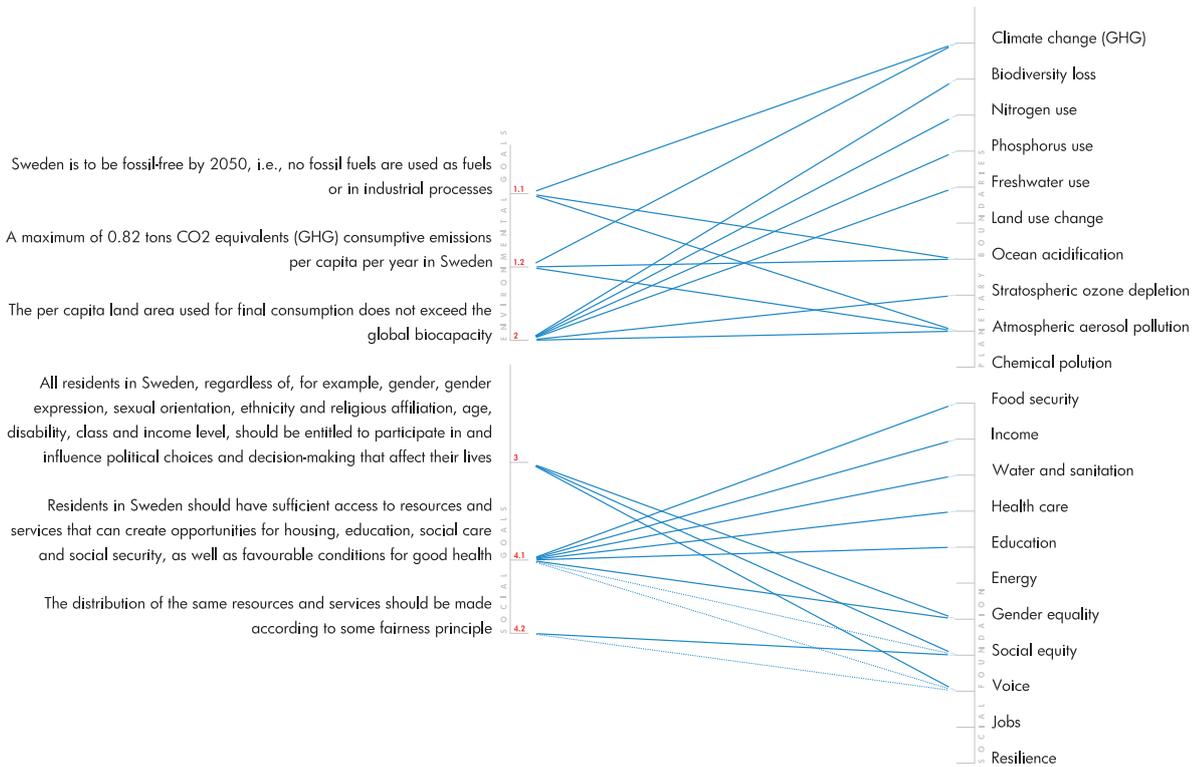
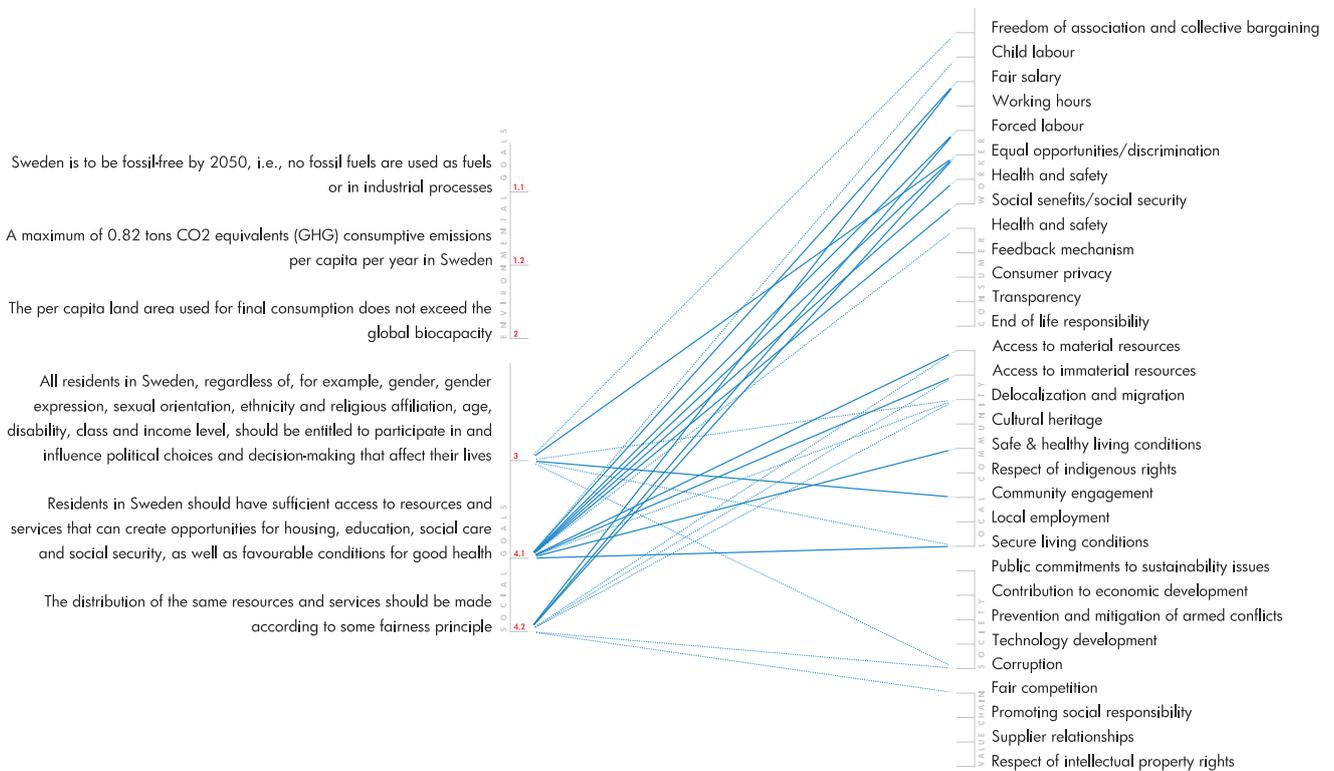Figure 5. Normative goals compared with Raworth´s doughnut aspects.

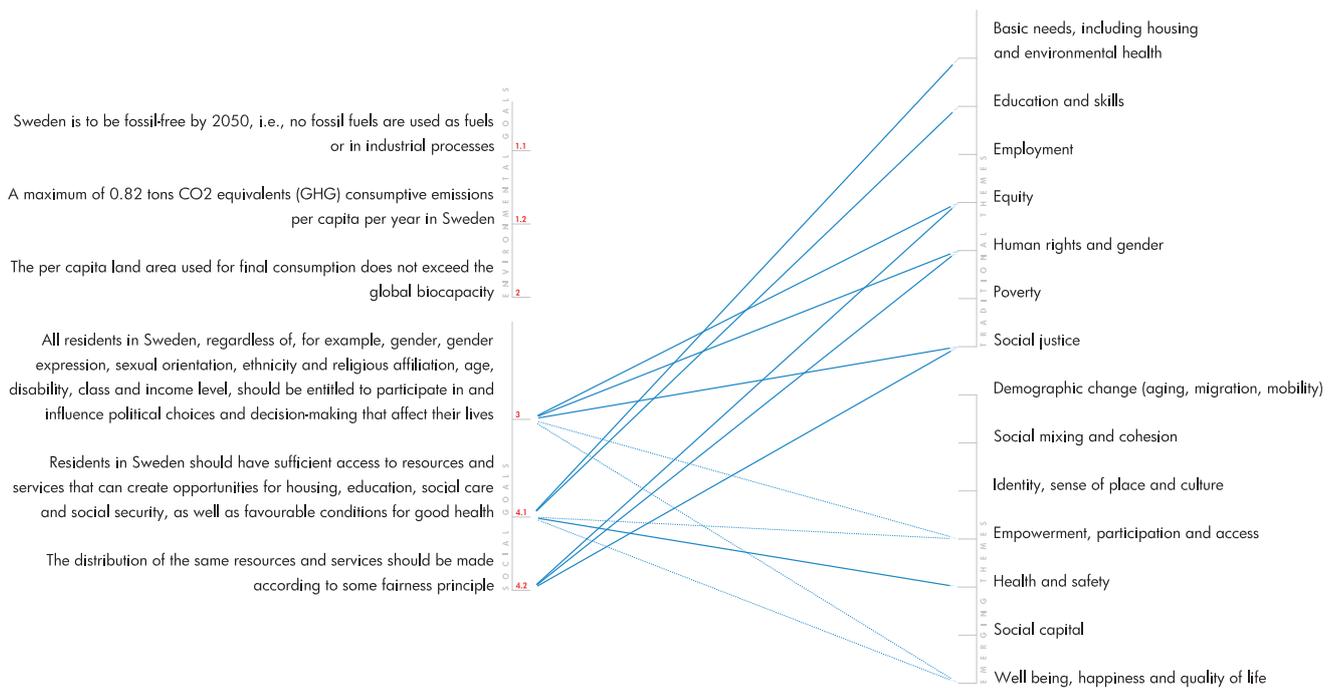Figure 6. Normative goals compared with Social LCA´s subfactors.

Figure 7. Normative goals compared with Colantonio's traditional and emerging social sustainability topics.

housing, and *sense of support* are all three included in the Scottish doughnut, but missing in Raworth's. In the three cases, there are government goals addressing them. They are included. *Crime* also appears only in the Scottish doughnut, but similarly to gender and social equality, it is considered relevant to be assessed in scenarios where deep changes occur.

The assessment aspects are chosen for Sweden. To maintain consumption and life cycle perspectives, data has to be chosen carefully in the next stage. One example of this can be climate impact, where data (CO_2-eq emissions, in that case) with those perspectives can be found. Regarding the social foundation, additional aspects will be included. The mentioned Guidelines for S-LCA of Products (Benoît & Mazijn 2009) has two sets of subcategories that, added to the social foundation will enable consumption and life cycle perspectives in the assessment. These subcategories are those under *worker* and *local community.*

Filling the doughnut
In order to illustrate the doughnut, numerical indicators together with thresholds have to be chosen. For the environmental ceiling, the website miljömål.se has a compilation of indicators linked to every EQO

that can be helpful. Indicators have been chosen among those related to challenges described in the definition of every EQO (SEPA 2013). Among those relevant, the ones with a defined threshold or goals have been selected. A description of each indicator selected and its threshold follows.

For *climate impact,* a different source from miljömål.se is used. The Swedish Environmental Protection Agency - Naturvårdsverket (SEPA 2012) has calculated CO_2-equivalent emissions for Sweden taking into account consumption and life cycle perspectives. The emissions per capita are calculated using that source. The threshold for this parameter is the normative goal for the scenarios, 0.82 tons CO_2 equivalents (GHG) consumptive emissions per capita per year. For *clean air*, the description emphasizes the risk of polluted air to human health, but also to plants, animals and heritage. In the description of the main challenges, pollution derived from road traffic is highlighted. Population disturbed by car emissions inside or close to home is taken as an indicator. The absence of disturbance is taken as a goal. Discussing *natural acidification*, emphasis is put on the limits that can be tolerated by soil and water. The percentage of acid forests and lakes is taken. Zero is marked as a threshold. As for a

	Raworth's doughnut	Scottish doughnut	Folkhälsopolitiska mål	Swedish Government
1	Food security	Food	Food habits and safe food	
2	Income	Income	Economic and social security	
3	Healthcare	Heath	Health promotion and health care	
4	Education	Education		
5	Energy	Energy		
6	Voice	Governance	Participation and influence in society	
7	Gender equality			Gender equity goal
8	Social equality			
	Jobs	Work		
	Water and sanitation			
	Resilience			
9		Connectivity		IT policy goal
10		Crime		
11		Housing		Dweling and building goal
		Local environment		
12		Sense of support		Social care goal

Table 1. Aspects included in Raworth's and the Scottish dougnut, together other national goals.

non-toxic environment, much data can be found. Still, it is hard to find a threshold. For this reason, arable land certified as ecologic is chosen. The goal established is 20% of the total while the current percentage is close to 16%. The amount of certified arable land under the threshold is taken as indicator. Regarding *ozone layer,* the indicator and threshold is taken from the planetary boundaries (Rockström et al. 2009). For *safe radiation environment,* the focus is on the effect of radiation for humans and biodiversity. Skin cancer cases is taken as an indicator, where there already exists a defined threshold of 800 cases a year. For *zero eutrophication,* ammonia pollution is selected for being the only one of the three available indicators with an established threshold. The threshold is a maximum emission of 50.000 tons per year. For *flourishing lakes and streams* and *mountain landscape,* it was hard to find a good indicator with a defined threshold. However, it is stated that the goals will not be fulfilled (SEPA 2017a). For *good-quality groundwater,* contamination of groundwater is one highlighted aspect. Groundwater without protection area is selected as an indicator. Zero is selected as a goal. For *a balanced marine environment,* preservation of biological diversity and sustainable productive capacity in the North and Baltic Sea are two main points, where the Baltic is the most damaged of both. Species near threatened, threatened or worse in the Baltic is selected as an indicator. Zero is selected as a goal. Regarding *wetlands,* preservation is a main point. Established wetland area is selected as an

indicator. There is a goal to get to 12.000 ha established wetland area. As for *sustainable forests,* they are described as valuable for biological production, as well as cultural heritage and recreational values. Preservation is pointed out as a main challenge. Percentage of forests with damage or severe damage is taken as an indicator. As there is no proposed goal, zero is taken as a goal. *Varied agricultural landscape* includes many aspects. One of the indicators provided is the area of hayfield attached to environmental compensation. There is a goal for this of 10.000 ha. For *a good built environment,* the impacts of transport noise and bad indoor environment are among the key challenges. Indicators selected are population disturbed by poor indoors environment and by traffic noise. The goal used is zero. For *diversity of plant and animal life,* preservation of biological diversity is the main point in this aspect. The indicator taken here is the global extinction rate from the planetary boundaries (Rckström et al. 2009). A compilation of the indicators can be seen in Table 2. Further comments and detailed sources can be found in Appendix 1.

For the social foundation, no overarching source such as miljömål.se is found. Therefore, different sources are consulted. The most common references have been Statistics Sweden - Statistiska centralbyrån and a report from OECD gathering social indicators (OECD 2014). In general, the selection of specific indicators has been conditioned by availability, but kept close to the formulations in the global (Raworth

	Assessment aspect	Status	Parameter	Year
1	Reduced Climate Impact	1296.2%	CO_2-equivalent emissions over normative goal	2008
2	Clean Air	6.0%	Population disturbed by car emissions inside or close to home	2007
3	Natural Acidification Only	27.8% / 10.0%	Acid forests / Acid lakes	2010/2016
4	A Non-Toxic Environment	20.2%	Arable land certified ecologic under the objective	2014
5	A Protective Ozone Layer	276/283	Global concentration of ozone and threshold (Dobson unit)	2009
6	A Safe Radiation Environment	493.9%	Skin cancer cases over threshold	2015
7	Zero Eutrophication	107.5%	Ammonia emissions over threshold	2014
8	Flourishing Lakes and Streams	-	The goals will not be fulfilled	
9	Good-Quality Groundwater	28.9%	Underground water without protection area	2016
10	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos	27.0%	Species near threatened, threatened or worse in the Baltic	2013
11	Thriving Wetlands	52.42%	Established wetland area under the objective	2011
12	Sustainable Forests	21.00%	Damaged or severely damaged forests	2015
13	A Varied Agricultural Landscape	13.17%	Area providing environmental compensation under the objective	2014
14	A Magnificent Mountain Landscape	-	The goals will not be fulfilled	
15	A Good Built Environment	16.9% / 14.4%	Population disturbed by poor indoors environment / by traffic noise	2007
16	A Rich Diversity of Plant and Animal Life	>100/10	Global extinction rate	2009

Table 2. Aspects of assessment composing the environmental ceiling, together with their indicators.

2012) and Scottish doughnut (Sayers, Trebeck & Stuart 2014). Again, a description of each indicator selected and its threshold follows.

For *food security*, the indicator selected is the percentage of people who affirms having not had money to by food they or their families needed in the past 12 months. The goal used is zero. For *poverty*, the indicator selected is relative poverty. The goal used is zero. For *voice*, the indicator is the amount of people that affirm not to trust the national government. The goal used is zero. For *gender equality*, the indicator used is the salary gap. The goal used is zero. For *social equality*, the indicator used is the difference in life expectancy between different municipalities in Sweden. The indicator displays how long is the life of those with longer life expectancy compared to those with shorter. The goal used is zero. For *crime*, the indicator selected is the percentage of people who affirms to feel insecure alone at night. The goal used is zero. For *housing*, the indicator selected is the overcrowding rate in cities for population under 18. The goal used is zero. For *healthcare, education, energy, connectivity* and *sense of support* it was hard to find a suitable definition, so they are marked as "to be determined". In the case of *energy*, there exists information towards

a state-specific definition of energetic poverty (Johansson 2017). Data for the indicators connected to S-LCA has not been found. The indicators are compiled in Table 3. Comments and sources on the can be found in Appendix 2.

The doughnut can be displayed with the available data (see Fig. 8). However, it must be noted that even if efforts have been made to offer choose relevant indicators, those selected are not necessarily the most relevant for every aspect of assessment. In any case, they are useful in this assessment framework to display how the assessment can be done and they can be a first step for the baseline data of every aspect of assessment.

Overlap: normative goals and aspects of assessment

In *Beyond GDP growth*, the scenarios were created normative backcasting (Svenfelt et al. 2015:4). This means that by definition, the scenarios should fulfil the normative goals used for their generation (Börjesson et al. 2005:21). In backcasting scenarios it is yet not common to have more than one normative goal, only focusing on achieving one particular goal and commonly not discussing potential conflicts with other sustainability objectives (Svenfelt et al.

	Assessment aspect	Status	Parameter	Year
1	Food security	6.2%	Population with not enough money for food	2012
2	Poverty	9.1%	Relative poverty	2010
3	Healthcare	-	To be determined	
4	Education	-	To be determined	
5	Energy	-	To be determined	
6	Voice	35.0%	Population who do not trust the government	2012
7	Gender equality	13.0%	Salary gap	2015
8	Social equality	8.1%	Years of life expectancy difference	2012/2016
9	Connectivity	-	To be determined	
10	Crime	15.0%	Population who feel insecure alone out at night	2015
11	Housing	18.5%	Overcrowding rate in cities for people under 18	2016
12	Sense of support	-	To be determined	

Table 3. Aspects of assessment composing the social foundation, together with their indicators.

manuscript:26). Svenfelt et al. (Manuscript:27) argue that this could be tackled with multi-goal backcasting scenarios, helping to identify potential conflicts. However, this kind of multi goal scenarios, where all goals are fulfilled at the same time, can be hard to produce. After a fast review of the current test version (Svenfelt et al. 2015), it can be disputed if the normative goals are entirely fulfilled or not. The normative goals are rather ambitious (Fauré et al. 2016:13). In the production of this kind of scenarios, it is often that an iterative assessment and feedback can lead to improving the scenarios until the normative goals are fulfilled.

An iterative feedback assessing the scenarios against the normative goals is taking place elsewhere (Finnveden & Fauré 2017). This makes it necessary to explore which aspects of assessment could be included in the normative goals in order not to duplicate work. The overlap of the normative goals with the aspects is not always complete, but in many cases a connection strong enough can be made to conclude which aspects of assessment should not be included in this assessment.

The first normative goal states that "no fossil fuels are used as fuels or in industrial processes" and limits consumptive emissions per capita per year in Sweden to a "maximum of 0.82 tons CO_2 equivalents (GHG)". The first EQO, *reduced climate impact,* would be included in this normative goal. Many other EQOs discuss the impact of GHG emissions as part of the challenges for their achievement (e.g. clean air, zero eutrophication). However, this is a partial topic in those, where it cannot be concluded the normative goal includes the assessment aspect.

The second normative goal states that in the scenarios "the per capita land area used for final consumption does not exceed the global biocapacity". Biocapacity is defined as "a measure of the amount of biologically productive land and sea area available to provide the ecosystem services that humanity consumes – our ecological budget or nature's regenerative capacity" (Borucke et al. 2013). *Good-quality groundwater* discusses the provision safe and sustainable drinking water mentioning specific natural processes that could be endangered. This assessment aspect is included in the normative goal.

When going through the EQOs, there are two main groups where the logics of the definitions make them not be included in the second normative goal. The first group are those that could initially be included in this normative goal, but where for this to happen, the normative goal should be applied also outside Swedish borders. For instance, for *natural acidification*: according to the EQOs most acidifying pollutants deposited in Sweden come from other countries. Similarly, *zero eutrophication* and *a protective ozone layer* would be included if the normative goal was applied globally. *A balanced marine environment, flourishing coastal areas and archipelagos,* even mentions seas biocapacity as an objective, but again, the fulfilment of this aspect of assessment is beyond the normative goal. In this group, the normative goal applied in Sweden would not be enough to fulfil the objective within the borders. The second group of EQOs that fall outside the normative goal would be those that are related to preservation. The normative goal is about ecosystem services, but it does not necessarily consider preservation. Examples of this group could be *flourishing lakes and streams, thriving wetlands* or *sustainable forests.*

The third normative goals states that "[a]ll residents in Sweden, regardless of, for example, gender, gender expression, sexual orientation, ethnicity and religious affiliation, age, disability, class and income level, should be entitled to participate in and influence political choices and decision-making that affect their lives". Raworth describes *voice* as "[p]opulation living in countries perceived (in surveys) not to permit political participation or freedom of expression" (Raworth 2012:10). Sayers, Trebeck & Stuart (2014:31-32) reformulate it as *governance* and describe it as perception of the individuals to influence ("have a say") government action. At the same time, the first Folkhälsopolitiska mål describe *participation and influence in society* as one of the most basic conditions for public health (Folkhälsomyndigheten 2008:42). In this stage and for the purpose of this analysis, it can be fair to assume that the normative goal fulfils to a big extent the assessment aspect.

Where this normative goal was developed (Fauré et al. 2016), much emphasis was put on gender equality and issues of discrimination in society. However, the final formulation of the normative goal used to build the scenarios is not enough to assume the assessment aspect of gender equality would be fulfilled. This has to do with the normative goal being formulated as an entitlement (substantive justice), whereas the gender and social equality aspects of assessment are formulated as distributive justice.

Finally, the fourth normative goal is described as follows: "[r]esidents 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". *Food security* is described as the opposite to undernourishment (Raworth 2012) and as being able to afford an adequate diet (Sayers, Trebeck & Stuart 2014). The ninth and tenth Folkhälsopolitiska mål (Folkhälsomyndigheten 2008:90) discuss, in the same direction, good food habits and a healthy diet. Back to the normative goal definition, the formulation of it is rather complicated. "[C]an create opportunities for" can be interpreted as putting the focus on how housing, education et cetera can take different shapes. Following this interpretation, "favourable conditions for good health" are included in the normative goal, which would include food

security. *Healthcare* is defined as access to essential medicines (Raworth 2012), by measuring years of healthy life expectancy (Sayers, Trebeck & Stuart 2014). The sixth Folkhälsopolitiska mål (Folkhälsomyndigheten 2008:73) discusses health promotion and health care. Similarly to food security, healthcare can be included in the normative goal as favourable conditions for good health are mentioned.

Education is discussed in terms of children not enrolled in primary school and illiteracy between 16 and 24 years old population (Raworth 2012) and as adults lacking any formal qualification (Sayers, Trebeck & Stuart 2014). Education can be included in the normative goal. *Energy* is defined as population lacking access to electricity and lacking access to clean cooking facilities (Raworth 2012). Also as fuel poverty, where more than 10% of the income is spent in energy. Sufficient access to housing and favourable conditions for good health should mean that energy, defined in those terms and combined with the first normative goal, would be contained in the normative goals. *Housing* is defined as an aspect of assessment in opposition to overcrowding (Sayers, Trebeck & Stuart 2014). The governmental goal regarding the housing and construction includes "offering a range of dwellings that satisfies consumer demand and needs" (Government 2017a). Both definitions would be included in the normative goal. Finally, *sense of support* is defined as perceived support from family, friends and others (Sayers, Trebeck & Stuart 2014). The governmental goal (Government 2017b) mentions social support by society to those particularly vulnerable, the support and help provided by society to people who are particularly vulnerable. These would be included in the normative goal under social care.

There are also two EQO that are formulated in a way that could be included in this normative goal. The second EQO discusses *clean air* mainly in terms of presenting a risk for human beings, mentioning the effects of it air pollution in healthcare. The seventh describes *a non-toxic environment* in similar terms. However, those are not considered to be included in the normative goal as they also discuss the effect of those to ecosystems, even if in a way lesser extent. The possible fulfilment of these can be illustrated in the doughnut (see Fig. 9).
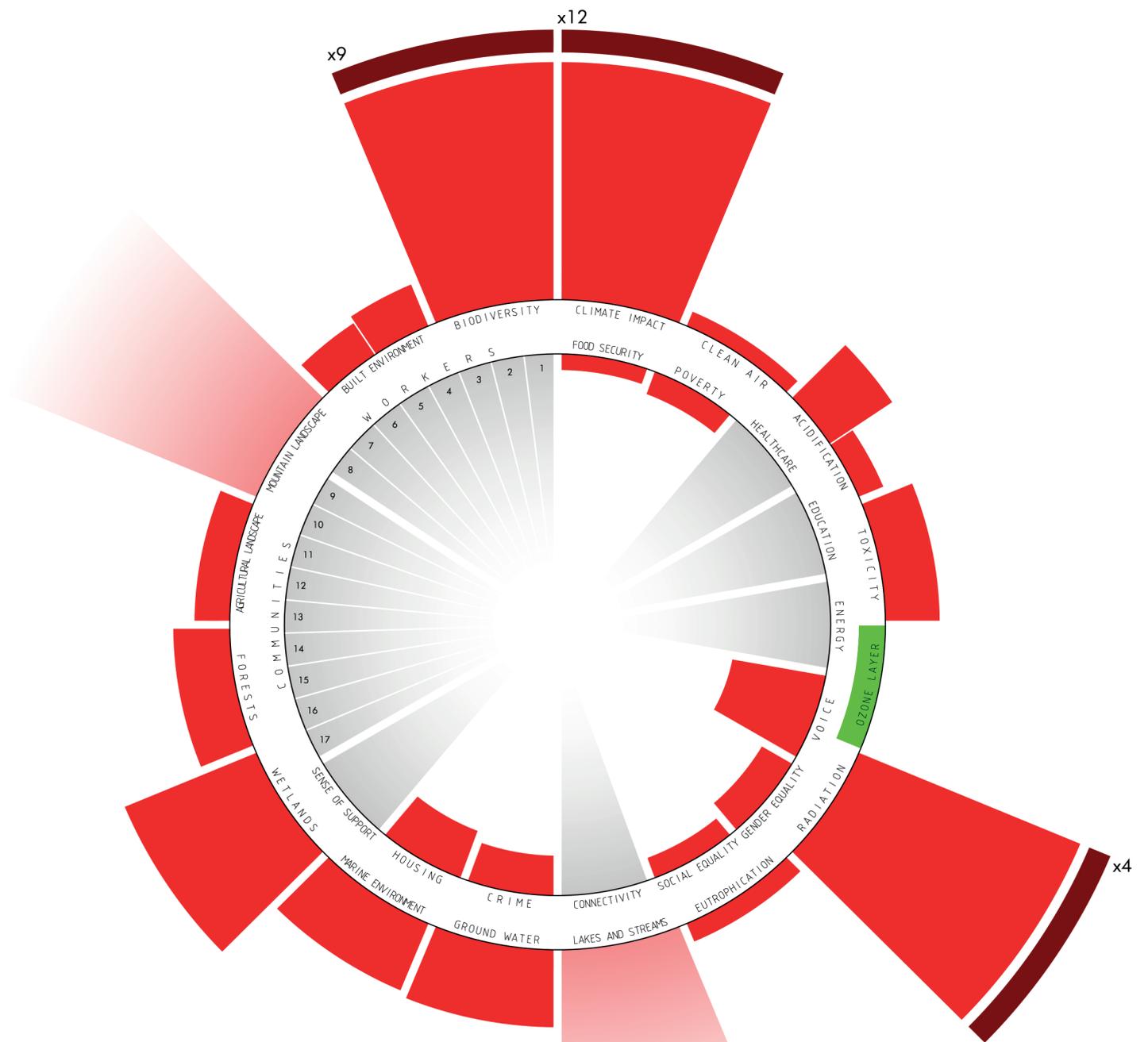
Figure 8. The doughnut.

1: Freedom of association and collective bargaining
2: Child labour
3: Fair salary
4: Working hours
5: Forced labour
6: Equal opportunities/discrimination
7: Health and safety
8: Social senefits/social security

9: Access to material resources
10: Access to immaterial resources
11: Delocalization and migration
12: Cultural heritage
13: Safe & healthy living conditions
14: Respect of indigenous rights
15: Community engagement
16: Local employment
17: Secure living conditions

Figure 9. The dughnut after the achievement of the normative goals.

1: Freedom of association and collective bargaining
2: Child labour
3: Fair salary
4: Working hours
5: Forced labour
6: Equal opportunities/discrimination
7: Health and safety
8: Social senefits/social security

9: Access to material resources
10: Access to immaterial resources
11: Delocalization and migration
12: Cultural heritage
13: Safe & healthy living conditions
14: Respect of indigenous rights
15: Community engagement
16: Local employment
17: Secure living conditions

ANALYSIS: INVENTORY ANALYSIS

The test version of the scenarios is the object of assessment. In this step, the information necessary will be extracted from them according to SAFS. Baseline data on the selected assessment aspects will be done here. In the construction of the doughnut, different sources were mentioned. To facilitate the assessment and make it more relevant, only the most important source will be chosen in the baseline data, basing the assessment aspect in that definition. Current trends will be included to help illustrate the assessment aspects.

Scenarios description

The four scenarios described here are those included in the last test version that was available in English when the assessment started (Svenfelt et al. 2015). This is however not the last version that will appear. The final scenarios as well as updates and other information about the project can be found in the project's website: bortombnptillvaxt.se.

The first scenario described is named *collaborative economy* (Svenfelt et al. 2015:16-27). In the scenario, digitalization has a big role. Technology is accessible and understandable, where open data and digital commons play a big role. This opens possibilities for sustainable solutions to take place. Location does not play such an important role as it does today, but access to nature is an important value. People's role as individuals and professionals is more intertwined than it is today. Physical goods are not so common and are often shared. Regarding energy and production, power and ownership has been transferred from corporation to groups. Private ownership is small. Consumer cooperatives are common, ranging from national to small scale. New business models enable sharing large companies in cooperative forms, as well as coordinating big investments. Export and import takes place mainly for things that cannot be produced locally. No fossil fuels are imported and nuclear energy has been phased out. Energy production is local, based on renewables and biofuels in the same proportion.

The second scenario is called *local self-sufficiency* (Svenfelt et al. 2015:28-37). There, Sweden is highly self-sufficient. Many live in rural areas, scaling down their consumption and income and productive land is highly valued. At the same time, metropolitan areas have sprawled with bigger cultivation areas. There is a big decentralization, both regarding administration and decision-making. Decision-making takes place in a different way in different communities, but with high participation in all cases. People invest a lot of time, often unpaid, on food security, health, education and social care. There is a general tendency towards voluntary simplicity and living within ecosystem's limits. The State has a role putting forward overall laws regarding the welfare system and environmental objectives. Only domestic renewables are used, with a bigger proportion of biofuels than renewables. Energy production takes place at the local level. Knowledge of the local systems is important for resource administration. Social and ecological systems cannot be understood apart.

The third scenario is *automatization for quality of life* (Svenfelt et al. 2015:38-49). Large parts of production have been automatized allowing less working hours. Home labour has also been automatized to some extent. There is more free time and there are policy instruments to fulfil political goals while reducing paid work. Labour is perceived as an duty rather than an opportunity. The discourse is more focused in freedom and meaningful employment. The population is concentrated to the urban cores and there is high connectivity between people, but also objects. A social majority defends reduced consumption and paid labour. Planetary boundaries, life quality and health are regarded high importance. No fossil fuels are imported and nuclear energy has been phased out. Every region has their own specific energy sources according to their circumstances, but there presence of renewables is bigger than that of biofuels. Development of technology puts the focus in software development, while hardware is rarely substituted.

Finally, the fourth scenario is called *circular economy in the welfare state* (Svenfelt et al. 2015:50-61). In the scenario, waste no longer exists as a concept. When re-use of products is not possible, these are optimised to be disassembled and their components can be re-used. Consumption is rather on services than on materials. The State creates conditions and incentives for efficient resource use and low raw materials input. The population is concentrated in major cities. Welfare system is well developed. Nuclear or fossil fuels are not used, and there is a higher share of renewables than biofuels. State is an important actor ensuring access to energy through large-scale solutions. One underlying idea is that energy and resources are sufficient, but it is necessary to use them effectively. Ecosystems are an integral part of the economy.

Baseline data: gender equality

Gender equality happens when there is an uneven access to resources depending on gender. This uneven access can be reinforced by stereotypes, rigid gender roles and prejudice. The Swedish government has a gender equality goal divided in six areas (Government 2017c). First, gender equal division of power and influence, giving the same rights and opportunities to shape conditions for decision-making. Second, economic gender equality, mainly linked to economic independence. Third, gender equal education, aiming to same opportunities and conditions to study and personal development. Fourth, equal distribution of unpaid labour and care. Fifth, gender equal health, discussing equal conditions for good health. And sixth, men's violence against women must stop, both sexes must have the same right and access to physical integrity.

Regarding the first area, in the national parliament, 44% of the seats are occupied by women, which has been increasing since women were allowed to vote and be elected in 1919 (SCB 2017a), but in the private sector, only 6% of CEOs are women (SCB 2017b). As to the second area, the salary gap in is 13%, and has been almost stable, reducing slightly, since 1994 (SCB 2017c). In the fourth area, women spend more time than men in unpaid labour, and less time in paid labour (SCB 2017d). Finally, regarding the sixth area, there is still a tremendously larger percentage of women who are worried about feeling assaulted or abused compared to the percentage of men (SCB 2017e).

Baseline data: social equality

Social inequalities occur when resources are distributed unevenly in society. Economic inequalities are probably the most studied kind of social inequalities, but discrimination due to race, gender or sexual orientation are still a source of social inequalities (UK Government 2010) creating an uneven distribution of privileges and power. There is no specific social equality goal in the Swedish State, but it can be argued that a progressive tax system or universal access to education are tools implemented by the government aiming to a more equal society.

Regarding economic inequalities in Sweden, it still belongings to the most equal OECD countries. However, it has been the country where inequalities growth has been the largest among that group, increasing by one third between 1985 and the early 2010s (OECD 2015). Currently, the wealthiest decile owns 68.6% of the country's wealth (Credit Suisse 2014:33) and relative poverty lies on 9,1% (OECD 2014:56). Apart from income inequality, free access to education or care has been pointed out as an important pillar of redistribution (OECD 2015) but differences in health also exist. For instance, there is a difference of almost 7 years in life expectancy between different municipalities (SCB 2017f).

Baseline data: built environment

The EQO defines this aspect of assessment saying that the built environment must provide a good and healthy living environment, while contributing to a good regional and global environment. It also highlights the protection of natural and cultural assets. According to the objective, buildings and amenities shall be placed and designed according to environmental principles, and in a way that promotes sustainable management of land, water and other resources. The objective also mentions how urban areas are currently growing (SEPA 2013). Further indications also include sustainable building design, access to green spaces and existence of green corridors in urban areas and beautiful and heterogeneous built environment. It regards building design and construction methods as important, together with building management and the shift to renewable energy sources (SEPA 2017b).

Key challenges are pointed out to be conservation of cultural heritage of built environments, the impact of transport noise and poor indoor environments. Minimization of hazardous waste is also named. This objective is marked to be achieved in 2020, but it is stated that it will not be possible achieved by then on the basis of current or planned policy instruments (SEPA 2017c). Regarding poor indoor environment, 16.9% of the population are disturbed in their indoor environment (SEPA 2017d). As for traffic noise, 14.4% name this as a source of discomfort (SEPA 2017e).

Contextual factors

The contextual factors are described in the test version of the scenarios (Svenfelt et al. 2015:8-13). *Governance and planning* describes the most important actors influencing social development and the most significant decision-making levels. Norms and qualities that characterise decision-making and planning processes are also described. *Economy* puts the focus on measures in the economy that work towards reaching the normative goals, making a distinction between environmental and social targets. Descrip-

tions are included for production and ownership, scale of different industries, State's responsibility in welfare and the financial system. *Household forms, consumption and power relations of everyday life* describes how is general population's consumption and what do they consume, putting the emphasis in their agency in relation to the production. It also includes how do they live together, describing common constellations of people and their relationships. Everyday decision-making and governance together with power relationships are also described. *Time use and welfare* describes people's use of time and their perception of it. It also describes their experience of, access to and organisation of welfare. *Mobility* considers transport of passengers. Building on the basis that trips are not an end itself, they describe how travel demand looks in every scenario. *Human settlement* describes the built environment in every scenario.

Information from the scenarios

Information is extracted from the test version of the scenarios. This is done by reading the scenarios while keeping in mind the definition and baseline data of the assessment aspects. All the information that can be related to the assessment aspect is extracted. Some assessment aspects (e.g. social equality) could be looked upon in a very broad sense. To deal with this, it is important to focus on the assessment aspect definition. In cases where there it was unclear if a part of the scenario could be related to the assessment aspect or not, the general criterion has been to include it. This information will be dealt with in the assessment phase. A compilation of the excerpts can be found in Appendix 3.

ANALYSIS: ASSESSMENT OF RISKS AND OPPORTUNITIES

This section will build up on the information gathered earlier and assess risks and opportunities for every aspect selected.

Interrelation analysis

This analysis in divided in two steps. First, the contextual factors are matched with the assessment aspects. The relevant contextual factors for each assessment aspect are identified. In some sense, this has been done in the previous step, where information from the scenarios was gathered. The compilation of excerpts in Appendix 3 shows for which contextual factors there is relevant information in each assessment aspect. For the assessment aspects gender and social equality, all contextual factors were relevant. For a good built environment, only the contextual factor governance and planning did not contain relevant information. Most of the information was in three contextual factors: situation in 2050, mobility and human settlement.

In the second step, information from each scenario is analysed regarding each assessment aspect. The assessment is done compared to current situation. The information from each scenario is analysed for every contextual factor independently, assuming the rest remain unchanged. The analysis per contextual factor has been in all cases summarized and discussed in terms of risks and opportunities.

In this stage of the process, SAFS suggests the inclusion of different actors. Experts in social or environmental issues can contribute with valuable knowledge resulting in a better assessment. Actors and stakeholders can be incorporated providing valuable insights, as well as making the assessment process and the scenarios more democratic. In the present case, due to time limitations, this was not possible. For the assessment aspects selected, the baseline information and the scenarios themselves contained enough information to make the analysis possible. The analysis for all three assessment aspects can be found in Appendix 4.

Assessment: gender equality

Here the results of the interrelation analysis are considered and aggregated. This is done for each aspect of assessment in each scenario. The results are presented in terms of risks of negative developments or opportunities for improvement. One of the main

vectors discussed in this analysis is the existence of a welfare state versus the existence of other systems for decision making. The distribution of paid and unpaid labour has also been an important vector. Economic independence has also appeared often. There have been aspects included in the baseline data that were hard to discuss in the scenarios. Some of them are gender equal education or men's violence against women.

In the first scenario, collaborative economy, it is hard to conclude if the risks are bigger than the opportunities or the opposite. Opportunities can appear in the transference of power and ownership from organizations and corporations, where women are underrepresented, to users. At the same time, the presence of time banks can make unpaid labour more explicit resulting in a more equal distribution. Slight opportunities can appear in new constellations of households, where unpaid labour and care can be made explicit and trigger more equality in this aspect. This can possibly also tackle men's violence against women. Risk can appear when resolution of problems and needs in other levels far from a welfare state. There, uneven distributions and discrimination against women can take place. In other words, the necessity to remain in good terms with the supply network can reinforce an uneven status quo.

In the second scenario, local self-sufficiency, there is a great deal of risks. Risks can appear in the generalization of multi-employment. It can affect more those earning less and devoting more time to unpaid labour, having to put together a bigger deal of time in labour. Also, a higher amount of unpaid labour can affect more to those who currently do it more nowadays. It is unclear how gender equality can be affected by new local structures. Some can present an opportunity (joint administration, where gender inequalities can more easily be discussed) others can present a risk (where family ties and strategic alliances are important, making it easy to continue an uneven status quo).

On the contrary, in the third scenario, automatization for quality of life, there is a good amount of opportunities. Opportunities appear due to the emphasis on distribution of resources. An explicit aim for redistribution of resources can help deal with inequalities such as salary gap. A high level of economic security and an increased economic independence are described in the scenario. They are positive according to the baseline data. Opportunities can as well

appear with higher participation in decision-making processes. The abandonment of dependency relationships can tackle uneven unpaid care. The existence of regional authorities promoting social targets is also an opportunity itself. It is however unclear how an overall decrease in employed and home working hours will affect current patterns.

Similarly, in the fourth scenario, circular economy in the welfare state, opportunities can be found though maybe not to such a big extent. Opportunity exists for economic independence with a well-developed welfare system and a strong safety net, according to baseline data. Slight opportunities can exist in the continuation of an elected assembly and public authorities, as it is a space that currently has gender-equal representation, together with easier access to transport. The assessment is unclear in some aspects (e.g. salary gap) as the situation in the scenario appears similar to today's.

Assessment: social equality

Regarding social equality, a few vectors appear several times on the assessment. One discusses new lines along which inequalities divide, for instance belonging to different networks. A second one is the explicit existence of redistribution as an aim in the scenarios. Transport also appears frequently. It can create a division between urban and non-urban areas. Transport is also discussed in terms of access to and generalization of cheap means of transport. In some cases, it is hard to make an assessment of specific situations. For instance, when there is more room for equality within communities but more inequalities between them.

In the first scenario, collaborative economy, opportunities appear bigger than risks, but risks are still remarkable. Opportunities appear to reduce inequalities with shared knowledge and ownership from companies to individuals. Also in the higher existence of cooperatives instead of companies. Opportunities also appear with broad access to knowledge and the new forms of accommodation and ownership. It is also particularly positive that emphasis on reducing inequalities exists. There is a risk regarding the power shift to networks. It can make the belonging to different networks a new inequality line. There is also risk regarding the expensive prices on car use. They can worsen inequalities between people in non-urban areas, where price can be a barrier. It can also worsen inequalities between urban and non-urban areas, where the former do not need car transport to the same extent.

In the second scenario, local self-sufficiency, risks outstand opportunities. Risks can appear when no focus is put on redistribution. Inequalities between locals systems can appear as each has a different tax system. The necessity to have multiple jobs can negatively affect more those worse off. Inequalities appear between more and less capable. Regarding access to transport, inequalities exist between major cities and the rest. Inequalities can also appear between settlements as a consequence of different kinds of administration. Greater risk exists within those settlements with hierarchical structures, directly creating inequalities. It is uncertain how consumption and income reduction would be distributed. It can be an opportunity if it mainly affects the better off. Uncertainties also appear regarding how to assess a possible reduction of inequalities within settlements, but an increase between settlements.

For the third scenario, automatization for quality of life, bigger opportunities than risks were found. The explicit aim to focus on more even redistribution is an opportunity itself. The change of focus from pursuit of material status to sufficiency, together with the introduction of new and powerful instruments to realise political goals while reducing paid work, can help tackle inequalities. Opportunities can appear with a higher importance of extremely cheap means of transportation (walking, biking), making access to transport easier for a majority of the population. This is combined with action for sparsely populated areas. There are risks of more inequalities between those involved in technology development and those not, allowing possibilities for the creation of an elite. There are uncertainties regarding the role of the State dealing with inequalities.

In the fourth scenario, circular economy in the welfare state, opportunities appear to be more important than risks. Similarly to the gender equality assessment, inequalities appear similar to today's. Opportunities can appear mainly through the existence of a welfare state. It can help reduce inequalities by a strong safety net, active redistribution and welfare services and progressive taxes. New forms of management of housing and easy access can also help reduce inequalities. Inequalities however appear similar to today's.

Assessment: built environment

In this assessment aspect, opportunities outstand risks in all four scenarios. The existence of a well-established definition of the aspect discussing its challeng-

es has facilitated the assessment. A few vectors are recurrent in the assessment. The first one is the mix of energy sources, with different proportions in every scenario. The second one is the source of construction materials (recycled, traditional, et cetera). The third one is the space management. Different strategies appear for this: monitoring, redefining indoor temperature standards are two examples.

In the first scenario, collaborative economy, opportunities appear in different forms. The presence of only renewable energies makes buildings more sustainable. Collaborative accommodation results in less heated area per person. The use of digital tools makes premises use more efficient. Both together reduce the impact of buildings. Circular flows of construction materials also reduce the impact of buildings.

In the second scenario, local self-sufficiency, the absence of fossil fuels is an opportunity. The transport tendencies give room for a better built environment in terms of noise and air contamination. Urban structures take form of bioregions. Ecovillage and urban village structures are used. Both are opportunities for a more sustainable built environment. Traditional construction materials and methods together with passive design techniques are positive. Lower standards in terms of thermal comfort is an opportunity for buildings with less environmental impact. However, small scale solutions for heating and electricity might not be sustainable.

As for the third scenario, automatization for quality of life, the lack of fossil fuels is positive, together with a bigger proportion of renewables. So is the good development of district heating. Technology enabling zero energy buildings is positive. Opportunities arise from automated systems and monitoring together with parametric design and material optimisation. Reduction of distances travelled per person can contribute to a better built environment. So can greater standards in terms of aesthetics, heating and comfort. However, there is a risk new construction in central urban environments can endanger natural and cultural assets if pressure these areas lowers protection of those.

In the fourth scenario, circular economy in the welfare state, strong presence of renewable energy sources is positive. Sharp decrease of car traffic is an opportunity for a better built environment. Reduced heated area per person, together with well-developed district heating are also opportuni-

ties. Opportunities also appear in form of building upgrades and monitoring, together with reuse of materials. There is a risk of hard access to nature when cores are densified and access to it is thought from a bike or public transport instead of pedestrian perspective.

Integration

This step aims to explore the relationship between environmental and social factors in the assessment. The consequences of environmental deprivation for social conditions should be made explicit here. One example of this could be exploring the access to good quality groundwater if the main sources were contaminated. This would presumable affect social groups differently. SAFS suggests collecting the results of the assessment for the environmental factors and discuss how they could be turned into new contextual factors. These contextual factors would mainly consider access to natural resources, ecosystem services or more generally, a good environment where life can take place. This second loop of assessment can confront the results of the environmental assessment with the description of the scenarios. If the results of the environmental assessment are differ from the scenarios description, the social assessment will change.

This step should be done when all the environmental aspects have been assessed, which is not the case here. Still, the questions that are to be answered in this step will be put forward and answered with the information available so far.

· *Would access to natural resources in the future scenario be restricted based on the environmental assessment outcome, e.g. by an outcome indicating deforestation?*
Not this far, since only one environmental aspect has been assessed. The result of it did not indicate a restriction of access to natural resources

· *Would the environmentally sound life circumstances be degraded, e.g. by an outcome indicating heavy air pollution?*
After the assessment performed, where only one environmental aspect has been assessed, this is not the case.

· *Would access to ecosystem services be restricted, e.g. by an outcome indicating loss of biodiversity?*
Restriction of access to ecosystem services is not the case so far.

INTERPRETATION

The definition of every aspect of assessment influences the assessment to a big extent. The definition of the aspect influences in the first place the collection of information from the scenarios. Information that could be included in the assessment according one definition could not be included according to another. For instance, regarding *a good built environment*, different definitions can be found considering different aspects and disciplines can have divergent views. In that step, consistency with the assessment aspect definition is necessary. S-LCA aspects of assessment have been included to ensure consumption and life cycle perspective however, they have not been tried and it is yet uncertain how they could be assessed.

There have been different data gaps. Regarding the doughnut, further definition of some aspects is pending. *Healthcare, education, energy, connectivity* and *sense of support* would be in that group together *workers* and *communities*. No suitable indicators could be found for *flourishing lakes and streams* and *a magnificent mountain landscape.*

For the aspects assessed here, data gaps were different for every aspect. *A good built environment* had enough information for the assessment where the Swedish Environmental Protection Agency - Naturvårdsverket was the main source. The scenarios did also contain enough information. *Social equality* was harder to assess as the aspect definition had to be made within the assessment. Data for economic inequality was easy to find, but it was harder to find data for other kinds of inequalities. The scenarios contained enough data to perform an assessment, but it is possible that a different definition of *social equality* could have missed data for the assessment in the scenarios. Regarding *gender equality*, taking the Government's gender equality goal has been helpful. Data was also easy to find as Statistics Sweden - Statistiska centralbyrån has specific reports and indicators for gender equality. However, information regarding some parts of the aspect were missing in the scenarios.

The good performance in all scenarios of the assessment for *a good built environment* was related to a big extent to two factors. Those were the energy mix and the specificity of tools that could adapt to every scenario. The energy mix, where no fossil fuels are used and in many cases renewables are used

to a big extent, was imposed by the first normative goal. Different kinds of construction and use of the built environment exist in every scenario integrated to the logics of them. All of them are opportunities for a better built environment. For this aspect of assessment uncertainties were small, as some of the descriptions of the scenarios were directly related to the aspect definition. Regarding *social equality*, it is still uncertain how different forms of governance and decision-making could affect it. The assumptions made have been made explicit in the assessment. Regarding *gender equality*, there is also uncertainty about how the scenarios would affect the aspect. The assumptions have been made explicit in the assessment.

All of these data gaps, assumptions and the different definitions should be kept in mind, together with the texts describing the assessment for every aspect when at the doughnuts illustrating every scenario (see Figs. 10-13). For the scenario collaborative economy, *a good built environment* has been marked in green within the doughnut because the scenario is an opportunity for the aspect of assessment. *Social equality* has been marked green with a gradient within the current overshoot because the scenario is considered a slight opportunity. The overshoot in *gender equality* has been marked yellow because the consequences of this scenario for the aspect of assessment are unclear (see Fig. 10). For the second scenario, *local self-sufficiency*, a good built environment has been marked in green within the doughnut because the scenario is an opportunity for the aspect of assessment. *Social equality* and *gender equality* are marked red beyond the current overshoot because the scenarios contain risks for these aspects (see Fig. 11). For the third scenario, automatization for quality of life, all the aspects of assessment are marked green within the doughnut because the scenario contains opportunities for all three (see Fig. 12). Finally, for the last scenario, circular economy in the welfare state, *a good built environment* and *social equality* are marked in green within the doughnut because the scenario contains opportunities for these two aspects of assessment. *Gender equality* is marked with a green gradient in the overshoot because the scenario contains slight possibilities for this aspect (see Fig. 13).
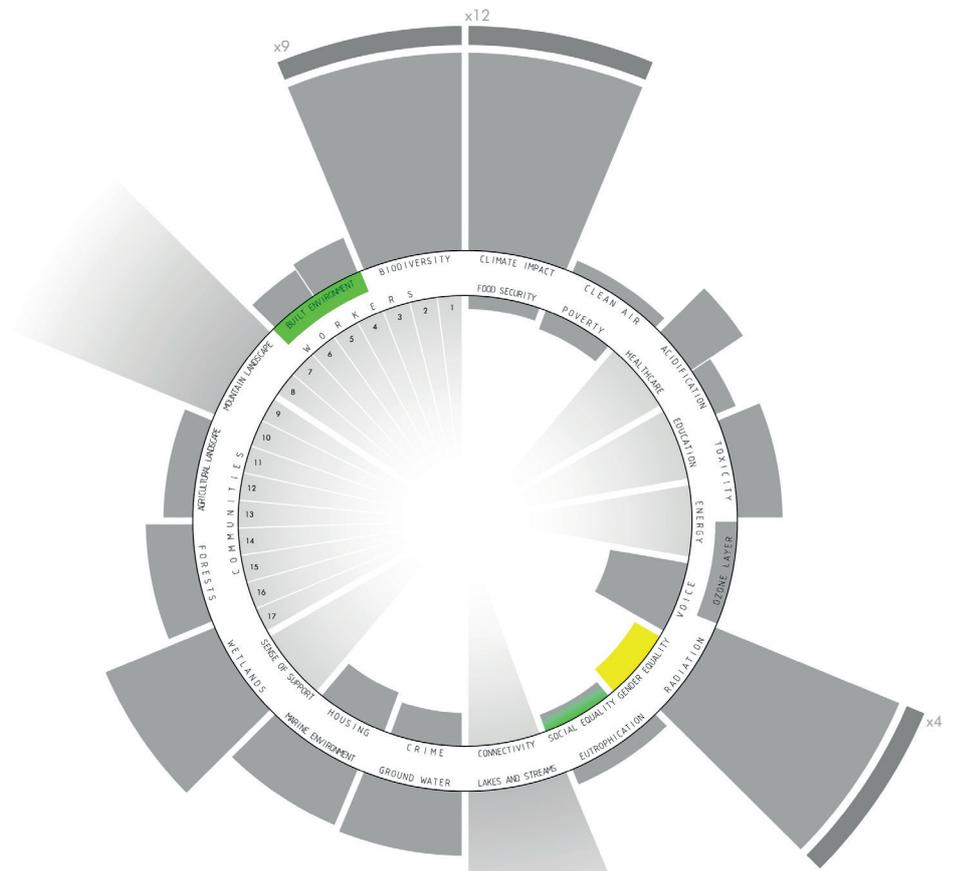
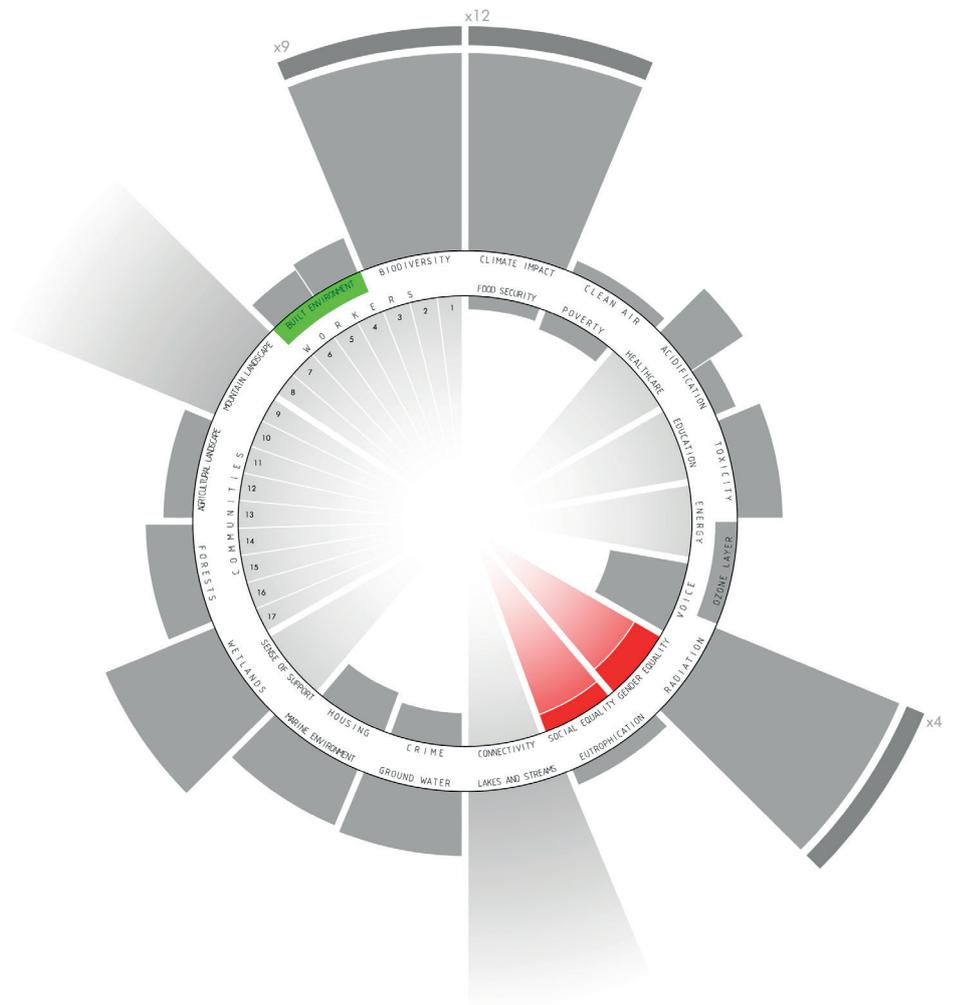Figure 10. The dughnut for the first scenario,
collaborative economy.

Figure 11. The dughnut for the second scenario,
local self-sufficiency.

Figure 12. The dughnut for the third scenario, automatization for quality of life.
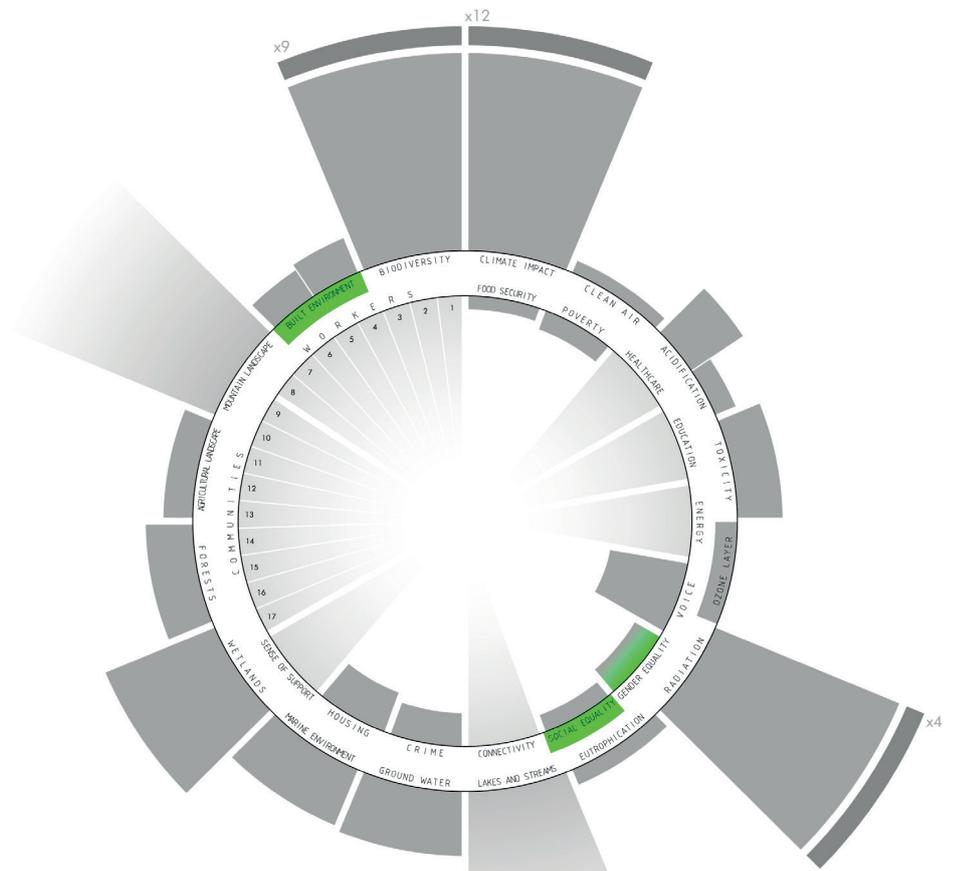

Figure 13. The dughnut for the fourth scenario, circular economy in the welfare state.

DISCUSSION

Doughnut interpretation and construction

One risks of the use of the doughnut format is that it can be mistaken for the assessment. Summarizing and communicating an extensive assessment with a single image can make the reader take it for a conclusion and skip the rest. The doughnut in this context is a tool to discuss risks and opportunities of different assessment aspects in one same place and compared with current state values. This means that the description of risks and opportunities for each aspect and the logics behind them is the necessary result of the assessment. The doughnut does not make any sense without them. At the same time, there has to be a careful selection of the indicators included in the doughnut. A change in the election of the indicator for an aspect or in the proposal of a threshold would change the graphic result hugely. A certain level of consensus regarding which indicators and thresholds represent every aspect better is necessary in order to use the doughnut successfully.

In a similar sense, the presentation of an assessment aspect as one or two words can lead to misunderstanding (Finnveden & Fauré 2017). The complete definition of every assessment aspect is important in order to perform the assessment and to know *what* was assessed. The specific definition of an assessment aspect can be way wider than the name of it might suggest. This happened, for instance with the EQOs, where food supply was mentioned under climate impact. At the same time, a name can suggest the reader more than the assessment aspect definition includes.

The construction of the doughnut can be turned into a task on its own. Sayers, Trebeck & Stuart (2014) have been a main reference for the doughnut construction. Their formation of a Scottish doughnut included a vast literature of social conditions in Scotland and the UK (ibid.:70-75), a workshop gathering representatives from civil society and academic institutions from different countries (ibid.:17), and a review of previous versions of the doughnut and planetary boundaries (ibid.:46-47).

Some of the factors that could make this task bigger are the discussions regarding the nature of aspects and the adaptation to local specificities. Regarding the nature of aspects, Raworth's doughnut discussed the social foundation in terms of entitlements (Raworth 2012), while Sayers, Trebeck & Stuart

(2014) did it in terms of redistribution. For instance, Raworth (2012:10) described poverty as population leaving with less than 1.25 dollars per day, while Sayers, Trebeck & Stuart (2014:38) used a definition of relative poverty that included everyone below 60% of the median house income of the country. Regarding adaptation to local specificities, energy can be an example. It can be argued that approaches to energy poverty such as those used in previous doughnuts are not so useful in Sweden (Johansson 2017). According to Johansson "it is in the Swedish context especially important to include transport as the lack of affordable transport, being one factor that limits the opportunities for the population to take jobs or involve in social activities" (2017). A distribution perspective can also be used here, discussing the effects energy strategies and policies have in the distribution of it (ibid.).

Use of environmental and social aspects

There have been big differences between how environmental and social aspects were selected and defined. The environmental aspects had thorough definitions, including main challenges for each aspect (SEPA 2013) and a compilation of indicators connected to each aspect (collected at miljömål.se). Regarding the social aspects, different sources were used for each aspect. Different government goals or the Folkhälsopolitiska mål (eng. public health goals) can be used in some aspects, but an own definition would have to be made in some others (e.g. social equality). The social indicators were selected from different sources. A set of social sustainability goals for Sweden similar to the EQOs would have been helpful in this sense.

There have also been great differences regarding how the assessment was made. For the social aspects, the connection of the scenario description with opportunities and risks for each assessment aspect was harder. It was often that the assessment indicated how scenarios "could possibly" become a risk or an opportunity. The certainty of the assessment was higher with the environmental aspects. For instance, the energy mix described on the scenarios could directly been described as better or worse than today's.

LCA perspective

LCA and consumption perspective have sometimes been hard to follow. Data with this perspective is available for some environmental aspect (climate impact) but could not be found for all. Fauré et al.

(2016) give examples of how this data could be elaborated for, for instance, land use (ibid.:8). For most assessment aspects in the environmental ceiling, only the impact in Sweden is considered. This is related to their definition taken from the EQOs. However, some of the assessment aspects selected evaluate the conditions for those implicated in the production of products consumed in Sweden. Those are the ones taken from S-LCA, located in the social foundation. Under the assessment aspect local communities, access to material and immaterial resources is evaluated. The same happens with safe and healthy living conditions. Unless the assessment aspect definitions were reconsidered in their operationalization (for instance, expanding some of the EQOs outside of Sweden), issues such as ocean acidification would fall into the S-LCA aspects as this framework is.

Plausibility assessment

Even if this text focused on sustainability assessment, plausibility could still be an interesting input to the Beyond GDP growth project. Weik et al. (2013) identify different levels of plausibility: *theoretically occurrable, occurred in the past under different conditions, occurs elsewhere under different conditions, occurs elsewhere under similar conditions, occurred in the past under similar conditions* and *trend extrapolation.* Those could be could be a good starting point for assess the different scenarios or different aspects of them. It could be even more interesting if distributing agency to the scenarios. This can be made thinking that some agent (e.g. the government, a community) would take the scenario as a desirable objective, and considering which factors would be internal, discussing finally how likely is that external factors would develop resembling what is described in the scenarios. However, there has to be awareness on the difficulty of that task, particularly in backcasting scenarios, where there is often no modelling of the structure of the current system (Börjesson et al. 2005:21).

CONCLUSION

The answers to the research questions have been discussed and in some cases answered through the text. Here, they will be made explicit.

First research question: most suitable method

SAFS (Arushanyan et al. 2017) is the most suitable assessment method for the scenarios in *Beyond GDP growth*. A list of reasons has been found. First, system construction does not play a major role in it, while it does in other assessment methods. In backcasting scenarios system construction is not always done. Second, SAFS addresses social and environmental sustainability in an integrated way, excluding the economic dimension, which goes in line with the work of *Beyond GDP growth*. Third, at the same time, it fits the qualitative nature of the scenarios better than other kinds of assessment (Arushanyan et al. 2017:30-31). This is done by assessing aspects that are far from the normative goals in terms of risks and opportunities. Fourth, the inclusion of a consumption perspective, which is an important feature lacking in other assessment methods. Consumption perspective includes the impact of consumption outside regional boundaries. Fifth, SAFS can be performed after the scenarios are produced, which is the case here. And finally, sixth, SAFS is presented as an easily replicable method in a very accessible way and has been already tried in normative scenarios.

Second research question: possible improvements

However, SAFS can be improved. One of the other methods presented (Nijkamp & Vreeker 2000) uses a flag system based on thresholds to make the results more accessible and intuitive. In order to operationalize the assessment, in this framework both thresholds and objectives were used. Still, the logics are the same. Indicators are used to illustrate a wider assessment aspect. Raworth's doughnut (Raworth 2012) provides a recognisable and visually compelling format to present these indicators. There, the current state of these indicators presents the size of the challenges in every assessment aspect. After the assessment, every indicator shows how the scenarios could affect these assessment aspects.

The *Integration* step in SAFS can also be improved. In this step, the results of the environmental assessment are used for a second loop of social assessment. In SAFS, this step comes after the environmental and social aspects have been assessed. Then, access to natural resources, access to ecosystem services and access to a good environment are assessed. This is done using the data coming from the results of the assessment, particularly of the environmental indicators, instead of the data coming from the scenarios. This was not possible in a previous case where SAFS was applied. The reason was because the assessment aspects were formulated in form of *pressures*. If they were to be used in the integration step, they should have been formulated in form of *impacts* (Arushanyan et al. 2017:30).

If SAFS is to assess access to natural resources, ecosystem services or a good environment, *whose* access will have to be defined in the question. This is particularly relevant if the assessment method has consumption and life cycle perspectives. In this assessment framework for the *Beyond GDP scenarios*, two groups are identified. The first one is the people within the boundaries of the scenarios i.e. the residents in Sweden. The second one is the people outside these boundaries. These last are affected by the scenarios and therefore should be considered. In this framework, the residents in Sweden's access to natural resources, ecosystem services or a good environment is to a large extent included in the Environmental Quality Objectives (EQOs). The EQOs are the environmental aspects selected to assess the scenarios. They consider both protection of nature, but they also discuss the effects of environmental deprivation for human beings. The second group is composed by those non-residents in Sweden. This second group is mainly affected by the effects consumption within Swedish borders can have outside of them. To assess this, relevant assessment aspects coming from Social Life Cycle Assessment (S-LCA) are included. This last set of aspects coming from S-LCA should use as an input both the information from the scenarios and the results of the assessment of the rest of the aspects. However, their assessment, or even the gathering of a baseline data for them, might be difficult.

Two minor changes could be made. The first one concerns the step of *defining the goal and scope of the analysis*. There, the question regarding the social and environmental aspects to be assessed can be omitted, as it will be discussed in the next step. The second one would be performing the *interrelation analysis* before *gathering relevant information from scenario descriptions*. This can reduce the task of information gathering.

Third research question: advantages and utility

The presentation of the baseline data and the results of the assessment in a doughnut format can help discussing them. In a regular flag model, all assessment aspects are represented the same way. This means that a good (green) or bad (red) result in any of them appears equal to the same result in any other. Using the doughnut allows the presentation of the assessment to include the severity of the current challenges in every assessment aspect. This can help to identify which assessment aspects need most urgent action. It can also allow a deeper interpretation. This way, a slight opportunity (soft green) in one assessment aspect can be more important than an opportunity (green) in another one, if the challenges were greater in the former. At the same time, the doughnut helps to provide a good general overview of the aspects of assessment. Finally, if interaction between goals is on debate (Nilsson, Griggs & Visbeck 2016), the overview can help identify which goals reinforce or counteract each other in different kinds of scenarios.

The assessment of the aspects presented as an alternative to the *integration* step has not been done. Still, I believe that in this framework those aspects that were to be assessed in the *integration* phase on SAFS are included. It is obvious that the assessment of the aspects extracted from S-LCA can be difficult. However, this is a qualitative assessment. Being so, it is possible that a thorough translation of the results of different assessment aspects to specific impacts might not be necessary. In SAFS, the assessment of some aspects relies on baseline data collection and comparison of that baseline data with the state of the scenario (Arushanyan et al. 2017:30). For those assessment aspects extracted from S-LCA, there is no scenario description. The qualitative results of the assessment are the information the baseline data can be compared with. In a similar way that the assessment of some aspects can rely on expert interviews or internal and expert group discussions (ibid.:30), this could happen for the S-LCA aspects. This has been the approach taken for this assessment. I am aware it relies heavily on the selection of the assessment aspects. For this assessment, the assessment aspects chosen were very broad. This made sense because the scenarios describe society and the built environment in a quite comprehensive way. However, it is uncertain how more restricted, specific scenarios would affect the assessment aspects selected.

The development and improvement of SAFS can be useful for futures studies practitioners. Commonly, backcasting studies are built only around one normative goal. This can have drawbacks. By focusing on only one goal, other sustainability aspects can be neglected. Conflicts between different sustainability aspects are common in real life practice (Nilsson, Griggs & Visbeck 2016) but they are usually not studied nor made explicit in backcasting scenarios (Svenfelt et al. manuscript). To counter that, Svenfelt et al. (manuscript) propose the use of multi target backcasting scenarios. This makes that "a part of the conflict identification is built into the scenario construction and process" (ibid.:27). However, building multi target backcasting scenarios can be a difficult task. If the normative goals are too ambitious, the scenario generation can become a hard process. In such cases, a sustainability assessment with a method such as SAFS can be an alternative. It can make the scenario generation more simple while making explicit the risks and opportunities for other sustainability aspects. In a more general sense, sustainability assessment could be included as a part of the scenario generation, being a fourth step (Börjesson et al. 2005:25-33).

Fourth research question: operationalization

The framework has been tested in the scenarios. The outcomes of the assessment for a good built environment show a great deal of opportunities in all four scenarios. This has to do to some extent with the energy mix used in the buildings as a result of the first normative goal. The assessment has found a good variety of tools to create a good built environment throughout the different scenarios. Regarding social equality, new lines along which inequalities and divisions can appear were found in some scenarios. Some aspects were hard to assess. For instance, more equality within communities but more inequality between them or vice versa. As for gender equality, the inexistence of a welfare state and the power and decision-making transference to other arenas has been seen as a risk. The distribution of paid and unpaid labour has also been discussed to a big extent. Bigger uncertainties exist in these last two aspects of assessment.

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APPENDIX 1. ENVIRONMENTAL INDICATORS

The indicators have been selected according to the criteria described in the text, but further explanations can be found here. All indicators unless expressed otherwise were found in miljömål.se. In its Swedish version, the web page contains a compilation of indicators per EQO that facilitate the searching.

Reduced Climate Impact:
SEPA: Consumption-based indicators in Swedish environmental policy. Available at: https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6508-9.pdf?pid=3817 [Accessed 25 Sept. 2017]

Clean Air
The description emphasizes the risk of polluted air to human health, but also to plants, animals and heritage. In the description of the main challenges, pollution derived from road traffic is highlighted. SEPA: Besvär av inomhusmiljön [online]. Available at: http://www.miljomal.se/Miljomalen/Alla-indikatorer/Indikatorsida/?iid=221&pl=1 [Accessed 25 Sept. 2017].

Natural Acidification Only
"The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water". Two indicators are given: percentage of woods and lakes that are acid.

A Non-Toxic Environment
The focus is put on human-made and extracted substances in the environment not representing a threat to human health or biodiversity. Different data can be found: in 2016, 4477 contaminated areas were identified in Sweden, while in 2014 7.1 tones of hazardous materials were counted per person. The ratio of ecologically cultivated land has been chosen because there is an already established goal (20%). Ecologic milk and meat production do not have established goals.

A Protective Ozone Layer
The ozone layer provides protection against UV radiation. Planetary Boundaries' figures are chosen over Miljömål's as they provide a boundary.

A Safe Radiation Environment
This goal focuses on the protection for humans and biodiversity against the harmful effects of radiation. When describing the challenges, the incidence of skin cancer is put forward first. Regarding radioactive substances coming from nuclear facilities, the necessity of a permanent repository is stated. The description does not go further in that regard.

Zero Eutrophication
Ammonia pollution is selected here for being the only one of the three available indicatiors having an established goal.

Flourishing Lakes and Streams
Three main points are named as challenges: physical disturbance from hydroelectric schemes, valuable waters lacking long term protection and restoration of disturbed fresh waters. There are only three indicators: pearl mussel presence, breed birds by water courses and waterfront construction in lakes and rivers. It can be argued that none of the indicators is comprehensive enough or match the challenges directly.

Good-Quality Groundwater
Preassures on ground water and water contamination are two of the main challenges in this parcel. Regarding the amount of wells, there is data showing how many are there certified, but it is put forward that more knowledge in this field is needed to reach the goal. At the same time, there is data on how many underground water areas have count with a protection area. MIssing better data about pressures, this will be taken as an indicator.

A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Preservation of biological diversity and sustainable productive capacity in the North and Baltic Sea are two main points. Miljömål provides data about fishing boats and professional fishers, however no to al is set. International colaboration is given importance at this point. The Baltic Sea is the most damaged of both. Threatened species according to the Baltic Marine Environmental Protection Comission - Helsinki Comission is chosen as an indicator. Data available at: http://www.helcom.fi/Lists/Publications/BSEP138.pdf [Accessed 25 Sept. 2017].

Thriving Wetlands
Preservation of wetlands is the main focus. Number of established (original in Swedish: "anlagt") wetlands is given and a goal is set.

Sustainable Forests

Forest and forest land are valuable for biological production, as well as cultural heritage and recreational values are named, and preservation is pointed out as a main challenge. Percentage of forests with damage or severe damage is taken as an indicator. However, there is no proposed goal.

A Varied Agricultural Landscape

This goal talks about the importance of agrarian landscape for food and biological production. Preservation of local crops and breeds is also included, however no indicator is provided for this. Mowing land and pasture fields accommodate a large part of the natural and cultural values of the cultivation landscape. A goal is established for this.

A Magnificent Mountain Landscape

Preservation, in terms of biological diversity and recreational value is put forward. Encroachment is especially mentioned. Regarding the challenges, reindeer herding is put forward. In the indicators, the numbers for reindeer herding appear over the threshold and when describing noise levels, they are described as low. Still, SEPA insists the goal will not be fulfilled by 2030 and therefore is kept in red, even without precise indicator.

A Good Built Environment

The provision of a good and healthy living environment in buildings and cities is put forward here. The impacts of transport noise and bad indoor environment are among the key challenges. Other challenges are cultural heritage preservation and minimizing hazardous waste.

A Rich Diversity of Plant and Animal Life

Preservation of biological diversity is the main point in this aspect. However, the only indicator provided in Miljömål refers to nexting birds. Due to that, the goal and data is taken from the Planetary boundaries.

APPENDIX 2. SOCIAL INDICATORS

Due to the lack of a to-go source analog to mil-jömål, indicators had to be found in different sources. For some assessment aspects, indicator is lacking. Given definitions and defined goals and thresholds for each aspect could help the operalization.

Food security
Not enough money for food (OECD 2014:28).

Poverty
Relative poverty (OECD 2014:113).

Healthcare
Uncertain. No indicator was found.

Education
Uncertain. No indicator was wound.

Energy
Uncertain. No indicator was found. Johansson (2017) can be a source to consider, having useful insights regarding an own definition of energy poverty definition for Sweden.

Voice
Population who does not trust the government (OECD 2014:139).

Gender equality
Salary gap (SCB 2017c).

Social equality
Years of life expectancy. Difference between municipalities. (SCB 2017f).

Connectivity
Uncertain. No indicator was found.

Crime
Population who feel insecure at night.
BRÅ (2017:9). Nationella trygghetsundersökningen 2016. Stockholm: Centrum för kunskap om brott och åtgärder mot brott. Available at: https://www.bra.se/download/18.37179ae158196cb1 72d6047/1483969937948/2017_1_Nationella_trygghetsundersokningen_2016.pdf [Accessed 25 Sept. 2017].

Housing
Overcrowding rate in cities for population under 18 years old.
Eurostat (2017). Overcrowding rate by age, sex and poverty status - total population - EU-SILC survey [online]. Own elaboration for year 2016. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK_DS-093630_QID_57A8F904_UID_-3F171EB0&layout=AGE,L,X,0;GEO,L,Y,0;UNIT,L,Z,0;INCGRP,L,Z,1;TIME,C,Z,2;SEX,L,Z,3;INDICATORS,C,Z,4;&zSelection=DS-093630INCGRP,TOTAL;DS-093630UNIT,PC_POP;DS-093630INDICATORS,OBS_FLAG;DS-093630SEX,T;DS-093630TIME,2014;&rankName1=TIME_1_1_-1_2&rankName2=UNIT_1_2_-1_2&rankName3=INDICATORS_1_2_-1_2&rankName4=SEX_1_2_-1_2&rankName5=INCGRP_1_2_-1_2&rankName6=AGE_1_2_0_0&rankName7=GEO_1_2_0_1&pprRK=FIRST&pprSO=PROTOCOL&ppcRK=FIRST&ppcSO=PROTOCOL&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time_mode=ROLLING&time_most_recent=true&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23&lang=en [Accessed 25 Sept. 2017].

Sense of support
Uncertain. No indicator was found.

APPENDIX 3. INFORMATION FROM THE SCENARIOS

GENDER EQUALITY	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	The administration of global commons is improved and facilitated by increasingly efficient and often technology-supported partnerships and collaboration between local, national and international organisations and institutions, the private sector and civil society. Inequalities decrease. Recurring economic crises contribute to people being forced to live on less economic resources and thus being inventive with regard to sharing resources (47). Ownership of production resources and material resources has been increasingly transferred from a private and public form to various forms of shared ownership (50). Power over resources and decision-making moves increasingly from hierarchical institutions to interlinked networks and digital platforms.	What people do as private individuals and in professional roles cannot be separated, but instead merge. In both energy and other production, power and ownership have been transferred from organisations/corporations to groups/collectives. This also means that power/ownership is transferred from the individual to the group/collective. Jointly managed commons, where resources are managed in a network jointly by those who are also using the resource (55).	Planning and decision-making is characterised by strong norms of reciprocity and interaction, where civil society actors have a prominent role. Open data combined with widespread access to digital technology stimulates citizens and other actors from civil society to get involved and take the initiative to influence societal development in line with the shift in values mentioned above. There are still public authorities whose task it is to guarantee that basic societal functions are operating in line with international and national laws and guidelines. National legislation is regulated by an elected assembly that is appointed in a similar way to today. Public policy and planning is run in line with farreaching deliberative principles focusing on transparency, mutual dialogue and learning (58). These active, democratic arenas are well in line with the spirit of co-creation and conviviality characterising the collaborative economy as a whole (59). Overall, power is spread over many actors. Bottom-up initiatives and various forms of joint administration are important principles. Not all individuals own the same amount, but there is an awareness that everyone has the opportunity to contribute to the economy.	A large part of production is organised in cooperatives and in networks where production resources are shared. Private ownership has decreased in favour of joint ownership. Production resources are often owned jointly. The solutions are based on bottom-up initiatives and collective administration. This means that users of resources together possess the right to design their own institutions which are not challenged by external authorities. Tax revenues are generated both from fees for users of the jointly/state owned natural resources and from production tax. The level of taxation only covers basic needs. In addition to this, some medical care (especially more advanced medical care), some education and the judicial system are tax-financed. However, many of these functions have been supplemented with services that are produced locally by cooperatives and other associations. One form of saving that has arisen is time banks. This means that people can choose to work up a capital of time. Saved time can be used for consuming during periods when they, for various reasons, do not work, or as a form of pension (61).
Local self-sufficiency	There are few global institutions, and they do not have sufficient coordination and cooperation for being able to deal with environmental issues and social injustices. In several regions, authoritarian government become common. Inequalities persist or worsen over time, especially in developing countries. Many countries are struggling to maintain their living standard, create access to clean water, improved sanitation and health, and to care for vulnerable groups of the population. Inequalities persist or worsen over time, especially in developing countries. Many countries are struggling to maintain their living standard, create access to clean water, improved sanitation and health, and to care for vulnerable groups of the population. At the same time, many people are more exposed to the effects of climate change due to the lack of development regarding welfare, low income and lack of effective institutions. In Sweden... Since resources are found at the local level, the power and influence of municipalities over their own development is gradually strengthened, and the population also gains greater participation in decisions.	There is diversity between different local communities regarding forms of decisionmaking, but across the country there is a high degree of local participation in politics, decision-making and planning. People invest a lot of time, usually unpaid, and energy on food security, health, education and social care, and are gainfully employed to a lesser extent.	The arenas for local decisions treat both issues concerning society's overall strategic focus and principles for prioritising the use of common resources. This is supplemented by a high proportion of more concrete, and "here and now"-oriented, planning and decisionmaking processes that are organised on the basis of deliberative principles with a focus on transparency, mutual dialogue and learning (96). Differences in the distribution of resources are not seen as a major problem as long as everyone has access to basic welfare and security. Justice is above all understood from a procedural perspective, i.e. with a focus on having transparent processes where everyone has the opportunity for participation and influence (97).	Significantly lower tax revenues (fewer hours in paid work) mean that other solutions are needed to guarantee the social sustainability targets. Local communities have developed various solutions to secure a minimum of general welfare. Most people have several jobs, and many work part-time in welfare.
Automatisation for quality of life	Inequalities decrease, both between and within countries. In Sweden, production is already more than sufficient to maintain what people in Sweden need to have a good life and that we can therefore stop working so much, then spread in society (127). As time went on, production capacity and the total resources of Swedish society were considered sufficient for everyone's reasonable needs, and the challenge instead lies in distributing the resources more evenly (128).	Technological development has resulted in the automisation and robotisation of large parts of production. People have been able to exchange these productivity gains for reduced working hours (129). Work in the home has also to some extent been digitalised and automated, which taken together has led to people having more free time (130).	Justice concerns everyone's right to a level of economic security and the existence of democratic and transparent decision-making processes that involve more members of the general public and that make explicit the impact of automisation on the individual's level.	Regional authorities regulate production to ensure the achievement of environmental and social targets. To achieve the social sustainability targets, society's mechanisms are adapted for the just allocation of resources.
Circular economy in the welfare state	Both global and national institutions are slowly working towards sustainable development, which means that the global sustainability targets have still not been achieved in 2050. But small improvements are constantly being made as regards human health and well-being. Population growth and the income differences mean that many societies are stratified with limited social cohesion. Many challenges remain with respect to reducing vulnerability to climate/environmental change and social sustainability, hindering the transition to sustainable development globally.	A central starting point for society is also that sustainable development presupposes a well-developed welfare system. Welfare is organised and financed via the State, and there is a very strong safety net.	The State – that is, the national government and parliament – makes the majority of decisions about the governance of society. The State governs through acts and ordinances, and through a broad flora of policy goals and instruments, which are designed with an explicit idea that resource efficiency as part of a green and circular economy is the key to a successful and just society. A just society is achieved through an active redistribution policy that focuses on equalising differences in access to economic resources (equalisation of income differences). The principle of distribution has clear traits of a classic social democratic welfare regime in which the State has a central and strong role and where there are universal welfare systems to which all citizens are entitled (170).	People make their living through paid work in the private or public sector. The State uses progressive taxes and transfer systems to guarantee that all people have access to basic welfare services and pensions.

GENDER EQUALITY	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	In the collaborative society with a weak welfare state, it is important for people to remain on good terms with their supply network and their "community". Overall, citizens have a high degree of empowerment, but the expectation to be constantly capable and socially smart is stressful and means that those who do not make an effort and/or those with weaker social capital risk being worse off (60). For this reason, special measures are needed to guarantee resource security for all citizens. Exchanges and production/consumption are primarily peer-to-peer via digital platforms that are controlled and owned by the users, in something akin to cooperatives (64). As with family structures, the public system has been weakened, and resource and interest communities have instead emerged in which people together resolve common problems and needs. Citizens are trained to be capable and cooperation-oriented and to use their empowerment to have a good life, individually as well as collectively. Collaborative forms of accommodation are common, in which everyday functions and tasks are shared to varying degrees. This is also based on a shared work input with regard to e.g. babysitting, cooking and care of the elderly.	Much of paid work has been replaced by unpaid work in the form of initiatives for different types of collective (resident associations, idea-based organisations, etc.). People's total working time (paid and unpaid work) is governed by their life situation. Time banks can be used to create a buffer for periods where they are not able to work as much. A large part of everyday life happens in collective digital contexts, and friendship relations have increased in importance for social cohesion, while the importance of family relations has decreased (62). Many cooperatives function as an extended family and provide basic services such as child supervision and social care (63). There is a fairly egalitarian thinking regarding access to basic resources. This states that all members of society should have a relatively high minimum standard	ITS has also made possible a more intermodal transport system where many no longer own the means of transport they use. Instead, people purchase transport services from a variety of means of transport and combine these according to their needs (72). In inner cities, cars are rarely used (74). These complement and interact with more conventional private and public forms of transport. Owning and using a car individually is expensive.	New constellations of households live together, such as several people with different relational ties in the same house. Examples of shared home functions that occur to a greater extent are kitchens, bathroom functions in the form of common baths, saunas and the like (82). Regulation, e.g. within various networks in order to avoid discrimination in associations/cooperatives, as well as incentives to create diversity (and counteract exclusive effects), is an important part of enabling diversity and access for all.
Local self-sufficiency	Decisions are primarily made in smaller societal units in the form of resource administrating communities (98). This means more direct democracy and deliberative decision-making, which involves a high degree of participation for all citizens. All citizens of working age are expected to participate actively in the local production of food and other goods, but also in the production of welfare services such as elderly care, childcare and education. Some communities rotate positions of power and public roles. Some local communities are stronger and more effective depending on local resources and conditions, and on organisational capacity, etc. This scenario will probably have some inequality, for example in the form of people who are more capable of contributing to production also gaining certain advantages or better access to resources, and the weak and sick not always receiving the resources they would need. Most local communities have some form of tax system to finance joint investments, care of the elderly, children and the sick. However, these tax systems can vary, with some communities being more egalitarian and others more hierarchical. There is a tendency for those with the greatest influence over key production resources (land, energy, raw materials as well as technical aids and expertise) to have more influential positions and greater influence over important decisions in this scenario. Everyday life is built around the provision and production of food, basic goods, maintenance of buildings and care, as well as the decision-making and education necessary for that provision. Household units are formed on the basis of provision – for example, an apartment building can constitute a kind of extended household including several adults, children and elderly persons. Core values are industriousness, community and the value of practical know-how. Here, there is little of what was previously called "leisure" and most of people's waking hours are devoted to some form of work for provision and care. Although everyday life is characterised by hard work, mental health is generally good as everyone – young and old alike – has a task, is "needed" and is part of a community. For the old and sick, however, things may be tougher, but local commonality systems have been developed to take care of children, the elderly and the sick.	The total working hours in this scenario have not decreased appreciably compared with 2015, but a higher proportion of the work is performed under local/regional direction and is also unpaid since much of the work is for the purposes of self-sufficiency.	Everyday life is very stationary for most citizens. People are transported within the local communities mainly on foot and by bike, and by simple motorised bi- and tricycles. High-capacity public transport is mainly found in metropolitan areas and major cities (largely applicable to infrastructure already in place), but is significantly scaled down compared with 2015, and in some smaller cities and towns it is almost completely discontinued.	People live relatively spread out in smaller village units, but there might be more people in the same household/building unit in relatively large living spaces for larger households and different functions grouped in different types of buildings. Both private and shared ownership exist, with great variation between different parts of the country and between regions, where certain settlement clusters/villages are under joint administration, while elsewhere there is a more hierarchical structure and, in yet other contexts, a more open governance. The settlement is often organised in the form of ecovillages and urban villages (117), with strong cohesion within the group. In structures under joint administration, shares in both land and settlement are prerequisites for being allowed to cultivate the land, which is managed as commons (118). In other areas with a more hierarchical structure, land ownership is an important question of power, and family ties or strategic alliances rather than joint administration control who gains access to land resources and settlement. More of the maintenance need in the settlement is met by private individuals through joint efforts for the commons. Construction largely takes place in "sweat equity", i.e. the input of working hours, as part of the local commons or within the household.
Automatisation for quality of life	There may be some features of neo-corporatism (137), but with a greatly increased influence of the general public as they have more time to engage in societal development and politics. People, in their role of users of smart systems, have direct influence on the system digitally – in a sort of digital direct democracy (138). People now devote more time to leisure activities – sports, self-fulfilment, spirituality, nature experiences, fishing, cultivation – and have more time to care for their elderly, work in civic centres and other non-profit activities (145). As technology focuses on improving quality of life and human emancipation, more and more people have left dependency relationships behind and are governed more by pleasure and love. Household units exist in many varied forms – single households, as well as nuclear families and polyamorous families (146).	People spend little time on paid work. 40-hour working weeks are no longer the norm; instead 10-hour working weeks are the new norm. The high level of disposable time means that more people engage in voluntary work and in socialising with family and friends. Locally managed, but nationally accepted time banks regulate, for example, workload during the life cycle according to individual needs (with spending more time on paid work when there is opportunity for this, while shifting down when, e.g. there are small children in the household) (141). The radically reduced working hours have very far-reaching consequences for how people organise their everyday lives, but also for fundamental social and cultural values. Many people perform much less paid work than today, at the same time as paid and unpaid work is performed at home to a greater extent. Work at home also creates greater opportunities to take care of children, the elderly and the sick.	Public transport has some new travellers. This is a consequence of people not having has much time pressure in everyday life and therefore not needing to use a car to be effective in compressing everyday activities in time-space (148). Car ownership has decreased drastically, but there is geographic variation. In sparsely populated areas, car ownership and car use are still high. In urban areas, cars are mostly used for major purchases and transporting goods, and for some leisure travel to more distant destinations not served by public transport, or at times such as late evening when the frequency of public transport is low.	
Circular economy in the welfare state	Representative democracy prevails. Citizens take part in democratic elections at the local, regional, national and EU levels. An important task for the State is to monitor the welfare system and distribute welfare resources. Power relations between citizens are similar to those that existed in 2015 – access to resources and services is controlled largely by the ability to pay. However, the power of companies and the State has been strengthened in relation to individual citizens. Development has generally gone from a "buyers' market" to a "producers' market" as it is companies that own and control the resources used in production. Other actors also influencing the political agenda to a high degree are companies and sectors that are important to the circular economy. Many people are driven by an individualistic social and cultural ethic (176) and consider it natural to compete for attractive positions in society and a high social status, but instead of material markers, use is made of services, leisure activities and cultural capital (mainly education) to mark status positions. As there is a strong welfare state and many people in paid work, this means that the family is less important for provision. The dream of lifelong marriage has increasingly faded, and the statistics for ended marriages have continued to increase (178). Nowadays, many live in "star families" rather than traditional nuclear families.	Since a high level of general welfare is a strong political objective, a relatively large share of economic activity is focused on the production of welfare services. Time expenditure for paid work is high, as the 40-hour week is the norm, but more dependent on the season.	As regards everyday mobility, car traffic has decreased sharply in favour of walking, cycling and public transport (including intermodal travel). Car ownership has decreased dramatically, but it is common to be part of a carpool.	

SOCIAL EQUALITY	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	Currently high-income countries are shifting focus from economic growth to a stronger emphasis on human well-being. This entails a somewhat slower economic growth in the longer term. In Sweden: recurring economic crises contribute to people being forced to live on less economic resources and thus being inventive with regard to sharing resources (47). Individuals and companies increasingly began to work with "open innovation" and to share knowledge and production processes instead of as previously protecting and keeping secret knowledge and products. The collaborative economy is focused on access to goods and services, rather than individual ownership. Ownership of production resources and material resources has been increasingly transferred from a private and public form to various forms of shared ownership (50). Power over resources and decision-making moves increasingly from hierarchical institutions to interlinked networks and digital platforms. Citizen power, informal economic activities and collaborative solutions are becoming increasingly important.	The consumption of goods and spatially dependent services is small, and people instead share the goods, machines and other things they need and use many digital services. The consumption of goods and spatially dependent services is small, and people instead share the goods, machines and other things they need and use many digital services. This means that private ownership is small and that little material is needed for the production of goods. Power/ownership is transferred from the individual to the group/collective. The focus is on sharing rather than on owning. Production of goods and services is mainly through consumers in cooperatives and other associations.	Planning and decision-making is characterised by strong norms of reciprocity and interaction, where civil society actors have a prominent role. There is a national legal system and national fiscal system, but in practice much of the actual design of, e.g. welfare services and technical infrastructure (regarding IT, transport, energy distribution, etc.) is left to new arenas. Digital arenas for decision-making are important for managing joint resources and for how an effective civil society can be stimulated also in other respects. Public policy and planning is run in line with farreaching deliberative principles focusing on transparency, mutual dialogue and learning (58). Overall, power is spread over many actors. Bottom-up initiatives and various forms of joint administration are important principles. Not all individuals own the same amount, but there is an awareness that everyone has the opportunity to contribute to the economy. There is a community spirit imbued with a strong belief in civil society.	A large part of production is organised in cooperatives and in networks where production resources are shared. Both large and small production units export and import goods and services. IT is well developed and also makes it easy for minor actors to engage in international trade. Private ownership has decreased in favour of joint ownership. Production resources are often owned jointly, and the real capital that is under private ownership is often also part of the economy of "sharing". Owners are largely seen as administrators of resources, but whose services often benefit more people. The solutions are based on bottom-up initiatives and collective administration. This means that users of resources together possess the right to design their own institutions which are not challenged by external authorities. The level of taxation only covers basic needs. In addition to this, some medical care (especially more advanced medical care), some education and the judicial system are tax-financed. There is a wide variation between different people regarding how much of their work is part of the pecuniary economy and the non-pecuniary economy. For some people, tax-based funds are the only type of income that is paid in the form of money. One form of saving that has arisen is time banks. This means that people can choose to work up a capital of time. Saved time can be used for consuming during periods when they, for various reasons, do not work, or as a form of pension61. Time as currency can, for example, be used in natural resource management (including agriculture and other food security), as well as in welfare services. As with trade and industry in general, the financial system consists of a mixture of private banks, cooperatives and savings forms such as time banks and other nonfinancial forms of savings.
Local self-sufficiency	With regard to global developments, the globalisation trend has turned and moved towards greater fragmentation and local/regional markets (87). There are few global institutions, and they do not have sufficient coordination and cooperation for being able to deal with environmental issues and social injustices. Inequalities persist or worsen over time, especially in developing countries. Many countries are struggling to maintain their living standard, create access to clean water, improved sanitation and health, and to care for vulnerable groups of the population. At the same time, many people are more exposed to the effects of climate change due to the lack of development regarding welfare, low income and lack of effective institutions. In Sweden: Since resources are found at the local level, the power and influence of municipalities over their own development is gradually strengthened, and the population also gains greater participation in decisions.	Many people have chosen to voluntarily scale down their consumption and financial income There is diversity between different local communities regarding forms of decisionmaking, but across the country there is a high degree of local participation in politics, decision-making and planning. Some local communities are stronger and more effective depending on local resources and conditions, and on organisational capacity, etc. People invest a lot of time, usually unpaid, and energy on food security, health, education and social care, and are gainfully employed to a lesser extent. Due to the decrease in paid work, tax revenues cannot form the basis of welfare. There is instead an explicit requirement for every citizen to participate actively in the local production of food and other goods, but also in the production of welfare services. The design of welfare is thus largely steered by the local communities. The State still plays a certain role through its adoption of overall laws and objectives for welfare systems and for the environment objectives that have been set and are followed. Behind local self-sufficiency is the idea of voluntary simplicity and that sustainable societies should live within the limitations regarding the ability of ecosystems to supply society and to absorb and clean emissions. People adjust their consumption of goods to the ability of local ecosystems, which means downscaling.	Civil society actors (the family, households, local production associations, networks, cooperatives, etc.) have an important role. Local communities have therefore assumed a significant role for the entire society, at the expense of the State. Most local systems have, for example, their own types of tax systems, incentive structures, etc. that are adapted to local conditions. However, the State still has a function to guarantee a national judicial system and to ensure the existence of a social safety net and basic resource security for citizens. The nation-state is run by an elected assembly that is a liberal representative democracy (95). Its task is to guarantee a legal system that is adhered to and to safeguard fundamental civil rights. The local communities are often governed through a combination of representative democracy and more active democracy, and with fairly large variations from one community to another, which is accepted as long as there is compliance with basic rules of transparency, co-determination and legal certainty. This is supplemented by a high proportion of more concrete, and "here and now"-oriented, planning and decisionmaking processes that are organised on the basis of deliberative principles with a focus on transparency, mutual dialogue and learning (96). As regards justice, this scenario does not pay particularly great attention to economic redistribution between individuals and groups.	Significantly lower tax revenues (fewer hours in paid work) mean that other solutions are needed to guarantee the social sustainability targets. Local communities have developed various solutions to secure a minimum of general welfare. Most people have several jobs, and many work part-time in welfare.
Automatisation for quality of life	Inequalities decrease, both between and within countries. In Sweden: At the same time there was, and is, an increasingly rapid technological development in society, and increased use of effective robotic technology means the replacement of human labour. During a transitional period, society wrestled with problems of unemployment in many sectors, but also with the questions of how to distribute the revenues of robotisation and of how people were to use all their new-found time in a meaningful way. As time went on, production capacity and the total resources of Swedish society were considered sufficient for everyone's reasonable needs, and the challenge instead lies in distributing the resources more evenly (128).	Technological development has resulted in the automisation and robotisation of large parts of production. People have been able to exchange these productivity gains for reduced working hours (129). Sufficiency characterises people's lives rather than the previous pursuit of material status. Policy has introduced new and more powerful instruments to realise political goals and reduce paid work. In society, there is a political majority for reduced consumption and reduced paid work. This new view has been driven by a broad popular movement that has raised public opinion both with respect to planetary boundaries and to questions of quality of life and health. Behind ideas of sustainable automisation as a strategy for sustainable development, there is thinking to the effect that work is not a human right, but rather an obligation and duty that is not desirable and that more and more want to be free from (131).	Regional conditions and industry structure affect welfare policy and business policy, and cause differences between regions in terms of production opportunities and tax revenues from production. The State's role is essentially one of coordination and administration in order to ensure innovation and application of technological opportunities in a way that does not create unsustainable disparities between regions. This means that the State has regulatory powers in cases where a region has been excessively disadvantaged relative to regions that have been favoured. Welfare is regulated to a higher degree at the regional level. [...] Regional variations of, e.g. welfare systems, exist since welfare is interpreted more on the basis of regional wishes and conditions, where social welfare and access to culture, for example, are prioritised in sparsely populated areas, while metropolitan areas invest in the accessibility of welfare systems and measures to reduce segregation. As regards justice, all citizens have the right to a basic level of security. Greater socioeconomic variations are accepted between people and regions since the opportunities of automisation will probably vary in different parts of the country. Justice concerns everyone's right to a level of economic security and the existence of democratic and transparent decision-making processes that involve more members of the general public and that make explicit the impact of automisation on the individual's level.	Access to energy is relatively good, though limited, which means that there is a need for prioritisations. Energy for the production of basic needs such as food is prioritised. Even though the productivity of automisation has been withdrawn in the form of a reduction in normal working hours, real wages have decreased. [...] Services are also more expensive as normal working hours have decreased. The price of energy has increased since automisation means a high demand for energy. The price of raw materials from land use, such as food and forest raw materials, has also increased. To achieve the social sustainability targets, society's mechanisms are adapted for the just allocation of resources. One measure to avoid increased wealth and income differences is the distribution of productive capital (technology, machines) so that a few people do not control an excessively large part of production and incomes. Another measure that has been introduced is highly progressive taxes on income from capital since the real capital contributes much more to automated production and is thus an important source of income. Tax on work generates lower revenues for the State since working hours have decreased, and it has not been possible to increase the tax ratio to the corresponding degree.
Circular economy in the welfare state	Development levels and income increases are unevenly distributed across the world. Both global and national institutions are slowly working towards sustainable development, which means that the global sustainability targets have still not been achieved in 2050. But small improvements are constantly being made as regards human health and well-being. Population growth and the income differences mean that many societies are stratified with limited social cohesion.	A central starting point for society is also that sustainable development presupposes a well-developed welfare system. Welfare is organised and financed via the State, and there is a very strong safety net.	The goal of a circular economy is both to contribute to sustainable development and to have strong state finances that allow a lot of scope for financing welfare services in areas such as education, health and social care as well as R&D in priority areas. A just society is achieved through an active redistribution policy that focuses on equalising differences in access to economic resources (equalisation of income differences). The principle of distribution has clear traits of a classic social democratic welfare regime in which the State has a central and strong role and where there are universal welfare systems to which all citizens are entitled (170).	Other actors also influencing the political agenda to a high degree are companies and sectors that are important to the circular economy, such as actors supplying logistics, statistics and knowledge solutions. People make their living through paid work in the private or public sector. The State uses progressive taxes and transfer systems to guarantee that all people have access to basic welfare services and pensions.

SOCIAL EQUALITY	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	In the collaborative society, citizens are highly involved in decision-making that relates to everyday life, the organisation and running of cooperative activities and to the built environment. Overall, citizens have a high degree of empowerment, but the expectation to be constantly capable and socially smart is stressful and means that those who do not make an effort and/or those with weaker social capital risk being worse off (60). For this reason, special measures are needed to guarantee resource security for all citizens. Things are shared to a high degree, and private ownership has all but disappeared. Knowledge is shared at the global level, often via Creative Commons licences, whose regulation allows innovation to remain open and be used freely for non-commercial purposes (66). Production resources are distributed and controlled by the prosumers. Social capital is important for coping well in this society, also including social organisation capability, trust and good reputation (67).	Much of paid work has been replaced by unpaid work in the form of initiatives for different types of collective (resident associations, idea-based organisations, etc.). People's total working time (paid and unpaid work) is governed by their life situation. The level of consumption has decreased, partly because productivity is lower and partly because consumption logic is steered by the new collaborative justice ethics, where people's consumption choices are not designed to outclass their friends. However, the principles of what constitutes justice are local rather than global. Some cooperatives investing in a resource (accommodation, experiences, various types of welfare services, etc.) can offer their members better access to this particular product/service. However, there is a minimum level for what is considered basic needs that must be met for all.	ITS has also made possible a more intermodal transport system where many no longer own the means of transport they use. However, the range of different transport services remains unevenly distributed between different contexts, such as between the inner city, suburbs and rural areas. Inner cities, especially those in metropolitan areas and major cities, constitute especially transport-rich contexts where intermodal travel and the use of ITS is greatest (73). Owning and using a car individually is expensive. There are local pools, linked to accommodation [...]. It is also relatively common to be a member of larger (geographical coverage) point-to-point pools with different vehicle types.	Inequalities between and within countries have decreased. Universities, schools and teaching are available digitally. Knowledge is possible to acquire through digital commons and online courses and therefore does not steer where students live to as great an extent. More premises and areas with spaces for activities ranging from tool pools to cultivation have spread out, often at the expense of the share of private spaces. Cooperative forms of ownership and administration are predominant. Cooperative forms of tenure, such as tenant-owner associations (where there is no extensive speculation in the tenant ownership title, which instead consists of fixed deposits based on construction costs and current loan terms, such as the title's form before deregulation in 1968 [84]) and cooperative tenancy associations, where residents have great influence over their own dwelling and over the association's administration. Regulation, e.g. within various networks in order to avoid discrimination in associations/cooperatives, as well as incentives to create diversity (and counteract exclusive effects), is an important part of enabling diversity and access for all. Access to materials is limited in part by local conditions, but there is trade between regions and between cooperatives that develops new technologies and materials, and skills are also shared globally.
Local self-sufficiency	Decisions are primarily made in smaller societal units in the form of resourceadministrating communities (98). This means more direct democracy and deliberative decision-making, which involves a high degree of participation for all citizens. Everyday operations include planning and organising the local community. Some communities rotate positions of power and public roles. Some local communities are stronger and more effective depending on local resources and conditions, and on organisational capacity, etc. This scenario will probably have some inequality, for example in the form of people who are more capable of contributing to production also gaining certain advantages or better access to resources, and the weak and sick not always receiving the resources they would need. Specific principles of distribution regulating how large differences are perceived as just in this regard are decided locally. Most local communities have some form of tax system to finance joint investments, care of the elderly, children and the sick. However, these tax systems can vary, with some communities being more egalitarian and others more hierarchical. There is a tendency for those with the greatest influence over key production resources (land, energy, raw materials as well as technical aids and expertise) to have more influential positions and greater influence over important decisions in this scenario. This is a potential source of corruption and dissatisfaction, and thus an issue in need of proactive management to avoid the risk of ruining local cohesion.	Purely in terms of time, this scenario does not have the conditions for a greater participation in civil society, but people's increased cooperation in local contexts nevertheless creates arenas for influencing local and regional decision-making processes. People's increased involvement in local networks also gives rise to a higher degree of security since information transfer is fast and people experience a proximity (geographical, but also social) to decision-making bodies.	High-capacity public transport is mainly found in metropolitan areas and major cities (largely applicable to infrastructure already in place), but is significantly scaled down compared with 2015, and in some smaller cities and towns it is almost completely discontinued.	Because local production is important for the provision of energy and food, it is becoming increasingly important to live close to the provision systems. Cities have thus seen an outflow, and there are more areas for cultivation in these sprawled cities. In locations with good access to productive agricultural land and drinking water, the pressure on housing might even be high. As the local/regional units are self-organised, they might seem relatively different. Both private and shared ownership exist, with great variation between different parts of the country and between regions, where certain settlement clusters/villages are under joint administration, while elsewhere there is a more hierarchical structure and, in yet other contexts, a more open governance. In structures under joint administration, shares in both land and settlement are prerequisites for being allowed to cultivate the land, which is managed as commons (118) and whose taxation and administrative responsibility are based on shares. Some units have reintroduced allotments, which are subject to a regular lottery and rotation in order to avoid more or less advantageous land continuously going to the same household. Accommodation can also be under joint administration as a commons in itself, based on a principle of shares, or as private ownership of small houses that are part of the system of joint administration of surrounding infrastructure (119). In other areas with a more hierarchical structure, land ownership is an important question of power, and family ties or strategic alliances rather than joint administration control who gains access to land resources and settlement. More of the maintenance need in the settlement is met by private individuals through joint efforts for the commons. Construction largely takes place in "sweat equity", i.e. the input of working hours, as part of the local commons or within the household.
Automatisation for quality of life	Technology developers, researchers and industry actors have an important role, with a particular focus on those who develop and deliver technological and knowledge solutions to facilitate automatisation. [...] There may be some features of neo-corporatism, (137) but with a greatly increased influence of the general public as they have more time to engage in societal development and politics. People, in their role of users of smart systems, have direct influence on the system digitally – in a sort of digital direct democracy (138). However, a technocratic elite might arise consisting of those who develop and control the digital steering systems, but citizens can take their own initiatives within the system's framework. Technological aids have been developed in a user-friendly direction, which together with broad IT training has enabled the vast majority of citizens, including the elderly, to utilise robots and technological aids for routine tasks also in the home. Everyday life is permeated by an autonomous view of quality of life that does not attach as much importance to material resources and assets as today. Value is instead placed on autonomy and independence made possible by greater access to disposable time (143) Another important aspect of quality of life is the opportunity for genuine experiences.	People have low average incomes since they work little, but there is a guaranteed basic level of security. Despite higher material costs, automated production means relatively low prices for many basic goods and services since the production of many goods and services no longer needs expensive human labour to the same extent. Locally managed, but nationally (and, in some supranational organisations) accepted time banks regulate, for example, workload during the life cycle according to individual needs. Paid work loses its function as a normative and moral measure of human activity142. Time and activities are instead valued on the basis of the experience value and quality to the practitioner and her social context, such as family and friends.	Above all, however, travel on foot and by bike has increased, including electrically assisted bikes. People in sparsely populated areas with the need to own a car have access to heavy subsidies (purchase premiums) so as to avoid adverse distributional effects, and there is also support for distribution systems and hybrid filling stations in sparsely populated areas (152). There has been very little new investment in transport infrastructure since 2015, but some road infrastructure for car traffic has been converted into cycling infrastructure, and also to some extent pedestrian infrastructure.	Inequalities between and within countries have decreased. Privatised areas (both indoors and outdoors) in urban areas are in a completely different way, open, free of charge, high available to all and have good and numerous meeting places (157).
Circular economy in the welfare state	Representative democracy prevails. Citizens take part in democratic elections at the local, regional, national and EU levels. [...] An important task for the State is to monitor the welfare system and distribute welfare resources. Power relations between citizens are similar to those that existed in 2015 – access to resources and services is controlled largely by the ability to pay. However, the power of companies and the State has been strengthened in relation to individual citizens. Other actors also influencing the political agenda to a high degree are companies and sectors that are important to the circular economy, such as actors supplying logistics, statistics and knowledge solutions. The transition of consumption patterns entails a decoupling of the link between social status and the consumption of spectacular goods (housing, cars, etc.). Status is instead marked through the consumption of more exclusive services or leisure activities (175). Many people are driven by an individualistic social and cultural ethic (176) and consider it natural to compete for attractive positions in society and a high social status, but instead of material markers, use is made of services, leisure activities and cultural capital (mainly education) to mark status positions.	Since a high level of general welfare is a strong political objective, a relatively large share of economic activity is focused on the production of welfare services. Working life is characterised by a renaissance of old craft professions since it has become more common to repair, service and update consumer goods at the same time as new knowledge professions emerge, for example, by regulating material flows or matching people's needs and wishes with appropriate (levels of) services. Many of these new jobs, such as smart product design, service and repair, recycling and product matching, require, as mentioned, a relatively high level of education. Relatively high incomes create opportunities to buy services that facilitate everyday life. A strong welfare state and its institutions ensure that all citizens have access to services that guarantee a basic security. These services can, for example, be subsidised via progressive taxation of more exclusive services.	As regards everyday mobility, car traffic has decreased sharply in favour of walking, cycling and public transport (including intermodal travel). Investments in alternatives to the car (walking, cycling and public transport) contribute in themselves to a more just distribution (189).	In the ownership and administration of human settlement, the basic ideas of public utility have seen a renaissance (194). That is to say, a larger proportion of human settlement is owned by long-term property owners on a non-profit-making basis. [...] These companies constitute housing policy instruments by offering basic security in the form of a dwelling for all inhabitants. [...] Market conditions prevail to some extent in parallel to this, with the housing companies competing to offer the best service to their tenants.

GOOD BUILT ENVIRONMENT	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	A general trend in the global development (42) is that many countries are joining a more sustainable road, which is a development that takes planetary boundaries into consideration.	Digitalisation means that location does not play as big a role and that people can live where they want to a higher degree. Energy consists solely of renewable energy. [...] The proportion of electricity from the sun, wind and water is just as great as the proportion of biofuels. The energy systems are primarily regional or local, and wind turbines are managed by groups or individuals with shares. Similarly, biomass installations are jointly managed.		
Local self-sufficiency		Many live in rural areas and in small towns, and the metropolitan areas have sprawled, with a large proportion of areas for cultivation. The proportion of electricity from the sun, wind and water is less than the proportion of biofuels.		Renovation and building conservation works are common as are other crafts, such as shoemaking and the production of tools.

GOOD BUILT ENVIRONMENT	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	Collaborative forms of accommodation are common, in which everyday functions and tasks are shared to varying degrees. [...] Digital tools facilitate the organisation and monitoring of schedules, the input of household members and resource expenditure.	This states that all members of society should have a relatively high minimum standard, for example in terms of accommodation or access to basic welfare services.	The range of different transport services remains unevenly distributed between different contexts, such as between the inner city, suburbs and rural areas. Inner cities, especially those in metropolitan areas and major cities, constitute especially transport-rich contexts where intermodal travel and the use of ITS is greatest (73). In these contexts, ITS in combination with the use of information and communications technology (ICT) for information on opportunities for interaction and participation in various activities, has led to increased travel, but cars are rarely used for this (74). E-commerce has grown large, which has meant that shopping centres have come to be used for other purposes, but this has also led to closures of some convenience stores, which in turn has generated some new and motorised journeys (75). Teleworking, including virtual communication and virtual meetings, has increased. To some extent, this has led to people settling further from areas of activity. Only transport powered by fossil-free energy sources is permitted in Sweden in 2050 (under an EU Directive), and these vehicles are relatively expensive, as are the fossil-free fuels. In addition, ridesharing services have been developed with both pool cars and private cars, which too are attractive since they result in higher assigned road capacity.	People are living more scattered across the country, though still in clusters or communities in urban areas. [...] Knowledge is possible to acquire through digital commons and online courses and therefore does not steer where students live to as great an extent. The scenario is dominated by decentralised concentration80 – where creative centres of production and consumption constitute new cores in human settlement patterns and platforms for activity (such as workshops, offices, factories) and where geographic location is not as dependent on large urban infrastructures. Low-density housing areas and suburbs are utilised to a higher degree than today, but often in existing structures. [...] Green areas are often shared, rather than private, to enable more concentrated land use. Existing human settlement is the foundation for this, but it has in many ways been modified and converted in order to accommodate these new functions and relationships. The private heated living space per person has decreased, with access to larger common areas as an expansion of "home functions" (semi-heated or with regulated heating based on the nature of use and needs over time) (81). Premises generally being used in a more efficient manner (in terms of use and m2). The housing cooperatives themselves drive new construction or conversion under their own auspices, either in the form of self-building among their members, in the form of construction communities or in collaboration with, e.g. building cooperatives. As production is dominated by on-demand thinking (rather than mass production) of both construction components and household products, projects are often based in open source databases where drawings are shared (85). there are easily accessible systems that keep track of energy use in spaces that are not being used [...] complemented by social, "low-tech" solutions, where flexible use of the settlement and public spaces is also based on direct communication within users. The materials used in new construction and conversion are in part adapted for circular flows, but also to new technology that can be printed on demand. Various material components can be included, as well as the recycling of waste materials (86). Access to materials is limited in part by local conditions.
Local self-sufficiency			People live close to agriculture, where the majority of other production is also located. People are transported within the local communities mainly on foot and by bike, and by simple motorised bi- and tricycles, which run on locally and regionally produced biofuels or electricity (111). Long-distance public transport services are also very limited. These services use the same infrastructure and routes as goods transport (114).	Rural areas, [...] are now experiencing a renaissance. Many people choose to move from metropolitan areas, thus reducing the high pressure on the core and suburbs of these areas. Cities have thus seen an outflow, and there are more areas for cultivation in these sprawled cities. People, especially those of working age, live more scattered throughout the country in smaller local/regional centres of settlement, with high access to productive land or other natural resources. Use of older structures and building stock is an important prerequisite. Outflow from the cities has resulted in the need to demolish houses in some places and to build new ones places. In locations with good access to productive agricultural land and drinking water, the pressure on housing might even be high. There has also been an outflow from town centres to surrounding suburbs, where it has possible to convert previously car-related spaces to areas for cultivation and energy production. The new production of human settlement taking place is largely decentralised in the form of bioregions (115), i.e. demarcated regions that have the capacity for self-sufficiency, but conditions for sustainable use of natural resources through proximity to natural resources and thereby awareness of their administration. This settlement constitutes smaller entities of lower density, with a lot of space for various ways to achieve self-sufficiency for food, materials, energy, etc. (116). Productive land for cultivation close to housing is important. People live relatively spread out in smaller village units, but there might be more people in the same household/building unit in relatively large living spaces for larger households and different functions grouped in different types of buildings. Small-scale solutions for heating and electricity also entail some flexibility (e.g. limitation of area use over the seasons and between different functions). The standard has dropped regarding, e.g. thermal comfort and modernities in the home; at the same time people spend more time outdoors. The settlement is often organised in the form of ecovillages and urban villages (117), with strong cohesion within the group. Industrialised, large-scale construction has all but disappeared. Skills development and re-learning of construction techniques and materials use based on self-building/self maintenance, such as wood, clay and straw construction, depending on geographical location. The technology level and complexity of technology in the buildings have fallen significantly. Building materials are time-intensive rather than expensive. They are mainly produced locally and supplied by local companies in the local currency, or are obtained through one's own production on the basis of the natural resources at hand. Tactile materials such as straw and clay, which require knowledge and craft, are predominant in the selfbuild of new human settlement. The settlement largely consisting of smaller and simpler buildings (such as small houses and apartment buildings of no more than two to three floors). Utilisation of passive design techniques for, e.g. heat recovery, ventilation and maximising sunlight is widespread. Infrastructure systems are small and local, with a high proportion of recirculated nutrients from food waste and sewage, as well as, e.g. private wells for drinking water.

GOOD BUILT ENVIRONMENT	Development until 2050	Situation in 2050	Governance and planning	Economy
Automatisation for quality of life		The population is concentrated to both medium-sized and major cities. There are many people in the southern half of Sweden, but the population in the northern parts has also increased in the major cities. The proportion of electricity from the sun, wind and water is higher than the proportion of biofuels. Waste and residues that are not recycled are used for heating. The district heating system is well developed in medium-sized and major cities.		
Circular economy in the welfare state		Sweden is heavily urbanised. The population and economic activity are concentrated to major cities and metropolitan areas with a regional hinterland. There are large wind farms, both onshore and offshore. Hydropower also constitutes a major source of energy and has been expanded somewhat. The proportion of electricity from the sun is high. The investment in biofuels is smaller, but biomass from, e.g. algae is used to a greater extent thanks to innovation support and procurements. In the cities, land is intensively utilised, and the ecosystems that are part of the circulation process can be at a great distance from residents. Rural areas are sparsely populated but intensively utilised and provide the urban population with goods and ecosystem services. Large areas have been set aside as nature reserves and carbon storage reserves (167). People appreciate the open landscape, the untouched nature and nature experiences outside the cities.		Various types of legal and economic instruments have been used to achieve the targets for reduced carbon dioxide emissions (a maximum of 2 tonnes per capita) and a halving of land use per capita.

GOOD BUILT ENVIRONMENT	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
				Regional governance and the opportunity to work less mean that people are more spread out across the country, but still live around the major and medium-sized cities. People choose accommodation to a high degree on the basis of qualities in the local community. Some further concentration and new construction in central urban environments has taken place, but there is also construction of completely new urban cores. Former urban structures and existing settlement are used to some extent, not least through the conversion of, e.g. former office environments in cities into dwellings. Some further concentration in central urban environments has taken place. An important element is also the construction of completely new urban cores, often quite extensive in size, where rational patterns of settlement exploitation and location are produced according to parametric methods (materials and energy optimisation as well as variables for light, green spaces and social movement patterns). Technological and digital development enables both efficient production, optimisation of design in new ways and the use of more efficient technology (such as vacuum insulation) to achieve zero-energy buildings, for example. Furthermore, it is easier to build in sensor and monitoring systems from the start, and finally the car-based settlement structures that still prevailed in the early 2000s were too difficult to adapt to the new patterns of mobility. With new technology, previously unbuildable, but attractive sites now also have the potential to be utilised (to free up space for other purposes and save natural land), such as human settlement at sea (e.g. amphibious buildings and floating structures adapted to changing water levels [154]). In built areas, the settlement structure is relatively high and densely populated (but not necessarily orthogonally in grids, but characterised more by organic forms and placement), with adjoining highly productive green spaces for cultivation both horizontally (surrounding settlement cores) and vertically (in and on human settlement).
Automatisation for quality of life	The proportion of electricity from the sun, wind and water is higher than the proportion of biofuels. Waste and residues that are not recycled are used for heating. The district heating system is well developed in medium-sized and major cities. An increased demand for local leisure activities (e.g. nature experiences but also self production of local food goods) means that experience production lays claim to larger areas of the local surroundings. But this production tends to be in places that have not previously been used to any greater extent.	People spend a lot of time at home and in the local community related to their dwelling. The tasks they engage in make it possible to work at home/locally to a high degree, which further reduces the need for work journeys. The journeys that are made are more spread out over the day and night, and non-work trips are predominant. Passenger transport work (in person-kilometres) has decreased by about half. In metropolitan areas and major cities, congestion in public transport has ceased. Service frequency is not as high and is more spread out over the day and night, both in metropolitan areas and other cities. Public transport has some new travellers. Car ownership has decreased drastically, but there is geographic variation. In sparsely populated areas, car ownership and car use are still high. In urban areas, cars are mostly used for major purchases and transporting goods, and for some leisure travel to more distant destinations not served by public transport. Above all, however, travel on foot and by bike has increased, including electrically assisted bikes. [...] However, the use of motorised transport is higher in metropolitan areas and major cities as a consequence of greater distances. Rail-based motor traffic is powered by electricity from renewable sources, while roadbased motor traffic consists of hybrid vehicles run on electricity, hydrogen and biofuels. Electricity and hydrogen are prioritised as their energy efficiency is significantly higher in comparison with biofuels.	Previous values about prestige projects, such as large arenas, and shopping malls, as growth engines are gone (156). Privatised areas (both indoors and outdoors) in urban areas are in a completely different way, open, free of charge, high available to all and have good and numerous meeting places (157). This, combined with a greater cultural diversity, creates changes in how the built environment expresses itself and is used. Residential environments and public buildings and places are used to a higher degree and for a greater part of the day as less time is spent in dedicated working environments. [...] People live close together, with a relatively high standard (aesthetics, heating, comfort), made possible by technology. Residents have access to, and can supervise the administration of, the built environment by means of connection to "smart systems" that provide an overview of the stock, resource use, degree of utilisation and so on. Administration is in turn handled via automated systems, where the human settlement is equipped with electronic sensors for environmental feedback. Sensors detect maintenance needs and cleanliness, for example, and the system matches empty units with residents/activities that need them. Automated systems control heating and cooling to reduce energy expenditure (158). Parametric design and materials optimisation characterise building processes. Automated systems for the production of human settlement ensure that materials expenditure, fitting and so on in prefabricated modules and elements are "clicked together" on site by a radically reduced workforce. Construction is very rational and uses materials with requirements on high strength/volume, such as steel or new bio-materials/bio-plastics.
Circular economy in the welfare state		Well-developed rail networks, including station locations, maintain the development of settlements locally and regionally. [...] In comparison with 2015, national passenger transport work has decreased, but not to dramatically low levels. As regards everyday mobility, car traffic has decreased sharply in favour of walking, cycling and public transport (including intermodal travel). Many parking areas have had to give way to other land use. Strategically selected commuter towns have been developed in a functionally mixed direction. [...] Well-developed public transport has been used to link these to workplaces and other services in the major cities (known as Transit Oriented Development, TOD) (184). Investments in space-efficient means of transport result in problems of "many people in one place" in the form of congestion not being so great. Population density also forms a basis for a wide range of activities, private and public service with good accessibility via walking, cycling and public transport. However, the built environment is being slowly transformed over time, and there is still a large proportion of sparsely populated and car-oriented settlement within urban areas, as well as many different types of sparsely populated areas around the country. Most vehicles are energy-efficient hybrid cars that can run on both electricity (renewable energy sources) and several types of biofuels (pure and drop-in fuels).	The population and economic activity are concentrated to major cities and metropolitan areas with a regional hinterland. Due to the high cost of building materials, new human settlement is limited to areas of strategic condensation (also vertically in some cases) in metropolitan areas and close to public transport. Investments have instead been steered towards renovating and upgrading existing stock, and to some extent towards altered functions and degrees of utilisation, of existing buildings and locations with a low degree of development. This generally means more people on the same area in the strategically selected commuter towns. Access to green areas within a certain radius of the home (by public transport or bike) is seen as key to everyday physical activity that ensures the good general health of the public. The norm of overcrowding has changed so that it now stimulates the efficient use of living areas (193) and constitutes a minimum level of heated living area per person with thermal comfort in accordance with public health norms. The State has steered away from excessive living areas per person. The companies meet national, health-related norms in return for the State's provision of stable financial conditions. There has been skills development within aspects of step-by-step renovation and the use of new technologies that are incorporated into a larger proportion of service works in the construction sector: repairs, continuous maintenance, monitoring and so on. Virgin materials are no longer used in the construction process. There are instead many different strategies for the re-use of materials (C2C) (195) and for the development of innovative materials, such as insulation materials made of recycled textile fibres. Dismantlability, recyclability and long life are keywords for all new construction and for the remodelling of existing settlement (196). There is a general transition to renewable materials or materials that can be remodelled with limited energy expenditure. Circular, but still often relatively large-scale systems have been established for appropriating and utilising resources. District heating systems are well developed, especially in cities, and supply the growing urban population with heat.

APPENDIX 4. ANALYSIS OF THE ASPECTS OF ASSESSMENT

GENDER EQUALITY	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	Unclear. Even if power and ownership move from hierarchical institution to shared ownership and interlinked networks globally, it cannot be said that this will affect gender equality in Sweden possitively or negatively.	Opportunity. Women are under-represented in organizations and corporations. Transference of power and ownership to groups using resources would give room for higher equality.	Slight opportunity. Continuation of elected assemby and public authorities can be seen as good. The focuson mutual dialogue and learning and active democracy can also be possible. However, unexpected drawbacks of new forms of interaction could appear.	Opportunity. Bottom-up management and ownership can have a good effect replacing structures where women were under-represented.
Local self-sufficiency	Unclear. It is hard to assess how this would affect gender equality in Sweden.	Slight risk. New distribution of paid/unpaid labour can reinforce current uneven patterns.	Unclear. It is hard to devise if new arenas for decision making will have a possitive or negative effect in gender equality. Focus on transparency, mutual dialogue and learning can turn positive.	Risk. Generalization of multiemployment can affect more those earnig less and devoting more time to unpaid labour.
Automatisation for quality of life	Opportunity. Distribution of resources and decreased competition regarding salaries can turn into more gender equality.	Unclear. It is hard to elaborate how an overal decrease in employed and home working hours will affect current patterns.	Opportunity. Higher level of economic security for everyone together with higher participation can be positive for gender equality.	Opportunity. Regional authorities promoting social targets are positive for gender equality.
Circular economy in the welfare state	Unclear. It is hard to assess how this would affect gender equality in Sweden.	Opportunity. A well-developed welfare system and a strong safety net can be positive for economic independence.	Slight opportunity. Continuation of elected assemby and public authorities can be seen as good.	Unclear. This situation could or could not continue the current salary gap.

SOCIAL EQUALITY	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	Opportunity. Shared knowledge and ownership from individuals and companies can reduce inequalities. The power shift to networks can make the different networks different inequality lines. Rise of citizen power can reduce inequalities.	Opportunity. Share instead of ownership can help tackle inequalities. So can cooperatives instead of companies.	Slight opportunity. The fact that civil society actors have a prominent role can help tackle inequalitie. So can the importance of bottom-up initiatives.	Unclear. Cooperative production, access for minor actors to international trade and joint ownership can be positive. Still, the fact that "some" education is public could become a risk.
Local self-sufficiency	Unclear. There is a risk that inequalities between regions can increase. There is an opportunity to decrease the inequalities within regions.	Unclear. Consumption and income reduction can be positive for social inequality if coming from the better off. Different forms of decision making deciding different kind of welfare management can create inequalities between local communities in terms of access to it.	Risk. Even if there are overarching intitutions that act on principles of transparency and co-determination and local decision-making focuses on transparency, mutual dialogue and learning, none of them are focused on redistribution. This can foster inequalities when every local system has own tax systems.	Risk. The necessity of multiple jobs can affect more those worse off.
Automatisation for quality of life	Opportunity. Focus on more even redistribution helps reducing inequalities.	Opportunity. The change of focus from pursuit of material status to sufficiency together with the introduction of new and powerful instriments to realise political goals while reducing paid work can help tackle inequalities.	Unclear. The active action of the State dealing with inequalities between regions but permiting adaptation to specific needs reduce inequalities. So can the decision-making processes. The acceptance of greater socioeconomic variations might work against it.	Unclear. Real wages decrease together with rise in prices for services, energy and raw materials can foster inequalities. Measures limiting over accumulation of productive capital together with progresive taxes can tackle them.
Circular economy in the welfare state		Opportunity. The existence of a strong safety net and a well-developed welfare system can help reduce inequalities.	Opportunity. Active redistribution and welfare services can reduce inequalities.	Opportunity. Progresive taxes can reduce inequalities.

GOOD BUILT ENVIRONMENT	Development until 2050	Situation in 2050	Governance and planning	Economy
Collaborative economy	Slight opportunity. Production of materials outside Swedish borders that can be used in urban areas and building construction are more sustainable.	Opportunity. The presence of only renewable energies will make buildings more sustainable.		
Local self-sufficiency		Slight opportunity. The absence of fossil fuels is positive.		Slight opportunity. Renovation and conservation can result in more sustainable building envrionment than proliferation of new construction.
Automatisation for quality of life		Opportunity. The lack of fossil fuels is positive, together with a bigger proportion of sun, wind and water energy. So is the good development of district heating.		
Circular economy in the welfare state		Opportunity. Strong presence of renewable energy sources. Access to nature in populated areas appear harder, contrary to the EQO.		Opportunity. Both targets add on to a better built environment.

GENDER EQUALITY	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	Risk. A resolution of problems and needs in other levels far from a welfare state can reinforce uneven distributions and discrimination against women. The necessity to remain in good terms with the supply network can reinforce an uneven status quo.	Opportunity. Time banks will make explicit unpaid labour. Cooperatives providing care using this system would make a more even distribution of unpaid labour.	Slight opportunity. Purchase of service as form of access to transport instead of ownership can result in a more even access.	Slight opportunity. The appearance of new constellations of households can make explicit the distribution of unpaid labout and care. It can also be possitive towards takling men's violence against women.
Local self-sufficiency	Unclear. More direct democracy substitusing a national assembly can have unclear effects. The egalitarism or authoritarianism of specific communities will affect gender equality, but it is hard to devise how.	Risk. Higher unpaid work can affect more to those who currently do it more nowadays.	Slight opportunity. The expansion of cheap means of transport among all the population can contribute to gender equality.	Unclear. The effects for gender equality can depend much on local structures. Whereas some can present an opportunity (joint administration) others can present a risk (where family ties and strategic alliances are important).
Automatisation for quality of life	Opportunity. Neo-corporativism can be a risk due to women's under-representation in corporate structures. However, a bigger and more direct implication in politics with a greater agency can make it an opportunity. The abandonement of dependency relationships can tackle uneven unpaid care. Economic independence can be reinforced.	Unclear. It is hard to say if reduction of labour hours will make them more gender equal. Similar happens with more paid and unpaid work at home.	Unclear. It is hard to elaborate on the consequences for gender equality.	
Circular economy in the welfare state	Unclear. The situation appears very similar to today's, which means there might not be much change in terms of gender equality.	Unclear. The situation appears very similar to today's.	Slight opportunity. The expansion of cheaper means of transport together with publci transport among all the population can contribute to gender equality.	
SOCIAL EQUALITY	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	Slight opportunity. High involvement in decision-making, distribution of production resources and knowledge share can decrease inequalities. However, social preassure to "perform" can create disengagement and inequalities.	Unclear. The decoupling of consumption with class reaffirmation can decrease inequalities. The belonging to different cooperatives can be a source of inequality depending on the minimum levels for all.	Risk. In non-urban areas, the fact that using a car is expensive can aggravate inequalities, both between people in non-urban areas and betwen non-urban and urban.	Opportunity. The fact that access to knowledge is broad can help reduce inequalities. So can the form of accomodation ownership. The particular emphasis on counteracting exclusive effects can also be really positive.
Local self-sufficiency	Risk. Inequalities appear between more and less capable.	Unclear. Proximity to decision-making bodies can help reducing inequalities, however distance to local networks can mean less security.	Risk. Great inequalities in terms of access to transport can appear between major cities and the rest.	Risk. Inequalities can appear between settlements as a consequence of different kinds of administration. There is also especial risk in settlements with hierarchical structures.
Automatisation for quality of life	Risk. Inequalities can appear between those involved in technology development and those outside. They can also appear between technocratic elites and the rest.	Slight opportunity. The replacement of paid work for time and activities can reduce inequalities, since the access to them is broader.	Opportunity. Bigger importance of extremely cheap means of transportation (walking, biking) together with action for sparsely populated areas can help reduce inequalities.	Opportunity. The change of meaning to privatised areas can help reduce inequalitites.
Circular economy in the welfare state	Unclear. Inequalities appear similar to today's.	Opportunity. Welfare state and welfare services can reduce social inequalities.	Slight opportunity. More just distribution provided by alternatives to car can help reduce inequalities	Opportunity. New forms of management of housing and easy access can help reduce inequalities.
GOOD BUILT ENVIRONMENT	Household forms, consumption and power relations of everyday life	Time use and welfare	Mobility	Human settlement
Collaborative economy	Opportunity. Collaborative accomodation together with the use of digital tools can help reduce the impact of buildings.	Opportunity. High standard of accomodation can help resolving the problems diagnosed in the EQO definition.	Opportunity. The absence of fossil fuels is positive towards a better indoor environment in terms of polution. However, aspecs as noise contamination are unclear.	Opportunity. The decrease of private heated space per person and its exchange for other common areas, together with more efficient use of premises, makes the built environment more sustainable. The fact that the future inhabitants construct themselves can result in a more efficient design and management in the long run. There is a risk that subtituting mass production of components leads to less eficiency. Still, risk reduces if those come from circular flows. Energy monitorization can result in a more sustainable use of buildings.
Local self-sufficiency			Opportunity. The transport tendencies give room for a better built environment in terms of noise and air contamination.	Opportunity. New urban structures in form of bioregions can be developed according to environmental principles. There is a risk for heritage buildings in their re-use. Protection of the built environment against air and sound contamination from traffic happes in new urban structures. There is a risk small-scale solutions for heating and electricity might not be sustainable, but lower standards in terms of thermal comfort and appliances can reduce energy use. Ecovillage and urban village structure can be more sustainable. Traditional construction materials and methods can be more sustainable. So can passive design techniques, together with the infrastructrue systems described.
Automatisation for quality of life		Slight opportunity. More access to the activities describe can be positive for the built environment.	Opportunity. Reduction of kilometer traveled per person, together with car use reduction and more transport on foot and by bike can contribute to a better built environment as described in the EQO. So can a bigger share of electricity from renewable resources.	Opportunity. There is a risk new construction in central urban environments can endanger natural and cultural assets. Technologies enabling zero energy buildings and other help create a better built environment. Greater standards in terms of aesthetics, heating and comfort is in line with the EQO. Automated systems and monitoring can make built environment more sustainable. So can parametric design and material optimisation.
Circular economy in the welfare state			Opportunity. Sharp decrease of car traffic can reduce air and noise contamination in the built environment.	Opportunity. Building upgrades, monitoring and re-use of material for construction are efficient resource management of buildings. Access to green areas makes up for a good built environment according to the EQO. Reduced heated area per person makes a more sustainable building use, together with well-developed district heating.

APPENDIX 5. INTERVIEW GUIDE

Göran Finnveden and Eléonore Fauré were inter-viewed together by the author. The interview took place on 22 May 2017, between 16:30 and 18:00 in KTH, Stockholm. The interview was recorded. The charts (Fig. 3-7) included in the text were commented in it. The interview guide follows:

I am doing my master thesis about the assessment of futures scenarios. To do so, I am focusing on the research project Beyond GDP Growth. I am using the translated unrevised version of the test scenarios in English. Regarding methodology, I am basing my work in SAFS, but leaving the door open to the reformulation and adaptation of some steps. In general, SAFS proposes the following steps:

SCOPING
    1.1 Defining goal and scope of the analysis
    1.2 Defining environmental and social aspects to be assessed
INVENTORY ANALYSIS
    2.1 Collecting data on the current state
    2.2 Defining contextual factors
    2.3 Gathering relevant information from scenario descriptions
ASSESSMENT OF RISKS AND OPPORTUNITIES
    3.1 Interrelation analysis
    3.2 Assessment
    3.3 Integration
INTERPRETATION

My idea is to define in the coming days a set of aspects for the assessment, work on the inventory analysis part during the summer and discuss the results on a workshop. The idea for the workshop is to work in the assessment of risks and opportuni-ties and start hinting the interpretat ion of the whole assessment.

Part 1:

My first concern was to find a set of aspects that did not overlap with the normative goals of the study. I have reviewed five different sets:

UN's Sustainable Development Goals
SEPA's Environmental Quality Objectives
Raworth's doughnut
S-LCA's subcategories organized by stakeholder
Colantonio's compilation of new and emerging social sustainability aspects

- Can you think of another set of aspects that could or should have been included?

- Did you have any of these sets of aspects particu-larly present when starting the Beyond GDP Growth project?

- Would you say any of the sets is more relevant to the project than the others?

- For this analysis I have gone through the basic explanation of the sets of goals and aspects, aiming to cross off the ones that were already covered in the normative goals. Do you think this is a right way of proceeding? Is there something i should keep in mind or have forgotten?

- Other than overlap with the normative goals, there are other aspects that I think should not be consi-dered in the assessment, such as those related to income and jobs, due to the nature of the project. Do you agree?

- Something I have realized doing this comparison is that the goals on the project are extremely compre-hensive. I will go through my analysis and comment it. Your can stop me at any point.

- I think they cover almost all the SDGs and the ones that are not covered have to do with aspects that are too vague in the description of those or outside the focus of Beyond GDP.

- I think they cover some of the EQOs, but many of them fall outside the scope of the normative goals.

- I think they as well cover most of the aspects of the doughnut.

- While doing this analysis it has been kind of easy to deal with the normative goals 1.1 and 1.2, since they are formulated in a very understandable way and it is relatively easy to elaborate on the effects of that goal. On the other hand, many of the aspects so far have been crossed off due to the normative goal number 2. This goal has to do with the term "biocapacity". I find it really hard to work with this goal. I have the feeling it automatically eliminates many aspects, but that it is really broad and maybe hard to operationalize or explore the implications of it. Do you have any comment about it?

- As to the aspects of the S-LCA, they overlap with most of the sub-aspects for the stakeholders 'worker' and 'local community', but not so many for the rest. One thing I wonder regarding this set of aspects is

to what extent the thinking of assessment of products can be applicable for degrowth/no growth scenarios. …?

- Finally, in comparison to Colantonio's compilation, I would say they cover most or all the traditional themes, but not so many of the emerging ones, which are also softer. Why do you think that is?

Part 2:

- After this, I think it is very hard to come up with a selection of aspects that are relevant, but that are not already covered. Do you have any suggestion?

(Here talk about what I would do: choose some EQOs, as they are more ambitious and already specific, and some social aspects)

APPENDIX 6. INTERVIEW GUIDE

Bengt Johansson was interviewed by the author through email. Correspondence took place on 19 Sept. 2017, between 13:00 and 15:00. Questions refer to the report Energifattigdom, försörjningstrygghet och offentligt agerande co-written with other authors at FOI, and a piece of news related to it that appeared in FOI's pressroom. The questions made follow:

In my work, I touch upon energy poverty in Sweden, comparing it to different definitions it has had in previous sustainability assessments in other locations.

This is a surprisingly unexplored field. In my search, I have come across one blog article published at FOI's pressroom where it is stated that "The concept of energy poverty has hitherto not been used in Sweden to any appreciable extent, largely because of the nature of the Swedish welfare system". Would it be possible for you to answer to some questions regarding that?

- Do you think the Swedish welfare system would make the existence of energy poverty marginal in Sweden if it was defined as:

   - lack of access to electric energy?
   - lack of access to clean cooking facilities?
   - 10% or more of income required to be spent on all energy?

- Is there any aspect not mentioned you consider should be included in the definition of energy poverty in the context of Sweden?

I would really appreciate your answer or any further reference that could be helpful in this regard. Even if this is not a central aspect of my thesis, energy poverty in Sweden is considered at some stages of it.