DESIGNING SOCIAL SUSTAINABILITY

Towards an operationalization of social sustainability concepts in an integrated design process

DTU Civil Engineering
Department of Civil Engineering

Master thesis

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Master Thesis

Designing Social Sustainability:Towards an operationalization of social sustainability concepts in an integrated design process.

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Front page image: Map of Upplands Väsby, Sweden, by Märta Helander and Amanda Dahl.

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PREFACE

When I chose to study architectural engineering, it was out of a fascination with architecture — specifically its interface with engineering and how the two professions can work together creatively in a design process. In this thesis I have tried to follow that initial fascination into unknown waters. Traditionally, the issues covered by social sustainability have not been a part of the responsibility of the engineer, but rather as a part of the working process of the architect, so why have I chosen this subject? Because addressing sustainability is inherently an interdisciplinary task, and in this context social sustainability provides a new and exciting possibility for architects and engineers to cooperate in order to solve complex issues.

In the end, this research has only managed to take a few steps in the right direction, and these steps could only have been taken based on the insight of existing literature and with the help of a number of individuals who have assisted me in my work:

First of all, I would like to thank my supervisor, Lotte Bjerregaard Jensen, for trusting in this project from the beginning and for providing me with the level of freedom necessary to explore a topic that was initially on the boarder of my knowledge.

I would also like to thank Amanda Dahl and Märta Helander, for their company, invaluable input and for allowing me to participate in their design project and use their material and experiences for my case study. Participating in your design process and observing your approach to the field of social sustainability and design solutions has been truly inspiring. Also a thank you to Kristoffer Negendahl and Anne Beim, for knowledgeable insight and for providing the opportunity to work with students from KADK and participate in lectures.

I also wish to thank everyone else who have been involved in this project and provided knowledgeable input, either in interviews, meetings or discussion sessions. Elise Grosse, Robin Andersson, Sofie Weidemann, Liane Thuvander, Paula Femenías, Peter Andreas Sattrup, Sofie Kirt Strandbygaard, Mathilde Landgren, Nina Koch-Ørvad and all the participants at the STED conference: Thank you!

Finally, I would like to thank my girlfriend, my family and friends for maintaining an interest in my studies, for valuable sparring and discussion and for providing emotional support throughout the process.

Aleksander Probst Otovic
Copenhagen, 15 July 2016

ABSTRACT

This thesis investigates how a design process can be supported to secure more socially sustainable solutions in the transformation of Nordic post-war social housing projects. While the concept of social sustainability is gaining relevance along with increasing globalization and urbanization, the field is still widely recognized as being underdeveloped as well as lacking a solid framework to operationalize it. Yet within the built environment, a link between changes in the physical makeup of socially disadvantaged areas and a subsequent increase in social sustainability is being established, and it seems likely that a transformation of buildings and neighbourhoods can have positive effects on both existing and future residents (Bjørn & Holek 2014).

The investigation is done through a literature study and subsequent case study. The literature study investigates the fundamental theory of social sustainability, how existing conceptual frameworks deal with it, and how the concept can be operationalized in a design process. The case study is then used to test a preliminary framework for the implementation of social sustainability in a design process, which is developed based on the literature review and interviews with Nordic social sustainability researchers and practitioners.

It was found that social sustainability could best be described through a range of defining themes and characteristics, which include, i.a., equity, social mixing, cohesion, empowerment, participation, well-being, and quality of life. The concept is then primarily conceptualised through a breakdown of these characteristics into more tangible indicators, and design process integration thus depended on how these indicators were weighted, selected and analysed as well as on their scale, visualisation, comparison of results and inclusion of residents in design processes.

Hence, this report suggests an approach for systematic enquiry into social sustainability, which covers the key topics using a compilation of themes with associated sub-criteria and indicators. Based on the conditions surrounding the individual project, these indicators can be weighted to direct focus towards the most relevant issues, and by analysing the indicators and converting qualitative and quantitative results to a common scale, the social sustainability performance of design proposals can be visualised to support the design process and secure more socially sustainable solutions in the transformation of Nordic post-war social housing projects.

TABLE OF CONTENTS

INTRODUCTION

1

The field of sustainability is a fast-growing research discipline that has received increasing amounts of attention over past decades. As decision makers have begun to realise the need for action, the change in discourse has led to a more solution-oriented public debate. Similarly, as practitioners in the field of building and urban design have realised the importance of sustainability in their work, so building owners and property developers have begun to understand its value, creating a demand for sustainable architecture and urban design as well as methods for its certification. Thus, international certification systems such as DGNB, LEED and BREEAM are gaining wide momentum as value drivers for development, giving out ratings of sustainable design based on a range of pre-defined criteria. To help produce sustainable designs that are able to achieve top certification ratings, tools are continually being devel-

F 1.1 Transformation of social housing complex Fyrklövern, Upplands Väsby, Sweden.
This side: Existing.
Opposite: Visualisation.
Socially sustainable or not? Photo and image by White Architects.

oped to tie current knowledge of sustainable practice to the early phases of construction project design processes, thus closing the gap between theory and practice.

Still, the sustainability debate seems to overlook certain elements. Since the World Commission on Environment and Development (WCED) presented its definition of sustainable development in the report *Our Common Future* (WCED 1987) — and even before this — focus within the field of sustainable development (or simply sustainability) has been largely two-dimensional, namely on the environmental challenge, within an economic-centred way of thinking (Partridge 2005) and thus the call for change has often resulted in little more than new and greener ways of generating revenue. Due to the financial growth prerogative, the environmental benefits have even been so questionable in some cases as to give rise to the term *green-washing*.

To put this into perspective, sustainability is now often described as consisting of an interrelationship between environmental, economic and *social* aspects (McKenzie 2004). Of these aspects, social sustainability has been largely neglected in urban planning, renovation and building design, as initiatives to improve social cohesion, equity, diversity and quality of life have been sidetracked by a largely energy-oriented building strategy. Only within the last decade has the social aspect gained a foothold within the discussion of sustainability (Partridge 2005).

In construction and planning today, the concept of social sustainability continues to be the most elusive part of the triad of sustainability. In theory, it might be commonly represented as an equally important part of the whole, but in reality, architects have been struggling to come up with ways to integrate

socially sustainable practice in their design while taking into account environmental and economic considerations.

Still, it is arguably the most important and the easiest one to *understand*. In contrast to environmentally and/or economically sustainable architecture, which often has to rely on marketing or superficial aesthetic measures, such as green roofs and façades, to communicate their sustainable profile to their surroundings, socially sustainable architecture can have a direct (albeit subconscious) effect on the people who come in contact with it. In other words: In terms of architecture, social sustainability encompasses that, which can be *felt*. Thus, no other part of the framework for sustainable development is so intuitively relevant to the happiness of human beings — so intrinsically linked to the fundamental needs of *safety* and *belonging,* presented by Maslow (1954) — as the successful creation and maintenance of socially sustainable communities.

So — what exactly is social sustainability? Can it even be influenced by architecture? And if so, how do we design for it, measure it, create it? These simple questions form the core platform upon which this thesis builds its research.

This chapter briefly introduces the background of sustainability, investigating the development that has led to the social sustainability we have today. It then explores the common barriers that currently stand in the way of social sustainability, leading to the formulation of a research objective. By translating the objective, this chapter finally arrives at a research question and subsequent methodology. In the last section, the structure of the thesis is presented to provide an overview of the content.

BACKGROUND

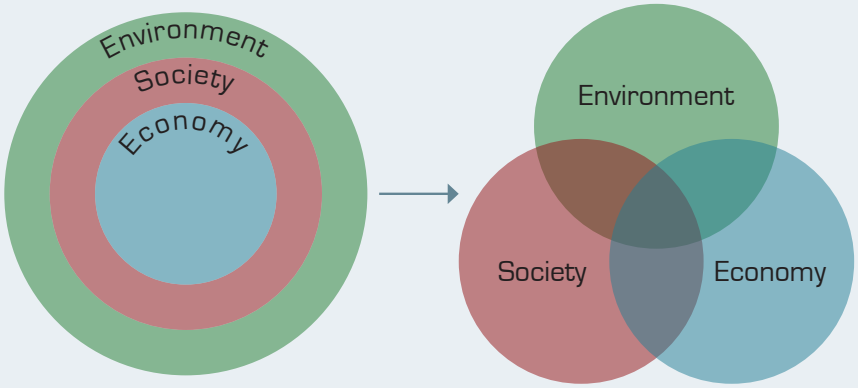
The previous section introduced some of the central themes and problems surrounding social sustainability today. These will be touched upon in more depth in subsequent chapters. First, however, it is necessary to build an understanding of how the concept of sustainability has come to be, and what political and scientific agendas have shaped the term and the way it is used today.

Emergence of sustainability

The Brundtland Commission:
"Sustainable development is to ensure that we meet the needs of the present without compromising the ability of future generations to meet their own needs"

The use of the term *sustainability* in scientific discussions does not have a well-defined origin. Rather, the term has emerged alongside a general increase in awareness towards environmental issues, especially during the last decades of the 20th century. As mentioned, the WCED, also known as the *Brundtland Commission*, presented its definition of sustainable development in 1987. Although the report was preceded in terms of its concern for the environment — e.g. by *Limits to Growth* by the *Club of Rome* (Meadows *et al.* 1972) — its definition has since become one of the most oft-cited: "Sustainable development is to ensure that we meet the needs of the present without compromising the ability of future generations to meet their own needs." (WCED 1987). Subsequent international summits such as the Rio de Janeiro Earth Summit in 1992 and a follow-up conference in Johannesburg in 2002 have furthered this international agenda of environmental protection through sustainable resource management (McKenzie 2004).

Although the Brundtland Commission's definition of sustainable development is still the go-to source whenever an explanation of the concept of sustainability is necessary, it is not without its critics. Most importantly, the inherent use of the word sustainable *development* presupposes that development is a necessary condition. Instead of entertaining the idea of maintaining status quo as a viable solution, sustainability becomes a new form of growth,



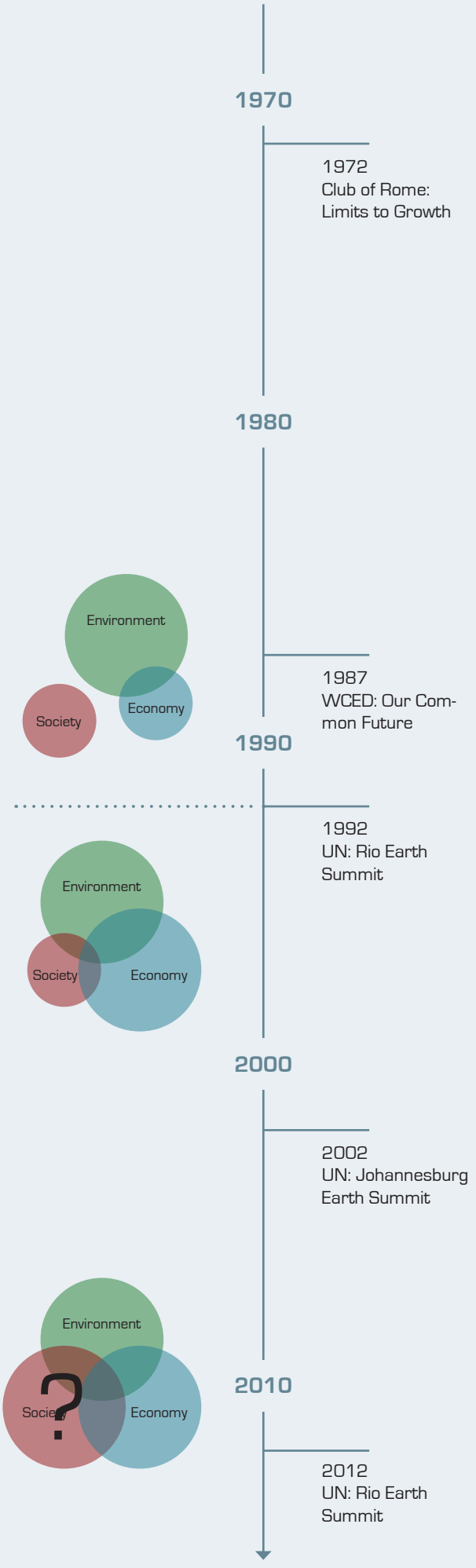
F 1.2 Common models representing environmental, social and economic aspects of sustainability (after Barron & Gauntlet 2002).

and focus thus lies wherever development is most needed (*ibid.*). Partridge (2005) argues that where pre-Brundtland conceptions of sustainability contained an inherent tension between the preservation of the natural environment and the idea of perpetual economic growth, the 1987 definition was conceived within a global neo-liberal context, which it supported by confronting ecological problems with unsustainable economic growth without questioning the economic framework itself.

The social aspect

Emerging out of the two-dimensional focus of environment and economy, a social aspect is now commonly accepted as being part of an interrelated sustainability triad. Citing Bader (2008), Boonstra (2013) ascribes the 1992 Rio Earth Summit as a key event in shifting emphasis towards social sustainability, while Koning (2001) also notes a more pronounced social dimension in Agenda 21, the United Nations programme of action after the conference. Figure **F 1.2** shows that the interrelationship between the three pillars of sustainability can be represented in several ways. One model uses three concentric circles to represent the hierarchical dependency of the different aspects upon each other, supposing different levels of sustainability, while another more recent model uses three overlapping circles to represent them more equally (McKenzie 2004; Barron & Gauntlet 2002). According to this model, true sustainability is to be understood as consisting of an equilibrium between three interrelated and equally important aspects. This equal representation does however contrast with reality, as the three aspects rarely receive equal amounts of attention. Often, despite the intention of the model, focus is directed back towards the conventional two-dimensional discourse. There seems to be a general consensus among writers in the field of sustainability that the social aspects still suffers from a lack of attention (Koning 2001; McKenzie 2004; Partridge 2005; Barron & Gauntlet 2002; Widok 2009; Colantonio 2009).

Colantonio (2009) represents the development, starting in the 1980s, using the sustainability triad model. This representation has been interpreted in Figure **F 1.3**, with slight changes. Although the development is moving towards a



F 1.3 Development of focus within sustainability. (after Colantonio 2009; Boonstra 2013).

Glocalization:
"The practice of conducting business according to both local and global considerations.

Blend of Global + Localization"

(Stevenson & Lindberg 2010)

F 1.4 Social issues on a global scale.

more balanced focus with increasing attention towards the social part (Widok 2009), the field of social sustainability is still widely recognized as being underdeveloped as well as lacking a solid framework to properly operationalize the concept.

Why social sustainability?

As we have seen, social sustainability is gaining momentum in the new millennium, as the rationale is getting increasingly clear: Societal changes on a global scale call for new ways of dealing with social issues. Koning (2001) states that "globalization, glocalization, new risks and uncertainties, new social forms and inequalities, and wide-ranging urbanization form the context for discussing sustainable development and social sustainability," and in Agenda 21, the United Nations programme of action after the 1992 Rio Earth Summit, the global problems are described as "a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being" (UNCED 1992). The main themes incontrovertibly seem to be social.

It can seem odd that the concept of social sustainability should be the last of the three aspects to become operational — after all, people are indisputably at the centre of the sustainability discussion. In its definition of sustainable development, the Brundtland Commission talks about the needs of future generations, not the needs of the environment or economy. As much as social sustainability depends on the successful mitigation of global environmental and economic issues, evidently, those issues are only relevant within a social context, as noted by Becker *et al.* (1999). In other words, it is ultimately the fear of humanitarian consequences that drives sustainable development. Along the same lines, Koning (2001) also wonders about the lack of attention towards the social agenda, both in policy and in academic writing, "especially because sustainable development is so closely linked with well-being, future generations [and] quality of life."

The role of the built environment

Having discerned the way in which social sustainability has developed its position within the total sustainability framework as well as the global importance of social sustainability issues, a pertinent question might be in what way architecture and the built environment relate to the social sustainability of communities and how they might positively influence it. The scale of the global issues might suggest that they are beyond the influence of any local initiatives — much less ones that seem mainly to be concerned with the shaping of our physical environment and not with people. The seemingly artistic and aesthetic focus of architecture (Thuvander *et al.* 2011) might appear to have little relevance in regards to social issues, which seem rather to be solvable directly through social efforts. It is also true that architecture and urban planning can only contribute to a certain extent in a global social sustainability context. Their value, however, should not be neglected — given the amount of time the average person spends either indoors or in an urban setting and the amount of subliminal meaning embedded in our physical surroundings, the structure of the built environment is bound to have a tremendous impact on the way people live their lives.

Despite this, the influence of the built environment on social sustainability remains a fairly unexplored topic, although scattered attempts have been made at demonstrating the link. To this effect, Danish urbanist Niels Bjørn has co-authored several publications on the social effects of physical interventions in social housing areas (Bjørn 2008; Bjørn & Holek 2014). Along with contributions from other authors, these publications have served to corroborate what was initially a conjecture: That a physical transformation of the built environment can serve to transform the social environment within it, thus strengthening the social sustainability of a community. The subsequent chapter will go into more detail regarding the link between architecture, urban planning and social sustainability and the available evidence that supports it.

Why is social sustainability not widely practiced?

In conclusion of the background, social sustainability has emerged fairly recently out of an otherwise two-dimensional sustainability discourse. Where efforts towards sustainability used to be comprised of environmental considerations conceived within a neo-liberal growth paradigm, the social aspect has gathered momentum and is now considered, theoretically, as an equally important part of the modern three-piece sustainability framework. As such, the concept of social sustainability is gaining relevance along with the emergence of new social issues, which sprout as a result of global trends, such as increasing globalization and urbanization.

Within the context of the built environment, recent studies have begun to establish a link between changes in the physical makeup of socially disadvantaged areas and a subsequent increase in their social sustainability. It seems more and more likely that, when designing and renovating new and existing buildings and districts, a due consideration of the factors influencing social sustainability can have significant positive effects on both existing and future residents (Bjørn & Holek 2014).

The question arises: Why is social sustainability not practised to the same extent as the other pillars of sustainability? What problems stand in the way?

THE PROBLEMS

Although the arguments for social sustainability seem compelling, the change in impetus needed to make the concept operational has been widely lacking. Considering the question posed by the previous section, several barriers can be identified that continue to prevent social aspects from becoming a viable part of design practice. This section summarises some of the current barriers that limit the extent to which the concept of social sustainability can be operationalized.

No clear definition

Particularly pertinent to this discussion is the fundamental question of how to define the concept, and thus how to compare solutions. As previously established, the social aspect suffers from a lack of attention, and this is not only the case within sustainability research itself. Partridge (2005) also identifies a lack of willingness within the social sciences to engage with the concept of sustainability, and she states that "sustainability and the environment remain marginal concerns for the social sciences". Although some sources do offer insight into possible definitions, there is no clear and common understanding of the concept, nor is there consensus on a definition. This fundamental problem stands as an initial barrier whenever the need to include social sustainability concerns arises.

Contextual bias

To make matters worse, the contexts within which many of the proposed definitions have been conceived can be considered more important than the wording itself (McKenzie 2004). Attempts at including social concepts have often been conducted within other pre-biased models, and it is then included mainly as an addition to further the existing agenda, which might be either environmental or economic (*ibid.*).

In the case of Triple Bottom Line reporting (Elkington 1999) an underlying business-oriented agenda tends to direct focus away from the social performance and towards the bottom line that supports the business most directly, i.e. the economical one (Partridge 2005; McKenzie 2004).

In a similar way, the conventional approach to sustainability tends to focus on the environmental issues, including the social aspect only as an "afterthought" (Partridge 2005). Although the problem is the same as with Triple Bottom Line reporting, in this case "social processes are considered only from the point of view of environmental targets or goals which have been previously defined in non-social terms and to which societal processes are to be adjusted" (Becker *et al.* 1999).

Lack of hard evidence

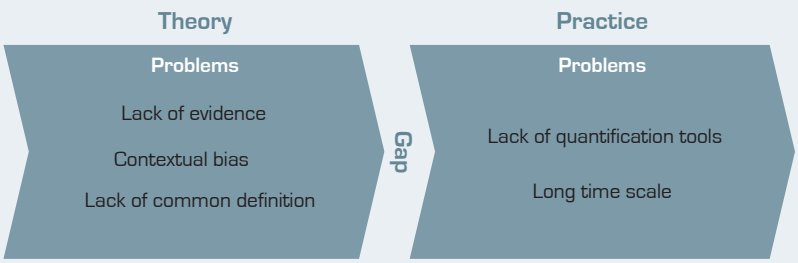
In consequence of the problems presented, efforts to provide an effective and unbiased conceptual framework have been impeded. Although advances have been made in the last 15 years, the words of Koning (2001) regarding a "lack of a suitable framework to operationalize the concept of social sustainability" still ring true. In part, this is due to a lack of means with which to quantify social impacts and thus qualify social efforts.

The challenge is complex for several reasons. Although many interlinks with environmental and economic sustainability aspects exist, providing the evidence is not a simple matter. The long time-scale and subtle nature of many social efforts make it hard to pinpoint their effect, and problems with v incentive — also called principal-agent problems (IEA 2007) — where sustainable initiatives do not directly benefit the investor, can make it hard to muster support. Furthermore, ethical values often come into play when dealing with social issues, and to quantify those poses new problems (Widok 2009). Nevertheless, quantification is necessary to be able to communicate results and make the concept less abstract in order for the social sustainability agenda to gain relevance and more widespread commitment in a competitive industry (*ibid.*).

What can be done?

A large part of the barriers opposing social sustainability as a part of design practice relate mainly to the vagueness of the term. The basic definition is unclear, yet a multitude of more or less biased sustainability frameworks attempt to conceptualise the social dimension in different ways, adding to the overall confusion. It seems there is a fundamental problem with the *tangibility* of social sustainability that needs to be addressed before a truly effective conceptualisation can be developed.

In continuation of this argument, it seems the *ability to practice* social sustainability hinges not only on a more clear definition, but also on the ability, within this definition, to translate findings into quantifiable results, which could serve to justify the inclusion of social sustainability concerns in the de-



F 1.5 The identified problems help maintain the gap between theory and practice. In order to close the gap, issues on both sides need to be addressed. Hence social sustainability both needs to be more well-defined and quantifiable before it can be used in a practical situation.

sign process, as well as identify interrelationships and cross-benefits between all three sustainability aspects.

Recent developments within design method research have successfully proposed the integration of energy and comfort criteria in the design of new buildings and urban planning (Nielsen 2012; Strømann-Andersen 2012). The road has thus been partly paved for the integration of other (e.g. social) criteria in the design process. However, the question remains whether it is possible to improve the practicability and tangibility of social sustainability to this end?

OBJECTIVE

Based on the above mentioned problems, this research aims to address some of the factors currently inhibiting the successful application of socially sustainable principles in building and urban design. These factors are many-fold, as several different aspects offer explanations as to why the social aspect is lagging behind in the sustainable development: The lack of a clear and common definition in available literature can make the concept seem incoherent and intangible to designers who need a goal to work towards. The often long time-scale of socially sustainable initiatives can bring their financial and environmental soundness into question in projects with a short-term scope — making socially sustainable projects a tough sell. The low availability of well-established methods of quantifying the wide effects of social sustainability, as well as linking them to their environmental and economic co-benefits, can weaken the socially sustainable argument in an industry where tools for calculating environmental and financial sustainability are readily available. Common for all these factors, however, is the fact that they weaken the position of social sustainability as a driver for design in the early phase, where the decisions are made that will shape the way people live and interact for decades to come.

Hence, the main objective of this research is to improve the tangibility and practicability of social sustainability in the design process by way of theoretical as well as practical investigations.

Objective:
To improve the tangibility and practicability of social sustainability in the design process by way of theoretical as well as practical investigations.

DELIMITATION

Although the intangible quality of social sustainability requires the literature study to be reasonably wide in scope to adequately reflect the varied existing theory, its application is limited to the study of architecture and urban planning. Here the examination of practical cases limits itself to the renovation and transformation post-war modernist social housing. This imposes some limitations upon the scope of the research in terms of building typology and project type and location.

Typology

The studied typology consists of large-scale social housing projects. This modernist typology was born out of post-war housing shortages and poor living conditions, resulting in an idealistic zeal among architects for providing the public with space, light, air and greenery (Bjørn 2008). Mostly built in the 1960 or early 1970s, this typology is still represented in various forms all over the western world. Today, many of these housing projects suffer from poor outdoor environments, low technical quality and are often beset by social and economic problems (Bjørn 2008; Hall & Vidén 2005).

Project type

The second limitation assumes a renovation project. Although some countries have traditionally opted to demolish and rebuild, there is a Nordic precedence not to urge for the tabula rasa and many social housing projects have already undergone extensive renovation since their construction (Bjørn 2008; Jensen 2015). Traditionally, focus has been on mending their often poor physical condition, sometimes adding a few bright colours in the process. Recently, however, focus has changed towards a more holistic transformation of the physical environments, including improved living conditions (Jensen 2015).

T 1.1 Research delimitation.

Limitation	Description
Typology	Post-war social housing
Location	Nordic countries
Project type	Renovation/Transformation

Location

The research is set within a Nordic context with a specific focus on a Swedish setting. Since the 1940s the government rejected low-income social housing as a viable solution and focused instead on providing good quality homes for the entire population. As a result, many housing projects were built by municipally owned housing companies and were originally intended for everyone to inhabit (Hall & Vidén 2005). In many instances the Nordic model of tenant-owner's associations also prevailed in Sweden (*ibid.*). Although the majority of the developed large-scale social housing areas are not high-rise (Hall & Vidén 2005; Bech-Danielsen 2013), today many social housing areas in Sweden and the other Nordic countries are suffering from some of the same problems that have become symptomatic for the typology all over the world.

Even though the scope of the project is limited to Sweden and the Nordic countries, the universality of the post-war social housing typology affords a certain extent of general applicability.

RESEARCH QUESTION AND METHODOLOGY

In the review of the background of social sustainability, the question of why the field is lacking behind in the sustainability agenda was raised. The subsequent analysis — spurred on by successful developments in integrated design — led to the formulation of an objective to improve the tangibility and practicability of social sustainability in the design process.

Main research question

The need for operationalization is recognized by several authors. Koning (2001) and McKenzie (2004) review various conceptualisations of social sustainability and agree that more work needs to be done in order for them to be effective. Even so, the focus seems always to be descriptive; investigations into how social sustainability might be created or implemented are few and far between (McKenzie 2004). With this in mind, the main research objective translates, within the given delimitation, into the main research question:

How can a design process be supported to secure more socially sustainable solutions in the transformation of Nordic post-war social housing projects?

Research question:
How can a design process be supported to secure more socially sustainable solutions in the transformation of Nordic post-war social housing projects?

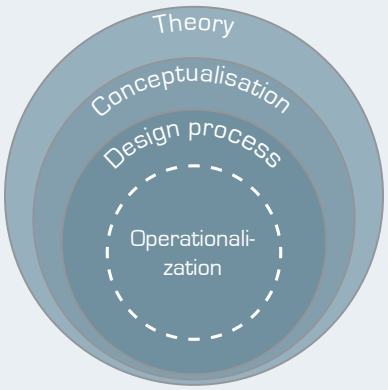
Perspectives

The main research question offers several different perspectives relating to the various barriers that were identified. The three perspectives pursued in this research thus relate to the current intangibility of social sustainability, to the lack of a framework for its quantification and to its possible implementation inside a design process. The perspectives approach the subject on different levels of abstraction, moving from the general to the concrete, as shown in Figure **F 1.6**. Hence the research attempts to approach an operationalization of social sustainability by investigating three sub research perspectives:

1. *Theory:* What is social sustainability, what characterises socially sustainable solutions and how can the concept be made more tangible?
2. *Conceptualisation:* How can social sustainability be evaluated and/or quantified and how can this inform a design process?
3. *Design process:* How can a design process be organised in order to include the social dimension?

Improving tangibility

The first perspective focuses on social sustainability theory and its relation to architecture and urban planning. The intention is to provide an overview of the way social sustainability research has developed as well as current trends. Possible definitions will be introduced and reviewed in order to gain an over-



F 1.6 The three research perspectives range from general theory to concrete design process.

view of current research in the field. Focus is on providing a clearer definition that can lead to a better understanding of the concept.

Increasing measure-ability

The second perspective deals with how the concept of social sustainability can be quantified. Various current sustainability conceptualisations and proposals for indicator sets are critically reviewed in relation to their possible applicability in a design process. Focus is specifically on increasing the measure-ability of social sustainability within the defined architectural context.

Integrating in design process

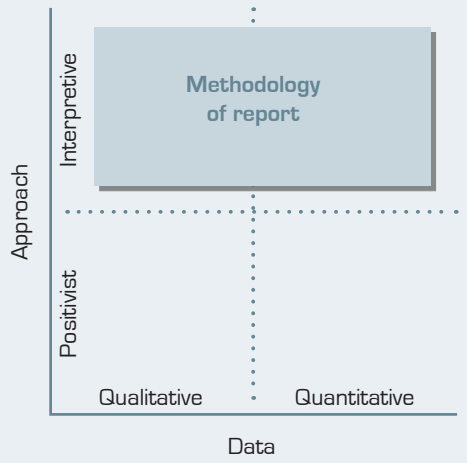
The third perspective is on the design process itself and how it is best organised to include social sustainability concerns. Topics of multi- vs. interdisciplinary work and design team integration are central to this discussion. The aim is to strengthen the position of social sustainability in the design process.

Methodology

In pursuit of an answer to the main research question, the three sub research perspectives are first analysed in a literature review. The findings from each individual perspective are summarised in partial conclusions, which form the foundation for the research. As a result, a preliminary framework for the implementation of social sustainability in a design process is developed. In relation to the literature review, the opinions of leading social sustainability researchers and practitioners were obtained through interviews and formal and informal meetings.

The subsequent part of the report constitutes the case study research. This case study is used as a test bed for the theoretical framework resulting from the literature review. The theoretical foundation for the applied methodology has been described by Yin (2003), and will be further elaborated upon in the relevant chapter.

The approach applied in this research is interpretive. This term implies that the positivist methods of natural science are inadequate to the study of social reality, as different human subjects ascribe different meanings to the objects, concepts and actions they are subjected to (Lee, 1991). In the case of the design process, the involvement



F 1.7 Method for report in terms of approach and data collection.

and interaction of multiple actors require a view that acknowledges multiple realities rather than one objective reality (Guest *et al.* 2013).

Although an interpretive approach implies the use of qualitative research, this is not to be confused with the types of data analysed. Just as qualitative data can be analysed from a positivist approach (Schweber & Leiringer 2012), so quantitative data can be analysed from an interpretive approach. This research deals with both.

Collaboration

Throughout the project, various actors have contributed to the research with different types of input. In this context, the Sustainable Transformation and Environmental Design (STED) project, sponsored by the Nordic Built programme, has worked as a central hub for getting into contact with relevant actors, communicating results and receiving feedback. The nine STED members are:

Universities: *Chalmers University of Technology* (Sweden)
Norwegian University of Science and Technology (NTNU)
The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation (KADK)
Technical University of Denmark (DTU)

Studios: *White Arkitekter* (Sweden)
Vandkunsten Arkitekter (Denmark)
Helen & Hard (Norway)
Studio Granda (Iceland)
Office For Peripheral Architecture (OOPEAA) (Finland)
(Negendahl 2016)

Of these, Chalmers, KADK and White have been particularly involved in the project through personal correspondence, meetings, interviews and case study work.

Nordic Built
Nordic initiative to accelerate the development of sustainable building concepts. Running 2012-2014 with subsequent funding program. (Nordic Built 2016)

The STED project
Initiated by Peter Andreas Sattrup at DTU in 2014, the STED project works towards innovation in design methods for sustainable transformation of the existing Nordic building stock, focusing on energy, environmental design and life cycle thinking. (Negendahl 2016)

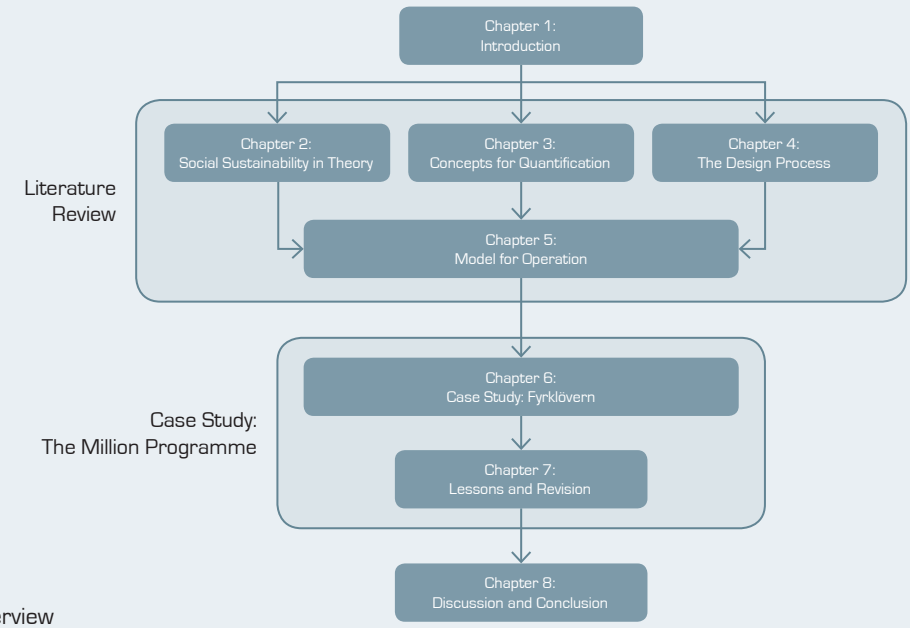
Thesis Structure

This thesis is structured into 8 chapters. The structure of the report is represented diagrammatically in Figure F 1.8.

It begins with a literature review divided into three separate chapters in accordance with the perspectives outlined above. These chapters provide the necessary background on current social sustainability theory, conceptualisations and design process theory to establish an outline of what can be considered best practice today. The literature review is concluded in Chapter 5 with a proposal for a preliminary model of social sustainability and method for its practical application.

Chapters 6 and 7 constitute the practical part of the research. The preliminary model resulting from the literature review is tested in a case study, and the findings lead to a subsequent revision of the model.

The report ends with a discussion and conclusion in Chapter 8, picking up the threads of the previous chapters and elaborating on their partial conclusions. Finally the report is summarised into a conclusion in an attempt to answer the main research question.

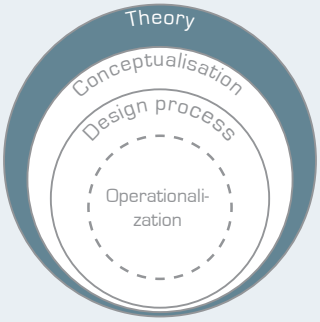


F 1.8 Schematic overview of thesis structure.

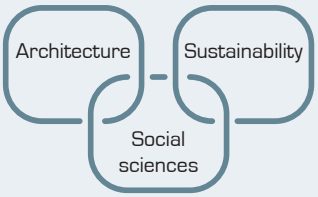
SOCIAL SUSTAINABILITY IN THEORY

2

In order to justify an investigation into the architectural means of socially sustainable transformation of social housing, a couple of theoretical links first have to be established. Primarily, a connection needs to be made between the social sciences and the concept of sustainability as a whole in order to gain insight into what a definition of social sustainability might be. Secondly, another link must be established, this time between social sustainability and the built environment — or more precisely: The ability of architecture to influence the people within it. Hence this chapter provides the theoretical foundation for the research, which it builds on the above theoretical chain through a review of pertinent literature.



F 2.1 Position of the chapter within the research structure.



F 2.2 The aim of this chapter: Architecture and sustainability are connected through the social sciences.

SUSTAINABILITY AND THE SOCIAL SCIENCES

Starting with the relationship between the social sciences and the sustainability debate, a central distinction is made by several authors between the *analytical*, *normative* and *political* implications of sustainability (Becker *et al.* 1999; Littig & Grießler 2005). On the analytical level, Becker *et al.* (1999) argue that sustainability weakens the otherwise dominant link between development and economic growth because it claims that societal development must be coupled with the reproduction of its natural prerequisites. The normative features include a call for justice on behalf of future generations, a subordination of economic processes to social and ecological constraints and an awareness of intragenerational social justice, gender equity and democratic participation in decision-making processes (Becker *et al.* 1999; Partridge 2005). The political context exists as a results of the commitment to action imposed by sustainability — a commitment directed towards "reshaping the relations between human beings and their environment" (Becker *et al.* 1999).

Lind & Mjörnell (2015), drawing on Littig & Grießler (2005), also note this distinction between analytical and normative conceptions of social sustainability and elaborate on the implications, yet in a more pragmatic wording: They asses that — apart from an academic interest in defining social sustainability and the factors that constitute it as well as how to make them operational — there is also a political interest in defining concrete goals for these various factors, in order to assess various interventions and commitments.

The lack of a clear differentiation between the analytical, normative and political aspects has implications in terms of difficulties in conceptualizing social sustainability (Littig & Grießler 2005). As mentioned in the previous chapter, a fundamental problem with social sustainability is its lack of a common definition that can be widely agreed upon. As a result of this vagueness, the depiction of the three interconnected dimensions representing the concept of sustainability (see Figure F 1.2 on page 14) has given rise to discussion over the nature of the relation between the three dimensions. Thus some perceive them as being partially in conflict, necessitating a payoff between them, while others, oppositely, see them as being mutually dependant — one cannot be fulfilled without the others (McKenzie 2004). The previous chapter also highlighted contextual bias as a key barrier for the operationalization of social sustainability, meaning that the context in which conceptualisations were conceived often determined the true focus of the models. Lind & Mjörnell (2015) expand on this, looking at current approaches and theoretical frameworks for social sustainability. They argue for a trend towards a more human-oriented approach to the concept, focusing on standard of living and well-being. They conclude that "people at the same time both affect and are affected by actions

F 2.3 The Environmental Space (ES) concept. After Spangenberg (2002)

designed to increase sustainability, whether interpreted as sustainability in the strict environmental sense of the word, or as part of a broader concept of sustainability" (trans. by author, Lind & Mjörnell 2015) and then propose an alternative model of social sustainability, conceived by Spangenberg (2002), which more intuitively illustrates sustainable development using the concept of *Environmental Space* (ES; Figure **F 2.3**). According to this model, a sustainable economic development needs to be kept at a high enough level to be socially sustainable, but low enough to be environmentally sustainable. Arguably, this model better represents the interaction between the environmental, economic and social dimensions of sustainability, but even though Spangenberg (2002) suggests that the ES concept can be used to guide local participatory processes, it offers no general targets or indicators. Thus there is still a need to more closely define the social dimension, if it is eventually to be analysed and rated.

Definitions

Many different definitions of social sustainability have been proposed over the years, yet there seems to be no consensus on what terms to include or what focus to adopt. Partridge (2005) comments that the extremely wide field of ideas and connotations associated with the term perhaps makes it almost as difficult to define as the concept of *society* itself. Looking at the development in defining social sustainability, Colantonio & Dixon (2011) argue that there has been a tendency for definitions to be conceived within the contexts of particular disciplines or studies, making them largely discipline-specific. On this account, wider, more general definitions are harder to achieve and thus fewer in numbers. Below a few definitions with varying specificity and focus are presented to provide an outline of the field; however, the aim of this research is not to attempt to provide any additional or final definition, but simply to approach the concept from different angles in order gain a better understanding.

Starting off, Koning (2001) does not so much propose a definition as a characterisation of social sustainability. She suggests that social sustainability refers to "a society that is just, where there is no exclusion of social groups,

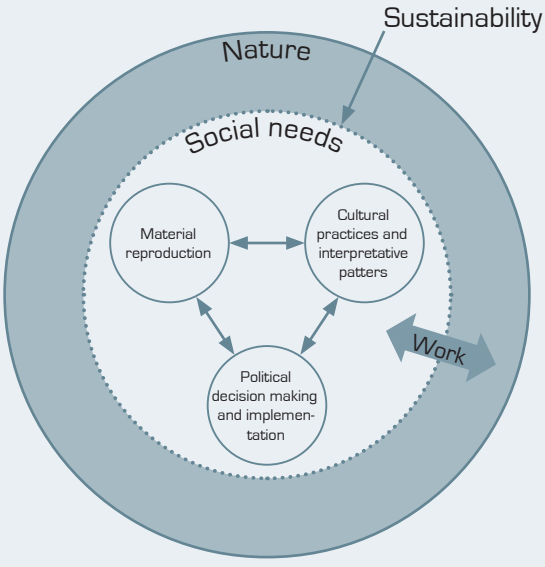
with a decent livelihood for all, and a society characterized by emancipation, freedom and solidarity."

Although the themes and terms included in this formulation paint an accurate and agreeable picture of a society in social balance, it does not include the temporal dimension, which has become an essential part of the sustainability concept (e.g. in the Brundtland Commissions definitions of sustainability, see page 14). Consequently, Partridge (2005) argues that it is indeed not a description of social sustainability, but of social *justice*, the difference being a focus on the future contained within the sustainability perspective. Along these lines, both Åhman (2013) and McKenzie (2004) identify a fundamental difference in literature between whether social sustainability is seen as a *development* towards a socially sustainable minimum level or as the *maintenance* of a desirable state that has already been reached; yet he argues that a truly sustainable society could be reached through the dynamic mediation between the two viewpoints. Either way the focus on the future remains an important aspect. With these things in mind, the *working definition* suggested by McKenzie (2004), although it is less specific, includes the focus on the future. According to him, social sustainability is:

> "A life-enhancing condition within communities, and a process within communities that can achieve that condition."

McKenzie compliments his definition with a series of features, which can work as indicators for the stated *condition*, while the definition itself remains very general. We will take a closer look at the indicators in the next section. In spite of his very wide definition, McKenzie (2004) problematises the idea of implementing a single definition, and instead calls for the adoption of multiple approaches.

Incited by the lack of sociological theory in the field, Littig & Grießler (2005) propose a sustainability concept, which is based on the concept of *needs*, inspired by the Brundtland Report. This includes not only basic needs, such as food, housing, access to water, safety, etc., but also other needs such as education, recreation/leisure, social relationships and self-fulfilment. The concept of *work* acts as an activity to fulfil these needs, partially through material exchanges with nature and partially as a means to



F 2.4 Schematic portrayal of sustainable development and the relationships between society and nature. After Littig & Grießler (2005).

structure society. At the same time, social coherence within societies is both the condition and outcome of the *economic*, *political* and *cultural* systems; three systems which serve to enable the fulfilment of human needs. The above considerations are illustrated using the schematic in Figure **F 2.4** (which shares certain similarities with the model in Figure **F 2.3** in the sense that sustainability is depicted as a state of social and environmental balance). Thus, Littig & Grießler (2005) propose the following definition:

> "Social sustainability is a quality of societies. It signifies the nature-society relationships, mediated by work, as well as relationships within the society. Social sustainability is given, if work within a society and the related institutional arrangements satisfy an extended set of human needs [and] are shaped in a way that nature and its reproductive capabilities are preserved over a long period of time and the normative claims of social justice, human dignity and participation are fulfilled."

Apart from attempts at improving the general sociological theory on sustainability, as the ones mentioned above, there has been numerous investigations into social sustainability in relation to communities and the built environment, ranging from district to city and region level. Polèse & Stren (2000) thus define social sustainability for a city as:

> "Development (and/or growth) that is compatible with harmonious evolution of civil society, fostering an environment conducive to the compatible cohabitation of culturally and socially diverse groups while at the same time encouraging social integration, with improvements in the quality of life for all segments of the population."

Quite similarly, indeed using some of the very same terms, Barron & Gauntlet (2002) of the Western Australian Council of Social Service (WACOSS) use the following definition for their *Model of Social Sustainability*:

> "Social sustainability occurs when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and liveable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life".

Both definitions include a focus on the future and on diversity, quality of life as well as other community factors. Writing about social sustainability in renovation, Lind & Mjörnell (2015) identify similar themes in writings on urban renewal and regeneration by Colantonio & Dixon (2011) and Chan & Lee (2008). They emphasise social sustainability as a process aimed towards harmonious living environments, reducing social inequality and improving quality of life through a common effort. The following section investigates the general characteristics that can be said to constitute social sustainability.

Characteristics

Despite its apparent vagueness, the concept of social sustainability is widely used, often in political contexts and without sufficient empirical or theoretical backing to justify the choice of objectives (Lind & Mjörnell 2015). Rather than theory, they are often based on current political agendas and a practical understanding of causality (Littig & Grießler 2005). There does, however, seem to be a range of themes and concepts that appear across multiple sources, and which might lead the way to a clearer understanding of social sustainability. Several of the definitions mentioned above, and especially those relating to socially sustainable communities and urban regeneration, seem to use the same themes to characterise the concept. Indeed, it is common for literature to focus on these characteristics instead of a definition, or at least to use them as a compliment to the definition.

Equity:
"The quality of being fair and impartial."

(Stevenson & Lindberg 2010)

One attempt that has inspired subsequent characterisations, like Abbas (2012), was formulated by Barron & Gauntlet (2002) as an elaboration on their definition (on page 33). They explain the five themes as follows:

> *"Equity:* The community provides equitable opportunities and outcomes for all its members, particularly the poorest and most vulnerable members. While equity is listed as a separate principle, it is such a fundamental component that it is really an artificial separation. Equity in fact operates like a filter through which all other principles are viewed. For example, while quality of life includes people's sense of connection with nature, this needs to be understood in terms of the extent to which all people have access to a positive environment.
>
> *Diversity:* The community promotes and encourages diversity.
>
> *Quality of life:* The community ensures that basic needs are met and fosters a good quality of life for all members at the individual, group and community level.
>
> *Interconnectedness:* The community provides processes, systems and structures that promote connectedness within and outside the community at the formal, informal and institutional level.
>
> *Democracy and governance:* The community provides democratic processes and open and accountable governance structures."

As mentioned, McKenzie (2004) also complimented his wide definition with a series of features or indicators. These are as follows:

> "Equity of access to key services (including health, education, transport, housing and recreation).
>
> Equity between generations, meaning that future generations will not be disadvantaged by the activities of the current generation.
>
> A system of cultural relations in which the positive aspects of disparate cultures are valued and protected, and in which cultural integration is supported and promoted when it is desired by individuals and groups.

The widespread political participation of citizens not only in electoral procedures but also in other areas of political activity, particularly at a local level.

A system for transmitting awareness of social sustainability from one generation to the next.

A sense of community responsibility for maintaining that system of transmission.

Mechanisms for a community to collectively identify its strengths and needs.

Mechanisms for a community to fulfil its own needs where possible through community action.

Mechanisms for political advocacy to meet needs that cannot be met by community action."

Relating them to McKenzie's definition (on page 32), they are to be understood as indicators of a *life-enhancing condition*, while the *process* consists of steps towards their establishment. The features above include several key themes such as equity, integration and participation as well as an explicit focus on processes to facilitate the transmission of knowledge to future generations. By stating a series of features or indicators for social sustainability, the concept becomes more solid, and the characteristics also allow for the adaptation to local conditions. Still, Lind & Mjörnell (2015) identify several issues: Firstly, including the indicators of social sustainability in the definition itself entails a problem of causality — are the indicators the cause of social sustainability, or are they just a result of it? Secondly, a weak definition causes social sustainability to lack own meaning, allowing indiscriminate integration of other, more well known themes into its framework (*ibid.*) thus weakening its credibility in political and normative contexts. Nonetheless, the approach has been popular in literature and has brought about several attempts at pinpointing the defining characteristics of social sustainability with varying degrees of specificity. This chapter will remain at the general level, while the next chapter will go more into detail with the contents of concrete conceptualisations and indicator sets.

In their review of the development of social sustainability themes, Colantonio & Dixon (2011) corroborate Barron & Gauntlet's (2002) emphasis on equity and basic needs as a fundamental part of social sustainability, and they argue that there has been a change in focus towards a new set of softer, emerging themes. The themes are summarised in Table **T 2.1**, which also serves to provide a general overview. While some of these themes have been described above, others deserve a swift introduction.

Social capital

The concept of social capital is often mentioned in relation to a discussion of social sustainability (Koning 2001; Colantonio & Dixon 2011; McKenzie 2004), the reason being that it encompasses the prerequisites for a wide array of the themes often viewed as main constituents of social sustainability. According to Colantonio & Dixon (2011), social capital comprises the set of

T 2.1 Key themes within social sustainability research (Colantonio & Dixon 2011).

Traditional	Emerging
Basic needs, including housing and environmental health	Demographic change (ageing, migration and mobility)
Education and skills	Social mixing and cohesion
Employment	Identity, sense of place and culture
Equity	Empowerment, participation and access
Human rights and gender issues	Health and safety
Poverty	Social capital
Social justice	Well-being, happiness and quality of life

social norms of conduct, knowledge, mutual obligations and expectations, reciprocity and trust that are widespread within a given region or community. As such, social capital is a non-physical quality of society, as it exists only in peoples minds and relations, yet it governs the way in which people interact and the extent to which mutually beneficial cooperation is possible. In terms of the benefits of social capital, Koning (2001) lists economic gain, enhanced well being, a sense of identity and belonging, social status and prestige, while Colantonio & Dixon (2011) focus on self-reliance, collective actions and collective decision making. The broadness of the term would require a breakdown into subcategories in order to quantify. Social capital has also been criticised, as increased social capital is not necessarily positive if it leads to increased isolation and barriers between groups Lind & Mjörnell (2015).

Participation and empowerment

Colantonio & Dixon (2011) state that public participation and involvement in governance and planning has recently become an integral part of social sustainability for three reasons: Firstly, public participation in governance allows the needs of communities to feed into policy making, delivering and monitoring processes. Secondly, this public involvement is an exercise of democratic rights, which are seen as intrinsically good. Thirdly, if the policy delivery process is more aligned with society, it could result in both greater efficiency and effectiveness. Furthermore, if governance does not stem from a struggle for power, policies can be locally anchored to a higher extent (*ibid.*).

Social mixing

Finally, social mixing and diversity within communities is frequently highlighted as a key component of social sustainability (Koning 2001; Colantonio & Dixon 2011). The concept includes both the aspect of buildings and their size, form, use, value and rent level, and the aspect of people and their ethnicity, age, jobs, tenure, etc. Although increased resilience and adaptability of a community have been raised as arguments for social mixing, lately the direct link to sustainability has been brought into question, as it has been argued that mixing people does not alone lead to sustainability without additional measures to ensure that people actually interact (Colantonio & Dixon 2011).

THE LINK TO ARCHITECTURE

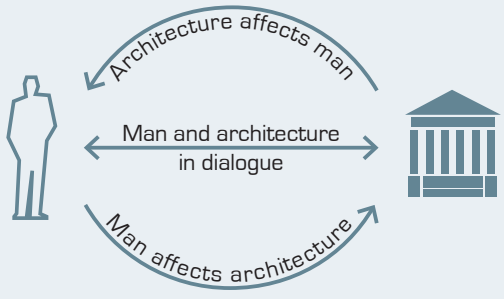
The link between architecture and the social sciences is a problem that has been approached from both sides of the field. Architecture is a field of study highly engaged with the effects that spaces and buildings have on people (and vice versa), while the social sciences have also ventured, albeit more recently, into the psychological effects of the built environment (Roessler 2015). This section attempts to establish the link by drawing upon literature that has shown a connection. First the discipline of architectural psychology is introduced. Then the effects on occupants are investigated, expanding the scale from room to urban level until arriving at the modernist social housing typology, which has been investigated through a series of case studies.

Environmental psychology

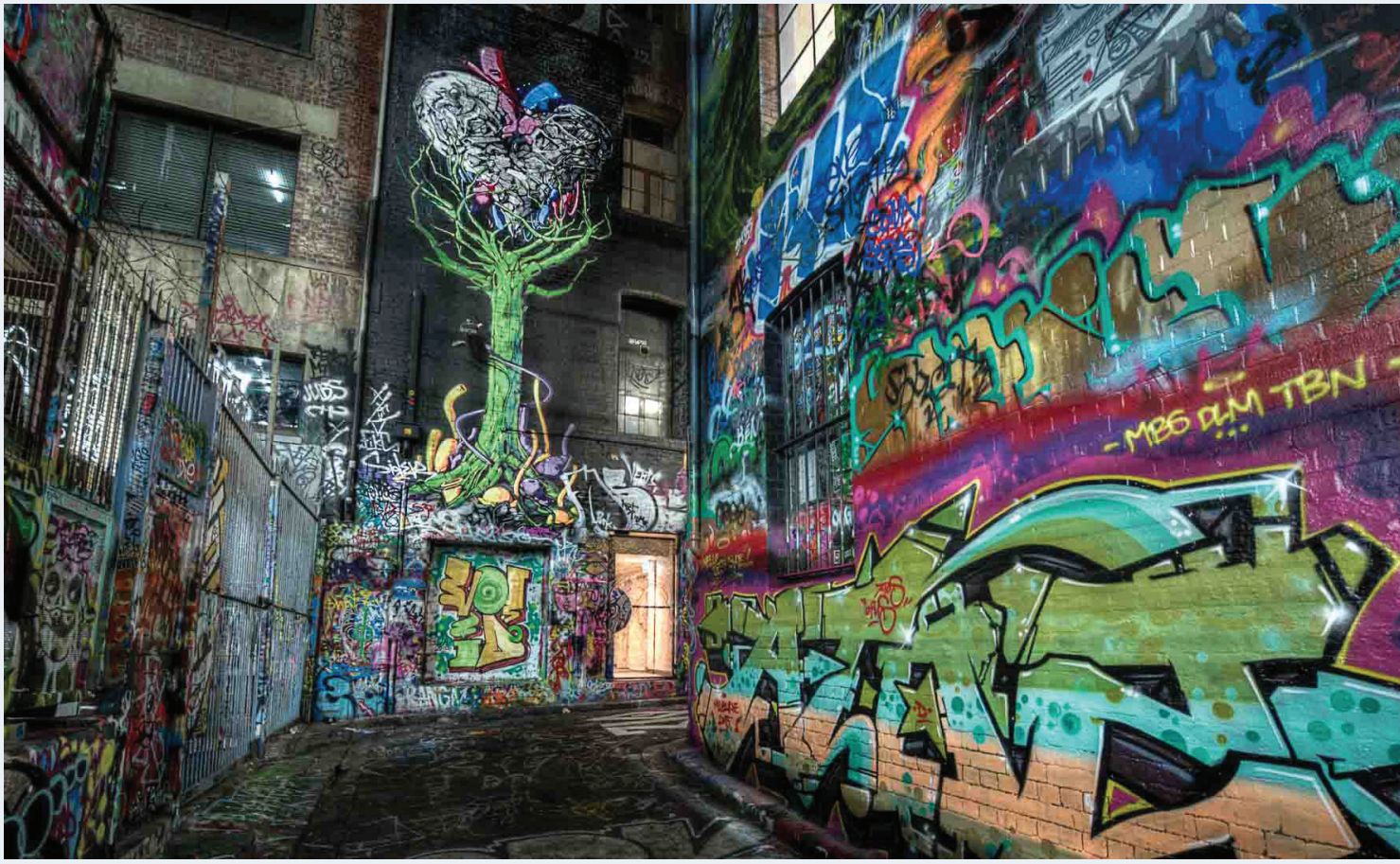
The field of environmental psychology is a fairly new one. In the late 1940s specialists began working on theoretical concepts, and while focus throughout the 1950s and 1960s was mainly on psychiatric hospitals and their influence on patient recovery, in the 1970s and 1980s the field was established as an independent discipline, at which time focus had moved towards the more general relationship between people and spaces, buildings and districts (Roessler 2015). Today, the field of environmental psychology has made its way into practice; large architectural firms collaborate with the social sciences on user involvement, where user behaviour and needs are analysed and the communication between architects and users is moderated. On the other hand, environmental psychology research continues to investigate general regularities in the relationship between man and environment (*ibid.*).

Roessler 2015 identifies three fundamental approaches to the relationship between architecture and man (Figure **F 2.5**):

Architecture affects and Man adapts: Man is subordinated the architectural agenda, which has been put in place to achieve a certain effect. Exam-



F 2.5 The interrelationship between man and architecture (based on Roessler 2015).



F 2.6 Street art in Hosier Lane, Melbourne, Australia: Man and architecture in dialogue. Google Images.

ples are churches, prisons (e.g. the Panopticon by Bentham) and monumental architecture such as that built by the Nazis.

Man affects and Architecture adapts: This approach is based on peoples physical and psychological needs and tries to shape the architecture to facilitate those; naturally, this is not without its risks. Examples include therapeutic or *healing* architecture and, arguably, Le Corbusier's *machine à habiter*.

Man and architecture in dialogue: A dynamic dialogue between architecture and people that gives both choice, possibilities and restraints. Flexibility allows architecture to act as a background for life as movable walls and floors can be continually re-configured. Similarly, unassigned spaces can be taken up by e.g. graffiti artists and skateboarders (Figure **F 2.6**).

Architecture and mental health

In a 2012 paper for the Global Journal of Health Science, Danish psychology professor Kirsten Roessler emerges herself into three very distinct environments (a big city square, a health garden and a fitness studio) with the aim of analysing their psychological effects. She concludes that the psychological effects of the environments vary widely, from fear of isolation and separation to a sense of freedom (Roessler 2012). Following this recent example it should seem that there is a straightforward connection between physical environment and perceived comfort, which could positively manifest itself if taken into careful consideration.

In the case of the Department of Psychiatry in Esbjerg, Denmark, a change of physical environment has been translated into positive results. Use of glass doors have increased visibility and together with access to enclosed gardens, this has helped reduce the number of forced fixations of patients by 69,9 % and cases of forced ingestion of sedatives by 61,4 % (Psykiatrien i Region Syddanmark 2015). Although the results cannot be wholly attributed to architectural changes, neither can they be reasonably explained without them.

As mentioned, the practice of designing medical facilities to optimise patient recovery has been a part of environmental psychology agenda since the 1950s. Frandsen *et al.* (2009) conducted a comprehensive literature study (including 200 articles) of the effects of the physical environment on patient recovery (*healing architecture*), presenting work related to the method of *evidence based design*, which is to be understood as design based on scientific methods across the natural, social and human sciences. The study found literature supporting a range of physiological, psychological and economic effects relating to different aspects of architecture. These relations were sorted into factors (Table T 2.2), which formed the connection between architecture on one side and effects on the other, which ranged from pain, sleep and mortality to stress, security and privacy (for a full list of effects along with architectural focus areas see Frandsen *et al.* (2009) or Roessler (2015) for English version).

One of the most diversely influential factors highlighted by Frandsen *et al.* (2009) was light. In an earlier literature study, Edwards & Torcellini (2002) specifically studied the effects of natural light on building occupants in a range of environments, including hospitals, offices and schools, finding beneficial effects across the line such as decreased stress levels, improved health and improved patient recovery rates.

Although a criticism of these evidence based approaches has been that they lack en explanation of the physiological mechanisms that couple the built environment to healing and thus treat the body as a black box (Roessler 2015), the evidence they offer is enough to warrant closer attention to the effect on people when dealing with architecture.

T 2.2 Factors linking architecture and effect on occupants in hospitals. The factors vary in general applicability: Some can justifiably be used outside of hospital architecture, while others, such as "errors and injuries" and "hygiene" have a highly targeted use. Regardless, they illustrate a quantifiable connection between architecture and man. After Frandsen et al. (2009).

Group	Factors
Body	Light
	Art
	Sound
	Air
	Movement
Relations	Personal space
	Social space
	Outdoor space
Safety	Hygiene
	Errors and injuries

Urban Scale and Social Housing

Expanding the scope from the study of healing architecture and effects on building occupants to an urban context, Berry (2007) offers an interesting perspective on an urban level. In a review of literature linking disadvantaged urban environments with mental health problems, she establishes the connection by citing both quantitative and qualitative studies of disadvantaged neighbourhoods. Hence urban environments have the capacity to influence mental health in four ways (Berry 2007):

Substandard housing, which affects peoples perception about their neighbourhood, increasing residential instability.

Physical incivilities such as litter, vandalism, excessive traffic and a high proportion of shared recreational spaces.

Socio-demographic disadvantages such as unemployment, poor education, ethnicity and poverty.

Social incivilities such as crime, gangs, noise and diminished social capital.

Notably, although the intention was to connect urban environments and mental health, the consequences of the above mentioned disadvantages are clearly more wide reaching in a social sustainability perspective, including detrimental effects to social cohesion, sense of place, well-being, happiness and quality of life. Looking back at Table T 2.1 (on page 36), the studies examined until now have mainly coupled architecture to the basic, quantifiable needs of people such as health and safety, whereas the more complex, qualitative themes such as equity, identity and empowerment have to be further specified to be included. This specification is the subject of the next chapter.

In an effort to provide evidence that physical changes to disadvantaged housing areas can generate social effects, Bjørn & Holek (2014) performed a

T 2.3 The physical interventions and effects in the 27 cases. The interventions and effects are listed according to popularity, the numbers signifying in how many cases they were identified. Effects also list the percentage of cases that acieved positive results. After Bjørn & Holek (2014).

No. cases	Physical interventions
18	Increased opportunity for enjoyment
18	Demolition
17	New development
16	Defining uses
16	Establishing new functions
15	Changing urban structure
13	Crime prevention initiatives
12	Renovating existing buildings
12	Breaking down scale
11	Re-zoning private/public
7	Interior upgrades
3	Improving public transport
1	Breaking down barriers to surrounding city
1	Unspecified urban renewal

No. cases	Effects	Success rate
15	Reduced unemployment	88 %
13	Reduced crime rate	100 %
13	Higher income	93 %
11	Increased safety	100 %
11	Increased satisfaction with area	100 %
11	Positive economic effects (rise in housing prices, increased investment)	79 %
9	Increased community participation	100 %
9	Increased attractiveness of area	69 %
7	Increased trust	88 %
6	Increased education level	100 %
6	Fewer on public benefits	67 %
6	Improvement in image	67 %
1	Stronger connection to area	100 %

review of available social impact studies. A total of 27 cases from 9 countries were ultimately compared across a series of physical interventions and social effects. The result of the study was positive, but even more interestingly it concluded that a far bigger social effect could be expected if the physical interventions in question were *structural* in nature, i.e. altered the architectural logic of the urban plan by changing road networks or in the building structure by changing exits and entrances. If structural changes were made to the area, combined with social initiatives, the positive effects included reduced unemployment and crime levels and higher education and income levels (*ibid.*). Lists of interventions and effects are shown in Table T 2.3. The study shows that people are invariably affected by their physical surroundings, and that carefully considering social impacts when planning the physical transformation of a disadvantaged social housing area can ensure the changes have positive consequences. However, the fact that only 27 cases were available worldwide tells a story of a global lack of commitment to measuring the social effects of physical intervention.

Many of the effects achieved in the 27 cases relate directly to the characteristics and themes of social sustainability identified earlier in this chapter. It thus serves to substantiate the alleged connection between architecture and social sustainability, which justifies the further investigation into socially sustainable transformation of Nordic social housing.

IN CONCLUSION

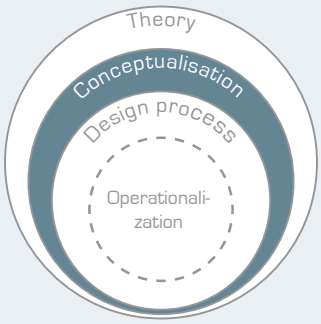
This chapter establishes a connection between the sustainability agenda and the social sciences, presenting various authors' attempts at defining the concept. It does not attempt to arrive at a final definition, but compares definitions of varying specificity, commenting that while subject-specific definitions might be necessary to make social sustainability sufficiently suited for practical work, a more general definition would help the concept gain own value and prevent it from becoming a container for terms from other subjects. Following the example of the literature, the definitions were complimented by a range of characteristics that more closely described the concept of social sustainability. These included among others equity, social justice, social mixing, cohesion, empowerment, participation, social capital, well-being, happiness and quality of life.

The influence of architecture on people was then investigated through a study of literature. The bi-directional relationship between architecture and people was established and the ability of the physical environment to influence people's health was established. By widening the scope to include an urban context, it was possible to identify the aspects of the built environment that were detrimental in a mental health perspective, and thus also to social sustainability. Finally, by reviewing evidence on the social effects of physical changes to disadvantaged housing areas, it was possible to link concrete architectural transformations to pertinent social sustainability issues — paving the way for an architectural design process to result in a socially sustainable transformation of Nordic social housing.

CONCEPTS FOR QUANTIFICATION

3

Having approached an understanding of social sustainability as a concept and established the underlying themes and characteristics that set it apart from sustainability as a whole, the question of how these might be properly translated and analysed arises. Within the fields of environmental and economic sustainability, methods have been developed that allow designers to accurately assess the sustainability of their designs: Through life cycle assessment (LCA) and life cycle costing (LCC) analyses, sustainability can be partially quantified (Mjörnell, Malmgren, Boss *et al.* 2014), and new design tools allow for progressively earlier implementation of these assessments. In contrast, social sustainability lacks a conceptual framework for quantification that is comparable, and hence integrating social sustainability analyses in a design process is all the more difficult. This chapter tackles the question of how social sustainability



F 3.1 Position of the chapter within the research structure.

concerns can be analytically approached in a design process and reviews a range of conceptualisations of sustainability that have been proposed as ways to integrate the social dimension on equal terms. Although these conceptualisations generally aim to provide a holistic overview of sustainability — including the environmental and economic aspects — due to the scope of this report, this chapter focuses and draws inspiration on the social elements of the conceptualisations. This is done in order to establish an understanding of how the social sustainability theory reviewed in the previous chapter can be operationalized, and which common considerations have to be made. Before this, however, it is necessary to look at what motivates the pursuit of measurability within social sustainability.

F 3.2 Quantification is important in order to communicate findings and support stakeholders' decision making process.

WHY QUANTIFY?

The need to quantify social sustainability may not seem straightforward given the tendency within the social sciences to work with qualitative research methods (Guest *et al.* 2013), and indeed, for reasons which will be made apparent towards the end of this chapter, qualitative data must remain a vital part of socially sustainable renovation projects. However, there are a number of solid arguments in favour of quantification, which cannot be ignored.

First off, there is a need to be able to rate different strategies over each other — if there is a possibility to achieve two different socially sustainable outcomes, it should be possible to say, which one is better (Widok 2009). This calls for a method that can *compare* sustainable solutions in a holistic way. Such a method would have to be able to measure social sustainability in a traceable and reproducible way, and could help with communication of results, which could in turn generate increased competition (*ibid.*). Quantification also seems to be necessary, if the social sustainability agenda is to transfer from the analytical to the normative level. Hence, the provision of quantitative targets is a necessity if social sustainability goals are to be integrated into policy-making processes (Littig & Grießler 2005).

On 5 April 2016 at the Technical University of Denmark (DTU), a meeting was organised by associate professor Lotte Bjerregaard Jensen and the author on the topic of how to quantify social sustainability. Participants included associate professor Liane Thuvander from Chalmers University of Technology, Sweden, senior sustainability consultant Peter Andreas Sattrup from the Danish Association of Architectural Firms and postdoctoral researcher at DTU Kristoffer Negendahl, along with Ph.D. and postgraduate students from both DTU and the Royal Danish Academy of Fine Arts School of Architecture.

During the meeting, the question of why social sustainability needs to be quantified was discussed. Three main points were widely agreed upon:

1. *Gathering empirical knowledge* from urban transformation projects is a key effort if the link to social sustainability is to be strengthened. Having theory accompanied by hard (economic) evidence would greatly improve the argument for social sustainability.
2. *Implementing and communicating knowledge* depends on a framework of results that is easily comprehensible. Transforming tacit knowledge into explicit (quantifiable) knowledge is part of this.
3. *Supporting stakeholders' decision-making* is ultimately what makes sure that the right solutions are chosen. In this respect, having quantifiable results, which can be translated into an economic gain will help create incentive.

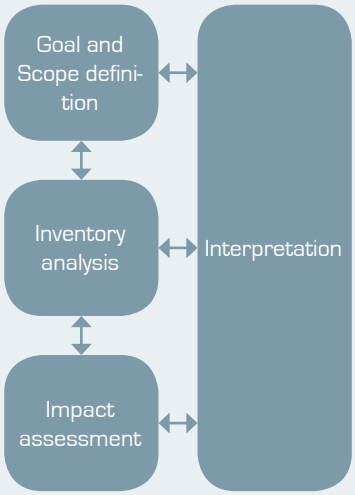
In conclusion, increased quantification and measurability helps communicate knowledge in a way that better supports the decision-making processes, which are ultimately decisive for sustainability (Figure **F 3.2**).

CONCEPTUALISATIONS

Quite a few attempts have been made at providing a framework for quantification of social sustainability, however none have yet reached a level of general applicability within social issues to tangent that of LCA and LCC within the environmental and economic aspects of sustainability. Often these frameworks constitute attempts at approximating a holistic description of sustainability, and in some cases this results in the social aspect being simplified or under-represented. Furthermore, depending on the context in which the frameworks exist, the sustainability concept adopts different scopes and system boundaries. Hence, although a distinct method for social life cycle assessment (S-LCA) has been developed (Benoît & Mazijn 2009), which is based on a methodology similar to that of environmental LCA (E-LCA), its is not as exhaustive, and other kinds of analysis are required to fully elucidate social sustainability. This argument, which is elaborated below, becomes the point of departure for this review of social sustainability conceptualisations.

Social LCA

Until recently, no commonly accepted methodology existed for the assessment of the social impacts of production of goods and services (Benoît & Mazijn 2009; Jørgensen *et al.* 2008). This might have been due to the fact that very little research had been published in peer-reviewed journals, while consensus was lacking with regards to many central aspects of the methodology such as scope, system boundaries, indicators and the origin of social impacts (Jørgensen *et al.* 2008). However, in 2009 the Life Cycle Initiative by the United Nations Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC) presented their *Guidelines For Social Life Cycle Assessment Of Products*, which presented a unified methodology (Benoît & Mazijn 2009). In order to consolidate LCA procedures and methods, the methodology is based on the International Organisation for Standardization's (ISO) standards on environmental management, as outlined in Figure **F 3.3** (ISO 14040 2008; ISO 14044 2008). Although it advanced the position of the S-LCA method-



F 3.3 The S-LCA framework is based on the four phases of LCA identified in ISO 14040 and 14044.

ology within social sustainability research, the guideline did not settle several of the central issues of disagreement: The guideline could neither determine any final sets of generally accepted impact categories, nor could any characterization model between subcategories and impact categories be generally accepted by S-LCA practitioners (Benoît & Mazijn 2009).

Is S-LCA a viable option when designing the transformation of social housing, then? Partly, and as we shall see later, Mjörnell, Malmgren, Boss *et al.* (2014) did apply the method, albeit with a limited scope, in their evaluation of renovation alternatives. The reservation on their part regarding the use of the method resulted mainly from an observation that a negligible amount of research has been done applying an S-LCA methodology on renovation projects (*ibid.*).

The application of S-LCA in a building context appears to be an interesting, yet underresearched subject. Dong & Ng (2015) present a Hong Kong based Social-impact Model of Construction (SMoC), but here the predominant focus is on the construction phase, including indicators of worker's health, working hours and freedom of association. Social sustainability is essentially about people, and hence its scope is broad and multi-faceted. When dealing with buildings and urban structures, this fact does not allow for the same product-life-cycle method as E-LCA, but instead calls for an equally multi-faceted approach, which includes the direct effects that (building) products also have on people (as established in the previous chapter). Imagine that after meticulously calculating the environmental impact of a building over its lifetime, its mere existence caused a complex range of additional impacts. Due to the fact that people occupy and live in buildings, this is exactly the case with social sustainabiltiy in the built environment. Hence, in their guideline for S-LCA, Benoît & Mazijn (2009) also include the reservation that S-LCA is still undergoing development, and that assessments of sustainability may also lie beyond the scope of E-LCA, LCC and S-LCA.

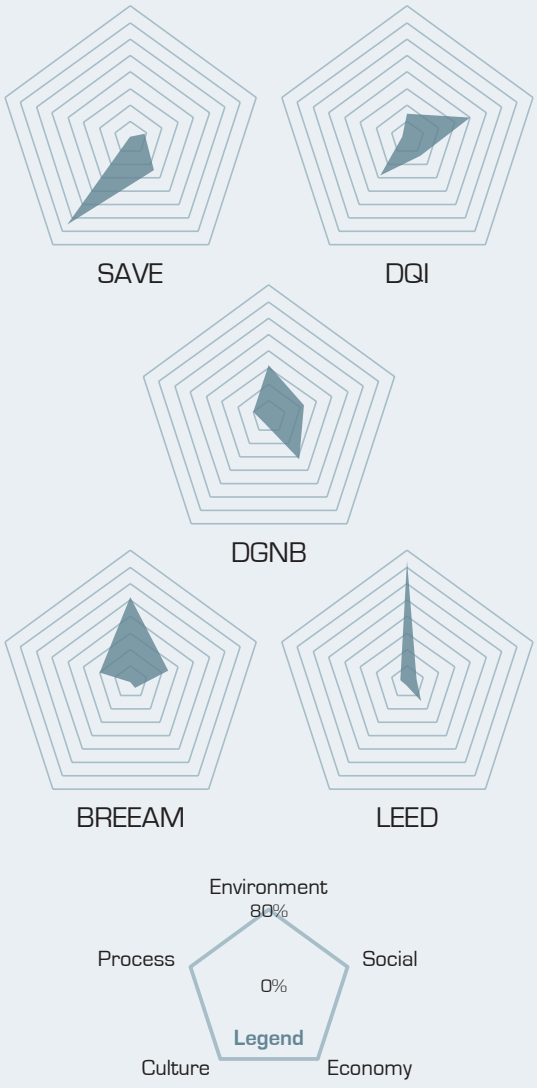
Characterization:
The calculation of indicator results (characterization) involves the conversion of LCI results to common units and the aggregation of the converted results within the same impact category.
(ISO 14044 2008)

Assessment methods

One approach to sustainability in urban development that has been around since the early 1990s, but which has been rapidly gaining momentum since 2008, is the (environmental) assessment method, often accompanied by a certification scheme (Cole 2005; Schweber & Haroglu 2014). Although originally conceived to mitigate the stress on natural systems by increasing environmental performance of buildings, certification schemes such as BREEAM by the UK Building Research Establishment, LEED by the US Green Building Council and DGNB by the German Sustainable Building Council now offer frameworks for sustainable building that include various aspects of social sustainability (Cole 2005; Hamedani & Huber 2012).

T 3.1 Overview of different major certification schemes in chronological order. After Hamedani & Huber (2012).

Certification Tool	Year	Country
BREEAM	1990	UK
HQE	1996	France
LEED	1998	USA
CASBEE	2001	Japan
Green Star	2002	Australia
DGNB	2009	Germany



F 3.4 Division of focus within selected categories of different assessment methods. Analysis and graphs by Madsen & Beim (2015).

Many of the assessment methods share a range of common characteristics: First of all, assessment methods tend to be based on varying frameworks of organised performance criteria, usually within resource use, ecological loadings, health and comfort in individual buildings. The performance criteria are assigned points or weightings, and a full engagement with a particular assessment method often involves obtaining some sort of certification. Furthermore, the application of LCA methodologies are increasingly used to underpin and refine assessments (Cole 2005).

A tendency towards environmental emphasis in the large international assessment methods (BREEAM and LEED) seems apparent from the analysis of the rating systems performed by Madsen & Beim (2015), in which the assessment criteria of a range of different rating systems were translated into a common scale (Figure F 3.4). The version of the German Sustainable Building Council (DGNB) assessment method adopted by the Green Building Council Denmark (DK-GBC) strikes a seemingly better balance between economic, environmental and social factors, yet like the other two certification schemes it seems to ignore cultural factors altogether. Table T 3.2 summarises the performance criteria for the *sociocultural and functional quality* part of the DGNB system, which exists for either buildings or districts (DGNB 2014). Comparing the criteria sets with the characteristics and themes of social sustainability identified in Chapter 2, several clear connections can be identified relating to e.g. comfort, social mix, interconnectedness, health and well-being, safety and quality of life, while other themes such as sense of place, democracy and governance, empowerment, participation and culture seem less well-represented. Overall, there seems to be a predominant focus on comfort criteria for buildings, and the fact that building and district are regarded in separate assessments reduce the holistic quality of the certification scheme.

On the other hand, assessment methods without a certification scheme such as the Design Quality Indicator (DQI), developed in England by the Construction Industry Council, and the Survey of Architectural Values in the Environment (SAVE), developed by the Danish Planning Agency and intended for municipal use, have a focus which

T 3.2 Core criteria set for sociocultural and functional quality in buildings and districts according to DGNB (2014).

Buildings	Districts
Thermal Comfort	Social and Functional Mix
Indoor Air Quality	Social and Commercial Infrastructure
Acoustic Comfort	Objective / Subjective Safety
Visual Comfort	Public Space Amenity
User Control	Sound Emissions and Sound Insulation
Quality of Outdoor Spaces	Open Space Offer
Safety and Security	Inclusive Access
Inclusive Access	Development Layout and Flexibility
Public Access	Urban Integration
Cyclist Facilities	Urban Design
Design and Urban Quality	Use of Existing Structures
Integrated Public Art	Art in Public Space
Layout Quality	

is much more culturally and socially oriented (Madsen & Beim 2015). Yet even though DQI and SAVE seem more appropriate for projects oriented towards social sustainability, there are other problems associated with the use of assessment methods in a design process. Either way, the significant variations in the focus of assessment frameworks problematise the ability of this methodology to provide a sufficiently balanced and holistic evaluation.

Implications for design process

There is a multitude of benefits and drawbacks related to the use of assessment methods and certification schemes in the building industry in general. The focus of this report, however, is on the ability of design process support to foster socially sustainable projects. In this context, a more specific range of issues emerge. In a literature review exploring the initial, current and future role of environmental performance assessment methods, Cole (2005) comments on the effect these methods have on the design process. While assessment methods have made sustainability accessible to a wider range of stakeholders, excessive focus on certification adversely affects the diversity and innovation within the sustainability debate; in the same sense, assessment methods may inhibit creativity and innovation in a design process:

> "[If] assessment methods are used as design tools, even though they may not have been specifically designed to do so … they potentially institutionalize a limited definition of environmentally responsible building practices at a time when exploration and innovation should perhaps be encouraged" (Cole 2005).

The unfortunate results of this institutionalisation include cases where building owners require designers to produce a design that obtains a high performance-score within a specific assessment method (*ibid.*). This issue is especially relevant in the context of social sustainability. Since the term is still in

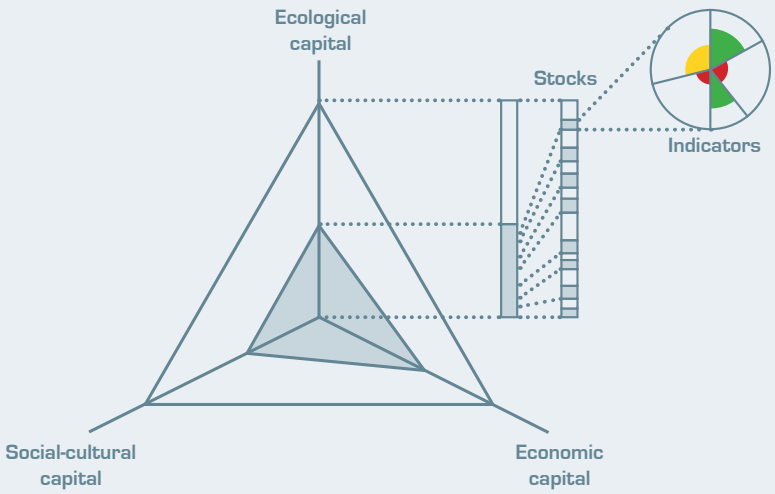
the process of being defined and operationalized, it is of great importance that designers do not settle for a convenient yet incomplete definition, and instead continue to explore the subject further.

In a recent investigation into the effect of BREEAM assessment on design processes based on eight case studies, Schweber & Haroglu (2014) found that design professionals with a strong profile in sustainability successfully used BREEAM for design support and development, while individuals with less experience with sustainable projects tended to treat it merely as an assessment method. It would thus seem that the ability of assessment methods to successfully integrate social sustainability aspects hinges heavily on the design team members prior experience with social sustainability and hence their capacity to abstract from the more mechanistic assessment framework. Consequently, assessment methods fail to provide more generally useful design support for social sustainability, which can also be used by non-specialists.

A final comment emphasises the importance of design team integration and cross-disciplinary teamwork. Schweber & Haroglu (2014) state the importance of project team collaboration, communication and coordination as well as high levels of commitment and early involvement of key actors to the design effect of assessment methods. As these methods inherently suggests that the best solution is to be found by individually optimising a selected range of weighted sustainability factors, this creates a space of solutions, which is intended to satisfy a pre-defined sustainability certification baseline. Although this might be in the immediate interest of building owners, it does not necessarily lead to the most sustainable building. Instead, assessment methods need to be part of a cross-disciplinary discussion:

> "Simply adding social criteria to the current mix of environmental performance measures may not necessarily expose the way that one influences and is influenced by others. It can only do so if the method or tool is used as part of the deliberations between various stakeholders, i.e. synergies are achieved through active, cross-disciplinary use of the tool, rather than by simply the structure of the tool itself" (Cole 2005).

Although this remark is directed at environmental assessment tools, it applies more generally. The question of how to include the social aspect in the design of buildings and districts should thus not be reduced to a checklist without careful considerations by stakeholders — considerations which might advantageously include project specific weighting of assessment criteria. Although it might compromise the certifications schemes in terms of comparability between projects, a bespoke weighting has the potential to direct focus in the design towards the areas where it is most needed, creating a more optimal space of solutions.



F 3.5 The Telos triangle consists of three capitals and their underlying stocks and indicators. Indicators are rated in four classes. After Koning (2001).

Telos

Another conceptualisation, although with a different scope and aim, is the Telos method for monitoring sustainable development. Telos, a network organization consisting of Tilburg University, Eindhoven University of Technology, Etin consultants, PON Institute for Research and Development, and the Province of Noord Brabant, developed the method for monitoring sustainable development in the Dutch province of Brabant. Although the scope and goal of the method is fundamentally different from the one in this report, its conceptualisation of social sustainability is still of interest, as it was one of the first attempts to include the social dimension in a sounder way and on more equal terms (Koning 2001).

In short, the method presents an overview of sustainability based on the environmental-economic-social understanding of the concept. The three aspects (called *capitals* in the Telos model) are each divided into a limited number of stocks (Table **T 3.3**), which are again divided into quantifiable indicators. The scores of the individual indicators are summarised in a triangular diagram, as shown in Figure **F 3.5**. In this way, although it is part of a holistic framework, social sustainability is evaluated, quantified and visualised as a separate entity.

In making the model, Koning (2001) describes that various concepts, including social capital, social infrastructure, well-being, culture, and social sustainability, were ex-

T 3.3 Stocks constituting the social-cultural capital of the Telos method. After Zoeteman et al. (2014).

Social-cultural capital	
Stocks	Social Cohesion
	Participation
	Arts and Culture
	Health
	Safety
	Living Environment
	Education

plored and used as a theoretical basis for the stocks[1]. The themes identified in relations to social capital and social sustainability were, among others, social justice, social cohesion, participation and solidarity between and within societies, while the investigation into well-being led to normative considerations of equal opportunities, individual considerations of independence and self-realization as wells as policy considerations in the fields of employment, housing, health, education, social participation, culture, mobility and leisure time. The stocks in Table **T 3.3** were chosen on the basis of these considerations.

The stocks were further specified using a set of *requirements*, *indicators* and *norms* (benchmarks for the indicators). However, given the narrower scope of this report, these will not be further examined. Instead, emphasis should be placed the framework for breaking down social sustainability into subcategories, which can again be broken down into measurable indicators. A similar approach was used by the certification schemes, yet the Telos method focuses more explicitly on the use of individual context-dependant weighting by dividing a total of 100 points over the number of stock or indicators (Koning 2001).

When the weighting of stocks and indicators is carried out by both stakeholders and groups of specialists, Koning (2001) argues that it helps stimulate a more integrative sustainability debate among policy makers and stakeholders. A similar argument has been raised regarding the certification schemes' ability to improve integration in the design process (Schweber & Haroglu 2014), the difference being the designers capacity to influence the weighting.

Finally, Koning (2001) emphasises the need for further elaboration and research into the operationalization of indicators, as well as discussion of the problems of quantifying social dimensions.

The ReBo model

With the aim of approaching the scope and context of this research, two local, Swedish conceptualisations of social sustainability in renovation practice are reviewed. Their advantage lies mainly in their insight into local conditions.

One attempt to conceptualise social sustainability, which is better aligned with the scope of this report, has been developed at Chalmers University of Technology. The ReBo model, presented by Thuvander *et al.* (2011), focuses on strategies for sustainable renovation of culturally valuable pre-boom multi-family building stock from the era known in Sweden as the Peoples Home (Folkhemmet) period from about 1940–1960. Drawing on existing value and indicator models, the ReBo model proposes a framework consisting of 7-10

1 Note the juxtaposition of the concept of social sustainability with those of e.g. social capital and well-being. This report assumes the position of social sustainability as an overarching concept, a viewpoint which is shared by the majority of the researched literature. However, there seems to be no formal hierarchy, and hence many of the concepts dealt with in Chapter 2 can be (and have been) explored independently.

T 3.4 Specification of social value area of the ReBo model. Based on Thuvander & Femenías (2014) and additional material provided by Liane Thuvander.

PL1: Value areas
General
Architectural
Cultural historical
Social
Technical
Environmental
Economic

PL1: Value area	PL2: Intervention Points	PL3: Aspects of PL2
Social value	Equity	Affordability
		Freedom of choice
	Connection/Accessibility	Street network
		Accessibility for disabled
		Access to local services and jobs
	Pride and sense of place	Public image in media
		Residents' image of the area
	Cohesion	Social mix
		Stability
		Social networks
	Living quality and health	Indoor climate
		Lifestyle choices
		Housing standard
		Comfort
	Safety and security	-
	Democracy, comprehension, action	Participation
		Education
		Communication
		Information

value areas, which are described in four *Parameter Levels* (PL) of increasing specification, ranging from the value areas themselves (PL1) to concrete indicators (PL4) (Table **T 3.4**). Thuvander *et al.* (2011) describe a "tentative methodological framework" for the model, proposing a list of PL 1-4. As the list for PL4 is incomplete (and tentative) it has been omitted here. The ReBo model emphasises project-specific weighting of parameters:

> "A crucial part of the parameter discussion is the balancing of the values in general, and balancing of the parameters in particular, since they are crucial for different renovation scenarios. An assessment of the criteria should include a weighting of the parameters on PL1-PL4." (Thuvander *et al.* 2011)

Additionally, the authors propose a *strategy matrix*, cross-matching Value Areas with buliding components to identify *action packages* for each buliding component (Thuvander *et al.* 2013).

RenoBuild

In a recent report for the Technical Research Institute of Sweden, Mjörnell, Malmgren, Boss *et al.* (2014) present a framework for the evaluation of the sustainability of different renovation alternatives with the goal of finding the most optimal combination of measures to achieve a cost-effective energy renovation with a low environmental impact and without adversely affecting the social conditions of the residents. Like Telos, the method is based on the environmental-economic-social understanding of sustainability, and it evaluates renovation alternatives using distinct methodological frameworks for each

T 3.5 Social Impact Analysis matrix. After Wistrand et al. (2011) and Malmgren, Boss et al. (2014).

	Building	Neighbourhood	District	City	Region
Cohesive City					
Social Interaction and Meetings					
Well-Functioning Everyday Life					
Safety and Openness					
Identity and Experience					
Health and Green Urban Environments					

T 3.6 Indicators of social aspects. After Mjörnell, Malmgren, Boss et al. (2014).

Social aspect	Indicator
Cohesive City	Variation in apartment sizes
	Variation in rent levels
	Variation in forms of ownership
	Number of businesses
	Variation of businesses
	Suited to special needs
Social Interaction and Meetings	Common meeting places
	Common facilities
Well-Functioning Everyday Life	Renovation causes no significant disturbance
	Adequate communication to tenant about renovation
	Reasonable rent increase
	Adequate living standard
	Access to parking and storage
	Good indoor environment
Safety and Openness	Measures to increase safety
Identity and Experience	Heritage and physical form
Health and Green Urban Environments	Access to playgrounds
	Impact on green spaces
	Impact on ability to cultivate
	Access to balcony and outdoor spaces
	Impact on outdoor noise level

aspect. Specifically the method involves the use of an LCA tool to calculate the environmental performance and an LCC tool to calculate the economic consequences of the renovations alternative, while another methodology altogether is used for the social aspect, namely the following:

To quantify social impacts, Mjörnell, Malmgren, Boss *et al.* (2014) suggest using the *Social Impact Analysis* matrix developed by the City of Göteborg (Wistrand *et al.* 2011; Mjörnell, Malmgren, Boss *et al.* 2014), which analyses six social aspects across five different scales (Table **T 3.5**; see also City of Göteborg (2016) for a fuller description of the tool). To make the model more suited for evaluation, the social aspects were developed further to include quantifiable indicators (Table **T 3.6**).

Furthermore, as the environmental and economic aspects were analysed in a life-cycle perspective, the method bases the evaluation of the social aspect on S-LCA in the sense that it attempts to address impacts across the whole life-cycle (Mjörnell, Boss *et al.* 2014). However, case studies performed by Mjörnell, Malmgren, Elfborg *et al.* (2014) have shown that the analysis should be limited to focusing on the renovation phase and the use phase. The social impacts of the materials used during the renovation, as well as social influences during the demolition and disposal of materials, were also estimated to be too difficult to manage both methodologically and in terms of resources. Although the Social Impact Analysis matrix has five scales, Mjörnell, Malmgren, Elfborg *et al.* (2014) also conclude that the scale should be limited to the building level and neighbourhood level, as it would be methodologically difficult to conduct a realistic analysis at levels above these (such as district, city and region).

Although all indicators are equally weighted in the RenoBuild method, different alternatives for weighting are considered by Mjörnell, Malmgren, Boss *et al.* (2014). The most promising alternative suggests that a number of principles for the weighting process should be developed by the Reno Build-researchers. On the basis of these principles, the indicators could then be weighted individually from case to case by residents and other stakeholders.

KEY CONSIDERATIONS

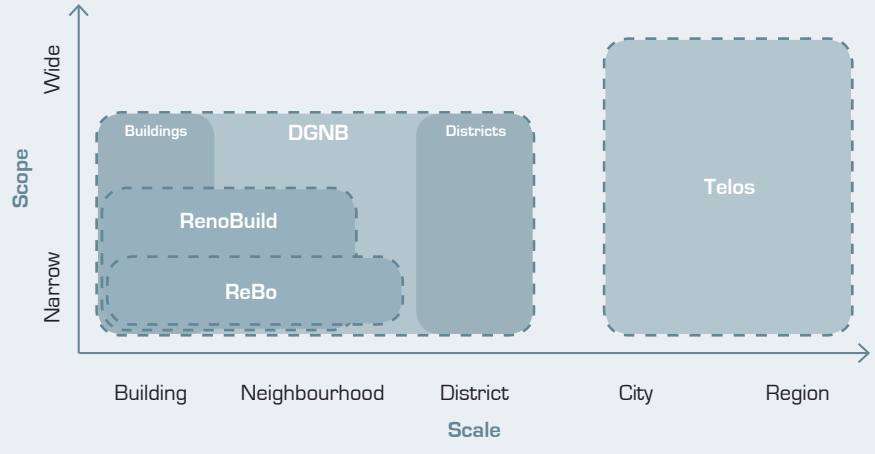
A number of key themes and considerations can be extracted from the above review of social sustainability conceptualisations. This section attempts to synthesise some of the issues that are most commonly dealt with.

Quantification

In order to assess the defined indicators, the reviewed concepts apply different strategies of quantitative and qualitative analysis. These include calculations of technical performance, statistics analysis and points rating based on qualitative analysis of various factors. For example, the Danish version of the DGNB system uses both qualitative (e.g. perceived layout of access routes) and quantitative (e.g. indoor thermal comfort) methods for points assessments (DK-GBC 2015), although the space for interpretation is kept to a minimum. The same goes for the Telos method, which bases its ratings on comparisons of quantitative and qualitative scores/measurements to normative targets (Koning 2001), and RenoBuild, which uses a scale of one to five to compare alternatives (Mjörnell, Malmgren, Elfborg *et al.* 2014). The ReBo method uses a wide range of reports, maps, tables, and images (Thuvander & Femenías 2014). Consequently, it seems rating systems are useful tools for translating both quantitative and qualitative analysis into comparable results and making social sustainability operational.

Scale and Scope

Several authors emphasise the need to address problems of social sustainability on a variety of scales (DGNB 2014; Koning 2001; Mjörnell, Malmgren, Boss *et al.* 2014). The conceptualisations also work within different contexts and thus apply different scopes within their methods. The DGNB system explicitly works within a variety of building typologies and has expanded its



F 3.6 Comparison of scale and scope of selected conceptualisations.

method to inclue district scale assessments (DK-GBC 2015; Hamedani & Huber 2012). Oppositely, the Telos method has expanded its framework downwards from the region level to include assessments of sustainable cities, at the same time expanding the scope from a Dutch to a global context, including a wider variety of issues (Zoeteman *et al.* 2014). The RenoBuild and Rebo method apply a much narrower scope, focusing on renovation projects on building and neighbourhood level. The ReBo model's focus on a specific typology further limits its scope, however its indicators suggest inclusion of the neighbourhood scale although this is not explicitly elaborated by Thuvander *et al.* (2011). Still, according to Koning (2001), the issue of scale lies mostly in the choice of indicators. As such, the Telos stocks can be considered of relevance for all levels, and should be considered even on building and neighbourhood scale.

Weighting

The prospect of project-specific weighting has been elaborated above. There seems to be a broad consensus that some degree of weighting should be carried out, yet authors disagree on who should carry out the weighting and how project specific it should be. Suggestions range from general weightings carried out by specialists to project-specific weightings by designers and/or stakeholders.

Visualisation

In the beginning of this chapter, a key motivation for quantifying social sustainability was identified as the need to communicate knowledge and support stakeholders' decision making. In this context, effective visualisation of results is a simple yet valuable tool. The Telos and RenoBuild methods are the most explicit in their use of visualisations; both use almost identical, schematic representations consisting of a partially filled-out triangle with environmental, economic and social aspects represented by the corners (Koning 2001; Mjörnell, Malmgren, Boss *et al.* 2014). Although the Telos triangle is intended to represent the level of sustainability in relation to a defined absolute level (where the triangle would be completely filled out), whereas RenoBuild uses the triangle only to compare alternatives (best alternative gets score of 100%), this type of visualisation is still effective in providing a clear overview. In comparison, the ReBo method uses more ad hoc approaches to visualise individual aspects of social sustainability, such as maps, tables, images or even an interactive point cloud model (Thuvander & Femenías 2014). It seems a combination of visualisations of individual aspects combined with a more general overview would provide a strong framework for communication.

Culture and Process

In the analysis of rating systems performed by Madsen & Beim (2015), *cultural* value, describing building-cultural and aesthetic qualities, and *process* value, describing qualities associated with the development and construction process, were used as independent parameters from the environmental, social and economic ones. Yet in interviews about the design process with architects and sustainability professionals, the importance of resident inclusion in design processes has consistently been emphasised as being essential to social sustainability, and in some literature the cultural parameter also seems to be intertwined with social sustainability. It is of interest to this report to briefly investigate these concepts, their meaning and the way they are commonly conceptualised.

The conceptualisations reviewed in this chapter differ in their approach to culture and process as being either independent parameters or integrated parts of social sustainability. In the Telos method culture is included, but not to a satisfactory degree, as Koning (2001) states. She identifies culture as a term that refers to:

> … symbols and meaning, norms and values, habits and learning, politics of identity, tradition, artefacts and so on. It covers the process of intellectual, mental and aesthetic development, it represents a certain way of life of a people, a period or a group, and it also corresponds to the products of artistic activities.

As it was shown in the analysis by Madsen & Beim (2015; see Figure **F 3.4** on page 48), the cultural aspect seems to be very weak within the certification schemes. In the DGNB system, apart from the *public art* indicator, the cultural elements are only implicitly described in the other indicators. Still, process is a category for itself with community consultation and municipal involvement as separate indicators, although it is only weighted at 10% — less than half the weight of the other four categories, which have 22,5% each (DK-GBC 2014). The ReBo model includes cultural and process as separate value areas[2], whereas RenoBuild describes that cultural heritage should be taken into consideration in cooperation with residents (Mjörnell, Malmgren, Boss *et al.* 2014; Mjörnell, Boss *et al.* 2014).

It seems there is some agreement that aspects of culture have an influence on social sustainability, and that inclusion of residents into the design/planning process is beneficial or even indispensable. Regarding culture, various terms (such as art, heritage, tradition, architecture) are used to describe it, however the definition above seems to more clearly link culture to social sustainability. To evaluate cultural values, the SAVE evaluation method has proven highly effective (Madsen & Beim 2015).

2 Process quality is included in some versions of the method, see e.g. Thuvander *et al.* (2011).

IN CONCLUSION

After briefly arguing for the need for quantification, this chapter introduces four distinct approaches to conceptualise social sustainability: The environmental assessment method (including certification schemes), the Telos method for monitoring sustainable development, the ReBo method and the RenoBuild method. While the former two provide a global perspective, the latter two give a more local insight into the Swedish research context. Furthermore, there seems to be some convergence regarding the indicators, characteristics and themes used to describe social sustainability in the different methods. Especially themes of social cohesion, health and safety, social mix, participation, accessibility, identity and comfort have been specified.

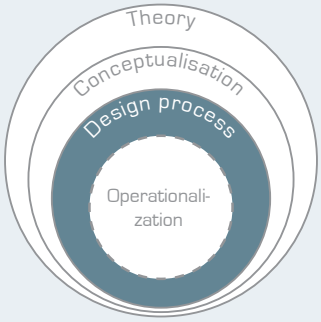
Furthermore, a number of key considerations have been identified that need to be taken into account in conceptualising social sustainability. These include deliberations on how to quantify, the scale and scope of conceptualisations, the weighting of indicators and how it should be carried out and the visualisation and comparison of results as well as reflections on the role of culture and inclusion of residents in design processes. In conclusion, none of the reviewed conceptualisations manage to exhaustively describe how social sustainability can be included in the design process, yet each one offers insight into different aspects of the problem. Hence the task of this report will mainly be an attempt to synthesise these learnings.

THE DESIGN PROCESS

4

Although it has now been shown how social sustainability can be conceptualised in various ways and to different ends, it is necessary to look closer at the design process in order to understand how these conceptualisations might be implemented. Before we delve into any concrete proposals for how to operationalize the social sustainability concept, it is thus necessary to look at how buildings and districts are currently designed, as well as how other parts of sustainability have recently made their way into the design process.

Several elements influence the way in which input is absorbed and dealt with in the design process: Motivation, communication between disciplines and information transfer can affect project continuity (Löhnert *et al.* 2003), and the availability of analytical tools can enable designers to analyse their designs at ever-earlier stages. In that context, methods and tools have been de-



F 4.1 Position of the chapter within the research structure.

veloped for the integration of a range of sustainability aspects. Predominantly, these have focused on indoor climate, daylight and minimisation of the energy use through optimisation of the building geometry and systems (Nielsen 2012), but another attempt at integrating life cycle assessment capabilities in an early-stage design tool has also proven to be practicable (Otovic *et al.* 2016). On the other hand, tools and methods for including the social dimension in design considerations seem to be lagging behind. Although much of the framework for design process integration is already there, the introduction of social sustainability dimensions within this framework is lacking. With the intention of identifying potentials for the operationalization of social sustainability, this relatively short chapter investigates the design process, how it has been developed to take additional parameters into account, and how social sustainability aspects could possibly be included.

THE DESIGN PROCESS

In the field of building design, the design process has suffered from a separation of architecture and technology, which has resulted in a division between aesthetic and performance based goals (Nielsen 2012). Whereas system and rationality often govern the processes of engineers and industrial designers, a mainly argumentative and empirical approach is found in the field of architecture and planning (*ibid.*). In order to bring together these approaches, the concept of *integrated design* is proposed. Since this concept began to surface in the field of building design, it has manifested itself in various frameworks for the design process, some of which will be touched upon in this chapter. Furthermore, the importance of multidisciplinary collaboration for the inclusion of sustainability goals is investigated in more detail.

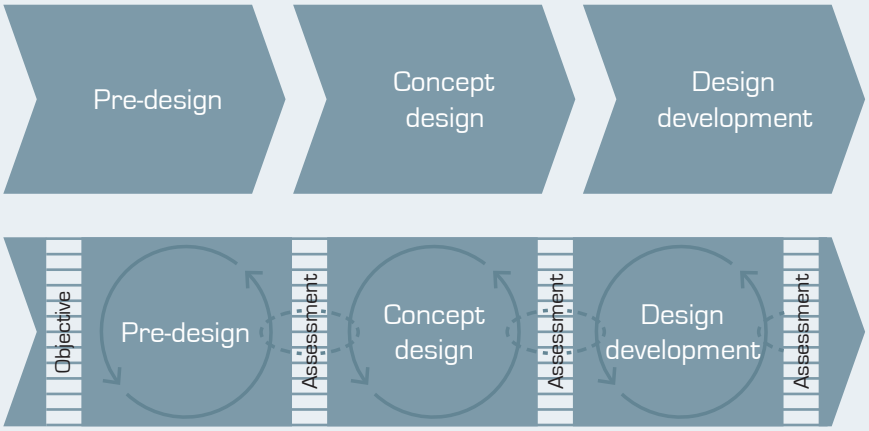
Traditional design process

Löhnert *et al.* (2003) of the International Energy Agency (IEA) critically review the traditional design process and its shortcomings: As a simplification, they argue that design can traditionally be understood as a linear process, in which several actors work on a design in an independent, sequential manner. Typically, the architect is the one to produce the actual design in consultation with the client, including geometry, fenestration, orientation and general exterior and interior appearance; optimisation only occurs at a later stage, when engineers are tasked with implementing the design. The individual, decoupled optimisation attempts have a limited ability to produce a solar-optimised building envelope, which has consequences in terms of e.g. energy use, daylight, thermal comfort and cost.

Although Löhnert *et al.* (2003) — being guided by the research agenda of the IEA — focus on the consequences in terms of energy use, arguably the consequences are more far-reaching. As we have seen, the physical characteristics of buildings and neighbourhoods have a profound impact on social sustainability as well. It is thus safe to say that the traditional design process is not well-suited to operationalize social sustainability.

Integrated design

The concept of integrated design is not new; on the contrary, the approach has been analysed from different perspectives for quite a while (Löhnert *et al.* 2003; Nielsen 2012; Cross 2001). More recently, however, suggestions on how to formalise and structure the process to achieve higher building energy efficiencies have greatly increased in number. Frameworks go by names such as the Integrated Design Process (IDP, by IEA; Löhnert *et al.* 2003; Knudstrup 2004), the Integrated Building Design Systems (IBDM, by Koen Steemers from Cambridge University; Santamouris 2006) and Integrated Energy De-



F 4.2 Traditional (top) and integrated (bottom) design approaches. After Nielsen (2012) and Löhnert et al. (2003).

sign (IED, by the INTEND project if Intelligent Energy Europe; Andresen *et al.* 2009). In this report, the term integrated design process (IDP) will be used to denominate the concept of integrated design. What the different frameworks have in common is a call for early actor involvement, use of integrated, cross-disciplinary design teams, joint decision making, design iterations early on and a focus on team motivation. Although the frameworks mentioned above tend to focus on the energy related and thus technical benefits of IDP, Nielsen (2012) emphasises the role of IDP as a more holistic concept:

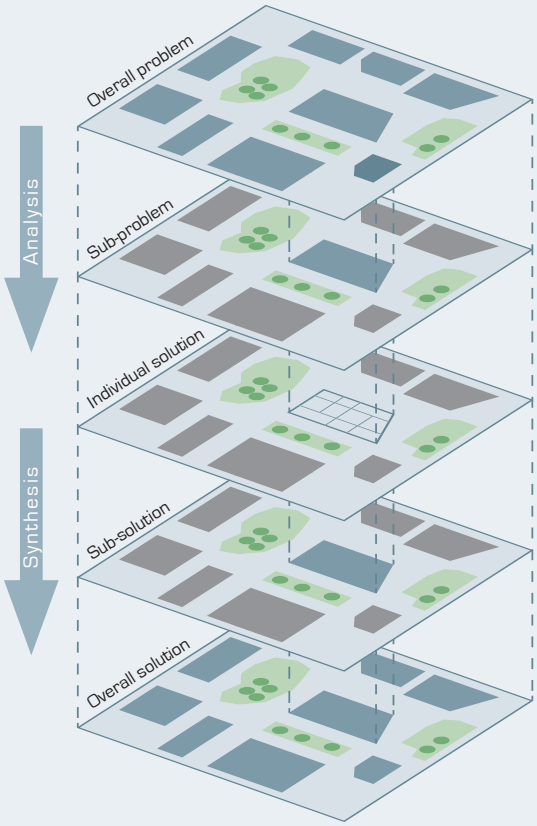
> "… [IDP] has the potential to contribute to a more holistic performance evaluation of the built environment and thereby illustrating that true architecture can amount to something greater than the sum of its individual parts — it can thrill, excite and improve the quality of life."

It seems this approach is indeed better suited for the integration of social sustainability performance requirements, as it aims more broadly at all parameters that are relevant to the success of a building.

IDP differs from the traditional design process in a number of ways: Firstly, it emphasises the creation of performance goals at the beginning of a design process by the involved specialists, which can be used to set up preliminary strategies and as benchmarks for later performance assessment (Andresen *et al.* (2009) suggest setting up a *Quality Control Plan*). Secondly, it focuses on providing a process that is able to facilitate the pursuit of the specified performance goals. The beginning of this section hinted at the difference in approach between the architect and the engineer. Löhnert *et al.* 2003 argues that the engineer works in a very analytical and linear way, disassembling the problem into sub-problems, which can be individually solved and assembled into a solution. On the other hand, the architect works in an iterative way, investigating both solution and problem at the same time and working with several alternatives in parallel. In order to bringing together these different process approaches of architecture and engineering, IDP suggests a design process, which is based

on a sequence of iterative design loops, separated by assessments of compliance with performance criteria (Figure F 4.2). This iterative design process supports the need for continuously changing perspectives between individual and overall problems/solutions (Figure F 4.3). This way of thinking is also closely related to the conceptualisations reviewed in the previous chapter, which operated specifically by breaking down social sustainability into a set of manageable sub-problems, which could be synthesised into a socially sustainable solution.

By following this design process, the role of the engineer/specialist moves from performance assessment and evaluation of a finished design towards actively supporting and optimising the design by assessing alternatives in collaboration with other specialists in other disciplines. Since this collaboration is what lies at the heart if IDP, it deserves a bit of further attention.



F 4.3 The fundamental need of continuous and quickly changing perspectives between solution and problem on the one hand and between the totality and particularity on the other is supported by the iterative design process. After Löhnert et al. (2003) and Nielsen (2012).

Interdisciplinary integration

Several authors writing about social sustainability call for a re-evaluation of the way different disciplines work together (McKenzie 2004; Partridge 2005; Becker *et al.* 1999; Becker *et al.* 1997; Stember 1991). They use terms such as *cross-*, *multi-* and *interdisciplinary* to describe the required mode of collaboration. Before going any further, it is first necessary to clarify what is meant by these terms. Stember (1991) identifies a hierarchy of 5 distinct levels of disciplinary integration (Table T 4.1), of which interdisciplinary comes second, only surpassed by transdisciplinary. She states that:

> "Interdisciplinary integration brings interdependent parts of knowledge into harmonious relationships through strategies such as relating part and whole or the particular and the general."

This correspond to the framework described in Figure F 4.3, and also supports the analytical framework that was predominant within the social sustainability conceptualisations in the previous chapter.

McKenzie (2004), Partridge (2005) and Cole (2005) all describe interdisciplinary integration as a necessity, if social sustainability is not to be treated merely as an *add-on*

T 4.1 Levels of disciplinary integration. After Stember (1991).

Level	Description
Transdisciplinary	The unity of intellectual frameworks beyond the disciplinary perspectives
Interdisciplinary	Integration of the contributions of several disciplines to a problem or issue
Multidisciplinary	Several disciplines who each provide a different perspective on a problem or issue
Cross-disciplinary	Viewing of one discipline from the perspective of another
Intradisciplinary	Within own discipline

to existing models. The conceptualisations only gain value when they are used and appreciated by all the actors in the design process. For this to be possible, the actors need to acknowledge, explicate and resolve their epistemological and methodological differences (Stember 1991; Becker *et al.* 1999). Consequently, interdisciplinary integration and the strategies for its implementation contained within the IDP, seem to be strong prerequisites for the effective operationalization of social sustainability.

DESIGN SUPPORT FRAMEWORKS

Within the IDP, a range of tools have been developed that are able to calculate different aspects of building performance. As stated in the beginning of this chapter, these are mostly aimed at analysing technical performance such as indoor climate, daylight, energy or aspects of the building life cycle; however, they also have the potential to inform aspects of social sustainability (investigation of this potential is a topic in the subsequent chapters).

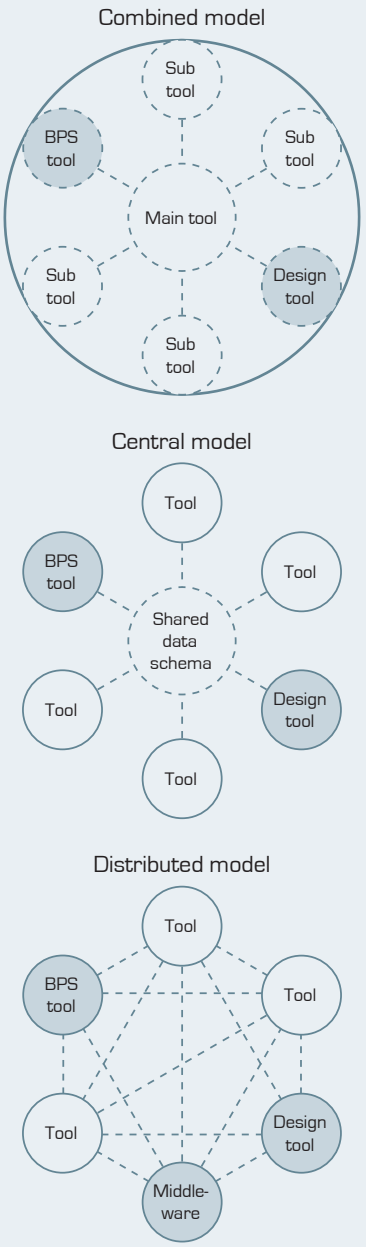
Modelling methods

In order to optimise the ability of design tools to support the design process, different frameworks have been proposed to connect the different tools that inform the design process. Using the terms *design tool* for a CAD tool dedicated to exploring design options, *building performance simulation* (BPS) *tool* for a tool that analyses performance in the early design stages and *middleware* for a component that translates data between the design tool and BPS tool, Negendahl (2015) proposes three constellations of tool integration (Figure **F 4.4**):

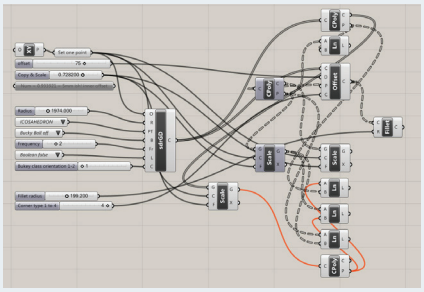
The combined model method uses a single program or environment that includes both design and BPS tools. Although this ensures a high level of integration, it also limits the functionality to what is offered by the model environment.

The central model method, such as that used in a building information model (BIM), uses a shared data schema to store building information. In this way, convergence between the design and BPS tool is secured, but unless the simulations are done by the designer, this does not necessarily result in relevant performance feedback.

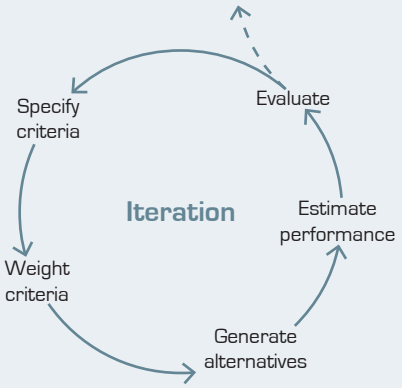
The distributed model method can be seen as an attempt to decentralise modelling efforts. To keep the tools integrated, a *middleware* component is used to translate data between the design and BPS tools. Using bi-directional links between the tools and the middleware allows the designer to receive run-time performance feedback.



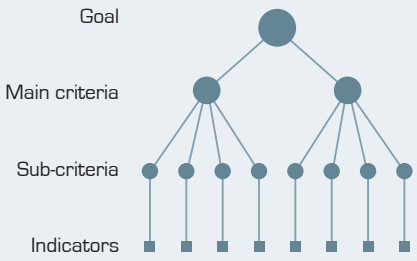
F 4.4 Methods for coupling of design and calculation tools. After Negendahl (2015).



F 4.5 The VPL Grasshopper3d programs data and geometry by connecting visual components on a canvas. Image by Robert McNeel & Associates (2016).



F 4.6 Steps using MCDM in an integrated design process. After Balcomb et al. (2002).



F 4.7 MCDM: Breaking down design criteria into measurable indicators. After Balcomb et al. (2002).

An *integrated dynamic model*, then, is a distributed model where the middleware consists of a visual programming language (VPL) such as Grasshopper by Robert McNeel & Associates (2016). Theoretically, this allows anyone to build new project-specific links between the design tool and new types of BPS tools and gives the ability to integrate various social sustainability performance evaluations into an integrated dynamic model, which could be highly useful for designers. This makes it an interesting framework to consider in relation to the operationalization of social sustainability.

Multi-Criteria Decision-Making

Another interesting aspect in relation to design process support is the concept of *Multiple-Criteria Decision-Making* (MCDM), which has been the subject of interest across different fields for a long time[1], with recorded use as far back as the 18th century (International Society on MCDM 2016). More recently, the IEA developed a MCDM tool to use along with their guide for IDP (Balcomb *et al.* 2002; Löhnert *et al.* 2003). The method essentially offers a framework for structuring the goal-setting, weighting, assessing and decision-making processes of IDP, which allows for a visual representation of the overall performance of design alternatives. The MCDM method supports the iterative approach of IDP, as it help create performance requirements for optimisation. It also uses a similar approach to that of the social sustainability conceptualisations, breaking down criteria into assessable indicators. What makes MCDM well-suited for projects focusing on social sustainability aspects it the fact that it does not necessarily require quantitative input for scoring:

> "In some cases [scoring] might require performing computer simulations to determine energy use. In others it might require estimating construction costs, determining probable indoor air quality, judging relative architectural merit, or forecasting how adaptable each scheme would be to changes in building use or clients." (Balcomb *et al.* 2002)

In a sense, we have already dealt with types of MCDM in the previous chapter. The Telos method and the RenoBuild methods both included elements that were fairly similar to those usually associated with MCDM. The *star diagrams* used to visualise results in these methods are also recommended by Balcomb *et al.* (2002). Using this method for evaluation of design can thus potentially help quantify social sustainability and make it visible to stakeholders.

1 See http://www.mcdmsociety.org for an extensive bibliography of literature pertaining to MCDM.

THE IMPORTANCE OF COMMUNITY INVOLVEMENT

In continuation of the call for an interdisciplinary design process, it is of key interest to look at the possibility and importance of including the users of the design in the process. In their paper on designing for social sustainability, Palich & Edmonds (2013) argue that it is as much about the process as the outcome; an inclusive design process that integrates the input of the community in the decision making processes is in itself increasing social sustainability by improving social networks and empowering people, and is more likely to produce designs that are aligned with the wishes and needs of the people that are going to use it.

In interviews with architect Elise Grosse and sustainability specialist Robin Andersson at architectural firm White's Stockholm office on 11 March 2016, as well as with architect Åsa Bjerndell at White's Malmö office on 11 May 2016, a consistent emphasis was placed on the importance of community involvement and integration of users in the design process. Addressing the need to quantify, Andersson anticipates a development in the ability to predict economic benefits of social sustainability, but warns about excluding the participatory processes:

> "I don't think you could or should ever exclude what kinds of positive effects the actual physical meetings with the people have. That meeting is very valuable and that's hard to put a price tag on."

Åsa Bjerndell also sees economic benefits to social sustainability in the form of lower operation and maintenance cost for building owners, which can be caused by an increased sense of ownership among residents. She sees community involvement as way to give the users ownership of a project. For her, a major part of the work lies in identifying interests that are shared by both the owners and the community:

> "[The owners] have a budget for things that they want to do, so we find one of those projects and combine it with someone in the area who wants to do something … then we have a budget, there's actually someone who wants to put money into it, but we also have someone who is the receiver of it, and to put those things together, then you can start."

She describes an inclusive design process as one that alternates between discussing and designing: While the discussion with the community is important, having it lead to concrete design solutions would not be "responsible", according to Bjerndell. Instead, the participatory process is comprised of several iterations of seeking community input on design proposals to maintain participation, ownership and trust.

IN CONCLUSION

This chapter introduces a number of concepts related to the design process. After briefly reviewing the traditional approach to building design and recognising its shortcomings, the integrated design process (IDP) is established as a viable alternative, which seems more promising as a way to integrate an operationalization of social sustainability. The concept of interdisciplinary integration is examined further in a social sustainability context, and is found to be essential. Next, frameworks to help support the design process by digital modelling and by evaluation of design alternatives are investigated. The integrated dynamic model seems to be of special interest due to its ability to integrate new tools and provide run-time performance feedback, while multi-criteria decision-making (MCDM) provides a solid framework for comparing results and thus for the integration of social sustainability parameters on equal terms with more traditional areas of focus.

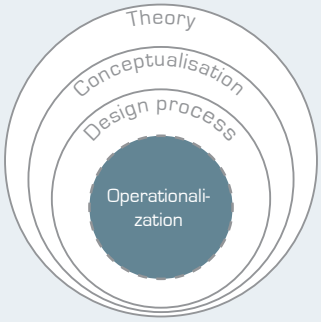
Finally, community involvement was seen as essential to the design process by several professionals working with social sustainability in Sweden, the reason being that an alignment of investor and community interests could lead to an increased sense of ownership, with a range of positive effects in terms of sustainability. Throughout this chapter, iteration was seen as a central, unifying element, ideally with community involvement as a part of every design iteration.

MODEL FOR OPERATION

5

In the preceding chapters we have seen how social sustainability has been defined in different ways by various authors, and some of the common themes that characterise it have been identified. We have seen how this has been translated into conceptualisations with their accompanying methods and models, each with its own intended use and understanding of social sustainability and hence limitations in terms of scope and scale. We have also established a provisional framework for design process integration, drawing mainly on the strategies of IDP. As a whole, this has hopefully provided us with a more profound understanding of social sustainability, what it is and how a better description of it may be used to help guide a design process.

But whereas the previous chapters have mainly been concerned with the prerequisites for social sustainability in a design process, this chapter intends to



F 5.1 Position of the chapter within the research structure.

synthesise these learnings into a suggestion as to how it might be implemented. As such it responds to the research question by proposing an operationalization of social sustainability, which is aimed specifically at supporting the design process. For this, inspiration is mostly drawn directly from the concepts and methods reviewed in Chapter 3 and adapted to the particular context of this project, i.e. Nordic post-war social housing. In order to substantiate the chosen model, parallels are also drawn to the key themes identified in Chapter 2.

The conceptualisations reviewed in Chapter 3 were also evaluated on their scope and scale of operation. In the same way, this chapter focuses on scope and scale in order to produce a set of tentative indicators for social sustainability, which can potentially be used in a design process.

Finally, central aspects pertaining to the integration of the model in a design process are discussed in an effort to make the proposed model operational.

DRAFTING A MODEL

In the search for a model of social sustainability, this project follows the methodology of RenoBuild and thus attempts to follow the general framework associated with the research perspective of social LCA (S-LCA), as presented by e.g. Benoît & Mazijn (2009). This includes stages of *goal and scope definition*, *inventory analysis* and *impact assessment*, although the content of these stages will be adapted to this particular context. To assist with the first two stages, this report proposes a model consisting of a set of *themes* and underlying *criteria* for social sustainability, corresponding to impact- and sub-categories in S-LCA. The proposed model results from an attempt to maintain a manageable number of general themes with a high level of abstraction, in this case five, which are then rapidly expanded into a larger number of more tangible criteria. As was the case with the Telos model, these criteria are in theory applicable across all scales, and need to be specified into concrete *indicators*. First, however, theoretical deliberations are necessary in order to give some substance to the preliminary model.

Theoretical foundation

As mentioned, the themes and criteria in the model (Table T 5.1) are derived partly from theory, partly from the reviewed conceptualisations, although some significant changes have been made to their hierarchy and placement. Thus, trying to cover the theoretical aspects described in Chapter 2, the themes contained in the model are described as follows:

Equity/Quality of Life: This theme has been broadened to include several criteria that constitute top-level themes in e.g. the ReBo and Telos models, such as safety, health and education. The criteria within this theme relate both to the fundamental needs of people, but also to more existential needs, such as the ability to choose and influence your own environment. While equity was in fact established as a much broader component, through which all the other themes could be viewed, it has been included

T 5.1 Preliminary model of social sustainability consisting of key themes and criteria.

	Themes	Criteria
Social Sustainability	Equity / Quality of Life	Affordability
		Solidarity
		Freedom of choice
		Comfort
		Health
		Education
		Safety / Security
	Connection / Accessibility	Transportation
		Urban connection
		Disabled access
		Services/jobs
	Pride and sense of place	Public image
		Residents image
	Social cohesion	Social diversity
		Stability
		Social networks
	Democracy	Participation
		Communication

here along with quality of life to keep focus on an equitable fulfilment of basic needs.

Connection/Accessibility: A recurring theme in the reviewed conceptualisations and theory, connections and access are key factors for the interconnectedness of communities. Here, emphasis is on the ability of the built environment to strengthen interconnectedness by providing necessary facilities and functions.

Pride and sense of place: A loan from the ReBo model, this theme deals with internal and external opinions and the (mainly physical) factors that influence them. It is also an almost verbatim translation of one of the emerging key themes on page 36, which is also closely connected to cultural aspects.

Social cohesion: Another recurring theme, cohesion is given different meanings in the various conceptualisations. Here, the ReBo model is used again, as it is best aligned with the theory. The term is thus used to denote the social prerequisites for interconnectedness, such as mix/diversity, stability and networks (as opposed to the physical prerequisites included within connection/accessibility).

Democracy: Finally, democracy is used as a theme to denote both participatory processes and the means of communication that are necessary to support them. As both Chapter 2 and 4 have shown, these are strong prerequisites for community empowerment and sense of ownership.

The model is, of course, a simplification, as social sustainability cannot be exhaustively described in this way. Hence, some criteria might be connected to several themes, while other criteria might not have been included at all. On the other hand, the model provides a strong starting point for the description of social sustainability in the transformation of social housing projects, as it addresses a wide variety of pertinent issues for further exploration.

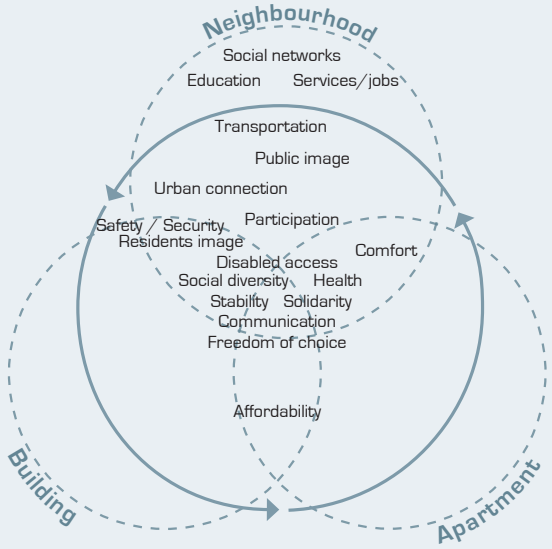
Scope and scale

The next step in making the model operational involves a specification of indicators. The choice of indicators was influenced by the aim and scope of this project, i.e. transformation of Nordic modernist social housing, but the indicators themselves can be regarded as universal. This has resulted in the tentative compilation of indicators in Table T 5.2, some of which have been collected from the social sustainability conceptualisations in Chapter 3, while others are based on the social sustainability theory in Chapter 2. In order to adapt the model to the scope of this project, it was critically reviewed and edited by the author in collaboration with postgraduate students Märta Helander and Amanda Dahl of the Royal Danish Academy of Fine Arts

T 5.2 Expanding the preliminary model: Proposed tentative model of social sustainability in the transformation of post-war social housing. Some indicators have been defined by the author based on indicated literature.

	Themes	Criteria	Indicators	Source(s)
Social Sustainability	Equity / Quality of Life	Affordability	Rent level	1/2
			Heating cost	1
			Individual metering	1
			Possibilities for food production	1
			Good quality apartments	1/2/3
		Freedom of choice	Variation in apartment sizes	2
			Variation in tenure	1/2
			Apartments for residents with special needs	2
			Access to balcony	2
			Access to green/recreational areas	2
			Access to storage	2
			Ability to shape own space	7/6
			Ability to cultivate/grow	2
		Comfort	Daylight	4
			Heating	1/4
			Indoor climate	1/2/4
			Noise	2/4
			Wind	7/4
			Human scale	6/7
		Health	Ability to exercise	3/7
			Access to health facilities	3
			Awareness of own health	3
		Education	Access to elementary schools	3
			Access to secondary education schools	3
		Safety / Security	Vandalism	3
			Road safety	3
			Measures to create feeling of security (lighting etc.)	2/4
			Natural surveillance	6/7
			Visibility	6/7
	Connection / Accessibility	Transportation	Public transport	1
			Carpool	1
			Balance of modes of movement	1
		Urban connection	Connection to city	4/6/7
			Garbage collection	1
			Entrances	6/7
			Car access to area	1
			Parking facilities	1/2
			Pedestrian plan	1
			Bike paths	1/4
			Meeting places	2/4
			Foot traffic to and through area	6/7
			Area used by non-residents	6/7
			Common facilities	2
		Disabled access	Possibility to stay in your own home	1/2
			Accessibility indoors/outdoors	1/2
		Services/jobs	Presence of local amenities	1/4
			Range of service	1
			Local job opportunities	1
			Support system for entrepreneurs	1
	Pride and sense of place	Public image	Tone and frequency	1
			Name of streets	1
			Stigma	1
			Public landmarks	7
			Differentiation of private and public	6/7
			Definition of uses (programming)	6/7
		Residents image of area	Maintenance and care	1
			What residents think about the area	1
			Local landmarks	7
	Social cohesion	Social diversity	Social mix	1/4
			Social inclusiveness	3
		Social networks	Volunteers	3
			Local societies/communities	2
			Residents' association	2/7
			Including residents in processes	2
	Democracy	Participation	Residents included in decision processes	2
		Communication	Access to information/internet	1/7

(1) ReBo — Material provided personally by Liane Thuvander. (2) Renobuild — Mjörnell, Malmgren, Boss et al. (2014). (3) Telos — Zoeteman et al. (2014). (4) DGNB (2014). (5) Frandsen et al. (2009). (6) Bjørn & Holek (2014). (7) Defined by author.



F 5.2 The social sustainability criteria cover several scales across apartment, building and district. Format based on Strømann-Andersen (2012) and Nielsen (2012).

School of Architecture[1]. Their comments as a result of the discussions, can be observed in the form of a revision paper with hand-written notes in Appendix A, page 138. The chosen indicators in Table T 5.2 thus delimit the *general* scope of the model, which can then be adapted to specific projects through judicious selection and weighting of key indicators. This process, along with the deliberations and discussions that it is supposed to generate, is intended to parallel the S-LCA stages of goal and scope definition and inventory analysis, although in a highly simplified and streamlined form more suitable for a design process.

The scales on which the model can operate are implicitly contained within the indicator set. Some indicators, such as *connection to city*, clearly operate on a neighbourhood/district scale, while others, such as *human scale*, may be interesting to examine across several scales. Figure F 5.2 explicates this by positioning the social sustainability criteria within a context of scale. The criteria are placed according to the scales they most directly reflect, although some criteria might have a more complex application (e.g. safety/security, which can also have implications for the individual apartments and the way they overlook public spaces). Even though this is an imprecise way of representing the scale of operation for the individual criteria, it is useful in providing an overview of the proposed model as a whole. As such, there is a clear tendency within the criteria to focus on the urban scale and its interfaces with the other two scales, whereas criteria exclusively engaged with the building and apartment level are lacking. Although this might be seen as a disadvantage or deficiency within the proposed model, it is often in the interfaces between apartment, building and neighbourhood that social sustainability can be most successfully supported,

1 The same students with whom the case study in Chapter 6 was conducted.

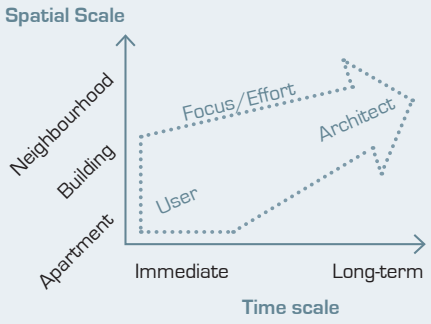
Themes	Example indicators	Scale		
		Apartment	Building	Neighbourhood
Equity / Quality of Life	Daylight (internal)	X	X	
Connection / Accessibility	Connection to city			X
Pride and sense of place	Name of streets			X
Social cohesion	Local societies/ communities		X	X
Democracy	Inclusion	X	X	X

T 5.3 Matrix tool for cross-referencing scales. Chosen examples illustrate how each category can be considered on several different scales.

an observation backed by the findings of Bjørn & Holek (2014) described on page 40, which have inspired this model to include such indicators as *differentiation of private and public* and *definition of uses* (relating to the programming of spaces). Their findings also favoured interventions on the urban scale, especially those which improved the structural logic, as they seemed to yield the most tangible results.

In order to work with scales in a design process, a table such as the one proposed in **T 5.3** can prove useful as a tool to plan and manage the effort on several scales. Similar methods were used by the ReBo and RenoBuild methods in Chapter 3, i.e. the *strategy matrix* and the *social impact analysis matrix*, respectively. As it was then explained, experience from practice with the social impact analysis matrix has shown that analyses of scales above neighbourhood level are methodologically difficult to manage (Mjörnell, Malmgren, Elfborg *et al.* 2014). Drawing on their insight, this model expands the focus downwards instead, including an *apartment* scale and limiting itself to the building and neighbourhood scales (note that this does not mean an exclusion of considerations on district, city or region level per se, only that the scope of renovation projects lies mostly within the boundaries of these scales). The decision to adopt a more narrow focus might result from considerations of practicality, however reflections on the community dialogue process also support it. In that regard, in the interview on 11 May 2016, Åsa Bjerndell emphasised the importance of serving the immediate needs of the residents, instead of "adding qualities for *other* people [emphasis by author]":

> "You can have a long-term plan, but when you talk to people, it's the urgent — the right-now things — that are the things where you can have a dialogue or a discussion … Start making it work for the people already living there before you start adding new things."



F 5.3 Focusing on the immediate issues before the more general, long-term efforts can help improve commitment by the community to the inclusive design process. Space-time graph inspired by Spacescape & Evidens (2011).

Hence, even though Bjørn & Holek (2014) favour structural alterations on a larger scale, this might not always be the best *starting point*. Instead, an engagement with the issues that are immediately relevant to the users can help secure a sense of ownership and commitment to the participatory process.

In closing, there are solid arguments for working in both ends of the scale, and the scale levels emphasised in this model are chosen to reflect that within the defined scope. Further, the notion that specific space and time scales may relate to different phases of an inclusive design process is interesting for the operation of the model.

Description of indicators

While environmental sustainability operates with quantifiable indicators, social sustainability indicators can also be described using semi-quantitative and qualitative data (Benoît & Mazijn 2009). Indeed, many social impacts are best described through qualitative indicators, a viewpoint which is shared across the reviewed social sustainability conceptualisations; their different strategies of qualitative and quantitative analysis were briefly outlined on page 55. In short, quantitative indicators describe an issue through numbers; examples from the model include the rent level or the number of local shops or meeting places. Geographic information systems (GIS) have the capability to provide quantitative data on a wide variety of indicators. Qualitative indicators can describe an issue through words (accompanied by images, maps, etc.); public image indicators such as stigma, name of streets or the tone of reports in media might best be described this way. For many of the proposed indicators, it has not been specified whether they are quantitative or qualitative, e.g. the variation in apartment sizes might be described by an analysis of the layout or by looking at area tables. The qualitative indicators can be translated into semi-quantitative indicators by categorising the results into a scale or scoring system. This way it is possible to aggregate results across both quantitative and qualitative indicators.

For the model proposed in this report, the description of indicators has a dual purpose in supporting the design process:

1. *Design process information:* Direct use of individual results and visualisations to support the design process. The selection of indicators and analyses performed to assess each indicator can be used directly to guide the design towards a higher level of social sustainability.
2. *Decision making support:* Aggregation of indicator scores to decide between design alternatives and to support the final design.

As an example, analyses and visualisation of daylight access have proven useful in guiding an integrated design team towards more optimal solutions (Nielsen 2012). At the same time its quantification within the criteria of comfort can help assess designs against each other.

DESIGN PROCESS OPERATION

The list of indicators in Table T 5.2 is too extensive for every design process to optimise them all. Oppositely, it might not be comprehensive enough to include all aspects of social sustainability relevant to any particular design process. Instead, the list is intended to serve as a point of departure, from which a given design process is able to define its own focus through a structured process of selection and weighting of indicators.

Selection of indicators

A key aspect of the proposed model is its insistence on adapting to local context when working with social sustainability in the design process. This is a result of a perceived consensus among the interviewed professionals that a site-specific approach is necessary. It can also be perceived as a counter response to the ubiquitous modernist social housing typology, which applied one more or less de-contextualised solution.

In order for the project team to decide, which indicators are the most important and which need the most urgent attention, this project suggests the following methods, which are already part of many architects' working practices:

Research into the historical development of the area might yield invaluable information regarding the original plans and intentions of the project. This can help reveal hidden potential and/or barriers to social sustainability, which can be addressed in the choice of indicators.

Site visits can give a clear indication of current conditions that cannot be experienced by looking at maps or drawings. It allows the design team to get a 'feel' of the place, which can help identify potentials for improvement across a wide variety of criteria such as comfort, safety/security, connection, services, etc.

Stakeholder involvement has already been argued for in several contexts. According to Åsa Bjerndell, including the perspective of the residents can often provide unexpected and counter-intuitive input, which makes it valuable in the definition of focus and subsequent choice of indicators. For this reason, in discussions with community representatives, the social sustainability model should not act as a questionnaire determining the direction of the debate, but rather as a tool for the design team to refer to in order to keep a wide perspective.

The proper involvement of community representatives might then enable the design team to identify the low hanging fruit, i.e. the themes, criteria and indicators that need to be most urgently addressed. The practice of involving stakeholders in the process of selecting, weighting and evaluating criteria is supported by the S-LCA methodology: Benoît & Mazijn (2009) suggest a combination of top-down and bottom-up methods, defining broad social issues

and the indicators to assess them on one hand, while inquiring with stakeholders about relevant indicators on the other. They also acknowledges the fact that the process of defining focus and constructing/selecting indicators is in part subjective, as it inevitably includes value judgements and assumptions.

Inspired by the MCDM method proposed by Balcomb *et al.* (2002) in connection with the IDP framework by Löhnert *et al.* (2003), this report recommends that no more than 8 criteria are used, with the number of indicators not exceeding 30 to keep complexity at a reasonable level.

Characterisation of indicators

The characterisation process is intended to parallel the S-LCA stage of impact assessment. The lack of generally accepted impact- and sub-categories and characterisation models within the S-LCA methodology makes it up to this model to characterise the social sustainability indicators. As opposed to E-LCA, the characterisation in S-LCA can include both *weighting* and *scoring* of indicators (Benoît & Mazijn 2009).

Weighting

Like with the selection of indicators, the subsequent weighting of both criteria and indicators can advantageously be carried out in consultation with key stakeholders. Based on Balcomb *et al.* (2002), it is recommended to use a scale of 4-10 for weighting (indicators with a weight below 4 being deselected from the beginning).

Scoring

Similarly, a scale of 4-10 can be used to score indicators. This can help assess the 'meaning' of diverse types of data and transfer it to a common numerical scale (Benoît & Mazijn 2009). To do this, Balcomb *et al.* (2002) suggest developing 'measurement' scales for individual indicators, which can be compared to the same qualitative scale (see Figure **T 5.4** and **T 5.5**). As an example, a daylight factor of 5% in the centre of the room might be considered 'excellent', while 1% might be 'marginally acceptable'. Again, the development of measurement scales and final scoring of indicators might also be based on input from stakeholders.

T 5.4 Qualitative scale suggested by Balcomb et al. (2002)

Score	Judgement
10	Excellent
9	Good to excellent
8	Good
7	Fair to good
6	Fair
5	Acceptable to fair
4	Marginally acceptable

T 5.5 Example of measurement scale for interior daylight: Daylight factor in centre of room.

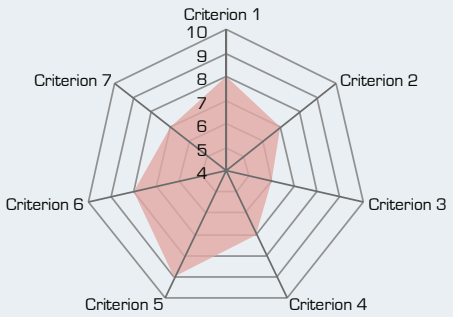
Score	Daylight factor
10	5%
9	4,3%
8	3,6%
7	3%
6	2,3%
5	1,6%
4	1%

Final score and visualisation

For the purpose of aggregating and visualising the weights and scores, a simple tool has been developed in Microsoft Excel, based on the MCDM methodology by Balcomb *et al.* (2002). The tool visualises the results using a radar diagram like the one in Figure **F 5.4** (see tool in Appendix B).

Design process integration

So far, this chapter has proposed a model and sketched out a methodology for dealing with aspects of social sustainability in a structured way, when work-



F 5.4 Radar diagram for visualisation of criteria scores.

ing with a transformation of social housing projects. Still, the connection to the IDP has not been directly described. The method for operation in an IDP, as proposed by this report, is outlined in Figure F 5.5. The method divides the effort into two stages:

Stage 1

The first stage takes place during the *basics* and *pre-design* phases of the IDP and is centred around the social sustainability model and its breakdown of themes into criteria and indicators. The intention is that this list of indicators is able to initiate, stimulate and support discussions among stakeholders as to the goal and scope of the social sustainability concern within the project. It also serves as a point of departure for the selection process, where indicators that are specifically relevant to the context of the project are selected, while others can be discarded. The relative importance of the chosen indicators is expressed through weighting and development of measurement scales. In stage 1 the base is built for the analyses in stage 2.

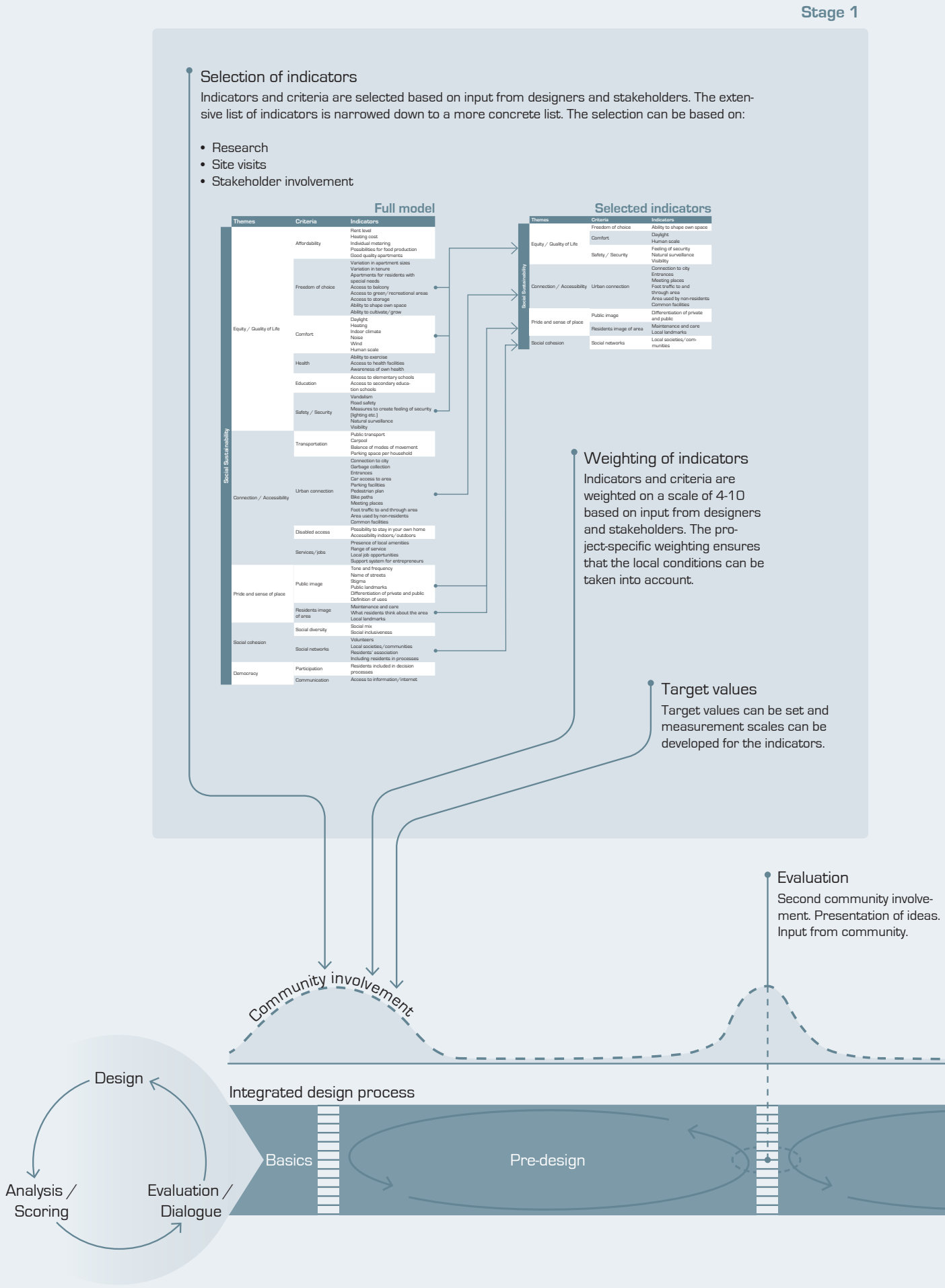
Stage 2

The second stage begins, to a certain degree, in the *pre-design* phase and continues through the *concept design* and *design development* phases. Here, focus moves from selection of indicators to their analysis and scoring. To assist in selecting analyses that cover as many of the relevant scales as possible, the proposed matrix tool can prove useful. In line with the IDP, designs are evaluated at the end of every design iteration, and the scoring is intended to assist in this process by providing a visual overview of the social sustainability of design alternatives. Of course, the scores can also be used inside the design iteration itself to guide the design towards the optimal solutions. Every design iteration thus alternates between three main activities: *Designing*, *analysing/scoring* and *evaluating* in dialogue with the community.

Design team

The IDP calls for a versatile, interdisciplinary design team, which can address a wide range of issues from the beginning of the design process. At the

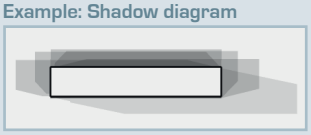
F 5.5 A method for operation: Recommended steps in the IDP when working with social sustainability.

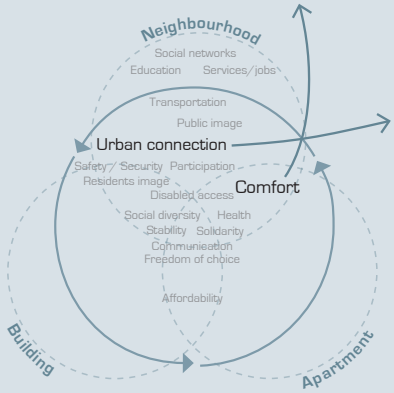


Analysis

Indicators are analysed across different scale levels. In the example below, a shadow diagram informs about the light levels (and this comfort) in the neighbourhood and apartments.

Example: Shadow diagram





Example: Sketching urban structure

Analysis of indicators can include (but is not limited to):

- Interviews
- Statistics
- Qualitative considerations/discussions
- Urban structure analysis
- Analysis of architectural quality
- Analyses of indoor and outdoor comfort
- Technical simulations/calculations (e.g. daylight analyses, thermal comfort)
- Connectivity analyses
- Use of GIS
- etc.

Cross-referencing with scales

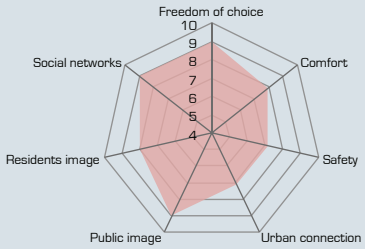
Themes	Scale		
	Apartment	Building	Neighbourhood
Equity / Quality of Life	X	X	
Connection / Accessibility			X
Pride and sense of place			X
Social cohesion		X	X
Democracy	X	X	X

Scoring of indicators

Based on the analyses and measurement scales, indicators are scored on a scale of 4-10 and alternatives are visualised.

Score	Judgement	Daylight factor
10	Excellent	5%
9	Good to excellent	4,3%
8	Good	3,6%
7	Fair to good	3%
6	Fair	2,3%
5	Acceptable to fair	1,8%
4	Marginally acceptable	1%

Main design criteria score

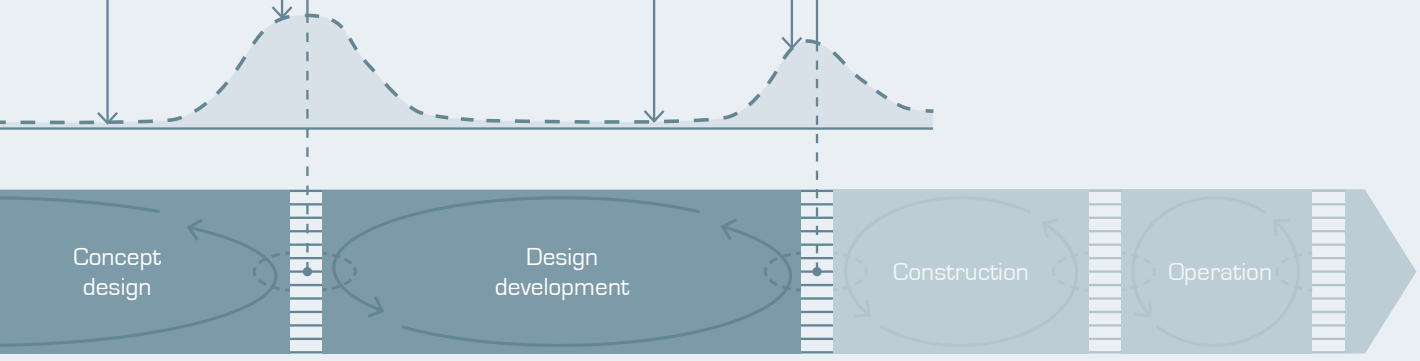


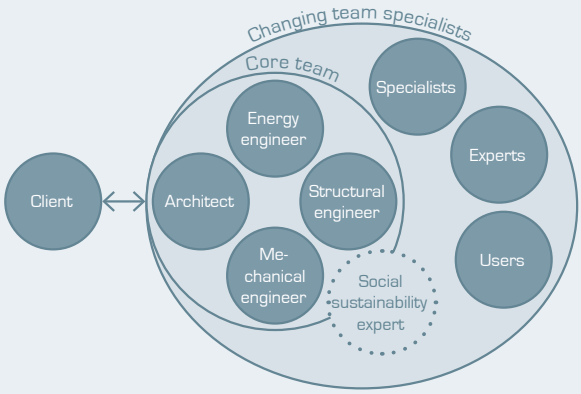
Evaluation

Third community involvement. Presentation of design proposals.

Evaluation

Fourth community involvement. Presentation of design proposals.





F 5.6 IDP design team with possible position of a social sustainability expert. After Löhnert et al. (2003).

core of the team we find structural, energy and mechanical engineers along with the architect (Löhnert *et al.* 2003). Any experts related to social sustainability could potentially be positioned inside the core team, although their position would more likely be as a team specialist to facilitate community involvement processes and to assist in the selection and evaluation of indicators. Especially in the early stages of the design processes, these experts would need to take on a more active role in guiding the goal and scope towards a harmonization of the interests of building owners and users.

ADDITIONAL CONSIDERATIONS

Striving for measurability

Given the qualitative nature of many of the themes related to social sustainability, it seems in order to question the ability of the engineer to contribute to the field in a meaningful way — after all, he is mainly concerned with the quantitative aspects of the built environment. Yet, as it has been shown, many of the indicators, that are considered qualitative might also advantageously be described in a quantitative manner. Hence, the role of the engineer in the operation of the proposed model is mostly focused towards increasing the measurability of the indicators. This can be done by developing new tools and performing technical analyses, which can be used to support the argument for social sustainability by describing it in more concrete terms — a primary purpose being the ability to identify effects across environmental and economic sustainability. Especially the latter — i.e. describing social sustainability in terms of economic consequences — is important for stakeholder communication (cf. the arguments on page 45), but all three aspects are important if the design team is to apply a holistic view of sustainability.

Inclusion of culture

As Chapter 3 has shown, there is no consensus in literature about the aspect of culture and how it is included. While some conceptualisations include social sustainability and cultural aspects side by side, others separate the concepts. Early versions of the proposed model included culture as a separate theme (see Appendix A), however after deliberations on the subject it was dropped. Instead, indicators relating to culture (such as local and public landmarks) are now included only by virtue of their capacity to increase the social sustainability of an area by adding to the public identity and sense of place. The rationale behind this is that culture is not *inherently* positive for social sustainability and that sometimes local community sentiments can have a more significant role, which should be the priority in terms of social sustainability. Still, culture can be evaluated separately, and tools to evaluate culture, such as the SAVE, can still be highly useful.

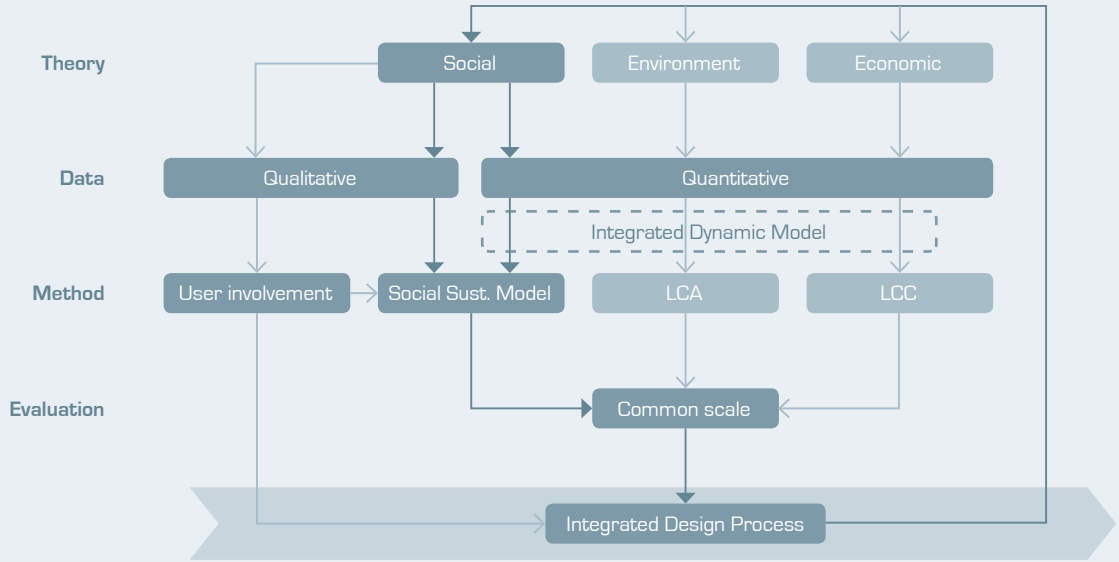
Model flexibility

The proposed model of social sustainability along with the related suggested methodology provides a general framework for the design process, which balances between broad over-simplification on one side and a narrow, excessive level of detail on the other. It is important to be able to see both the whole picture and the individual aspects without losing focus on either. Describing

the Telos method, Spangenberg (2002) calls this a "compromise between inappropriate harmonization on the one hand and unrelated reports from related areas on the other." In this regard, the three levels of abstraction (themes, criteria and indicators) can help designers move quickly back and forth between the specific and the general in the same way as was described in Figure F 4.3 on page 63.

Holistic sustainability perspectives

Although the model proposed in this chapter focuses on social sustainability, a holistic design process needs to also take environmental and economic sustainability into account. The aforementioned frameworks for their quantification are LCA and LCC, respectively, and together with the proposed model they are able to describe all three aspects of sustainability. The combination of these three types of tools was proposed by Mjörnell, Malmgren, Boss *et al.* (2014) in their RenoBulid method. By using the MCDM-approach outlined in this chapter, aggregating scores to a single number within each category, design proposals can then be compared based on their overall sustainability performance. This could be utilised in an iterative design loop such as the one outlined in Figure F 5.7, although it should be noted that this report focuses specifically on the social aspect.



F 5.7 Prooposed methodological overview of an iterative design loop for an integrated design process (including potential position of an integrated dynamic model). The integrated design process is informed through both qualitative and quantitative data using the developed model for social sustainability. Focus in this report is on the highlighted path.

IN CONCLUSION

This chapter utilises the knowledge that has been gained through the preceding three chapters and addresses the research question by proposing an operationalization of social sustainability aimed at supporting the design process. It proposes a compilation of themes to cover the key topics of social sustainability. The themes, each with a set of associated criteria, are further specified into a list of indicators, and all together they constitute a model of social sustainability for use in the transformation of Nordic post-war social housing. Through a process inspired by the S-LCA framework, a methodology for the operation of the model is also introduced:

By thoroughly selecting relevant indicators based on context-specific observations, the project scope can be focused towards the most relevant issues, and based on a conversion and comparison of indicator analysis results (both qualitative and quantitative), the ensuing design process can then be supported based on the social sustainability performance of design proposals.

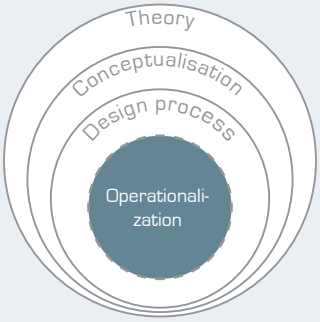
The proposed social sustainability model and method of operation are intended for use in an integrative design process, which means that collaboration with the community should be an essential part of the design process.

CASE STUDY: FYRKLÖVERN

6

The last chapter responded to the research question by proposing an operationalization of social sustainability. In this chapter, an attempt is made to test this proposal in an actual design process, to see whether it can be integrated into the decision-making and design-support processes to produce a more socially sustainable outcome. This is done through a case study of a relevant design project at the Royal Danish Academy of Fine Arts School of Architecture, Design and Conservation (KADK).

This choice of project has resulted from a seeming lack of available projects in architectural studios that deal specifically with social sustainability as a main priority, combined with the fact that student projects have more freedom to test new ways of designing without being restricted by business commitments. This made the project well suited for a first case study.



F 6.1 Position of the chapter within the research structure.

CASE STUDY PROPOSITION AND APPROACH

The case study is based on the author's participation in a postgraduate-level design project at KADK from 11 February to 22 June 2016, dealing with the transformation of the area known as Fyrklövern in Upplands Väsby north of Stockholm. The project participants wanted a strong focus on social sustainability from the start, which made the project ideal as a case study for the implementation of the proposed model.

The case study is thus based on the main research question (page 25), adding the central *proposition* that *the model proposed in Chapter 5 will be able to provide the necessary design support*.

Case study method

The method used in this report is largely based on the case study research perspectives presented by Yin (2003). Although the methods and practices he presents originate from a social science tradition, they are intended to be used in a much broader range of research fields. Furthermore, Yin recommends the case study strategy in situations where the research is based on a *how* or *why* question, and it can thus be considered suitable for this particular application. Within his case study research methodology, Yin touches upon a range of key aspects, the most relevant of which will be explicated here:

Firstly, it is important to note, that the focus of the case study is the design process and not just the specific design issues that it tries to solve. The *unit of analysis* is thus the process itself, including all that pertains to it: The participants, activities, results, etc.

Secondly, the fact that the case study was conducted by a participating agent (the author) means that sources of evidence include both *documentation* produced in the design process (i.e. written documents, drawings, images, models, etc.) and observations made by the author — what Yin denotes *participant-observation*. The latter assumes that the investigator takes on an active role within a case study situation, an approach most frequently used in anthropological studies but which is also used for the study of organizations or small groups (Yin 2003).

Thirdly, the single-case study setup might be regarded as questionable in terms of external validity (i.e. the ability to generalise). In response, it can be argued that the first-time use of a new design support methodology in practice has a certain revelatory quality, meaning that it has made it possible to observe things not previously available. This makes the study more about identifying new potentials and weaknesses and less about replicating or corroborating any existing results.

Collaboration

Through the Nordic Built STED project, certain actors have been particularly helpful in carrying out the case study.

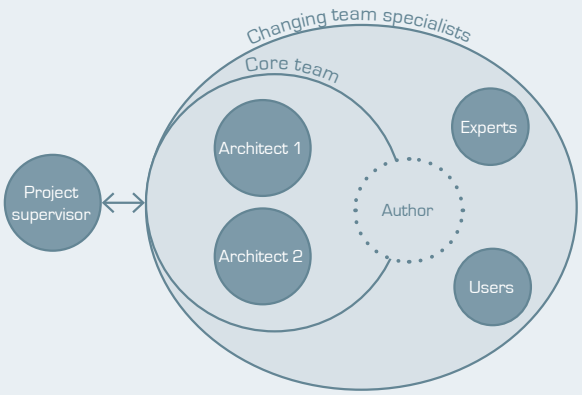
KADK

Contact between the author and KADK was facilitated through the STED network in an organised meeting between students from DTU and KADK. During this meeting common interests were identified, and KADK students Amanda Dahl and Märta Helander were kind enough to allow me to participate in their design project. It is this collaboration that has constituted the case study.

Furthermore, KADK has provided the opportunity to participate in lectures and workshops dealing with architectural and cultural valuation, which have proven to be useful tools in relation to the evaluation of social sustainability in the case study.

White Architects

In connection with a visit to the site in Upplands Väsby, architect Elise Grosse of White's Stockholm office invited us to share perspectives on social sustainability and solutions for the area in question. Grosse has also provided material, input and feedback in different contexts throughout the study.



F 6.2 Project design team setup

INTRODUCTION TO CASE STUDY: FYRKLÖVERN

In the decades following the Second World War, Sweden suffered from a growing housing shortage. Having completed the transformation into a highly industrialised society, the years of prosperity after 1945 combined with increasing urbanisation also meant that Sweden experienced a rapid change in the need for housing, which could not be accommodated within the old housing stock. Instead, drastic measures had to be taken to ensure the availability of good quality homes for the new welfare state.

The Million Programme

The Swedish parliament's response to the housing shortage became an ambitious plan to build one million new dwellings in ten years, between 1965 and 1974. The Million Programme, as the public housing policy came to be known, was part of a more general tendency for large investments prevalent in the 1960s and early 1970s, a period known as the 'record years' (which Hall & Vidén (2005) confine more specifically to 1961–75).

The rapid development of the new housing areas and their often peripheral locations went hand in hand with the advancing modernistic ideal and industrial approach. Prefabrication, standardisation and mass production increased construction efficiency but also left their clear marks on the architecture; many buildings were spaced equally to make efficient use of the crane tracks, and the prefabricated concrete dominated the façades and made for a drab impression. Critical voices soon began to question the new typology, drawing attention to its many shortcomings, such as the monotonous visual expression, desolate external environment and lack of local services, which allegedly lead to alienation and isolation (Hall & Vidén 2005). In addition, the fast pace and scale of construction meant that little effort went into adapting the buildings to the specific site.

Especially the outdoor environment was given low priority in the planning of the new housing areas. The extensive alterations to the landscape often ruined the conditions for plant life, and poor vegetation and planning of the footpaths and playgrounds between the buildings along with the placement of vast parking lots to separate the area from the rest of the city made the outdoor environment unattractive to residents and unreachable to outsiders (*ibid.*).

Despite these shortcomings, only a minority of the buildings from the Million Programme have been demolished; instead, routine maintenance and smaller, aesthetic facade changes have been prevalent (*ibid.*). Yet in a 1985 study of the qualities, flaws and potentials for renovation of pre-1975 apartments buildings in Sweden, Vidén *et al.* (1985) focus on continuous care for

the common indoor and outdoor environments and comment that "efforts in terms of renovations and additions and new soil treatment and vegetation can often be necessary to make the environment more attractive" (trans. by author). Today, an increasing focus on sustainability has led to increased appreciation of the inherent potentials of the Million Program housing areas as well as the people who live there:

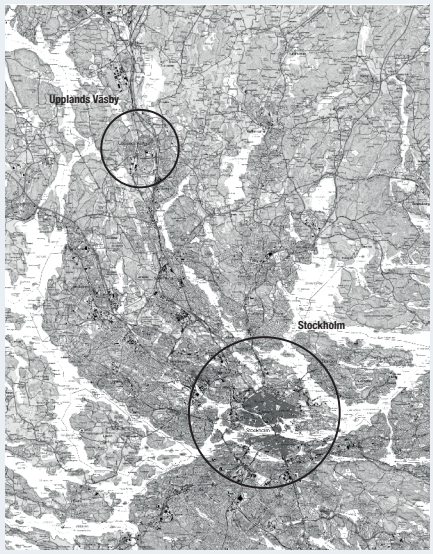
> "A growing awareness of the qualities to be found is encouraging more careful additions and alterations to develop the areas in a more sustainable direction, physically and socially… [and] the importance of taking the residents into account, in planning as well as in the management and development of existing housing, has been realized…" (Hall & Vidén 2005).

Drawing material
1:300 drawings of blue houses available in Appendix D, page 144

Fyrklövern

In her report on the cultural environment in the neighbourhood Fyrklövern in Upplands Väsby, Sundström (2010) outlines the history of the new city centre, built as a part of the Million Programme in its later years:

The new Väsby centre was inaugurated in 1972, designed and built in line with the modernistic planning ideas. As such, it was not just intended to be a commercial centre for trade, but also a central location for other kinds of services such as schools, libraries and dwellings. Residential buildings were subsequently built close to the shopping mall in order to gain a customer base for the commerce and to create a basis for social life in the centre. The buildings were then planned to give as many residents as possible close access to the shopping mall. Consequently, the commercial centre and the proximity of the residential buildings led to close development of the area, and it came to be characterized by the Million Programme's large scale, rectangular areas of identical houses, car-free courtyards and large parking lots. The high-rise buildings are characteristic for the early 1970s with bright colouring and blue sheet-metal façades (instead of concrete), yet despite efforts to improve the quality of the outdoor environment through added equipment and vegetation, the area still appears bleak and uncared for.



F 6.3 Upplands Väsby in relation to Stockholm. Image courtesy of the design team.

F 6.4 The Fyrklövern area seen from above. Image from Google.dk.

F 6.5 Comparison of Upplands Väsby before and after the construction of the new city centre. The case study project focuses on the four highlighted buildings. Maps from Eniro.se.

Väsby centre
(shopping mall)

Temporary area

Parking

Playground

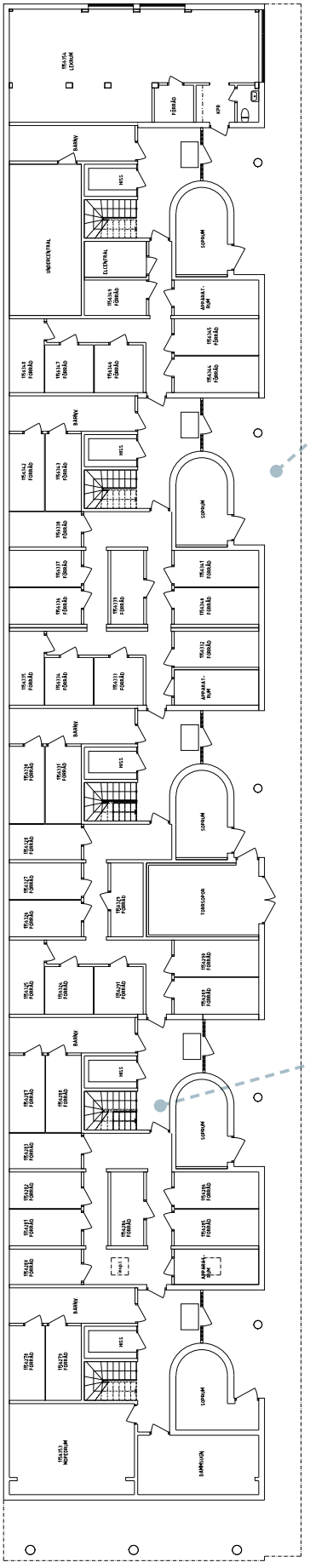
Football
field

Laundry

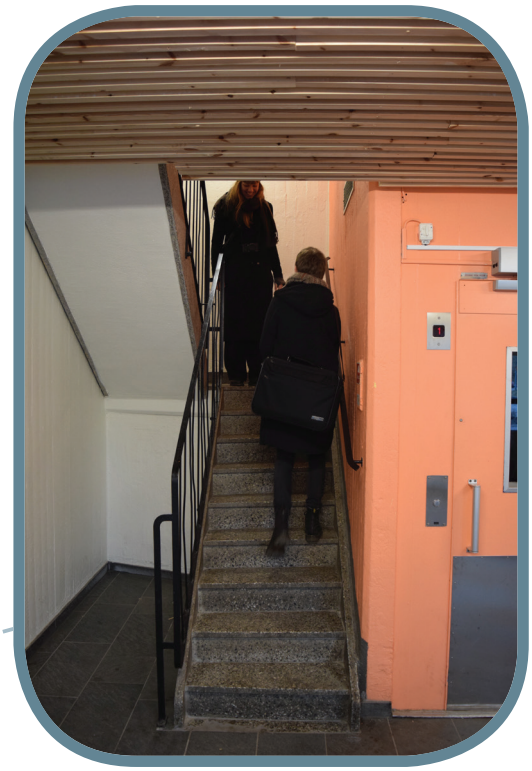
Parking

1:300

First floor



Ground floor



F 6.6 Visiting Fyrklövern. Photographs by the author.
Opposite page: The "Blue Houses" within Fyrklövern. The four southernmost buildings were the focus of the project. Map by Google Maps.
This page: Existing plans in scale 1:300 of ground floor and first floor of one of the high-rise buildings. Variations in apartment sizes occur between buildings.

Dirt in lamp

Rebar protruding

Facade sheet metal bent

Tilework damaged

F 6.7 The buildings suffered from a general lack of routine maintenance. Images by author.

The eight high-rise buildings that dominate the visual impression of Fyrklövern were constructed with seven floors with a basement and penthouse. The buildings are all parallel and the courtyards in between are equipped with playgrounds, vegetation and large trees. Each house has five south-facing entrances and contains around 500 apartments ranging from one to five rooms and kitchen, although the majority has three rooms. The buildings with rented apartments can accommodate a range of different needs, including assisted living, nursing homes and retirement homes.

Design project focus

For the sake of the design project, the architecture students chose to delimit their focus to the four southernmost high-rise buildings and the area around them. Although their initial intention was to work mainly with the outdoor spaces between the buildings and possibly the ground floors, this was later changed to a focus on…

… the *space between the buildings*,
… the *ground floor* and
… the *facade*.

This can be regarded as an acceptable focus in terms of social sustainability, as it addresses the main scales of *neighbourhood*, *building* and *apartment*.

Site visit

In order for the design team members to form an impression of the area and possibly identify its challenges and potentials, a study trip to Stockholm was arranged from 9–12 March 2016. During that period, we were able to visit the area of Fyrklövern on two separate occasions, in the morning/at noon and in the afternoon/evening. The main activities conducted during these visits were inspection and sketching of the buildings and outdoor spaces and observation of the residents including their walking paths and use of the space.

Condition

Overall, the buildings seemed to be in good condition considering the amount of time they have endured without a refurbishment. Except from the majority of the balconies, which have been progressively glazed beginning in the early 1990s, the houses stand mostly unchanged (Sundström 2010). Still, a lack of routine maintenance, both in the facade and in the outdoor environment, characterises the general impression. Most notably, many of the blue metal sheets and yellow tiles in the façades have been damaged and left without repair, even though their design allows for easy replacement. The high amount of damages related to vandalism also seem to indicate a missing sense of ownership or belonging, at least among some residents.

Walking paths

By far the most dominant walking path was the north-south oriented pathway leading from the southern entrance of the Väsby centre shopping mall, along the eastern gables of the blue high-rise buildings to Fyrklövern's southern entrance tunnel. This single pathway facilitated the flow of people walking between the high-rise buildings and the Väsby centre. As a result, the easiest way of entering the area seemed to be through the Väsby centre itself.

Amenities

In continuation, the only shop apart from the Väsby centre was a small newsagent in one of the gables. All other amenities were concentrated in the Väsby centre. This stood in sharp contrast to the old city centre by the railway station, where all the buildings had services and amenities in the ground floors.

Residents

Interaction with interested residents was occasional and limited to short conversations, during which a sceptical attitude towards 'architects' in general became apparent. Although it points to a lack of awareness about the issues that are present, to a certain degree this seeming resistance to external influences also indicates a sense of identity within the community. Although an interview with a resident had been planned beforehand, a last-minute cancellation prevented any further in-depth interaction as well as access to apartments.

Proposal by White

During the visit to Stockholm, a day was spent at the office of White architects discussing issues related to social sustainability and the Million Programme. A proposal by White for the Fyrklövern area, *Väsbys vertikala trädgårdar* [The vertical gardens of Väsby], was also presented by architect Sofie Weidemann for inspiration on how to address the issues.

Learnings

Although the Väsby centre stands as the commercial centre of the Million Programme areas of Upplands Väsby, including Fyrklövern, the old city centre by the railway station still *feels* more like the city centre. This can be ascribed to a number of issues in the Fyrklövern area relating to, e.g., physical isolation, lack of identity-strengthening features, poor outdoor environments, etc.

These impressions, challenges and potentials identified during the study trip were discussed within the design team, and they have formed the basis for the definition of scope in the next section.

DEFINING SCOPE

Based on the study trip, the visit to White's office and on researched literature, drawings and other material made available by White, a range of concrete issues were identified. Using the proposed model of social sustainability, these issues could then be explicated into more concrete indicators.

Selection of prioritised indicators

A prioritised set of indicators (Table T 6.1) was chosen from the general model to cover the main issues of Fyrklövern. These indicators defined the focus of the project in terms of social sustainability. The *meaning* and *motivation* for each indicator were discussed with the author within the design team and are explained below (for the original indicator sources, see page 73):

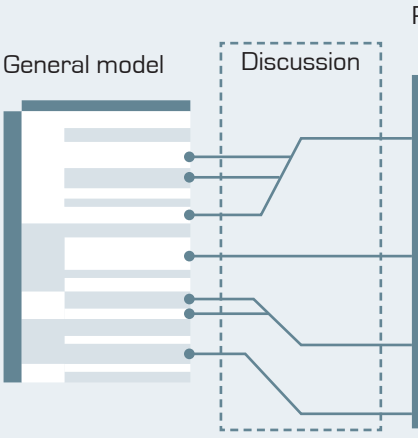
Ability to shape own space relates to the freedom of the residents to influence their surroundings and thus to create their own space that reflects their identity, both inside and outside. This was considered as a big potential for improvement, especially in the existing outdoor environment, which did not allow for much interaction.

Daylight here refers to the access to daylight in the apartments. As the large balconies cause the rooms behind to be withdrawn from the facade, the daylight level also has potential for improvement.

Human scale has not been included in the original planning, and the area suffers from too large-scale outdoor spaces and buildings with monotonous façades.

Feeling of security is here mostly related to the proper lighting of paths in the area, which were found to be too dark in the evening, creating a feeling of insecurity.

T 6.1 Moving from a general model to a project-specific breakdown of prioritised indicators.



Prioritised model

Social Sustainability

Themes	Criteria	Indicators
Equity / Quality of Life	Freedom of choice	Ability to shape own space
	Comfort	Daylight Human scale
	Safety / Security	Feeling of security Natural surveillance Visibility
Connection / Accessibility	Urban connection	Connection to city Entrances Meeting places Foot traffic to and through area Area used by non-residents Common facilities
Pride and sense of place	Public image	Differentiation of private and public
	Residents image of area	Maintenance and care Local landmarks
Social cohesion	Social networks	Local societies/communities

Natural surveillance refers to the feeling that there are 'eyes on the street', which can be a deterrent to crime (Bjørn & Holek 2014). This was regarded as a main problem in the area, as there were too many places, corners and recesses that were out of view of the façades, including the entrances and some of the common areas. The balconies did not help in this regard, as they limited the view to the outside courtyard from the living rooms and kitchens.

Visibility refers to the layout of the outdoor spaces in a way that gives the users an overview of their surroundings, without major obstructions to the field of view. Although the area was planned out with long, straight lines of sight, the retracted entrances, many sharp corners and level differences still make this an area of potential improvement.

Connection to city consists of roads, pedestrian and bicycle paths. This indicator takes a more general view of these, looking at the overall connectivity of the area to the surrounding city. Fyrklövern follows the layout of earlier Million Programme projects, and thus suffers from a general lack of roads and paths that connect the area to the outside. Instead, major roads block off the area on two sides, with only a few paths leading out through tunnels.

Entrances have a major effect on many of the other indicators. Good quality entrances can thus add to a sense of safety and identity as well as function as nodes for interaction between residents. The current entrances do not utilize this potential.

Meeting places are the public places where people can casually meet and interact. The current area does not offer a sufficient number or variety, and most public amenities are concentrated in the shopping centre.

Foot traffic to and through area is important in order to help create a feeling of life and of being an integrated part of the city. Partially in consequence of the issues stated above, foot traffic is today limited to the main walkway, and the area offers neither occasion nor opportunity for casual visits.

Area used by non-residents relates to the area being used not only by the people who live there. It is closely related to the above indicator, and has to do with the area's ability to attract external crowds. As of now, there are no big attractors.

Common facilities are the private spaces, where residents can meet for casual, spontaneous or regular activities. This includes access to function rooms or rooms for multiple uses that are available to all residents. The penthouses were initially intended as common rooms, but have since been converted. Now, the area is in need of these kinds of spaces.

Differentiation of private and public is important if residents are to gain a sense of ownership of both the indoor and outdoor spaces. Currently,

T 6.2 Distribution of focus for each indicator within different scales. The predominant focus is on the neighbourhood scale and its connections to building scale, but apartments are also affected in a few cases.

Indicators	Scale		
	Apartment	Building	Neighbourhood
Ability to shape own space	X	X	X
Daylight (internal)	X	X	
Human scale		X	X
Feeling of security		X	X
Natural surveillance		X	X
Visibility			X
Connection to city			X
Entrances		X	
Meeting places			X
Foot traffic to and through area			X
Area used by non-residents			X
Common facilities		X	X
Differentiation of private and public		X	X
Maintenance and care		X	X
Local landmarks			X
Local societies/communities		X	X

the courtyards and common areas are not really utilised by anyone, because they are not private nor completely public.

Maintenance and care is a given. As observed during the site visit, the area is suffering in this area.

Local landmarks can include pieces of public art, a certain tree, a playground or other things that have become characteristic of a specific place. These can be effective in creating an identity for a place. Contrarily, excessive standardisation of the outdoor environment can have the opposite effect, which is mostly the case around the blue houses in Fyrklövern.

Local societies/communities can certainly exist despite shortcomings in the physical environment, however the range of activities and types of societies that can be accommodated can be expanded if considered in the design. This is closely connected to the private common facilities, but also includes access to facilities in the outdoor environment.

These indicators were identified as being the most critical, and thus the ones that should be focused on, although other indicators could certainly have been included. Many of these chosen indicators deal with some of the same elements within the built environment (such as the entrances, façades, footpaths, etc.). This is unavoidable, and it gives an initial idea of the type of changes that need to be made to the design; in other words it shows a *pattern*.

Scale

As mentioned earlier, the project focused on the space between the buildings, the ground floors and the façades. Based on the careful examination by Sundström (2010), the apartments were generally regarded as being of a reasonable size distribution and good condition, so emphasis was not placed di-

Criteria	Weight	Indicator	Weight
Freedom of choice	10	Ability to shape own space	10
Comfort	9	Daylight Human scale	8 10
Safety	10	Feeling of security Natural surveillance Visibility	10 7 8
Urban connection	9	Connection to city Entrances Meeting places Foot traffic to and through area Area used by non-residents Common facilities	8 9 9 7 6 10
Public image	9	Differentiation of private and public	9
Residents image of area	8	Maintenance and care Local landmarks	8 8
Social networks	10	Local societies/communities	10

T 6.3 Weighting of individual indicators and criteria.

rectly on the apartment scale, save changes caused by alterations in the facade. The choice of focus is also supported by Table **T 6.2**, which shows a clear emphasis on the building and neighbourhood scales.

Weighting

Due to limited time and outreach potential of the design team, the possibility to include users in the weighting of criteria and indicators was not present. Instead, the weighting (Table **T 6.3**) is a result of a discussion between the design team and the author following the selection of indicators. This element adds an extra layer of nuance to the indicators, defining which are the most important, however most indicators were considered to be of high importance and thus score around 8-10.

Developing measuring scales

In accordance with the method described in the last chapter, measurement scales were developed for each indicator, relating their qualitative and quantitative results to a common, qualitative scale ranging from 4-10 (see Appendix C page 142). The scales were developed based on what was considered to be the best and worst possible outcomes for each indicator as well as the criteria to determine that outcome, and revisions were made when necessary.