Nordisk Arkitekturforskning
The Nordic Association of Architectural Research

Proceedings Series 2021-1

APPROACHES AND METHODS

IN ARCHITECTURAL RESEARCH

Editors: Anne Elisabeth Toft, Magnus Rönn and Morgan Andersson

NAF/
NAAR

Nordisk Arkitekturforskning
The Nordic Association of Architectural Research

Proceedings Series 2021-1

APPROACHES AND METHODS
IN ARCHITECTURAL RESEARCH

APPROACHES AND METHODS IN ARCHITECTURAL RESEARCH
Proceeding Series 2021-1

PUBLISHER
Nordic Academic Press of Architectural Research
http://arkitekturforskning.net/na/issue/publishing

EDITORS
Anne Elisabeth Toft, Magnus Rönn and Morgan Andersson

GRAPHIC DESIGN
Jonas Vetlesen

COPY-EDITING
Dawn Michelle d'Atri, Rabea Berghäuser and Amy Springer

PRINTING
07 Media

ISBN 978-91-983797-5-4

FINANCIAL SUPPORT
ARQ and Chalmers University of Technology, Building Design

NAF/
NAAR

CHALMERS

CONTENT

FOREWORD

Anne Elisabeth Toft and Magnus Rönn

The Nordic Association of Architectural Research (NAF/NAAR) is an independent and not-for-profit association of architectural researchers from universities and schools of architecture in the Nordic countries.

The present book, published by NAF/NAAR, is the proceedings publication from the association's 2019 symposium which was titled *Approaches and Methods in Architectural Research.*

The symposium was organized by NAF/NAAR in collaboration with researchers from the Department of Architecture and Civil Engineering at Chalmers University of Technology in Sweden, which also hosted the event on 13–14 June 2019.

The Department of Architecture and Civil Engineering at Chalmers University enthusiastically engages in research that queries architecture as a so-called 'making discipline' and 'material practice'. It has developed a keen interest in and knowledge about architectural research that specifically applies design- and practice-based methods such as projective research, often combined in transdisciplinary modes with methods adapted from scientific disciplines, the social sciences, the humanities, and the fine arts.

Focusing its discussions on a research interest shared by NAF/NAAR and its Swedish peers, the 2019 NAF/NAAR symposium pursued the current development of approaches and methods in architectural research.

During the symposium, twenty-four international researchers presented papers. All eleven articles in this publication—except those by the invited keynote speakers Isabelle Doucet, Professor of Theory and History of Architecture at Chalmers University of Technology, and Karl Kropf, Senior Lecturer in Urban Design and Historic Conservation at Oxford Brookes University and Director of Built Form Resource, an urban design, landscape,

and heritage consultancy—were submitted to a double-blind peer-review process, based on a peer-review template developed by NAF/NAAR.

As President and Vice-President of NAF/NAAR, we extend our sincere thanks to our collaborators at Chalmers University of Technology: Marie Strid, Julia Fredriksson, Morgan Andersson, and Fredrik Nilsson, who were instrumental in conceptualizing the theme of the symposium and organizing the event. We would also like to express our gratitude to the invited keynote speakers Isabelle Doucet and Karl Kropf, to all of the individual authors who submitted articles to the publication, and to the many peer reviewers who have supported NAF/NAAR and its work by offering their time and professional expertise for reviewing the articles in this publication.

Finally, we would like to direct our thanks to our financial benefactors. The publication of the present book was made possible thanks to the generous support of Chalmers University of Technology and the foundation ARQ.

Anne Elisabeth Toft
President of NAF/NAAR

Magnus Rönn
Vice-President of NAF/NAAR

INTRODUCTION

Anne Elisabeth Toft, Magnus Rönn, and Morgan Andersson

This proceedings publication explores approaches and methods in architectural research. The architectural professions are currently undergoing profound changes in terms of education, design work, and research. This calls for specifically articulated research competence, methods, and processes. It also necessitates a re-examination of the notion of architectural research, how it is interpreted in different research contexts, and which role it plays in architecture. Changes in design-, practice-, and arts-based approaches have resulted in new disciplines and new academic research, such as, for example, research by design, curriculum research, and practice-based research. Novel concepts such as transdisciplinary and post-normal science are also embraced by the research communities at universities and schools of architecture, and among architecture professionals an increasing interest in research and knowledge production has resulted in fruitful collaborations between the contexts of practice and academia. Seeking to understand the driving forces behind the evolution of architecture as a professional discipline, an academic subject for teaching, and a distinct field of research, Chalmers University of Technology and the Nordic Association of Architectural Research (NAF/NAAR) joined forces in organizing the 2019 NAF/NAAR Symposium: *Approaches and Methods in Architectural Research*.

Arguing that there is a significant need for up-to-date architectural knowledge in the current transformation of built environments all around the world, the symposium particularly focused on the different procedures by which architectural knowledge is systematically initiated, tested, and discursively formulated in diverse research contexts. Against this background, it also sought to explore how teaching and research can inform each other.

The symposium posed the questions: How can we produce relevant knowledge that helps us to understand the complexities in contemporary architecture, landscape architecture, and urban planning? In what way can we strengthen

the relations between research and practice? How can we understand the connection between methods and the articulation of architectural knowledge?

The Nordic countries have a long tradition of architectural research and formalized doctoral education.[1] The Scandinavian model, with its strong environments for innovation, societal impact, and citizen participation, is currently gaining more and more interest internationally.[2] It is a model that NAF/NAAR thinks should be further investigated and reflected upon, thus it and its methods and approaches in architectural research, education, and practice were central to the discussions at the symposium in Gothenburg.

Against this background, NAF/NAAR and the Department of Architecture and Civil Engineering at Chalmers University invited both academic scholars and professional practitioners to participate in the symposium. Providing a qualified platform to address the future challenges of the architectural profession, the discussions at the symposium outlined how architectural means and tools can be used as instigators and models for knowledge production and dissemination. They also framed how academia and practice can interact in architectural research, showing how differences and similarities between research projects conducted at universities, art academies, and architectural offices play out.

This publication compiles eleven articles and essays based on presentations given at the symposium. The written contributions are loosely gathered and grouped within given categories, which also structured the symposium sessions and the related discussions: 'Material, Building Design, and Programming'; 'Urban, Rural, and Regional Landscapes'; 'Renegotiating Architectural Practice and Profession'; and 'Heritage, Conservation, and History'.

Beginning with the articles written by the symposium's keynote speakers—Isabelle Doucet, professor of the theory and history of architecture at Chalmers University of Technology, and Karl Kropf, senior lecturer in urban design and historic conservation at Oxford Brookes University—the publication unfolds its theme in diverse ways that reflect its complexity. It broadly maps and presents a number of different discursive positions and research foci, spanning from thoughts on architectural writing as a form of scholarship in its own right to descriptions of architectural practices and the use of quantitative and qualitative methods in architectural heritage management.

In her article 'Tales of Cities as (Resistant) Practices', the architectural theoretician Isabelle Doucet reflects on how to write about architecture and urbanism. In doing so, she asks herself what holds relevance, and if she can write about it in ways that respect the situated nature of spaces and buildings. In her writings, she aims to bridge the gap between architectural theory and practice by using so-called situated and relational approaches. Confessing that writing 'situated stories' is indeed challenging, Doucet believes that such writing and its performance can expand the discourse of architecture and lead to a new critical engagement with architecture and the city.

The contribution by Karl Kropf is called 'Multiple Depth Analysis and the Urban Design Consequences of Semi-Public Realms'. In his article, he elucidates semi-public realms—that is, shared circulation spaces—in the built environment and visualizes the concept using models in order to gain a better understanding of how these spaces operate. This approach to investigating semi-public realms is based on a combination of four key conceptions of so-called morphological depth: a) configurational depth, measured as steps between two spaces; b) territorial depth, measured as a sequence of public-private spaces; c) structural depth, measured as the complexity of built form; and d) legal regimes, measured as the relationship between occupation and controlling agents. The first three understandings of morphological depth are related to architecture and urban design as built form. Legal regimes, on the other hand, are associated with power, surveillance, and regulations through private or public entities. In the article, the four conceptions are mapped by Kropf and presented in diagrams of generic structures of building forms. The objective is to translate research findings into design practices supporting the benefits of semi-public realms and to minimize misuse. Kropf's interest lies in developing a better understanding and sharpening the analysis and critique of semi-public spaces and in improving their design.

Material, building design, and programming

This first section of the book includes two articles. They deal with multidisciplinary research and practice and the methods and means for mapping, orchestrating, analysing, and communicating complex design issues within architectural structures.

Kiran Maini Gerhardsson opens the discussion in this section with a contribution called 'Benefits and Challenges of Adding Participant Photography to Qualitative Residential Research'. Addressing methods and approaches in

architectural research, her article reflects on the benefits and challenges of adding participant-produced photographs to qualitative interviewing. Based on two qualitative studies carried out in Lund and Malmö, Sweden, focusing on how residents use their electric luminaires and on the daylight coming through window openings in their home environments, the author pursues a discussion of the methods used in both studies. Her article supports findings in recent literature on qualitative research, namely that adding participant-produced photographs to qualitative interviews has multiple benefits in terms of knowledge production, from the perspective of both the researchers and the participants. Gerhardsson argues that the identified benefits, in terms of data quality, outweigh the disadvantages, such as the longer time needed for data collection, although some reflecting comments in her article also point out a number of issues that need to be addressed. One such issue is the necessity of identifying the relationship between a researcher-driven approach versus a more respondent-controlled one, which will affect the outcome. Another issue, as a result of the delegated work, is that significant factors may be missed in the research.

The second article in this section is called 'Biased Building Regulations for Windows?' by Thomas H. Kampmann. This article investigates how windows are constructed, regulated, and how they perform. The objective is to develop a tool enabling professionals to better understand the pitfalls of energy consumption for windows. There are two approaches in Kampmann's article. First, he undertakes a detailed examination of selected paragraphs in building regulations and analyses how windows and energy are expressed in the Danish building regulations 2015 and 2018. Secondly, he compares his finding to similar regulations in Finland, Norway, and Sweden. The comparative analyses reveal similarities and differences in window design and energy consumption in the Nordic countries. According to Kampmann, up to 1995 all windows in Denmark were treated equally with the simple rule that the U-value (thermal transmittance) should be lower than 1.8 kWh/m^2. Since then, the regulations have become more complex, and the new parameters make it almost impossible for architects and building engineers to select the most energy-efficient windows in Denmark. Kampmann's solution to this problem is a website providing reliable data on windows in terms of sustainability, maintenance, noise reduction, energy performance, and economy. On a general level, the article points out the need for information that is independent of manufacturers.

Urban, rural, and regional landscapes

The second section in this publication embraces four articles. They discuss contemporary approaches and methods in urban design, planning research, and practice, shedding light on how the architectural discipline can understand and tackle complexities within urban processes and produce knowledge for the future design of cities and metropolitan regions.

Ann Legeby starts the discussion in this section with a contribution titled 'Developing Station Communities: Alternative Approaches and Perspectives on Access'. The predominant paradigm of 'concentric centrality' as a model for urban development near stations, whereby high densities are encouraged within one kilometre, is here challenged in the context of smaller stations. Her article focuses on urban form and its configurative properties in connection with the possibility of opening new train stations in the Västra Götaland region in Sweden. The regional authorities aim to strengthen local labour markets, sustainable commuting possibilities, and development outside of metropolitan areas. Legeby advocates a shift from 'node thinking' to 'network thinking', where landscape conditions, barrier effects, visibility, and access in relation to key functions are taken into account, opening up the field for design strategies that are relevant for small communities and avoiding a narrow focus on transportation aspects. Nodes or points in the city landscape foster 'to-and-from' movement and risk being counterproductive from a social and cultural perspective. In smaller communities, the co-location of different facilities generates synergies and is essential for supporting local life and social processes.

Tony Svensson continues the examination of station communities and regional planning processes in the Gothenburg region. His contribution is called 'A CAS Perspective on Planning for Energy-Efficient Station Communities'. CAS, which stands for complex adaptive systems, is a broad concept for cities, communities, and regions characterized by a diversity of niches, regimes, landscapes, built structures, and planning actors. Svensson connects CAS to a paradigm shift in planning, changing focus from mobility, flows, and nodes to accessibility to places, qualities, and functions. Svensson's study on station communities takes place in the Gothenburg region and includes eleven municipalities along railways expanding in three directions from the city centre. The vision for the region promotes this development. CAS can, from a perspective of context, be useful in identifying problems, needs, and opportunities and in formulating strategies for planning an energy-efficient, clima-

te-smart, and sustainable society. Key concepts from a transport perspective, include the question of the station community's accessibility (distance), the social functions (diversity), and the functions for those who live and work in the station community (density), along with the station communities themselves (size and context). These concepts can be seen as a roadmap for further investigation of station communities in the metropolitan area.

'Potentials of Light in Urban Spaces Defined through Scenographic Principles', authored by Mette Hvass and Ellen Kathrine Hansen, presents methods and approaches used in studies of light for urban spaces. The two authors investigate how so-called scenographic principles for the use of electric lighting in theatres can provide inspiration for lighting design that supports everyday activities in the city. According to Hvass and Hansen there is a general need for better outdoor lighting in most cities since it is often designed merely to meet the requirements of brightness levels, for accessibility and safety. The perceived qualities of electric light, its aesthetic and affective values, however, are mostly neglected and not satisfactorily explored. Drawing on theories within scenography, urban design, social science, and lighting design, the two researchers argue that it is possible to use scenographic principles to create lighting in the city at night that enhances the connection between space, people, and light for a richer visual and social experience of the illuminated urban space. Pointing out the important architectural and social potential of electric light in the city, the article promotes scenographic principles as a qualitative tool in lighting design.

The last article in this section is 'Urban Design: Science, Art, or a Scientifically Informed Creative Practice?' by Jarre Parkatti, who wants to contribute to recent debates about the disciplinary autonomy of urban design. In his article, he examines the theoretical and methodological foundation of the discipline of urban design based on a critical review of the writings of Alexander Cuthbert and his questioning of the existence of scientific urban design knowledge. In the article, Cuthbert's discursive positioning, and his understanding of the role of social science and of urban design as a discipline, are discussed up against those of other scholars such as Mike Biddulph, Matthew Carmona, Stephen Marshall, Kim Dovey, and Elek Pafka, among others. In the article, Parkatti pursues the discursive debate, reflecting on the many different kinds of knowledge seemingly central to urban design theory and exploring to what extent this theory is 'scientific or normative' and what its possible scientificity means.

Heritage, conservation, and history

This third and last section in the book contains three articles focusing on architectural history and cultural heritage as significant avenues of recourse for future architectural design. More specifically, they deal with the methods and approaches that define and value architectural heritage as well as the discourses that govern them.

The article 'Swedish Prefabricated Houses in the Saudi Arabian Oil Fields', authored by Abdulaziz Alshabib and Sam Ridgway, discusses methods and approaches that have sustained the introduction of modern Western architectural design and industrialized construction techniques in Saudi Arabia during the twentieth century. From the 1940s, Swedish prefabricated timber houses have been imported to the Saudi Arabian oil fields. According to Alshabib and Ridgway, the buildings were originally ordered by the Arabian American Oil Company (Aramco) to accommodate its rapidly expanding workforce of both locals and expatriates, and many Swedish, Scottish, and English architects and builders accompanied the prefabricated houses to the building sites. By reflecting on the Swedish prefabricated houses and the architectural changes they helped to establish in Saudi Arabia, the authors aim to theorize and historically contextualize the Saudi government's current initiative to build one million affordable homes by 2030, using industrialized construction methods. The article concludes that the Swedish prefab houses, although both successful and popular in the Saudi oil camps, did not translate more widely into the modern Saudi Arabian urban environment, like examples in many other countries, such as Britain and Australia. The reason for this is due to the choice of material—timber—being regarded as temporary, non-traditional, and second class, and it is also scarce in the region.

Mari Oline Giske Stendebakken and Nils Olsson, both specializing in cultural heritage, have researched why a number of institutions in Norway are moving from protected buildings into new structures, while the historical buildings are derelict. In the article 'Typical Fallacies regarding Potentially Vacating Protected Buildings', they claim that this unfortunate trend, which most often has negative consequences for the protected buildings and their maintenance, is largely based on incorrect information about the buildings and their potentials. According to the authors, a significant factor for the abandonment of such structures is a prejudice towards older buildings in the documents that support politicians' decisions. This delicate issue, not only restricted to Norway, leads to the authors' critical discussion of how

protected buildings are valued, and the methods and tools which are used to define their quality assurance.

In their article 'Heritage Beyond a Subcategory of Cultural Ecosystem Services in Swedish Landscape Management', Susanne Fredholm and Freja Frölander discuss the so-called ecosystem services (ES) approach. Widely used in Swedish planning, it aims to identify and valorize the multiple benefits that ecosystems provide to human well-being. According to the authors, the concept of ecosystem services, however, has no legal definition and is currently not included in any legislation. While keeping a focus on the role of heritage management in ecosystem conservation, the article sets out to investigate the ecosystem services approach and what defines it. The authors' research is based on a review and analysis of Swedish national, regional, and local ecosystem services guidelines and a number of semi-structured interviews with ecosystem services practitioners and experts in Sweden.

Addressing what methods and approaches architects, landscape architects, and urban designers use in their work, why and how, this publication initiates critical reflection on their relevance, qualities, pitfalls, representations, and discursive positionings. It also suggests that new approaches and methods are worth considering. Not just because research and architectural knowledge are evolving practices, and different institutions, infrastructures, and frameworks produce different kinds of knowledge and in different ways, but because of the many future global perspectives and challenges that society at large is facing. Well aware that a selection of articles will give a mere glimpse of the larger discursive picture, it is, nevertheless, our hope that this proceedings publication will lend momentum to further discussions on architecture and architectural research, with a focus on the connection between approaches and methods and the articulation of architectural knowledge.

NOTES

[1] Further information on this subject can be found in *The Production of Knowledge in Architecture by PhD Research in the Nordic Countries*, Proceedings Series 2018-1.

[2] Fredrik Nilsson and Halina Dunin-Woyseth, 'Building (Trans)Disciplinary Architectural Research: Introducing Mode 1 and Mode 2 to Design Practitioners', in *Transdisciplinary Knowledge Production in Architecture and Urbanism: Towards Hybrid Modes of Inquiry*, edited by Isabelle Doucet and Nel Janssens (Dordrecht: Springer, 2011), pp. 79–96.

TALES OF CITIES AS (RESISTANT) PRACTICES

Isabelle Doucet

ABSTRACT

Originally published in the volume *Across Theory and Practice: Thinking Through Urban Research*, edited by Monika Grubbauer and Kate Shaw (Jovis, 2018), this article offers reflection on the opportunities and challenges presented by telling embodied-situated stories of architecture and cities. Situated and relational approaches are considered here as a way of challenging unhelpful divisions between theory and practice, and as an opportunity to address urban and architectural questions through their specificity rather than a generalized relevance or appeal. However, such situated stories do not come without struggles. I will thus ask: How to write stories in a situated manner and also keep stories situated? How to determine which stories are worth telling? And how can stories make a difference? This short article offers an occasion to reflect on such questions by exploring my earlier experiences with researching architectural and urban practices in a specific city—Brussels after 1968—and by thinking through such questions on the occasion of a thematic journal issue jointly edited with Hélène Frichot for *Architectural Theory Review* (2018).

KEYWORDS

Critical storytelling, situated perspectives, theory and practice in architecture

TELLING AND INHABITING (HI)STORIES OF CITIES: CAN IT BE GOOD ENOUGH?

What makes a city? What makes architecture? And, what is to be included in the discussions of architecture and the city? With these questions I started my study of the activist architectural and urban practices that emerged in Brussels after 1968. From the various methods available for researching cities, architecture, the built environment, and its inhabitants, I chose to tell my story of Brussels in a situated, embodied, and relational manner. With the resulting monograph *The Practice Turn in Architecture: Brussels after 1968*, I offered a tale of a city through its specificity and complexity, that is: the multiple assemblages through which this city is imagined, built, and lived.[1] I argued that Brussels' architecture emerges through architects, architectural movements, and ideologies; through urban renewal programs, urban traumas, plans, and projects, and urban policymakers; through activists, social workers, and citizens, and also through mundane everyday practices.

Studying a city in terms of Isabelle Stengers's 'ecology of practices'[2] implies thinking *through* such multiple practices rather than from a distance, through predefined analytical lenses. It implies thinking about the world 'through what is happening'.[3] Following Stengers, the meticulous unpacking of a situation allows for reliving the choices that were made towards the production of that situation, and it helps to understand how a particular state of affairs has come into being. It thus also shows how things could have been otherwise, had different choices been made.[4]

Such embodied-situated readings of situations—whether urban, political, or environmental—have become widespread in feminist writing and in the (critical) philosophical literature on the Anthropocene, and Donna J. Haraway, Rosi Braidotti, Isabelle Stengers, Anna Lowenhaupt Tsing, and María Puig de la Bellacasa, among many others, have been particularly inspiring.[5] In architecture and urban studies, partially thanks to the introduction of Science and Technology Studies and Actor–Network Theory, ontological accounts of buildings and cities have become widespread. When architectural and urban researchers write situated stories, they face several challenges. Writing in a discipline that is also connected to a profession, their stories are often hoped, even expected, not just to contribute to a better understanding of architecture and of cities, but to provide solutions towards *better* cities, and *better* architecture. Research funders seek impact, and academic reviewers look for relevance of any research to a wider field of knowledge, expecting conclusions and insights

that can be transported elsewhere, beyond the specificity of the situation that is observed. Situated accounts resist such upscaling and transcendence, so a key question is: How to tell the story of a city, a place, or a building that is relevant elsewhere whilst remaining situated. In other words: How can our stories make a difference? This will be the focus of this article. With 'we' I refer to those who, via their research, tell tales of cities, of architecture . . .

STORIES THAT MAKE A DIFFERENCE

'We need to tell and tell until all our stories of death and near-death and gratuitous life are standing with us to face the challenges of the present. It is in listening to this cacophony of troubled stories that we might encounter our best hopes for precarious survival'.[6]

In *The Mushroom at the End of the World*, Anna Lowenhaupt Tsing tells the story of the matsutake mushroom, a pricy delicacy known for its capacity to grow in the most devastated natural environments.[7] Tsing brings the story of this mushroom as a complex tangle of environmental disaster, natural and economic growth, and of foraging, trading, gifting, and consuming the matsutake mushroom; a story of 'collaborative survival'[8] in the ruins left behind by capitalism. Her storytelling is not focusing on neat stories of linear progress but brings in a tangle of stories involving people and their (personal, migratory) histories, states, economies, human and natural labour, forests, traders, legislations, techniques of foraging, and organisms such as mushrooms. Through this 'cacophony of troubled stories', as described in the opening citation of this section, Tsing creates an opportunity for imagining collaborative forms of survival in the present with its ecological, political, ethical, and economic challenges. Tsing thus turns mushroom picking into a 'worthwhile tale' of precarious survival.[9] Also, in a recently published conversation with Didier Debaise and Benedikte Zitouni in the journal *Architectural Theory Review*,[10] the importance of storytelling in terms of attachment is emphasized because, as Debaise argues, it shows the situations that we study through the 'heterogeneous interests that come together in a situation'.[11] Because, following Debaise, situated tales also help those collectives that are being observed 'to become attentive to all the chains of transformation and the chains of dependency that constitute the precarity of *their* situation',[12] the situated-embodied researcher, as Zitouni puts it, is in fact 'partaking in a territory'; their tales contributing to 'territories in the making'.[13] When researchers tell situated stories about cities, and buildings, in such a way, their stories matter; and they have the capacity to trigger change.

So when prompted with the question as to how to create better dialogues between theory and practice, I feel a little uncomfortable.[14] Because, even if such a question is motivated and justified, answering it would imply that such distinction between theory and practice remains in place. It also suggests that theory and practice are rather different types of activities, operating in distinct ways. Surely it is arguable that the reflective, conceptual, and abstract fields of philosophy and theory differ from the more hands-on professional architectural and design practices, everyday life activities, operating in and through the 'real' world. Is such division not informed more by disciplinary demarcations than by the actions and needs of actual spatial practices? Is theory not equally messy to practice, equally a craft? Philosophers of science working in the pragmatist tradition, such as Isabelle Stengers, Donna J. Haraway, and Didier Debaise, have shown that thoughts and conceptualizations can be experimental, probing, and speculative; that thinking, words, and concepts become practices of thought exercised in and through everyday, situated, and embodied actions. Didier Debaise and Bendikte Zitouni, in the earlier mentioned conversation, do not bring stories *about* situations; but think *through* these situations. They talk about their writings as a craft, and a speculative practice. They insist on staying close to the specificity of a situation.

This reminds me of John L. Austin who theorized words as 'performatives'.[15] Namely, words are defined not as much by their 'meaning' as by the actions they (allow to) perform, and by the ways in which words travel, adjust, and transform when moving from one milieu into another. I used Austin's work as a guide to understand the negative connotations of words used to depict architecture in Brussels.[16] Its citizens have suffered from decades of urban trauma caused by the demolition of historical inner-city neighbourhoods for the sake of development and large-scale modernization works resulting in residents being expelled from their livelihoods. Rather than being associated with optimism, Brussels architecture long carried an aura of suspicion. Hence the word 'architek', which dates back to the 1860s, serves as an insult in the Brussels dialect, and the term 'Bruxellization', which emerged in the 1970s, depicts the destruction of a city through capitalist development. Inspired by Austin, I have shown how these words, beyond their meaning, also *performed*, over long periods of time, this negative connotation of architecture. Words can do so when they travel widely, multiplying their agency through disguises and aliases such as terminologies of destruction (bulldozer urbanism, massacre city), and when they make regular appearances in novels, the popular press, travel guides, and well-known graphic novels.

THE STRUGGLE WITH SITUATED STORIES OF ARCHITECTURE

Confronted with a world full of words that perform, ideas that travel, and theories that are world-making as much as practices are, should we not challenge perceived distinctions between and subsequent attempts to reunite theory and practice, words and actions, writings and designs? Why are we so reluctant to challenge such distinctions? I believe there are two important obstacles.

Firstly there are insecurities about *how* to craft situated stories in such a way that these stories also matter. Ethnographers and pragmatist philosophers (of science) may be familiar with the writing of situated-embodied accounts of the world; architectural theorists not always are. Together with Hélène Frichot, I recently guest-edited a thematic issue for the journal *Architectural Theory Review* on the topic 'Resist, Reclaim, Speculate: Situated Perspectives on Architecture and the City'.[17] By means of a call for papers, we invited contributors to resist the taxonomies and conceptual categories to which they have become accustomed, or feel obliged to think. We invited them to reconnect with (hi)stories and (radical) imaginations that tell alternative or forgotten stories. We believed that through connecting with these stories other forms of engagement and resistance can emerge. Each story in this special issue matters because it potentially makes a difference vis-à-vis the situations they narrate. And yet, it was equally interesting to observe that we received a not insignificant number of papers that did not make it into the issue. These papers were not in any way lacking in sophistication or relevance, but they still were, indeed well-argued, *calls* for writing situated accounts and for acting as embodied researchers, rather than bringing actual situated-embodied stories. For me, this showed that, whilst theorists are very good at arguing in favour of certain ways of 'doing' theory, there also seems to be a deeply engrained resistance to actually 'doing' such theory, and to crafting stories in and through, rather than about, concrete spatial situations. Admittedly, I am stepping here into the same trap with this paper![18]

Secondly, there is the issue of academic claims and recognition. When researchers write about something specific and situated, they are still pressured to 'scale up' and draw wider conclusions from these situations that are applicable elsewhere. But, as so many have argued, including Didier Debaise and Benedikte Zitouni,[19] such move is dangerous because observations drawn from specific situations do not neatly translate to other, seemingly similar, milieus. What gets lost in translation are the chains of dependency,

the chains of attachment. The award system of academic work is not always sympathetic to the radical specificity of situated-embodied accounts and to the resistance to transplanting 'good stories' to other contexts.

MAKING STORIES MATTER

The first struggle—to learn the craft of writing situated accounts—is largely a matter of training and practice, which is beyond the scope of this article. I will here instead suggest some possible ways to overcome the second struggle, namely how to bring convincing stories that matter without having to scale up.

When we reclaim (hi)stories, we also indicate that we deem a particular story worthy of recollection. But at the same time it means to recognize that whatever story we bring, it is not a story that is deliberately geared towards a solution. Describing a city anew may not offer a *solution* for that city; but it may offer a different awareness of what is happening in that city, what is at stake, and about how solutions to perceived problems, or specific urban mindsets and ideologies, have come into being whilst others have not. At the heart of bringing stories through multiple voices, surprising actors, and forgotten stakes lies what Anna Tsing calls 'the art of noticing',[20] and the celebration of curiosity. In a similar vein, Isabelle Stengers notes that one should 'learn to wonder about what we take for granted'.[21] When, following Tsing, we learn 'how to look around rather than ahead',[22] surprising and unusual actors, stories, and histories may grasp our attention. In my tale of Brussels, I deemed it necessary to give voice to actors that, from a theoretical, critical, or conceptual point of view, seem, at best, odd. For example, the conceptualization, design, negotiation, construction, and subsequent use of a public urinal as part of a neighbourhood renewal program tells us something about how a city struggles to build and provide what is 'really' needed, that is, according to its citizens. The years-long saga of this urinal, which I have told elsewhere,[23] offers a story about the misconceptions and frustrations in participatory design, including perceptions of what is easy and difficult to realize. Why does such a simple building take so long to realize? How difficult can it be? Public urinals show how certain buildings, despite their small size and apparent simplicity, are in fact quite challenging to build. This is the case because they do not fit the taxon of neighbourhood renewal, which is often organized in categories dedicated to housing, public space design, and social work, neither of which offer good homes for a urinal. Also, realizing a urinal as part of a generously funded neighbourhood

renewal scheme is one thing, but keeping up with its cleaning and maintenance after the funding runs out is quite something else. City governments do not often have the capacity for such specialized cleaning, and outsourcing the cleaning to a private company generates long-term costs. The tale of this urinal—its justification, conception, design, construction, and use—proved to be an instructive and revealing story of making-city and of participatory planning in Brussels. Because this urinal moreover escapes the taxonomies of architectural theory and history, it would normally not have figured in a book on architecture and Brussels. And yet, when allowing curiosity and wonder, we are invited to become receptive to surprising voices. The urinal, banal and odd as it may be, has a lot to say about what it means to make-city and do-architecture in Brussels. This urinal therefore became a rightful actor in the architectural and urban study of Brussels. In *The Practice Turn in Architecture*, I dedicate an entire chapter to 'Unsung Heroes',[24] namely those actors that matter greatly in the specific situation of Brussels. These include the urinal, the word 'architek', and also those architectural projects that, despite not making it into the global discourses of celebrated, iconic, and star architecture, are to be seen as genuine, albeit 'situated', landmarks of Brussels' architectural culture.

Making situated stories matter also implies thinking more consciously about the agency of these stories *in spite of* their situatedness. Instead of scaling up, what other forms of agency could these stories have? Could we instead ask ourselves more consciously how the use of some titles, terminologies, and keywords in our stories can make them travel differently: in different climates, audiences, different ways, at different speeds? Are we obliged to also ask: Can our stories harm? When I was writing the book *The Practice Turn in Architecture*, I was challenging the abstract, autonomous, and detached tendencies of critical theory in architecture, and instead proposing a situated form of critical engagement. And yet, I nevertheless insisted on keeping the term 'criticality' in the mix. I proposed 'criticality-from-within' as an embodied and critical engagement that operates through the practices of architecture (rather than distant theorization from-above). In retaining the term criticality, I felt I could draw in precisely those audiences where I deemed my story could have a place, that is, architectural critical theorists and those already working in the relational-situated-pragmatist tradition.

Also, once our tales are out there, they too travel, get appropriated, recuperated, and resituated in different environments. In doing so, they can make

a difference, often beyond our control and intentions. We can hope that this agency is productive and for the better, but we may have to accept that all appropriation is contingent.[25] The agency and merits of situated tales are difficult to measure. Academic and professional measuring tools rarely do justice to the horizontal, meandering, and unpredictable travels of stories. Tsing, courageously, dedicates the conclusions of *The Mushroom at the End of the World* to the ways in which her story had an effect on intellectual life more widely, within and outside academia. She calls this 'intellectual woodlands': 'In the intellectual woodlands that I have been trying to encourage, adventures lead to more adventures, and treasures lead to further treasures.'[26] Our stories, our adventures, may be appropriated in surprising settings, where they are situated anew, and where they may be challenged. It is therefore exciting to see how stories are put to the test, and can be of use to the adventures of others; how stories are challenged and re-narrated.

AUTHOR'S NOTE

The original version of this article was published as an essay in the volume *Across Theory and Practice: Thinking Through Urban Research*, edited by Monika Grubbauer and Kate Shaw (Berlin: Jovis, 2018), pp. 111–19, a book that is, in my view, highly relevant for the readers of this proceedings publication. I am most grateful to the editors and the publisher for having granted permission for including this text. On the occasion of this republication, some revisions and edits have occurred, and also a few additional reflections have been added.

NOTES

[1] Isabelle Doucet, *The Practice Turn in Architecture: Brussels after 1968* (London: Routledge, 2015; originally published by Ashgate Publishing in Farnham, Surrey, and Burlington, Vermont).

[2] Isabelle Stengers, 'The Cosmopolitical Proposal', in *Making Things Public: Atmospheres of Democracy*, edited by Bruno Latour and Peter Weibel (Cambridge, MA: The MIT Press, 2005), pp. 994–1003, and Isabelle Stengers, 'Introductory Notes on an Ecology of Practices', *Cultural Studies Review* 11, no. 1 (2005), pp. 183–96.

[3] Stengers, 'Introductory Notes on an Ecology of Practices', p. 185.

[4] Isabelle Stengers, 'William James: An Ethics of Thought?', *Radical Philosophy* 157 (September–October 2009), pp. 9–19, and Isabelle Stengers, 'Including Nonhumans in Political Theory', in *Political Matter: Technoscience, Democracy, and Public Life*, edited by Bruce Braun and Sarah J. Whatmore (Minneapolis: University of Minnesota Press, 2010), pp. 3–34.

[5] Donna J. Haraway, 'Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective', in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991); Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016); Rosi Braidotti, *Transpositions: On Nomadic Ethics* (Cambridge: Polity, 2006); Isabelle Stengers, *In Catastrophic Times: Resisting the Coming Barbarism*, trans. Andrew Goffey (London: Open Humanities Press and Meson Press, 2015), originally published in French by Editions La Découverte in 2009; Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton and Oxford: Princeton University Press, 2015); María Puig de la Bellacasa, *Matters of Care: Speculative Ethics in More Than Human Worlds* (Minneapolis and London: University of Minnesota Press, 2017).

[6] Tsing, *The Mushroom at the End of the World*, p. 34.

[7] Ibid.

[8] Ibid., p. 20.

[9] Ibid.

[10] Isabelle Doucet, Didier Debaise, and Benedikte Zitouni, 'Narrate, Speculate, Fabulate: Didier Debaise and Benedikte Zitouni in Conversation with Isabelle Doucet', *Architectural Theory Review* 22, no. 1 (2018), pp. 9–23.

[11] Debaise, in ibid., p. 17.

[12] Ibid., p. 18 (emphasis added).

[13] Zitouni, in ibid., p. 18.

[14] This question regarding the relationship between theory and practice in urban research was central to the edited volume *Across Theory and Practice*, where a previous version of this article was published (see 'Author's Note').

[15] John L. Austin, *How to Do Things with Words* (Oxford and New York: Oxford University Press, 1990), first published by Clarendon Press in 1962.

[16] Isabelle Doucet, 'Making a City with Words: Understanding Brussels through its Urban Heroes and Villains', *City, Culture, and Society* 3, no. 2 (2012), pp. 105–16.

[17] *Architectural Theory Review* 22, no. 1 (2018).

[18] Upon further reflection during the process of republishing this text (see 'Author's Note'), I have reread some of my observations regarding theory/practice writing and the quest for impact and upscaling (as explored earlier in the text) and find that these passages sound too generalizing and more dismissive than had been intended.

[19] Doucet, Debaise, and Zitouni, 'Narrate, Speculate, Fabulate', pp. 9–23.

[20] Tsing, *The Mushroom at the End of the World*, p. 17.

[21] Isabelle Stengers, 'A Constructivist Reading of Process and Reality', *Theory, Culture & Society* 25, no. 4 (2008), p. 101.

[22] Tsing, *The Mushroom at the End of the World*, p. 22.

[23] Doucet, *The Practice Turn in Architecture*, pp. 155–86.

[24] Ibid.

[25] The paragraph in the original publication (see 'Author's Note') discussing an additional example from Brussels has been removed from this republication.

[26] Tsing, *The Mushroom at the End of the World*, pp. 287–88.

MULTIPLE DEPTH ANALYSIS AND THE URBAN DESIGN CONSEQUENCES OF SEMI-PUBLIC REALMS

Karl Kropf

ABSTRACT

In the context of the need to accommodate growing urban populations and densities, many emerging building types incorporate increasingly large and complex shared circulation spaces. These 'semi-public realms', found in both perimeter blocks and 'megastructure' types, present potential benefits but also potential problematic consequences for the combined private, semi-public, and public realms. Key issues include: ambiguity of form, boundaries, use, control, and imageability. Some of the factors at the root of these issues include lack of connectivity, excessive connectivity, excessive spatial depth, lack of hierarchy, and spatial differentiation in relation to depth. As the latter points suggest, a key concept that can help in understanding these issues—and contribute towards designs that avoid them—is depth. Within the field of built form studies and urban morphology, the idea of depth encompasses a number of different specific conceptions. Three of the most relevant are: configurational depth,[1] territorial depth,[2] and structural depth.[3] The aim of this article is to show that these three forms of depth are not mutually exclusive but have specific complementary relationships that can be used together to undertake a coherent, 'multiple depth' analysis of built form. Using examples of contemporary buildings types with extensive semi-public realms, the article goes on to show how such an analysis can aid in both urban design practice and urban design education.

KEYWORDS

Generic structure, public realm, density, urban design qualities

INTRODUCTION

Contemporary urban development in many parts of the world is increasingly taking the form of large, mixed-use, multi-occupancy buildings. There are a number of potential factors that might explain this trend. The large building types can be seen as a response to increasing global population in general and growing urban populations in particular, based on the evidence that higher densities are more sustainable. The large buildings can also be seen as a response to a crisis in global capital, with increasingly large amounts of private capital looking for decent returns in the face of historically low interest rates and volatile but restrictive public equity markets.[4] The (historically) steady capital growth of property in global cities such as London, Hong Kong, Singapore, San Francisco, and New York remain attractive investments. The building types might further be seen as a symptom of the state of the *res publica*, public sphere, and the attendant relationships between sovereign states, individuals, and a wide range of corporate bodies and institutions.

In some cases, the large, complex buildings are part of extensive, privately financed developments in which ostensibly public spaces remain private property. Such developments are, in some ways, the confluence of several interrelated historical phenomena that have been the subject of ongoing critique and debates over the years: the megastructure and the privatization of public space. If the profile and prominence of the megastructure as an architectural preoccupation has waned,[5] it is to a large extent due to its transformation and assimilation into the common repertoire of leading types. It has slipped from critical consciousness and become a cultural-financial habit: to a very large extent an expression and symptom of global capital.

As a very broad initial definition, the megastructure can be described as an extensive area of urban development under the control of a single entity with a unified, integrated design. The beginnings of its evolution were documented—and to a large degree promoted—by Sigfried Giedion in his *Space, Time and Architecture: The Growth of a New Tradition*.[6] Giedion pointed to Rockefeller Center in New York as a precursor to the idea of 'group form' and the work of Fumihiko Maki who coined the term 'megastructure'. In its original formulation, the megastructure was conceived as an extensive (infra)structural framework with replaceable modules. As epitomized by Cumbernauld New Town Centre, however, the difficulty of actually realizing the modular flexibility of megastructures at the urban scale, along with the generally unpopular 'Brutalist' architectural expression of their

designs, meant the ideal architectural version of the concept had a short life.[7] The underlying principle as recognized by Giedion did, however, have a more lasting appeal. Central to that appeal is 'urban development under the control of a single entity', a feature not really emphasized in the ideal version but key to the success of Rockefeller Center. With this definition, we can see the mixed-use/retail environments such as the Mall of America in Bloomington, Minnesota, the Jerde Partnership's Namba Parks in Osaka or OMA's Euralille as successors to the megastructure. From the wider urban perspective, the fortress-like character of some of these developments and the more general issue of the privatization of public space have been the focus of intense criticism.[8] To generalize, the focus of the critiques of these places is that they create an ambiguous realm that is neither fully public nor fully private. They can be overly complex with limited visibility, poor connectivity, and convoluted lines of movement embedded deep within the structure. There is often a lack of clear boundaries between areas for different uses and occupants but rather than offering opportunities for diversity, the overly determined design tends to prevent it.

More recently, critical 'selection pressures', including the major challenges to the retail sector presented by online giants, mean the shopping-based megastructures are undergoing further mutation. Like the precursor of Rockefeller Center, the contemporary megastructure is mimicking—and integrated with—public streets, yet many of the 'public spaces' remain privately owned. Examples include Hudson Yards in New York and developments at Kings Cross and Paddington Stations in London. The pretence of the streets creates a semi-public realm.

It is fair to point out, however, that the principle of a semi-public realm is also central to, figuratively and literally, the 'Berlin type' perimeter block as realized at the end of the nineteenth and beginning of the twentieth centuries in much of northern Europe. The type is usefully exemplified by Berlage's plan for South Amsterdam in which residential units are arranged to form a continuous line around the edges of the block, enclosing a central space for the exclusive use of the residents. This type has its successor in the many examples of 'podium' blocks in which the central space is raised up one or more floors of structured parking. In these cases, the semi-public space within the block is seen as an asset, making a positive contribution to people's living environments. More generally, Manuel de Solà-Morales takes the view that semi-public realms or 'collective spaces' are ubiquitous in urban

environments and form a continuum that needs to be understood in its own terms.[9] To agree with this view does not remove the potentially detrimental aspects of scale and control. The danger is that the semi-public realms proliferate and create another version of the megastructure, presenting relatively blank walls to public streets. The consequence is that the benefits of the semi-public realm to a few are realized at the expense of the fully public realm, reducing it to a utilitarian rump of transport links only suitable for vehicles and the people living on the margins.

This brief preamble suggests the semi-public realm is both ubiquitous and ambiguous in its status as well as in terms of its physical nature, its role in urban form, and the ways in which it is viewed and interpreted.

The aim of this article is to clarify and refine the definition of the semi-public realm, to situate it morphologically, and to put it into deeper historical perspective. In so doing the aim is to allow for and take into proper account the diversity and ambiguities found in specific cases. The underlying purpose of the investigation is to develop a better understanding and sharpen the analysis and critique of semi-public spaces as well as to improve their design. Clearer understanding should help us to find out how best to achieve and enhance the benefits of semi-public realms and minimize their potentially corrosive effects on the fully public realm. Central to that last concern is the conception of the civic and political and the social relations that underpin them.

The method adopted to investigate the phenomenon of semi-public realms is a kind of 'triangulation' that combines four different conceptions of morphological depth. The approach brings together the work of a number of different authors and for convenience might be termed multiple depth analysis.

Three of the main conceptions of depth relate directly to physical built form and the fourth involves the associated aspect of control. Of the three relating to physical built form, one is the idea of *configurational* or 'step' depth based on the principles of architectural morphology set out by Lionel March and Philip Steadman in 1971, by Steadman in 1983, and developed by Bill Hillier and Julienne Hanson, particularly in their concept of gamma analysis as used in *The Social Logic of Space* of 1984.[10] The second notion of depth is the principle of *territorial depth* developed by John Habraken and elaborated most fully in his treatise on control, *The Structure of the Ordinary*.[11] Kris W. B. Scheerlinck usefully brings these two together in the concept of 'depth

configurations'.[12] The third notion is rooted in the work of Saverio Muratori, Gianfranco Caniggia and Gian Luigi Maffei, and M. R. G. Conzen, relating to levels of aggregation and the compositional hierarchy of built form.[13] This notion has also been generalized by Brian Arthur as 'structural depth' in *The Nature of Technology*.[14] The evolutionary approach taken by Arthur, which parallels that of Conzen and the Italian architects—and urban morphology more generally—is taken as a further methodological foundation of this article. The fourth idea of depth picks up again on the work of Habraken and involves the customary or legal regimes of control held over spaces by particular agents or entities. This aspect brings out most directly the social structures and interrelations at the core of the notion of public space.

To summarize the different types of depth in simple terms, configurational depth is a measure of the number of spaces or 'steps' between two given spaces in a configuration of multiple, interconnected spaces. Habraken's territorial depth can be seen as the configurational depth of a specific string or sequence of spaces from the most public to the most private. Structural depth is a measure of the complexity of built form as indicated by the number of levels of aggregation of generic elements that compose the form. Depth of control is similar to structural depth but refers to the specific relationships of occupational, customary, or legal control over spaces and the controlling agent. As Habraken notes, there is an intimate relationship between the spatial units of physical built form and units of control, the latter tending to follow the former. That relationship is not, however, fixed and the variability of the relationship is crucial to understanding the position and role of semi-public realms within the wider built environment.

The four different types of depth can be combined and visualized by mapping them onto the diagram of generic structure of built form as introduced by Kropf.[15] In brief, the vertical axis of the diagram represents structural depth and the horizontal axis, taken through the three generic spaces or voids, represents generic territorial depth (see fig. 1). As will be explored in more detail below, configurational depth can also be represented by the horizontal axis through the voids but takes into account the full range of boundaries and spaces of specific examples. As will also be seen, depth of control has both structural and territorial depth and so maps onto both the vertical and horizontal axes of the diagram.

GENERIC STRUCTURE AND STRUCTURAL DEPTH

One of the important results published in Kropf's article 'Ambiguity in the Definition of Built Form' in *Urban Morphology* is the principle that different urban tissues can have different generic configurations.[16] In general terms, different urban tissues can be more or less complex because they contain a different number and range of generic elements and the complexity can be located in different parts of the tissue. It might be said that the diversity and variability of urban tissue that arise in response to different contexts and cultures is due to a fluidity in the structure of built form that is both discrete and continuous. That is, there can be differences in the number, type, and position of elements (discrete) and in their shape and size (continuous). While the continuous, specific variability can be measured by quantities such as length, the discrete, generic fluidity is measured by a combination of 1) the number of levels of aggregation constituting the tissue (structural depth) and 2) the position of the levels relative to an individual 'room' or simple sheltered space (territorial depth). Thus, differences in the generic configuration of urban tissue are characterized by the two attributes or 'dimensions' of structural depth and territorial depth (see Figure 1). As will be explored below, the two are interrelated.

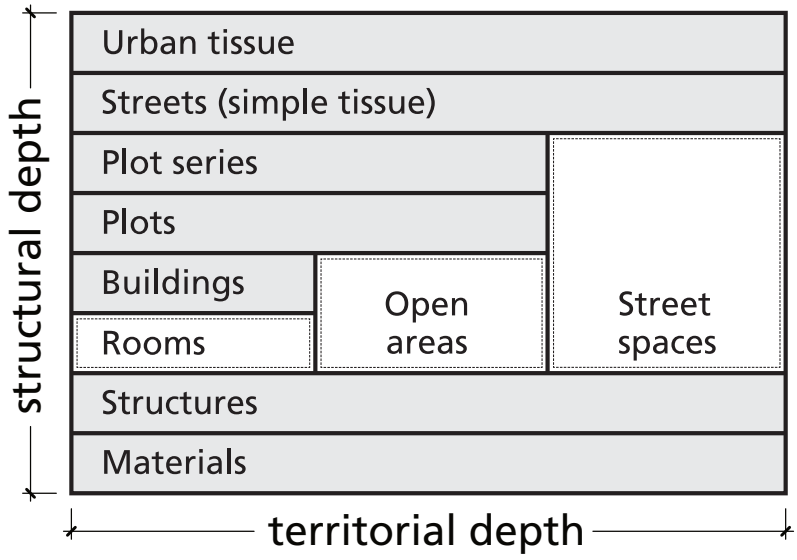


Figure 1. A multi-level diagram representing the reference generic structure of built form with axes identifying structural and territorial depth. Source: © Karl Kropf.

These principles and the potential for using them to articulate the definition, position, and role of semi-public realms can perhaps best be explained in more detail by looking at examples from a developmental-evolutionary perspective. Drawing on the process-based typology of Muratori, Caniggia and Maffei, and, in particular, Arthur's concept of 'structural deepening,'[17] the approach involves examining the evolution of human settlements in terms of primitive forms and their associated regimes of control. The term primitive is used here to deliberately evoke both the sense of the early stages of development and an intuitive concept used as a precursor to build more extended logical formalizations as used in mathematics. The result is more a thought experiment that gives an abstract, generalized view of the evolution of human settlements rather than a specific 'natural history' or genealogy.

The starting point for the purposes of the article is the range of archaeological evidence for human settlements from the Neolithic period.[18] Typical examples are constituted by three main elements: tracks, enclosures, and shelters. The tracks, some likely pre-existing, would have formed a network of routes extending into the wider area for access to food and other resources. A typical enclosure would have been defined by a more or less circular boundary wall of wooden palisade or stone with usually a single opening for controlled access. The shelters were located within the enclosure and typically circular in plan, constructed of timber or stone with a timber roof to form a single, fully enclosed space with a single opening. Each of the three elements can be defined in terms of a surface, boundary, and openings as a 'structured space'[19] and together form the core, root types out of which human settlements are composed.

As represented in the diagram in Figure 2, the structural depth of the Neolithic settlement is four, taking into account materials, structures, the three types of space, and the settlement as a whole.[20] The territorial depth is three, assuming for the moment the space within the enclosure that is not occupied by shelters is undifferentiated.

The three types of space also correspond to units of control. Tracks, as a shared resource for a group, are generally kept free of occupation or other impediments to movement. Control is therefore exercised to permit use by many. The walled enclosures are controlled to restrict entry to the resident group or those expressly invited in. Similarly, shelters are restricted to subgroups, generally an extended family. It could be said then, that there is a gradient

from 'public' tracks to 'semi-public' enclosure to private shelters. The context of the Neolithic period does, however, beg the question of what we might mean by the terms public and semi-public. A feature of the Neolithic period was frequent raiding and hostilities between groups, the response to which was to enclose a space shared by the group for mutual safety. The track would not provide that safety, less so as it extended out of the territory of the group. All are free to use the track but at the risk of attack and robbery. Is there a difference between 'no-man's-land' and public space?

Given the derivation of the term 'public' and its historical meanings, the 'public' space in the case of a Neolithic settlement is in some ways not the track but the shared enclosure, because it is more clearly bound up in the relationship or agreement between the individuals that constitutes the group. The *res publica* is both the group (also referred to as the *civitas*, the citizen community) and the common 'property' of the group, the ground that it shares and within which its social customs are observed. This is, of course, to apply the terms *res publica* and *civitas* anachronistically. In the context of the Neolithic period, the gradient from track to shelter is less one of public to private then one of protection. The concepts of *res publica* and *civitas* only emerged or co-evolved towards the Bronze Age with the city state and, as specific terms, are tied culturally and linguistically to Ancient Rome. It is still useful to apply the concepts to more primitive forms because it highlights the extent to which the notion of the 'public realm' is interdependent with a range of other cultural habits, activities, and institutions. That insight in turn points to the co-evolution of sociopolitical, socioeconomic, and physical structures in the emergence of the city state.

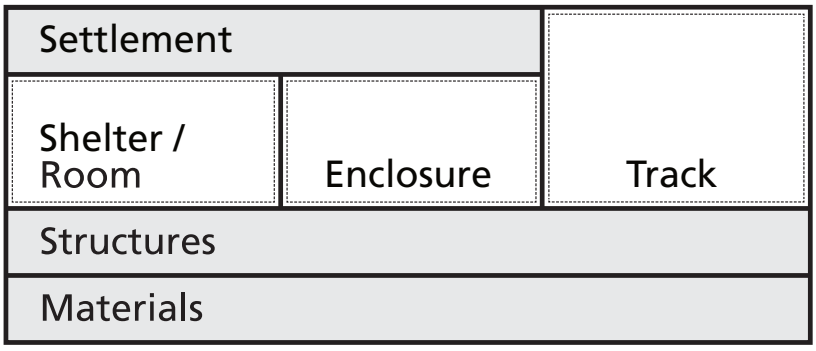


Figure 2 A multi-level diagram representing the generic structure of a typical Neolithic settlement. Source: © Karl Kropf.

In terms of physical form, the co-evolution involved a number of instances of structural deepening as defined by Arthur. Deepening occurs when elements are added to an existing structure so that it is transformed from a simple entity to an aggregate and when aggregated entities are combined together to make more complex objects.

In the case of the transformation of settlements from the Neolithic to the Bronze Age and beyond, the deepening involved, among others, the following:

- The creation of multiroom structures by subdivision, addition, or deliberate design
- The addition to shelters of a connected external enclosure such as a courtyard
- The packing of shelters together into aggregates with shared or abutting walls
- The coordinated connection, for access, of an aggregate of buildings to an abutting track
- The retention or creation of widened tracks within an enclosure for specific common activities and the creation of special buildings for specific activities resulting in the differentiation of areas, namely tracks and associated aggregates, within the settlement.

Each of these transformations increases the structural depth of the settlement as a whole by increasing the level or degree of aggregation as illustrated with the diagram of generic structure in Figure 3.

A further deepening occurred with the emergence of multi-storey, multiple occupancy buildings such as the Roman *insula*.[21] The deepening occurs with the creation of repeating configurations of rooms to form apartments on multiple floors. These require both shared vertical circulation and shared horizontal circulation. The combination of these generic elements has persisted as the 'apartment house' type, with many specific variants (see fig. 4).

Not all transformations in the evolution of urban form have resulted in structural deepening. There can be a 'shallowing' of generic structure by the removal of levels of aggregation. The phenomenon is highlighted by Philippe Panerai, Jean Castex, and Jean-Charles Depaule in their seminal work *Formes urbaines: de l'îlot à la barre*,[22] which recounts the effective disappearance of the 'plot' and 'street' from European cities as transformed under the urban

principles of the Congrès Internationaux d'Architecture Moderne (CIAM) beginning in the first half of the twentieth century.

Many of those principles remain current as an active type of urban tissue and in particular in the form of the contemporary megastructure, though often alongside other types. An example is the redevelopment of the former canal basin next to Paddington Station in west London (fig. 5).

The drawing shows three distinct tissues: one, Praed Street, is a more traditional type with individual plots and terraced houses with the generic configuration shown in Figure 3; the second is an 'insula type' with the generic configuration shown in Figure 4. The third tissue, Paddington Basin, is more ambiguous. Rather than a repeating pattern of building and enclosure (garden) aggregated into series, Paddington Basin includes a number of large buildings within what is essentially one large plot occupying most of a large convoluted block, due in part to the presence of the canal and station. At the same time, the buildings within Paddington Basin are of the apartment house or office building type. Both the apartment and office buildings are of

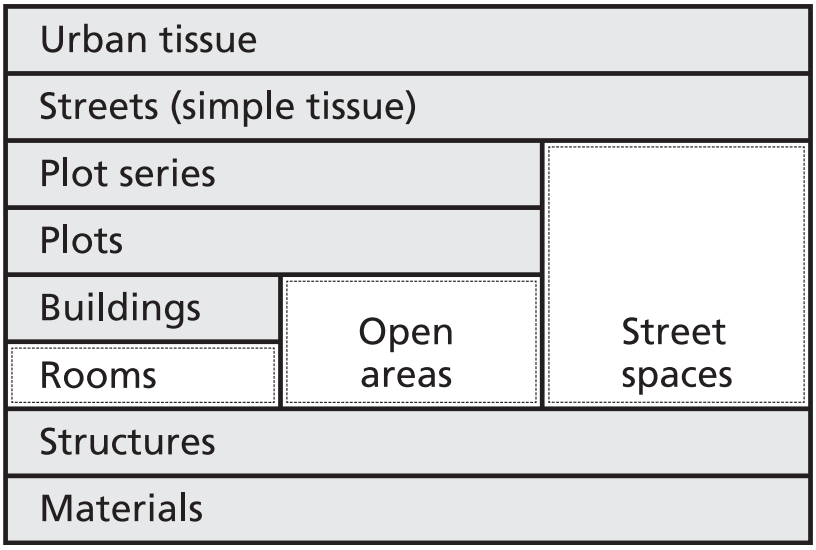


Figure 3. The process of structural deepening of built form that occurred in city-states by the Bronze Age resulted in an increased number of levels of aggregation relative to the simpler structure of a Neolithic settlement. Source: © Karl Kropf.

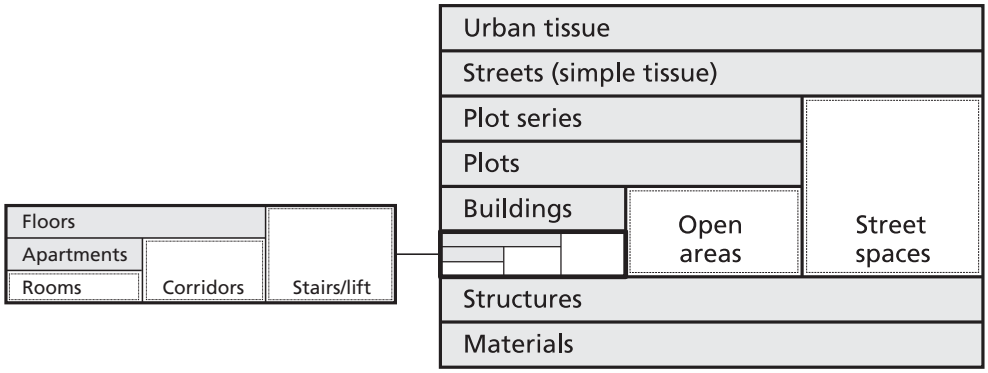


Figure 4. A multi-level diagram representing the generic structure of a typical Insula block. Source: © Karl Kropf.

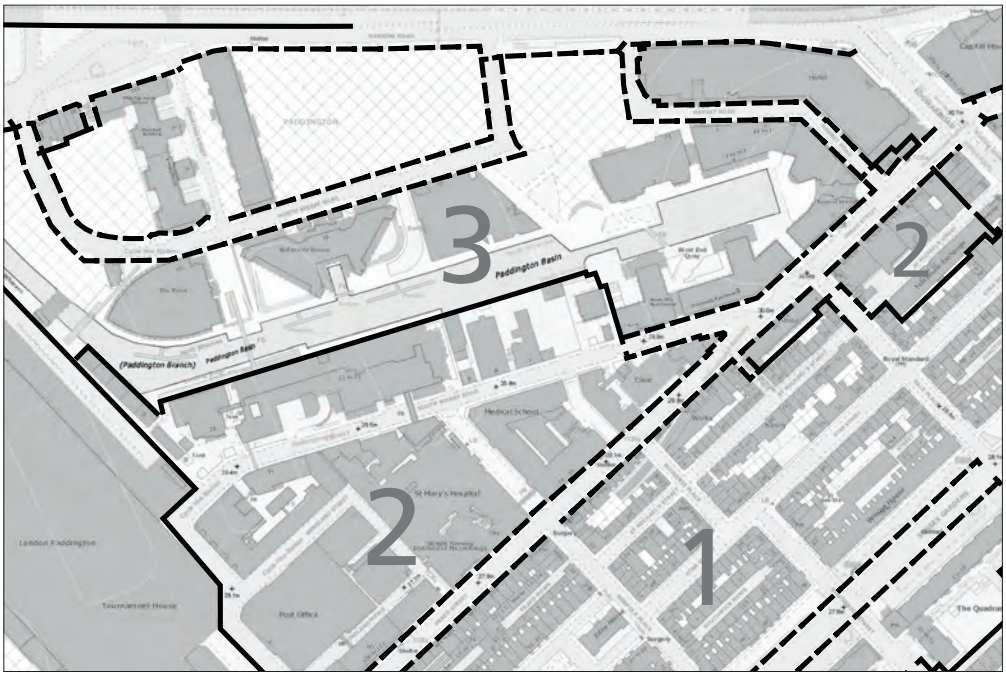


Figure 5. A plan illustrating the Paddington Basin area of London, identifying the distinct urban tissues, each with a distinct generic structure. Source: Mapping © Crown copyright and database rights 2021 Ordnance Survey 100025252.

multiple occupancy and include some kind of shared vertical circulation core and floors with horizontal circulation.

The resulting generic configuration of the Paddington Basin type is shown in Figure 6. In all three cases, the number of levels in the diagram is the structural depth of the tissue. Interestingly, comparing the Praed Street type (fig. 3) and Paddington Basin, it can be seen that both have the same number of levels but the depth is situated in different places within the structure. In the case of Paddington Basin, it is contained mainly within the building while in Pread Street it is within the subdivisions of the block.

TERRITORIAL DEPTH

Comparing the different examples of tissue as mapped onto the diagram of generic structure shows that there is a clear relationship between structural depth and territorial depth. In simple terms, at the generic level, increasing the structural depth *of spaces* increases territorial depth. In the diagram, the territorial depth is represented by the 'horizontal section' running through the voids or spaces. The depth is the number of generic spaces from one side to the other. In the case of the Neolithic settlement (fig. 2), there are just the three primitive types of structured space. The same is also the case with a simple settlement or tissue such as Praed Street (fig. 3) containing buildings, plots, and plot series, although there is an increase in structural depth higher in the diagram. With the introduction of multiple occupancy, multi-storey buildings in the example of the insula tissue (fig. 4), the structural and gene-

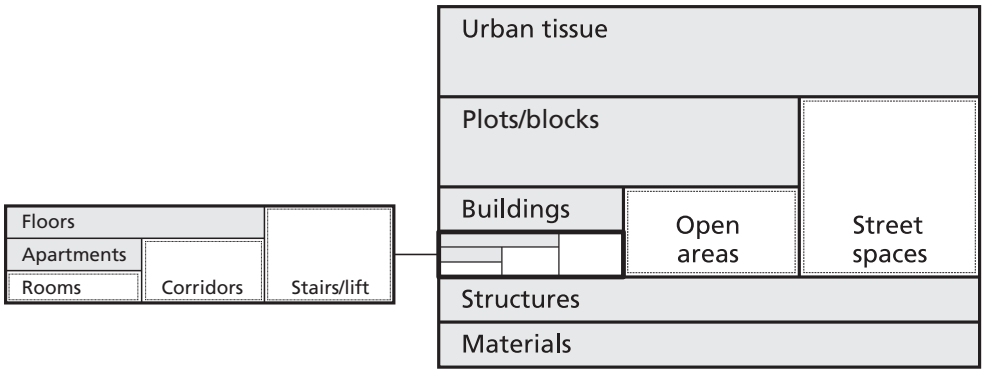


Figure 6. A multi-level diagram representing the generic structure of tissue 3 in the Paddington Basin area from Figure 5. Source: © Karl Kropf.

ric territorial depth are both increased relative to the Neolithic settlement and simple settlement. In the Paddington Basin type, the structural depth is the same as found in the simple settlement (or Praed Street, as noted above) while the territorial depth is greater but, again, located within the building.

CONFIGURATIONAL DEPTH AND THE NOLLI STRING

Before going on to interpret the differences between the mappings above, it is important to note that they illustrate the *generic* territorial depth of the different settlements or tissues. As used by Habraken and developed by Scheerlinck,[23] an analysis of territorial depth entails distinguishing all the specific spaces and subspaces through which one passes when moving from a public space into a plot and building to a private space. So, for example, if there are stairs and a porch or a stoop leading to the front door of a building, these increase the territorial depth. For convenience, the sequence of spaces can be referred to as a Nolli string, in honour of Giambattista Nolli and his renowned map of Rome depicting streets, enclosures, and buildings but also the interiors of public buildings. To formalize the definition, a Nolli string for a given building in its plot is the most direct sequence of spaces leading from the public street that gives access to the plot to any occupiable space in the building.

In order to better visualize and quantify territorial depth, it is helpful to follow the conventions as used by Steadman rooted in graph theory while also drawing on those of Hillier and Hanson and Scheerlinck. This involves representing the sequence of spaces as a graph with each distinct space and subspace being assigned a vertex and the opening from one to the next represented as an edge. The most public space that gives immediate access to the plot is identified as the root space and a Nolli string is the shortest simple path from the root space to any end node. The total number of vertices in a simple path to a given end space is the specific territorial depth and the longest string is the maximum territorial depth of the plot/building.

Within the terms of space syntax, a Nolli string can be seen as a subset of a J-graph of the plot/building with the root space taken as the public street that gives immediate access to the plot/building. A further representational step is to map the string onto the horizontal section through the voids of the diagram of generic structure, which can be termed the Nolli section. The mapping involves inscribing the vertices and edges of the string onto the diagram so that all of the specific spaces and subspaces within a generic type are placed in linear/depth sequence within the appropriate polygon of the diagram (fig. 7).

Broadly speaking the axis of the string represents a gradient from public to private. But as the discussion of the Neolithic settlement exposed ambiguities in the definition of 'public', the definition of 'private' cannot usefully be limited to the end node of a string. Privacy has many dimensions,[24] in part highlighted by the case of the balcony. While a balcony is an end point on a string, it can be eminently public because any occupants will be visible and audible from public spaces. The combination of visibility, audibility, and protection provided by the balcony has been exploited by religious and political leaders and activists throughout history, from the Popes at the Vatican to Mussolini in Palazzo Venezia, Eva Perón at Casa Rosada, and Julian Assange from the Ecuadorian Embassy in London. More recently, the combination has also provided a means of maintaining both social contact and distance within the context of the coronavirus pandemic. 'Private space' might therefore be considered to entail, as a kind of structural minimum, a combination of the position along a Nolli string (depth within the configuration) and the type of space in terms of number of openings, the centrality of the space, and its orientation toward and visibility/audibility from the public realm. While access, depth, and centrality are captured—visually and computationally—within a graph representation, visibility is not. A complementary representation is therefore to map the string onto the Nolli section of the generic

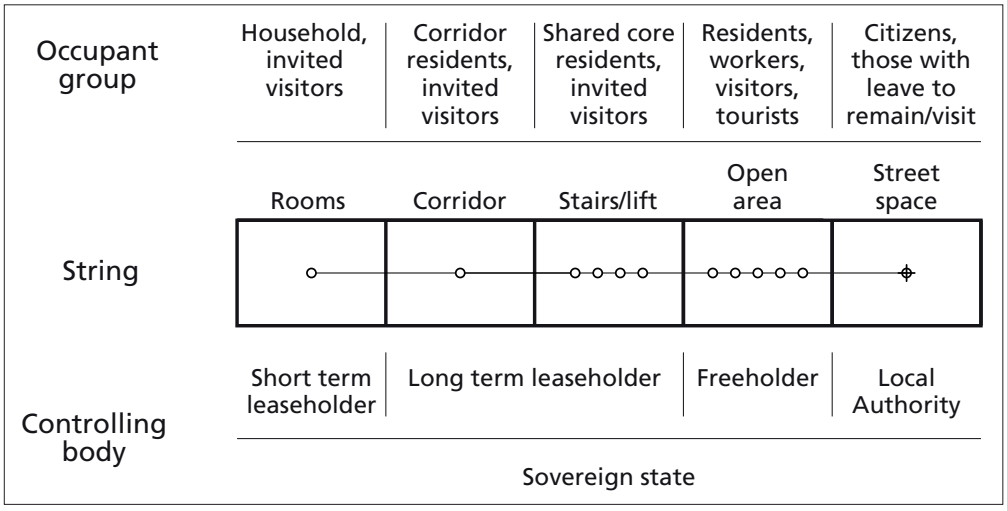


Figure 7. A diagrammatic representation of a Nolli string for a residential tower showing boundaries of control and occupant groups. Source: © Karl Kropf.

structure diagram and allow for folding of the string. In the case of the balcony, this results in the vertex of the balcony being placed in the polygon for 'enclosures' and the edge folded back onto the main string.

DEPTH OF CONTROL

The final indicator of depth to consider is the depth of control. As a preface, control is here interpreted as a general aspect of urban form encompassing a wide range of relationships between humans and physical built form, as well as the land on which it sits, including occupation, ownership, administrative and regulatory regimes, legal jurisdiction, and sovereignty. The brief discussion above in examining early settlements questioned whether the notion of 'public space' made sense outside the context of such a range of relationships as embodied in the tacit or explicit customary structures and institutions of a distinct social group. Public space has a physical manifestation but it is constituted and maintained as such by agreed rules of social interaction and behaviour. From this perspective, the tracks leading to and from Neolithic settlements, if set within a wider territory without any overall control by a tribe, would not be public in the sense that a street in London is public. As suggested in the discussion, what might be considered a 'proto-public realm' lies within the enclosure, which is the shared, common good of the group based on the customary understanding of the individuals in the group about their mutual relationships with each other and the group as a whole. It is out of that proto-public realm that a more truly public realm emerges with the city state and the structural deepening of its physical form. Similarly, the tracks or roads between settlements only really become 'public' with the emergence of supra-settlement control exercised by a federation, league or accord of groups, or as imposed by royal or imperial powers.

What emerges from seeking to clarify what is properly public is a hierarchy of control, of and by social groups. The hierarchy provides the framework of social structures and institutions that gives the notion of 'public' its being and meaning. Today, in the global north, such hierarchies generally include:

- Sovereign states (country or nation)
- Regional or federated state authority
- Department/Province/County/District authority
- Municipality or city authority

The scope of this article does not allow a fuller exploration of the many variants of such hierarchies but it is sufficient to note that each entity within it generally exercises control over an area with distinct boundaries. In general, the hierarchies are nested, with the spatial extent of entities lower down contained with those higher up and with no overlapping boundaries between entities of the same level. The hierarchies also tend to work on the basis that the structures and institutions embodied in the higher-level entity, such as the legal system and national laws, apply equally to the lower level bodies, though this is not invariably the case.

Of course, the exercise of control is not just limited to public bodies but extends to private entities that exercise control over others, depending on the structure of the legal system in operation. This extends the overall hierarchy of control. In the case of the UK, for example, property law allows for:

- Freehold (ownership in perpetuity)
- Long-term leasehold tenancy
- Short-term leasehold tenancy
- Sublet tenancy
- Owner/tenant occupation.

Even a quick reflection on the common English term for a person or company that leases property—landlord—points to the historical fact that the control over private land in the United Kingdom has its roots in the feudal system in which private landowners were empowered and obliged to undertake local public administration and justice. Private landowners were an extension of the state apparatus of control.

So, in the same way that we speak of the structural depth of physical form, there is an analogous structural depth of control. The more levels in the hierarchy, the greater the structural depth of the system. It is then also possible to inscribe the levels of control onto the Nolli section and correlate them with physical form as shown in Figure 7. In this case, the nature of the occupant group and the controlling body has been correlated to the generic types of space.

MULTIPLE DEPTH ANALYSIS: QUALITIES, RELATIONSHIPS, AND THE CIVIC

The example shown is a Nolli string into an apartment house within the Paddington Basin development with access from Praed Street. A notable feature of the example is that there is a compression of territorial depth in the open area (plot) while there is less depth within the building, despite there being more structural and generic territorial depth than is characteristic of Praed Street (fig. 3). The greater specific territorial depth and complexity within the plot is a manifestation of the attempt to create a quasi-street-like environment on what is a very large plot under the control of a private body.

Setting aside the issue of control by a single private body for the moment, the questions that should be raised from a design perspective are: Does the more complex, quasi-street-like environment have other positive qualities of streets? Conversely, do the semi-public spaces within the buildings have positive qualities appropriate to their position within the string? What is the experience along the whole string? As importantly, what are the knock-on consequences for other lines of movement and for experience of the whole tissue? As a comparison of the three tissues in the Paddington area shows, there can be significant differences in the generic configuration of the tissues, as indicated by the combined measures of depth, and corresponding differences in the richness of experience.

The combined indicators of depth as summarized in Figure 7 and the differences in the generic structure of tissues also point to another realm of engagement for design. That is, while the generic structure of physical form and the hierarchy of control are similar in principle, the relationship between the two is fundamentally variable, both spatially and over time and, as importantly, in how the boundaries are interpreted and observed by people using the spaces. A legitimate area for design exploration and innovation is the different potential relationships between the occupant group, the physical structure, and the controlling body. To a large extent this is to say, the three always go together in some form, but there is a choice in the consideration of which go together and in what ways. A large plot with complex buildings might be owned by a cooperative or it might be subdivided into smaller holdings for subgroups. If urban design is always an expression of the powers exercised in that combination - occupant groups, physical form, and controlling body - designers at least should have an awareness of those relationships.

Looking at the variability between physical form and control more broadly from the perspective of the developmental evolutionary thought experiment provides a further insight. In general, the transition from Neolithic settlement to city state, nation state, and empire has involved a progressive spatial expansion of the area within which the customary legal social pact establishing the *res publica* applies. The boundaries of that area—the enclosing palisade, the city wall, and national and imperial borders—are in many ways fundamental to the meaning of what is public. The public is both the place and the group taken together and one of the key roles of the social group or state is the maintenance and control of the borders, including who to allow in and monitor what they do.[25] From a global, transnational perspective then, it might be said that any given *res publica* is only semi-public. The freedom to walk and use any given public realm is limited to citizens and admitted guests. Put another way, is there a transnational *res publica*, a place where any person of whatever origin is 'free' to walk the streets as a 'citizen' as opposed to an alien?

The aim of this digression is to highlight and reinforce the idea articulated by Solà-Morales that the semi-public realm is not an exception but ubiquitous, that there are kinds and degrees of 'publicness'. For the purposes of analysis, critique, and design, a starting point should therefore be to acknowledge, and where necessary, delimit the boundaries of the different realms, to investigate the nature of the social entities that control them, and to understand the relationships and social pacts that constitute those social entities, whether public authority or private organization. As designers, we should also seek to reconcile the different semi-public realms so they work together as a whole and to understand the qualities and spatial relationships that make places feel more or less public.

We cannot assume that what may seem to be the 'normal' freedoms as granted to us as citizens apply to all people, in particular to the marginalized, dispossessed, and oppressed. We should not take for granted the freedoms that have been won from the extended negotiations within and between states to allow mutual access to the public realms in different parts of the world. Nor can we take for granted that nations that have historically practised and condoned a commitment to openness and liberty will continue to do so or continue to define that liberty in the same way. The civic is constantly being renegotiated.

NOTES

[1] Bill Hillier and Julienne Hanson, *The Social Logic of Space* (Cambridge: Cambridge University Press, 1984).

[2] N. John Habraken, *The Structure of the Ordinary* (Cambridge, MA: The MIT Press, 1998).

[3] M. R. G. Conzen, *Alnwick, Northumberland: A Study in Town Plan Analysis* (London: Institute of British Geographers, 1969); Gianfranco Caniggia and Gian Luigi Maffei, *Architectural Composition and Building Typology: Interpreting Basic Buildings* (Florence: Alinea, 2001); W. Brian Arthur, *The Nature of Technology: What It Is and How It Evolves*, reprint edition (New York: Free Press, 2011); Karl Kropf, *Handbook of Urban Morphology* (Chichester: John Wiley & Sons, 2017).

[4] Peter Lee, 'Why Private Capital Will Dominate Markets for the Decades to Come', *Euromoney*, 11 April 2019, https://www.euromoney.com/article/b1dx148qjztwp3/why-private-capital-will-dominate-markets-for-the-decades-to-come (all URLs accessed in April 2021).

[5] John R. Gold, 'The Making of a Megastructure: Architectural Modernism, Town Planning and Cumbernauld's Central Area, 1955–75', *Planning Perspectives* 21, no. 2 (2006), pp. 109–31; Valentin Bourdon, 'The Tragedy of the Megastructure', *Histories of Postwar Architecture* 3, no. 1 (2018), pp. 105–16.

[6] Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, 5th ed. (Cambridge, MA: Harvard University Press, 1967).

[7] See Gold, 'The Making of a Megastructure', for an account.

[8] Vito Acconci, 'Public Space in a Private Time', *Critical Inquiry* 16, no. 4 (1990), pp. 900–18; Mike Davis, *City of Quartz: Excavating the Future in Los Angeles* (New York: Verso Books, 1990); Kristiaan Borret, 'ON DOMAINS: The Public, the Private and the Collective', *OASE* 54 (2001), pp. 50–61; Setha M. Low, 'The Erosion of Public Space and the Public Realm: Paranoia, Surveillance and Privatization in New York City', *City & Society* 18, no. 1 (2006), pp. 43–49.

[9] Manuel de Solà-Morales, 'Openbare en collectieve ruimte: de verstedelijking van het privédomein als nieuwe uitdaging', *OASE* 33 (1992), pp. 3–8; Manuel de Solà-Morales, 'The Impossible Project of Public Space', *public space, Centre de Cultura Contemporània de Barcelona*, 14 February 2013, https://www.publicspace.org/multimedia/-/post/the-impossible-project-of-public-space.

[10] Lionel March and Philip Steadman, *Geometry of Environment* (London: RIBA Publications Ltd., 1971); Philip Steadman, *Architectural Morphology* (London: Pion, 1983); Hillier and Hanson, *The Social Logic of Space*.

[11] Habraken, *The Structure of the Ordinary*.

[12] Kris W. B. Scheerlinck, 'Privacy and Depth Configurations: Proximity, Permeability and Territorial Boundaries in Urban Projects', in *Revealing Privacy: Debating the Understandings of Privacy*, edited by Margherita Carucci (Bern: Peter Lang, 2012), pp. 89–104.

[13] Saverio Muratori, 'Studi per una operante storia urbana di Venezia', in *Palladio* (Rome: Istituto Poligrafico dello Stato, 1959); Caniggia and Maffei, *Architectural Composition and Building Typology*; Conzen, *Alnwick, Northumberland*.

[14] Arthur, *The Nature of Technology*.

[15] Karl Kropf, 'Ambiguity in the Definition of Built Form', *Urban Morphology* 18, no. 1 (2014), pp. 41–57; Kropf, *Handbook of Urban Morphology*.

[16] Kropf, 'Ambiguity in the Definition of Built Form'.

[17] Muratori, 'Studi per una operante storia urbana di Venezia'; Caniggia and Maffei, *Architectural Composition and Building Typology*; Arthur, *The Nature of Technology*.

[18] Stuart Rathbone, 'A Consideration of Villages in Neolithic and Bronze Age Britain and Ireland', *Proceedings of the Prehistoric Society* 79 (2013), pp. 39–60.

[19] Kropf, *Handbook of Urban Morphology*.

[20] On the basis that Neolithic sedentism was agriculturally based, the settlement would have included both the agricultural fields and the palisaded enclosure. Both are generically 'enclosures'.

[21] Glenn R. Storey, 'Regionaries-Type Insulae 1: Architectural/Residential Units at Ostia', *American Journal of Archaeology* 105, no. 3 (2001), pp. 389–401.

[22] Jean Castex, Jean-Charles Depaule, and Philippe Panerai, *Formes urbaines: de l'îlot à la barre* (Paris: Dunod, 1977).

[23] Habraken, *The Structure of the Ordinary*; Scheerlinck, 'Privacy and Depth Configurations'.

[24] See, for example, Carucci, *Revealing Privacy*.

[25] Nira Yuval-Davis, Georgie Wemyss, and Kathryn Cassidy, *Bordering* (Cambridge: Polity Press, 2019).

BENEFITS AND CHALLENGES OF ADDING PARTICIPANT PHOTOGRAPHY TO QUALITATIVE RESIDENTIAL RESEARCH

Kiran Maini Gerhardsson

ABSTRACT

This article discusses the benefits and challenges of adding participant-produced photographs to qualitative interviewing. The analysis is based on two qualitative studies aimed at improving the understanding of how residents experience and use their a) luminaires and b) window openings. A convenience sample (N = 12) was asked to take photographs of all luminaires in their apartments. Facilitated by the photo albums, semi-structured interviews were then held in the participants' homes and the researcher made observer-based environmental assessments of the apartments. The same procedure was used in the second study investigating window openings, with a new convenience sample (N = 20). Here, participants were asked to include between one to three keywords for each image when submitting the images prior to the home visit.

The reseracher experienced several benefits when combining verbal methods with imagery: discussion of the photos created more relaxed and focused conversations, enabling time-efficient interviews with improved data quality. Adding keywords to the images prompted further discussion and thereby additional information. It is suggested that the identified benefits outweigh the disadvantages, such as more time needed for data collection. This article supports findings in recent literature on qualitative research that adding participant-produced photographs to interviews has multiple benefits in knowledge production, from the perspectives of both the researcher and the participant.

KEYWORDS

Residential, user experience, participant photography, photo-elicitation interviews

INTRODUCTION

Knowledge of user needs and preferences concerning electric lighting, daylight, and room darkening in homes is limited. This was the motivation for conducting the two studies in the field of environmental psychology on which this article is based: the investigation of the use of indoor home lighting and window openings, and the role these artefacts play in residents' everyday living. Findings from the studies are reported elsewhere.[1] The focus of this article is on the method used in both studies: the combination of participant photography and qualitative interviews conducted in the field.

Photo-elicitation was assumed to offer an insightful research method. The decision to add participant photography and observer-based environmental assessments to the qualitative interviews is consistent with the author's pragmatic approach to conducting research: the production of useful knowledge allows either quantitative or qualitative research approaches, or both, in ways that offer the best opportunities to answer the research question.[2] Visual material, as a tool for communication, has also been central to the author's professional experience of creating architectural work as well as book illustrations.

The objective of this article is to identify both benefits and challenges of adding participant photography to qualitative interviewing aimed at examining user experiences of cultural inventories of the physical home environment. The article is divided into four parts. The first part begins with a short background to the conducted studies, and then photo-elicitation in research is presented (the terminology, the historical use of visuals in different disciplines and various reasons for including visual data in scientific research). The second part gives a detailed account of the methods used in both studies. The third part presents and discusses both benefits and challenges relating to participant photography and its contribution to the empirical findings. The article concludes with the most important insights.

Background

The rapid advancement in lighting technology has opened a window of opportunity for a universal design of interior home environments: new lamp technologies with variable intensity and colour temperature can be controlled, either manually or automatically, to fit residents' different needs and wants depending on age, culture, and other individual characteristics.[3] When daylight is available, the home environment has to permit

maximising, shading, or blocking it. Both luminaires and physical design features of the home environment are central to residents' exposure to light and dark, which, in turn, influence visual performance, experience and comfort (image-forming effects), and circadian regulation and alertness (non-image-forming effects).[4]

Not only do individual biological lighting needs and lighting preferences among healthy people justify the universal design of homes, or 'design for all', but so does the on-going demographic shift. The proportion of older people is increasing[5] and policy goals state that older people should be able to carry on living independently in their homes as long as possible. Living independently and in-home care demand special attention in the design of both physically and visually accessible homes.[6]

In times of accelerated change in technology, more research is needed on user experiences of products and the physical home setting. Qualitative methods, such as interviews and observations, are considered to be appropriate techniques for increasing understanding, but how do we get the most out of research interviews?

Photo-Elicitation in Research

Participant photography belongs to a wider research method named photo-elicitation which is defined by Harper as being 'based on the simple idea of inserting a photograph into a research interview'.[7] This wider use of photography is included in the guide *Visual Methodologies* by Rose who explains how photo-elicitation (i.e. using photographs to encourage interview talk), photo documentation (i.e. using photographs as documentary evidence), and further use of photos in research are distinct from other approaches to visual materials:

> because they do not work with 'found' images that already exist distinct from a research project: Hollywood films or family snaps, for example. Instead, they work with images that are made as part of a research project. The images can be made by the researcher, or they can be made by the people they are researching; and they can take the form of film or still photos, maps or diagrams . . . or drawings . . . . Importantly, these are not images that simply illustrate some aspect of the research project: what Marcus Banks (2001, p. 144) calls a 'largely redundant visual representation of something already described in the text'. Instead, in these methods,

> the images are used actively in the research process, alongside other sorts of evidence generated by interviews or ethnographic fieldwork.[8]

Rose divides the use of participant-produced photographs in research into two categories: photos can be supportive or supplemental.[9] When photos are supportive, they are used to encourage interview talk and they are subordinated to the researcher's interpretations. When photos are used as visual supplement to the written text, they are analysed as images on their own terms.

Photo-elicitation has been widely used in anthropology, sociology, human geography, health care, and action-oriented research addressing problems facing a particular community (photovoice). Although photo-elicitation for research purposes is limited within the psychology discipline,[10] photographs taken by clients have been used in photo therapy guided by a mental health professional to improve their well-being.[11] Environmental psychology researchers have used still photography or videos for environmental simulations in laboratory settings, that is, representations of already existing or planned environments, and for behavioural mapping in observational studies.[12] For an overview of photo-elicitation in previous psychology research and a step-by-step guide for psychology researchers, see Bates et al.[13]

Why use photo-elicitation in research? To evaluate the choice and use of visual methods, Pain reviewed 109 research reports published between 2000 and 2010, finding two categories of given reasons: 1) the enrichment of data collection or presentation, that is, improving the quality and depth, or 2) the relationship between participants and researchers, for example acknowledging participants' expertise, addressing the imbalance of power between researcher and participant, or effecting change within a community. Non-instrumental use of visual information was excluded in the review, that is, studies using the visual for its own sake.[14]

Departing from 'The Integrated Framework of Visual Methods' proposed by Pauwels, there are a number of additional issues to be considered by researchers opting for the use of photo-elicitation techniques.[15] During *the input phase*, the researcher has to decide on the origin and nature of the photos, which relates to the reasons for choosing photo-elicitation. Photos can be produced by participants,[16] the researcher,[17] or both[18]. The subject matter can be, for example, material culture, behaviour, elicited behaviour of a verbal or

visual nature, or concepts. The visual medium in photo-elicitation studies can be photography or film.

Investigating the role played by the physical setting in patients' recovery, Radley and Taylor asked patients to take photos of their hospital ward and then interviewed them both in the hospital and in their homes.[19] In another photo-elicitation study, the subject matter was the patients' preferences and appropriation of social spaces in the hospital environment.[20] Patients were asked to take photographs of places at the hospital that they would associate with pre-written questions and then answer them on one of 20 researcher-selected 'postcards' with images. In a study exploring suburban lived experiences, participants compiled a photo diary with images of at least ten aspects of the suburb, either good or problematic.[21]

In the *processing phase*, the researcher has to take decisions regarding the processing of the photos.[22] The analytical focus may involve a detailed analysis of the photo: the content, how it is depicted, or the visual form based on a theoretical foundation for visual analysis. When photo-elicitation is used in interviews, the focus is on the respondents' feedback on the photos. According to Pauwels, additional issues at this stage are visual competencies (e.g. the researcher's technical knowledge of photography and editing, sampling, and data production strategies), providing the necessary context when presenting the photos in reports, ethical issues regarding how recognisable participants are in the photos, and the question of copyright.[23]

The final issue for researchers to consider is in the *output phase* and involves how photos should be presented as well as their status in the final work.[24] In some cases the purpose of participant-produced photos is to communicate desired improvements in the community to decision-makers.[25]

Like non-visual research methods, such as verbal-only interviewing, the use of photo-elicitation is purpose-driven, that is, the ways in which photos are collected, analysed, and presented will depend on the aim of the study and reasons for including the photo-elicitation technique.

MATERIAL AND METHODS

Qualitative interviewing in the field, photo-elicitation, and observer-based environmental assessments (OBEA) were used to deepen the understanding of residents' experiences with artefacts (luminaires and window openings)

in their home environment. The main motivation for adding participant photography to the research design was an expectation that this would elicit more information from the research interview because it can encourage participants to talk and reflect.[26] Photos can be especially effective when they involve something that is visual, such as objects or people, compared to less concrete day-to-day phenomena.[27] The purpose of the interviews was not to make statistical generalisations, but analytical ones.[28]

My Home Lighting: Participants

The study was carried out in people's private homes. A convenience sample was recruited, consisting of six female and six male residents aged 26 to 76, with a variety of household size, housing tenure type, and dwelling size (see Appendix, Table A1). Inclusion criteria were Swedish-speaking adult residents living in apartments located in Lund or the adjacent city of Malmö. People in the researcher's network were approached and asked to invite contacts in their respective networks to participate in the study (close friends of the researcher were excluded). This sampling technique was preferred because people can otherwise be reluctant to agree to interviews in their private homes. As an incentive, the participants received either three lottery tickets or a movie voucher upon completion.

My Home Lighting: Material

The study was guided by the following question: 'How are luminaires used in homes and what are the residents' needs and wants regarding home lighting?' Information and material obtained were digital recordings of interviews, participant-produced images of their home lighting, floor plans, and observer-based environmental assessment (OBEA) forms completed in situ by the researcher (see Figure 1). The purpose of the initial walk-through and the environmental assessment was to ascertain if the participant had taken photographs of each luminaire and not accidently missed any, to see the luminaires in the actual setting, to record interior features relevant to the lighting situation, and to form an impression of the home lighting before carrying out the interview.

My Home Lighting: Procedure and Analysis

An invitation e-mail was sent to the participants explaining the purpose of the study and providing information about the requirements: a copy of the floor plan, if available, and information that a series of participant-produced photographs of residents' luminaires were to be taken before the home

Table 1. Contextual information for the two studies based on 'The Integrated Framework of Visual Methods': The 'Origin and nature of visuals' equals the input phase, 'Research focus and design' correspond to the processing stage, and 'Format and purpose' to the output phase.[29]

Characteristics	My Home Lighting	My Window Openings
Aim of study	To examine residents' needs and desires concerning interior home lighting in everyday situations, based on residents' experiences with their home lighting and perceptions of their luminaires. A second aim was to examine the key factors influencing residents' lighting choices.	To examine the role of window openings in homes: their contribution to the lighting situation and residents' dwelling experiences during the day and night.
Origin and nature of visuals (input phase)	*Origin/production context* Researcher-initiated production of visuals (not pre-existing visuals): participants were instructed by the researcher to take photos of their luminaires. *Subject matter* Artefacts (luminaires) and elicited behaviour were in focus. *Visual medium/Technique* Photography, using a camera phone or a single-use camera.	*Origin/production context* Researcher-initiated production of visuals (not pre-existing visuals): participants were instructed by the researcher to take photos of their window openings and room interiors, and to write keywords. *Subject matter* Artefacts (window openings) and elicited behaviour were in focus. *Visual medium/Technique* Photography, using a camera phone.
Research focus and design (processing phase)	the researcher at the end of the interview. Image-external context was provided in end reports, i.e. photos were supplemented with other kinds of data findings, such as informants' responses.	or family. Recorded interviews in situ provided the contextual information relating to the photos. Permission to use the photos without naming the photographer was obtained by the researcher at the end of the interview. Image-external context was provided in end reports, i.e. photos were supplemented with other kinds of data findings, such as informants' responses.
Research focus and design (processing phase)	*Analytical focus* Photo-elicitation, i.e. analysis of participants' feedback on visual stimuli (photos). *Theoretical foundation for visual analysis* Photos were not analysed, since the role of the visuals was to support the interviews, which were analysed thematically. *Methodological issues* A convenience sample with a variety of household size, housing tenure type, and dwelling size (see Table 2). Participants were offered a single-use camera. Recorded interviews in situ provided the contextual information relating to the photos. Permission to use the photos without naming the photographer was obtained by	*Analytical focus* Photo-elicitation, i.e. analysis of participants' feedback on visual stimuli (photos) and verbal stimuli (written keywords). *Theoretical foundation for visual analysis* Photos were not analysed, since the role of the visuals was to support the interviews, which were analysed thematically. *Methodological issues* A convenience sample with a variety of household size, housing tenure type, and dwelling size (see Table 2). Participants without a camera phone were offered a single-use camera. Older participants, unable to take photos, were assisted by friends
Format and purpose of visuals (output phase)	*Output/presentational format* Selected photos were used as examples of produced visual data in articles and oral presentations. *Status of the visual* Photos were intended as facilitators and prompts in qualitative interviewing and not as the end product. *Intended and secondary uses* See above.	*Output/presentational format* Selected photos were used as examples of produced visual data in articles and oral presentations. *Status of the visual* Photos were intended as facilitators and prompts in qualitative interviewing and not as the end product. *Intended and secondary uses* Selected photos of appropriate technical quality were intended to be used as examples of various challenges of the home setting in future communication with practitioners and popular writing.

visit. Participants who accepted the invitation were later given the following instructions by post: 'Please take photos of all the luminaires in your home with a camera phone, single-use camera or another type of camera, but no more than twenty-five images. Do one room at a time. You may include several luminaires in one image, or one per image, if the total number allows this. You are free to decide view angle, distance range to the luminaires, time of day, etc. Avoid including faces of people in the photos.' They were also given a limit of file size (approximately 1 MB). Two weeks were given to complete the assignment. Prior to the interviews, the images were assembled by the researcher in an album (see Figure 1a).

Home visits began with a walk-through with the participant who was asked to turn on any unlit luminaires. During the walk-through, observations of interior features relevant to the lighting situation were continuously recorded on a prepared form and on the floor plan. Features observed were the colour tone of the light sources (warm or cool), surface colours of flooring and walls (light, medium, or dark), window openings, and visible candlesticks (see Figure 1b). No lighting measurements were taken, as the aim of the inquiry was to obtain participants' experiences with their home lighting and perceptions of their luminaires.

Table 2. Participant characteristics in the two studies.

Characteristics	My home lighting	My window openings
Participants	$N = 12$. *Mdn* = 43 yr (*M* = 46 yr), range = 26–76 yr. 50% females.	$N = 20$. *Mdn* = 57.5 yr (*M* = 66.5 yr), range = 24–93 yr. 50% females.
Household size	Single person ($n = 8$). Multi-person, two adults ($n = 3$). Multi-person, adults + children >12 yr ($n = 1$).	Single person ($n = 8$). Multi-person, two adults ($n = 8$). Multi-person, adults + children >12 yr ($n = 4$).
Dwelling size	26–107 m^2	33–114 m^2
Housing characteristics (building year, location, housing tenure[a])	1880–2006. Lund and Malmö. Rented ($n = 7$), tenant-owned ($n = 5$).	1912–2011. Lund, Malmö, and Eslöv. Rented ($n = 4$), tenant-owned ($n = 16$).
Data production (photography and interviewing)	Eight weeks from October to November 2015.	Ten weeks from March to May 2017.

[a] *'Tenant-owned dwelling' refers to a common tenure model in Sweden. The tenants own a share of the housing association which in turn owns the building. Tenants can sell their share and the tenancy rights.*

Figure 1a. 'My Home Lighting':albums with participant-produced photographs served as facilitators in the interviews

Participant no 1: female, 31 years.
Time of visit: 18:30, 2 November 2015.
Studio apartment, ceiling height 2.7 m, construction year 1936, rental.

Room	Height of window sill	Blank wall: Yes/No	Wall finish: Light/ Medium/ Dark	Visible candle-sticks: Yes/No	Colour tone of the lamp: Warm/Cool	Daytime: Lights on/ Blocked daylight	Bathroom luminaire: Wall/Ceiling/ Integrated
Hall	–	No	Light	No	Warm	–	
Kitchen	Medium	Yes	Light	No	Warm	–	
Bathroom	–	Yes	Light	Yes	Warm	–	Wall mounted
Bedroom area/living room	Medium	Yes	Light	Yes	Warm	–	

Figure 1b. 'My Home Lighting': observer-based environmental assessment (OBEA) forms were completed in situ by the researcher to supplement the images.

The interview was semi-structured (see Appendix, Interview guide A1) and the photo album was used as a facilitator. Participants were asked to consider one photo at a time and talk about the luminaire: why it had been chosen and how it was used. If not addressed by the participant during the interview, additional follow-up questions were asked regarding lighting controls, lighting preferences of other household members, past changes to their lighting and desired changes, daylight satisfaction, lighting behaviour (turning off the lights when no one is in the room), and the possibilities to darken the bedroom at night. The recorded interviews varied in length (15–35 minutes) depending on the number of luminaires and on how much participants elaborated on their answers to the researcher's questions. The total duration of the home visit, including the walk-through and the interview, was approximately one hour. Field notes were recorded by the researcher after the visit, including participant characteristics and reflections.

After the collection of all the necessary material, the researcher carried out a thematic analysis following a three-stage process, including moving back and forth between steps.[30] The participant-produced images were not analysed, since the purpose of the photos in this case was to encourage participants to talk and reflect on their choice and use of luminaires.

My Window Openings: Participants

Residents' experiences with daylight and their window openings were explored in a similar way to the home lighting interview study, but with a new set of participants (see Appendix, Table A3).

My Window Openings: Material

The study was guided by the following question: 'How do residents experience their window openings, during day and night?' Information and type of material obtained were similar to the first study: digital recordings of interviews, participant-produced images of their window openings and room interiors, floor plans, and observer-based environmental assessment (OBEA) forms completed in situ by the researcher. Unlike the first study, research material also included keywords or short descriptions added to the images by the participants. The purpose of the initial walk-through and the environmental assessment was to ascertain if the participant had taken photographs of each window opening and not accidently missed any, to see the windows in the actual setting, to record interior features relevant to the research question, and to form an impression of the home before carrying out the interview.

My Window Openings: Procedure and Analysis

Similar to the first study, an initial invitation e-mail was sent to the participants explaining the purpose of the study and providing information about the requirements. This study included a series of participant-produced photographs of the window openings and the room interiors that were to be taken before the home visit. Participants who accepted the invitation to participate in the study received detailed instructions by e-mail and had 20 days to complete the assignment (see Figure 2). Unlike the first study, participants were also asked to assign one to three keywords to each image of the window openings in the hope of encouraging them to further reflect on the topic. The instruction was: 'Include between one and three characteristic keywords that capture something in the picture with the window opening, or something you thought about when taking the picture or looking at it afterwards. . . . If you find it difficult to come up with any keywords, you could imagine the opening has been blocked up so there is no window. What would a wall instead of a window opening mean to your everyday living, day and night?' Prior to the interviews, the images including the keywords, were assembled by the researcher in an album (see Figures 3 and 4).

Home visits began with a walk-through with the participant who assisted in taking some of the measurements, such as the height of the windowsill above the floor. During the walk-through, observations of interior features relevant

1. Please take photographs of every window opening in your home using a camera phone or another type of camera, but no more than **25 images**. The focus is on the window opening and not the design of the window.
   – Stand in a room with a window opening (or a glazed balcony door) in the wall. Position yourself in front of the window opening and take a picture. Distance is optional. You may supplement with additional photos of details if there is anything you would like to draw attention to. The window can be open or closed.
   – Then turn around and take a picture of the room view with the window right behind you.
   – Move to the next window opening in the room or to the next room. Proceed as above until you have taken pictures of all window openings.
   . . .

Figure 2. 'My Window Openings': Excerpt from instructions sent by post.

to the lighting situation were continuously recorded on a prepared form and on the floor plan. Features observed were:

- the placement of air intakes,
- inward or outward opening windows,
- external shading devices,
- fabric of interior shading,
- surface colours of flooring and walls (light, medium, or dark),
- colour of window frames, mullions, and glazing bars (light, dark),
- electric lighting turned on or/and shaded windows during daytime,
- type of room darkening,
- splay angle of window reveals,
- window recess measurement,
- windowsill height,
- size of window opening (for later calculation of window to external wall ratio),
- glazing size and room floor area (for later calculation of glazing to floor ratio).

The interview was semi-structured (see Appendix, Interview guide A4) and the photo album was used as a facilitator. Participants were asked to consider one photo at a time and respond to the following question: 'Imagine the window opening has been blocked up and there is no window anymore. How would it affect your use of the room and your dwelling, during the day and night?' If not addressed by the participant during the interview, additional follow-up questions were asked regarding, for example, satisfaction with and use of daylight, the possibilities to darken the bedroom at night, and preferences of other household members. The recorded interviews varied in length (30–75 minutes), and the total duration of the home visit, including the walk-through and the interview, was between one and two hours. Field notes were recorded by the researcher after the visit, including participant characteristics and reflections. Collected material was analysed following the same process as in the first study.[31]

Findings and Discussion

The findings of this article concern the role of participant photography in two studies. Based on these findings, grouped according to the different phases, I will discuss and reflect on the value of camera-based imagery in research on cultural inventories of home settings, and whether initial expectations of

generating more information from the research interviews were met. Unless stated otherwise, the word 'participants' refers to interviewees in both studies.

Observations in the Input Phase

Aspects of time, effort, and abilities in co-production. As in verbal-only interview studies in the field, recruitment takes time for various reasons: people may be reluctant to be interviewed in their private home and interviews and participant photography involve more effort compared to a questionnaire survey. Two volunteers in a previous conventional interview study in a laboratory setting were interested in taking part in the second study. However, they declined after receiving the formal invitation letter because they did not have a phone camera (despite the offer to send single-use cameras).

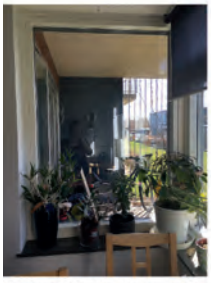
Some of the older participants needed assistance in taking and sending photos. Four older participants in the second study received help from a friend, a spouse, a son, or a daughter. One participant requested a single-use camera. Only two participants needed a reminder to email the photos they had taken. Before submission deadline, a male participant inquired about whether luminaires in the bathroom should be included before the submission of the photos. Other than that, preparation and photo production before the home visit did not present any unexpected complications, suggesting that the instructions were clear to participants in both studies.

Three participants in the first study were explicitly asked about their experience of taking the photos. A female participant living in a studio apartment commented: 'I didn't reflect too much about it, it was easy once I got on with it. But then my apartment isn't so big either . . .'. Another comment by a male participant, living in a large two-bedroom apartment, was: 'It was nothing special. I'm used to taking photos.' A similar sentiment was expressed by another male participant: 'It was just taking photos. Nothing special.' Even though the question was not posed to all participants, there was no indication that the required photography presented any problems to those who had agreed to participate.

The production of photo albums by the researcher comprised the digital assembly of photos and floor plans, when submitted by the participant beforehand, and print outs. In the second study captions with participants' keywords were also inserted. Photos were not edited apart from occasional reduction in size.

Kitchen (1). "Light, contact, sunshine"

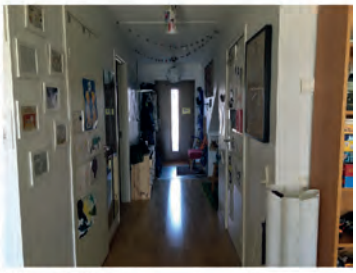
Kitchen (2)



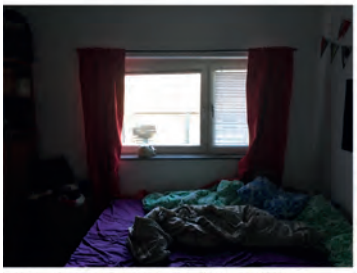
Kitchen (3). "Nature, people, watch"

Kitchen (4)

Living room (1). "Heat, exit, visual intrusion"



Living room (2)

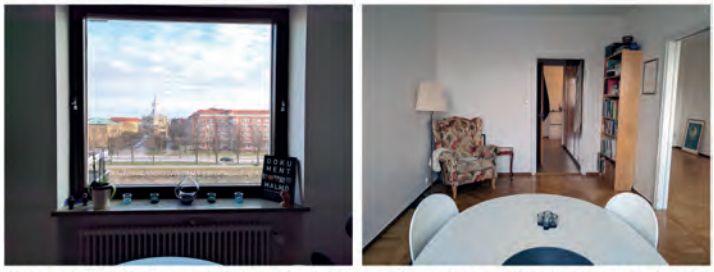


Bedroom (1). "Room darkening, morning"

Bedroom (2)

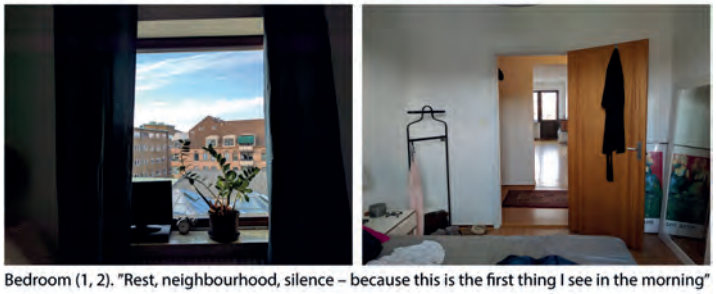
Figure 3. 'My Window Openings': photographs including keywords produced by a female participant, living with her son in a rented one-bedroom apartment on the ground floor. Each pair consists of a view from the inside looking at the window opening, and a view of the room taken from the window opening.

Kitchen (1, 2). "Living, city, everyday life – because I see Malmö Live, St Peter's Church and Turning Torso, which represent 'the city'"



Dining room (1, 2). "Calm, relief, simplicity – because of the influence of the window on the spatial experience and the outdoor view"

Living room (1, 2). "Light, relaxation, security – because of the size of the window opening, the water in the canal and the living room as the 'heart' of the apartment"



Bedroom (1, 2). "Rest, neighbourhood, silence – because this is the first thing I see in the morning"

Figure 4. 'My Window Openings': photographs including keywords produced by a male participant, living with his girlfriend in a rented two-bedroom apartment, 82 m2, on the third floor. Each pair consists of a view from the inside looking at the window opening, and a view of the room taken from the window opening.

Pre-views of artefacts and home settings before home visits. Seeing the images and floor plans prior to the home visit provided an unexpected opportunity for the researcher. The interview could be better planned in relation to the number of items (luminaires or window openings) and matters to bring up in the discussion, such as any items participants might have forgotten to include in their photo collection.

The subsequent home visit and interview provided an opportunity to check the depicted items in the real setting. Two female participants had forgotten to take photos of the luminaires in their bathroom. The former had also forgotten to include the ceiling pendant in the hallway. Another female participant, living in a two-bedroom apartment, had forgotten to include twig branch lights in the bedroom window. She explained that 'they are seldom lit. They were lit yesterday and today, to have some cosy lighting.' A male participant, living in a large-sized two-bedroom apartment (107 m^2), had forgotten to include the luminaires in two bathrooms, a walk-in closet and a small kitchen with no dining area. In the second study, a female participant, living in a two-bedroom apartment, had forgotten the window opening in her pantry.

Additional deviations from photos were observed during the walk-through. A male participant had moved a floor-standing luminaire from one bedroom to the master bedroom because it was only temporarily placed in the other room. A female participant, living with her partner in a one-bedroom apartment, explained why the floor-standing luminaire in the living room was placed in the middle of the room, unlike in the photo. It is moved around depending on where light is needed: beside the armchair or the dining table (the room had one pendant ceiling luminaire in the centre of the room but none over the table). One photo in the second study showed a bedroom window with the venetian blinds pulled down, but opened slats. During the interview, the female participant was asked if this was normal, but she explained that the blinds are usually closed throughout the day and night. Her response prompted further questions as to why she has the blinds closed during the daytime. Privacy can be an issue for some but not for others. An older female participant, living in a two-bedroom apartment, chose not to include the bedroom interior because she regarded it as being too private. Conversely, bedrooms with unmade beds occurred among images taken by younger residents.

Observations in the Processing Phase

Focused and relaxed interviews.

The researcher perceived the interviews supported by images to be more effective in obtaining information compared to previous verbal-only interviews. The photographs were taken by the participants, but they did not see the albums until the interview. With the albums guiding the interview, the conversation stayed focused on the subject matter, namely luminaires or window openings. Another possible contributing factor to the relaxed interview atmosphere was the active involvement of the participant in the initial observer-based environmental assessment. In the first study, the participant was asked to turn on the lights in each room while the researcher made notes and took the measurements. In the second study the participant assisted in measuring the windowsill in each room.

Keywords served as reminders in the interviews.

In the second study, the captions, containing the keywords written by the participants, served as valuable reminders in the interview. For example, a female participant, living in a two-bedroom apartment on the ground floor facing a busy street, had included three keywords to the window opening in her bedroom: 'light, sound, visual intrusion'. She was asked by the researcher to elaborate on 'visual intrusion'. Only then did she remember that she likes a closed curtain by the bed to avoid visual intrusion from the street. During the interview, some participants said it had been difficult to think of keywords for all window openings.

Images convey different types of information.

Although the intention was not to perform a visual analysis of the images, a few characteristics were noticed in the photos. In the first study, the only restriction was the limit on the number of images yet all photos were taken from a standing position. Some participants had chosen to submit more than one photograph of each item. A male participant, living in a one-bedroom apartment, depicted some of the luminaires lit and unlit, as did a female participant, living in a studio apartment. Another male participant, living in a two-bedroom apartment with a balcony visible from the living room, included the exterior LED tree lamp on the balcony.

In the second study, photo shoot instructions were slightly more restricted since the participants were to 'Stand in a room with a window opening . . . Position yourself in front of the window opening . . . '. The lack of variation

among participants' photos was less surprising because instructions left little room for personalisation. A female participant, sharing a two-bedroom apartment with her friend, provided additional photos including details for four of five window openings. A further female participant, living in a two-bedroom apartment with characteristic sight lines across the apartment, chose to show the room interiors with both opened and closed doors. Only one participant, living in a studio apartment, took photos of the window openings during the evening. When asked for the reason in the interview, he explained that he had postponed the assignment to the final evening before the submission deadline.

The instructions to participants in the second study explained that the focus of their photography was to be on the window opening and not window design. One reason was to encourage participants to reflect on how the opening contributes to residential comfort rather than the design features of the window. Another reason concerned a more practical matter. It was assumed that it would facilitate the photography since a series of adjoining window units would be regarded as one window opening. However, some types of window openings are not that straightforward, such as bay windows, consisting of three windows, and corner windows. Two participants, living in multi-dwelling buildings in the city centre with bay windows looking onto the street, depicted the bay windows in one image. A male participant regarded the bay windows as three openings, each with a different outdoor view and view distance. Considering that the apartment was on the fifth floor in a nine-storey building block facing the sea and the city, this was hardly surprising.

Images as visual memory aids for reconstructing the visit.
Looking at the photos when transcribing the interviews helped to recollect the interview situation. Images could also be used as photo documentation for confirming or correcting observations after the visit. In one case, a three-armed candle holder with candles in the kitchen was visible in the background but was not recorded on the prepared form.

Ethical considerations regarding photography.
All procedures were performed in accordance with the general ethical principles of psychologists,[32] followed informed-consent rules, and showed respect for confidentiality and privacy. No approval from the Ethical Review Board was needed, since the studies did not include interventions or potential risk of unintentional physical or psychological harm.[33] Permission to use

the photos without naming the photographer was obtained by the researcher at the end of the interview. No identifiable faces of people were visible in the photos. In a few photos of room interiors including mirrors, participants were visible but not recognisable. Participants could freely decide whether or not to include photos; one participant chose not to include a photo of the bedroom interior because she regarded it as being too private.

Discussion of Participant Photography in the Input Phase

The input phase comprises the origin of the photos and the context of the site. Taking the photos did not seem to be too demanding for most participants, which is not surprising considering the current widespread use of smartphones and images among Swedish people in general. Another reason could be that both studies involved inventories that are more easily depicted than abstract concepts. Also, when the subject matter is material artefacts, such as luminaires, window openings, or other inventories of the physical setting, some of the ethical issues related to photography of people and the social environment can be avoided: there are no issues of obtaining their permission, as no people are depicted. Although requiring less effort than more abstract and general topics, participants can be reluctant to engage with visual methods, as pointed out by Pain.[34] The exclusion of certain groups will certainly have an impact on the findings. In these studies, the assistance given to older participants was encouraged and taking pictures can make participation more enjoyable.

Another reason for including visual methods can be to mediate the relationship between researcher and participant, such as to address the imbalance of power between them.[35] However, in the two studies presented in this article, this was not the reason for using participant photography. Instructions as to what to depict were determined by the researcher who also assembled the photos in albums. However, the order of the photos, as the participant took them, steered the interview. Other studies have adopted a more respondent-controlled approach, for example Warner et al.[36]

The inclusion of participant-produced keywords in the second study was expected to encourage participants to further reflect on the topic before the interview. Some participants found it difficult to provide keywords to all photos depicting window openings, suggesting that they actively thought about them. It is likely that the addition of keywords furthered the participants' reflection on the topic since only taking photos can be a hasty and unconsidered exercise when depicting pre-determined artefacts.

Discussion of Participant Photography in the Processing and Output Phase
When photo-elicitation is used in interviews, the analytical focus in the processing phase is on the respondents' feedback on the photos. The researcher experienced several benefits: the discussion of the photos produced a more relaxed and focused conversation which enabled a time-efficient interview and keywords to the images prompted further discussion.

The interview, guided by the pictures displayed in front of the participants, was found to be time efficient. Another option would be to conduct an interview while walking through each room, stopping and looking at the actual luminaires or window openings and not their two-dimensional representations. Both techniques have merits, but the latter would require more time and participants may be unwilling to accept more extended home visits than one or two hours.

In her review, Pain concluded that there is strong support for the use of visual methods to enhance data richness although more research is needed.[37] In both studies, the use of participant-produced photos was appreciated by the researcher for eliciting more information because visual stimuli prompted further discussion. Richer data is also central to increased trustworthiness. The combination of seeing the depicted items in photos before the home visit and later in their real setting allowed for more questions than would have been the case without the photos. Deviations from photos were brought up in the interview, such as closed blinds during the visit which were opened in the photo, for instance in the bedroom (see Figure 3). Photos alone would thereby not have been effective. The subsequent interview was essential for seeing whether the setting had been modified. The statement by Kvale and Brinkmann concerning validity in qualitative interviewing applies also to photo-elicited interviews:

> Validity here pertains to the trustworthiness of the subject's reports and the quality of the interviewing, which should include a careful questioning to the meaning of what is said and a continual checking of the information obtained as a validation in situ.[38]

The analytical focus in both studies was the participants' feedback on visual stimuli (photos) and verbal stimuli (written keywords). Digitally recorded interviews provided the contextual information relating to the photos. Photos were not analysed as images in themselves, since the role of the visuals was solely to support the interviews.

However, photography can capture unintended perceptions of the subject of inquiry. Some participants in the first study forgot to include the luminaires in the bathroom, which indicates that bathroom lighting does not seem to play a prominent role in these particular residents' everyday lives. This is something to reflect on considering how central early morning light exposure is to circadian regulation.

Even though the photos have not been analysed, they carry information worth noting. Surprisingly, all photos of the luminaires in the first study were taken from a standing position although instructions allowed any position ('take photos of all the luminaires in your home . . . You are free to decide view angle, distance range to the luminaires, time of day etc.'). One reason could be that taking photos from a standing position is quicker, and thereby requires less effort. Another possible reason could be a non-conscious choice to depict an object in a way that is the most representative of reality, not uncommon for non-professional photography. Some participants chose to include several photos of the items. This extra effort reveals an appreciation of aesthetic values, interest in interior design, or the spatial qualities of the home setting, which became apparent in the interview.

Since data collection, selected photos from both studies have been used as examples of produced visual data in articles and oral presentations. Photos were not intended to be end products but as stimuli for talking about residents' experiences with their luminaires and window openings. Images in published and presented material always include either captions describing the context or participants' interview responses.

A forthcoming book for a wider audience will include selected photos of residents' window openings and room interiors. Photos will be used as examples of various design challenges for existing home settings of interest for practitioners involved in housing development and planning. The choice of photos will depend on the technical level of image quality. With that in mind, it may be tempting to prepare for improved image quality in future photo-elicited research by giving more restrictions. However, the original purpose of applying the technique in a particular study should be carefully considered and the possible consequences of demanding requirements such as increased participant effort. 'As with any type of research, visual research is purpose driven and yields its particular design for a large part from this purpose.'[39]

Table 3. Summary of discussion divided into reported themes, whether findings are valued as a benefit (+), a challenge (–), or non-problematic (×), and who is affected.

Findings sorted according to themes	Benefit (+)/ challenge (–)	Researcher/ participant
Input phase (origin and nature of visuals)		
Aspects of time, effort and abilities in co-production		
• taking pictures involves more effort and time,	–	Participant
• assistance in taking pictures may be required,	–	Participant
• taking pictures can make participation more enjoyable,	+	Participant
• sending reminders to email photos,	–	Researcher
• production of print albums.	–	Researcher
Pre-views of artefacts and home settings before home visits		
• better planning of the interview in relation to the number of items (luminaires or window openings) and what should be addressed in the subsequent home visit.	+	Researcher
Ethical considerations regarding photography		
• concerns of privacy, e.g. private spaces or personal items,	(–)	Participant
• giving instructions to participants that identifiable faces in photos should be avoided unless consent is obtained from the person who is pictured in the photo.	×	Researcher
Examples of insights in previous studies		
• excluding certain groups (participants reluctant to engage with visual methods),[40]	–	Researcher
• the need to obtain consent from people or not including them in the images can limit the participants choices when taking photos,[41]	–	Participant
• adopting a more respondent-controlled approach to address the imbalance of power between researcher and participant,[42]	+	Participant
• the value of visual data through engagement at all stages of the research process.[43]	+	Researcher, participant
Processing phase (research focus and design) and output phase (format and purpose of visuals)		
Focused and relaxed interviews		
• the discussion stays focused on the subject matter with the albums guiding the interview,	+	Researcher, participant
• interviews, supported by images, can enable a time-efficient interview,	+	Researcher, participant
• interviews, supported by images, can be effective in obtaining information.	+	Researcher
Keywords as reminders in the interviews		
• producing keywords,	–	Participant
• keywords to the images can prompt further discussion.	+	Researcher
Images convey different types of information		
• photography can capture unintended perceptions of the subject of inquiry.	+	Researcher
Images as visual memory aids for reconstructing the visit		
• looking at the photos when transcribing the interviews may help the researcher to recollect the interview situation,	+	Researcher
• using photos as photo documentation for confirming or correcting observations after the visit.	+	Researcher
Ethical considerations regarding photography		
• obtaining permission from participants to use the photos without naming the photographer (anonymity prevents publishing information about the copyright holder).	×	Researcher
Examples of insights in previous studies		
• strong support for use of visual methods to enhance data richness,[44]	+	Researcher
• facilitating the asking of questions and rapport between the researcher and participant.[45]	+	Researcher, participant

Table 3 summarises the findings and discussion of the article, that is, the benefits and challenges of the combination of qualitative interviewing and participant photography, and additional findings of previous studies using similar techniques.

Strengths and Limitations of the Studies

The discussion of the benefits and challenges of adding participant photography is based on two studies investigating inventories of home settings. Samples were similar in both studies, that is, residents living in multi-dwelling buildings, tenant-owned or rented, with a variety of ages. The inclusion of keywords written by the participants in the second study thereby enabled a comparison of the technique with and without the written input. However, participants were not systematically asked about the personal perception of the technique, unlike Meo in her within-subject comparison between verbal-only and photo-elicited interviews,[46] and Warner et al. who explored suburban lived experiences using photographic diaries.[47]

CONCLUSION

This article supports findings in recent literature on photo-elicitation studies that adding participant-produced photographs to the interview has multiple benefits in knowledge production, from both researcher and participant perspectives. In agreement with Roger, participant and researcher engagement characterises the use of visual data in research.[48] In the two studies investigating home lighting and window openings, I perceived it to be particularly characteristic of the input phase.

However, there are challenges to be considered from a researcher's perspective, such as participants' experience with digital photography despite the widespread use of camera phones. In addition, special attention must be paid to:

- Participants reluctant to engage with camera-based images. (Be prepared to make adjustments to procedure to prevent excluding them from participation.)
- The time needed for collecting the photos and the subsequent layout of albums, because this stage provides the first 'visual encounter' with the participants that contributes to better preparation before the interview.
- The time needed for post-production, such as the inclusion of additional explanatory captions in the albums.

The most important insight is the benefit of adding verbal stimuli (keywords) to the visual stimuli (photos) in terms of improved data quality. Working collaboratively may also contribute to a more enjoyable interview atmosphere for both researcher and participant.

In conclusion, it is suggested that the identified merits of visual data outweigh the drawbacks, such as the longer time needed for data collection. Participant photography can be a valuable addition to the researcher's toolbox to enrich the data in applied architectural research, when user needs and universal design are the focus of the study.

NOTES

[1] Kiran M. Gerhardsson, Thorbjörn Laike, and Maria Johansson, 'Leaving Lights On: A Conscious Choice or Wasted Light? Use of Indoor Lighting in Swedish Homes', *Indoor and Built Environment* (March 2020); Kiran M. Gerhardsson and Thorbjörn Laike, 'Windows: a study of residents' perceptions and uses in Sweden', *Buildings and Cities* 2, no. 1 (2021), pp. 467–486.

[2] Robert Burke Johnson and Antony J. Onwuegbuzie, 'Mixed Methods Research: A Research Paradigm Whose Time Has Come', *Educational Researcher* 33, no. 7 (2003), pp. 14–26; David L. Morgan, *Integrating Qualitative and Quantitative Methods: A Pragmatic Approach* (London: Sage Publications, 2014).

[3] Erhan E. Dikel, Gregory J. Burns, Jennifer A. Veitch, Sandra Mancini, and Guy R. Newsham, 'Preferred Chromaticity of Color-Tunable LED Lighting', *LEUKOS* 10, no. 2 (2014), pp. 101–15.

[4] Yvonne A. W. de Kort and Jennifer A. Veitch, 'From Blind Spot into the Spotlight', *Journal of Environmental Psychology* 39 (2004), pp. 1–4.

[5] World Health Organization, *Global Strategy and Action Plan on Ageing and Health* (2017), https://www.who.int/ageing/WHO-GSAP-2017.pdf?ua=1 (all URLs accessed in May 2021).

[6] Sara J. Czaja, Walter R. Boot, Neil Charness, and Wendy A. Rogers, *Designing for Older Adults: Principles and Creative Human Factors Approaches* (Boca Raton, FL: CRC Press, 2019); Nanet Mathiasen and Anne Kathrine Frandsen, 'Lighting Design as a Universal Design Strategy to Support Functional Visual Environments', in *Transforming our World Through Design, Diversity and Education: Proceedings of Universal Design and Higher Education in Transformation Congress*, edited by Gerald Craddock, Cormac Doran, Larry McNutt, and Donal Rice (Amsterdam: IOS Press, 2018), pp. 752–59; Cecilia Petterson, Inga Malmqvist, Sten Gromark, and Helle Wijk, 'Debate: Study Protocol; The Physical Environment and Home Healthcare Services: The Development and Content of a Study Protocol to Explore Enablers and Barriers for the Delivery of Home Healthcare Services', *Nordic Journal of Architectural Research* 31, no. 2 (2019), pp. 105–22.

[7] Douglas Harper, 'Talking about Pictures: A Case for Photo Elicitation', *Visual Studies* 17, no. 1 (2002), p. 13.

[8] Gillian Rose, *Visual Methodologies: An Introduction to the Interpretation of Visual Materials* (London: Sage Publications, 2007), p. 237.

[9] Ibid., p. 239.

[10] Elizabeth A. Bates, Joseph J. McCann, Linda K. Kaye, and Julie C. Taylor, '"Beyond Words': A Researcher's Guide to Using Photo Elicitation in Psychology', *Qualitative Research in Psychology* 14, no. 4 (2017), pp. 459–81; Paula Reavey, ed., *Visual Methods in Psychology: Using and Interpreting Images in Qualitative Research* (Hove: Psychology Press, 2011).

[11] Robert U. Akeret, *Photoanalysis: How to Interpret the Hidden Psychological Meaning of Personal and Public Photographs* (New York: P. H. Wyden, 1973); Judy Weiser, *Phototherapy Techniques: Exploring the Secrets of Personal Snapshots and Family Albums* (San Francisco: Jossey-Bass, 1999).

[12] Robert Gifford, *Research Methods for Environmental Psychology* (Oxford: Wiley-Blackwell, 2015); Robert W. Marans and Daniel Stokols, *Environmental Simulation: Research and Policy Issues* (New York: Plenum Press, 1993).

[13] Bates et al., 'Beyond Words': A Researcher's Guide to Using Photo Elicitation in Psychology'.

[14] Helen Pain, 'A Literature Review to Evaluate the Choice and Use of Visual Methods', *International Journal of Qualitative Methods* 11, no. 4 (2012), pp. 303–19.

[15] Luc Pauwels, 'Visual Sociology Reframed: An Analytical Synthesis and Discussion of Visual Methods in Social and Cultural Research', *Sociological Methods & Research* 38, no. 4 (2010), pp. 545–81.

[16] Charles F. Harrington and Ingrid E. Lindy, 'The Use of Reflexive Photography in the Study of the Freshman Year Experience', *Journal of College Student Retention: Research, Theory and Practice* 1, no. 1 (1999), pp. 13–22; Lone Stidsen, H. S. Bjerrum, Poul H. Kirkegaard, Niels Thuesen, and Anna Marie Fisker, 'Patients' Light Preferences in Hospital Wards: Related to Atmosphere in Danish Homes', *WIT Transactions on the Built Environment* 121 (2011), pp. 211–22.

[17] Rosalind Hurworth, Ellen Clark, Jenepher Martin, and Steve Thomsen, 'The Use of Photo-Interviewing: Three Examples from Health Evaluation and Research', *Evaluation Journal of Australasia* 4, no. 1 (2005), pp. 52–62.

[18] Erling Björgvinsson and Gunnar Sandin, 'Patients Making Place: A Photography-Based Intervention about Appropriation of Space', in *ARCH 14: Proceedings of the International Conference Research on Health Care Architecture*, edited by Ira Verma and Laura Nenonen (Helsinki: Alto University, 2015), pp. 25–42.

[19] Alan Radley and Diane Taylor, 'Images of Recovery: A Photo-Elicitation Study on the Hospital Ward', *Qualitative Health Research* 13, no. 1 (2003), pp. 77–99.

[20] Björgvinsson and Sandin, 'Patients Making Place: A Photography-Based Intervention about Appropriation of Space'.

[21] Elyse Warner, Louise Johnson, and Fiona Andrews, 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing', *International Journal of Qualitative Methods* 15, no. 1 (2016), pp. 1–9.

[22] Pauwels, 'Visual Sociology Reframed: An Analytical Synthesis and Discussion of Visual Methods in Social and Cultural Research'.

[23] Ibid.

[24] Ibid.

[25] Caroline Wang and Mary Burris, 'Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment', *Health Education & Behavior* 24, no. 3 (1997), pp. 369–87.

[26] Douglas Harper, 'Talking about Pictures: A Case for Photo Elicitation', *Visual Studies* 17, no. 1 (2002), pp. 13–26.

[27] Gillian Rose, *Visual Methodologies: An Introduction to the Interpretation of Visual Materials* (London: Sage Publications, 2007).

[28] Steiner Kvale and Svend Brinkmann, *InterViews: Learning the Craft of Qualitative Research Interviewing* (London: SAGE Publications, 2009).

[29] Pauwels, 'Visual Sociology Reframed: An Analytical Synthesis and Discussion of Visual Methods in Social and Cultural Research'.

[30] Virginia Braun and Victoria Clarke, 'Using Thematic Analysis in Psychology', *Qualitative Research in Psychology* 3 (2006), pp. 77–101.

[31] Braun and Clarke, 'Using Thematic Analysis in Psychology'.

[32] American Psychological Association, *Ethical Principles of Psychologists and Code of Conduct* (2017), https://www.apa.org/ethics/code/.

[33] Swedish Research Council, *Good Research Practice* (Stockholm: Swedish Research Council, 2017).

[34] Pain, 'A Literature Review to Evaluate the Choice and Use of Visual Methods'.

[35] Ibid.

[36] Warner et al., 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing'.

[37] Pain, 'A Literature Review to Evaluate the Choice and Use of Visual Methods'.

[38] Kvale and Brinkmann, *InterViews: Learning the Craft of Qualitative Research Interviewing*, p. 249.

[39] Pauwels, 'Visual Sociology Reframed: An Analytical Synthesis and Discussion of Visual Methods in Social and Cultural Research', p. 19.

[40] Pain, 'A Literature Review to Evaluate the Choice and Use of Visual Methods'.

[41] Warner et al., 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing'.

[42] Ibid.

[43] Kerstin Roger, 'The Fringe Value of Visual Data in Research: How Behind Is Academia?', *International Journal of Qualitative Methods* 16 (2017), pp. 1–7.

[44] Pain, 'A Literature Review to Evaluate the Choice and Use of Visual Methods'; Warner et al., 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing'.

[45] Warner et al., 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing'; Analía Inés Meo, 'Picturing Students' Habitus: The Advantages and Limitations of Photo-Elicitation Interviewing in a Qualitative Study in the City of Buenos Aires', *International Journal of Qualitative Methods* 9, no. 2 (2010), pp. 149–71.

[46] Meo, 'Picturing Students' Habitus: The Advantages and Limitations of Photo-Elicitation Interviewing in a Qualitative Study in the City of Buenos Aires'.

[47] Warner et al., 'Exploring the Suburban Ideal: Residents' Experiences of Photo Elicitation Interviewing'.

[48] Kerstin Roger, 'The Fringe Value of Visual Data in Research: How Behind Is Academia?'.

APPENDIX

Table A1. "My Home Lighting": participant characteristics.

ID	Gender	Age	Household size (adults + children <12 yr)	Number of bedrooms in the apartment, floor area, level	Housing tenure[a]	Building year and most recent renovation (if known)	Total number of luminaires
1	Female	31	Single-person	Studio, 49 m^2, second floor	Rented	1936	10 (10 photos)
2	Male	73	Multi-person (2)	Two-bedroom apartment, 107 m^2, second floor	Rented	1907, conversion of care home to dwellings in 2009 by the landlord	25 (16 photos)
3	Female	53	Single-person	Two-bedroom apartment, 58 m^2, second floor	Tenant-owned	1939, renovated by the tenant in 2015	16 (11 photos)
4	Female	69	Single-person	One-bedroom apartment, first floor	Rented	1880, renovated by the landlord in 2000 (approx.)	18 (13 photos)
5	Male	55	Single-person	Three-bedroom apartment, 99 m^2, ground floor	Tenant-owned	2002	23 (22 photos)
6	Male	30	Multi-person (2 + 2)	Two-bedroom apartment, 71m^2, first floor	Tenant-owned	1925	20 (16 photos)
7	Male	26	Single-person	One-bedroom apartment, 62 m^2, first floor	Tenant-owned	1932, renovated by the tenant	14 (15 photos)
8	Male	53	Multi-person (2)	Two-bedroom apartment, 81 m^2, first floor	Rented	1900, renovated by the landlord in 2015	17 (17 photos)
9	Female	26	Single-person	Studio, 26 m^2, second floor	Rented	1957	9 (14 photos)
10	Female	28	Single-person	Two-bedroom apartment, 85 m^2, fifth floor	Tenant-owned	2006	21 (14 photos)
11	Male	76	Single-person	Two-bedroom apartment, second floor	Rented	1907, renovated by the landlord in 1985	21 (8 photos)
12	Female	33	Multi-person (2)	One-bedroom apartment, second floor	Rented	1936	15 (10 photos)

N = 12, 50 per cent females, median 43 years (mean 46).

[a] *'Tenant-owned dwelling' refers to a common tenure model in Sweden. The tenants own a share of the housing association which in turn owns the building. Tenants can sell their share and the tenancy rights.*

Interview Guide A2: 'My Home Lighting'

Introductory questions:

A. Can you tell us how old you are and how many people live in your-household?
B. Do you work with or have you worked with anything to do with lighting?
C. Do you know approximately when the house was built?

Main question:

Now we'll turn to the pictures in the album that you have taken. Can you tell us a little bit about why you've chosen the luminaires and how they are used? I suggest that we do it room by room, in the same order you took the pictures.

Follow-up and additional questions:

1. Do you have any sort of automatic sensor, for example a presence sensor or daylight sensor?
2. Do you have a dimmer in the flat?
3. When is the lamp switched on? When you are eating, watching TV, when you are spending time with each other (conversation and with guests), during sedentary activities (reading, working at the computer, sewing, doing crafts), when you are sleeping/resting?
4. [Multi-person household] Do you agree on how the lighting should look or how bright it should be? If you have different needs, how do you resolve the differences?
5. Have you changed anything in terms of lighting since you moved in? Age can, for example, affect how much light you want.
6. What changes would you make if you could change your lighting? Which rooms? What stops you from making the changes?
7. Are you satisfied with your daylight?
8. Do you make use of daylight during the day? For example, by not switching on electric lights or keeping blinds up and not drawing dark curtains.
9. Do you turn off the lights when no one is in the room? If you do not do this, why not?
10. Can you black out the bedroom?
11. Do you black out the room every night?
12. Have you thought of anything else about lighting that I haven't covered?

Interview Guide A4: 'My Window Openings'

Introductory questions:

A. Can you tell us how old you are and how many people live in your household?
B. Do you know approximately when the house was built?
C. Do you work with or have you worked with anything to do with architecture or design?

Main question:

Now we'll turn to the pictures in the album that you have taken. I suggest that we do it room by room, in the same order you took the pictures. Imagine the window opening has been blocked up and there is no window anymore. How would it affect your use of the room and your dwelling—during the day and night?

Follow-up and additional questions:

1. [Multi-person household] Do you agree on how to use the windows? If you have different needs, how do you resolve the differences?
2. Have you changed anything in terms of how you use the windows or their design since you moved in, such as natural ventilation habits, curtains and window treatment, room darkening . . .
3. Do you need to open the windows? In which rooms? For what reasons?
4. What changes would you make if you could change the window opening? Which rooms?
5. Are you satisfied with your daylight?
6. Do you make use of daylight during the day? For example, by not switching on electric lights or keeping blinds up and not drawing dark curtains.
7. Would you be satisfied with a screen emitting the same kind of light as daylight?
8. Do you have any room without a window? What is your experience of such a room?
9. Have you ever stayed in a windowless hotel room? How did you experience that?
10. Do you occasionally need to darken the rooms, such as the bedroom at night?
11. Do you black out the room every night? [Multi-person household] Do you have the same needs?
12. Is there anything preventing you from getting the desired room

darkening? Do you use a sleep mask?

13. How is your sleep in general (do you feel rested when you wake up, do you get enough sleep)?
14. Would you describe yourself as a morning or an evening person?
15. How frequently do you clean your windows? Why do you clean them?
16. Through which window do you look to check the weather?
17. How is the indoor temperature affected by the windows in summer?
18. Can you hear any characteristic sounds from outdoors?
19. Have you thought of anything else about your window openings that I haven't covered? (Orientation, view, view content, visual intrusion, privacy, enclosure, natural ventilation, noise, etc.)

Table A3. 'My Window Openings': participant characteristics.

ID	Gender	Age	Household size (adults + children <12 yr)	Number of bedrooms in the apartment, floor area, level	Housing tenure[a]	Building year and most recent renovation (if known)	Total number of window openings[b]
1	Female	77	Multi-person (2)	Three-bedroom apartment, 89 m^2, third floor	Tenant-owned	1959, window replacement in 2011 by the housing association	5 (10 photos)
2	Male	77	Multi-person (2)	Three-bedroom apartment, 89 m^2, third floor	Tenant-owned	1959, window replacement in 2011 by the housing association	5 (10 photos)
3	Female	35	Multi-person (1+1)	Two-bedroom apartment, 76 m^2, ground floor	Tenant-owned	1944	4 (8 photos)
4	Male	70	Multi-person (2)	Four-bedroom apartment, 110 m^2, ground floor	Tenant-owned	1912, renovated in 1976 by the housing association	10 (14 photos)
5	Male	93	Multi-person (2)	Three-bedroom apartment, 114 m^2, third floor	Tenant-owned	2005	10 (18 photos)
6	Female	62	Single-person	Two-bedroom apartment, 84 m^2, second floor	Tenant-owned	1929, window replacement in the 1990s by the housing association	7 (7 photos)
7	Female	70	Single-person	One-bedroom apartment, 69 m^2, ground floor	Tenant-owned	1936	3 (6 photos)
8	Male	70	Single-person	Three-bedroom apartment, 114 m^2, ground floor	Tenant-owned	2002	6 (12 photos)
9	Female	83	Single-person	Two-bedroom apartment, 90 m^2, second floor	Tenant-owned	1967, window replacement in approx. 2005–11 by the housing association, balcony with glazing	4 (13 photos)
10	Female	59	Single-person	Two-bedroom apartment, 74 m^2, ground floor	Tenant-owned	1942, window replacement in 1982 by the housing association, new balcony with glazing	4 (8 photos)
11	Female	56	Single-person	Three-bedroom apartment, 89 m^2, second floor	Tenant-owned	1949	10 (8 photos)
12	Female	23	Multi-person (2)	Two-bedroom apartment, 82 m^2, first floor	Tenant-owned	1945	5 (16 photos)
13	Male	26	Single-person	One-bedroom apartment, 33 m^2 ground floor	Rented	2000	3 (4 photos)
14	Male	24	Single-person	One-bedroom apartment, 41 m^2, sixth floor,	Tenant-owned	2007	6 (12 photos)
15	Female	36	Multi-person (1+1)	One-bedroom apartment, 63 m^2, ground floor	Rented	2011	4 (8 photos)
16	Male	34	Multi-person (2+1)	Three-bedroom apartment, 114 m^2, third floor	Rented	1941	7 (10 photos)
17	Male	59	Multi-person (2)	Three-bedroom apartment, 112 m^2, fifth floor	Tenant-owned	1959	9 (18 photos)
18	Male	24	Multi-person (2+1)	Three-bedroom apartment, 109 m^2, second floor	Tenant-owned	1967	6 (12 photos)
19	Male	27	Multi-person (2)	Two-bedroom apartment, 82 m^2, third floor	Rented	1946	4 (8 photos)
20	Female	54	Multi-person (2)	Two-bedroom apartment, 84 m^2, first floor	Tenant-owned	2001	5 (11 photos)

N = 20, 50 per cent females, median 57.5 years (mean 66.5).

[a] 'Tenant-owned dwelling' refers to a common tenure model in Sweden. The tenants own a share of the housing association which in turn owns the building. Tenants can sell their share and the tenancy rights.

[b] A corner window, including at least one window on each side of the corner, is regarded as two window openings. A fully- or semi-glazed balcony door is regarded as a window opening. Entrance doors with only a small glazed unit are not regarded as a window opening.

BIASED BUILDING REGULATIONS FOR WINDOWS?

Thomas H. Kampmann

ABSTRACT

This article discusses the conditions under which windows are constructed in Denmark and offers general definitions concerning energy loss through windows. A brief introduction to the problems with regulating energy loss by means of windows in the Building Regulations BR2018 is offered as well, along with comments on future regulations.

Until recently, the Danish Building Regulations were difficult to understand from the perspective of energy performance for windows. Since a substantial part of the heat loss from buildings occurs through windows, this has a huge environmental impact.

The regulations are perceived as discriminatory, especially when it comes to secondary glazing and/or multi-frame windows, which are the solutions that are used most widely in historic buildings. Wooden windows are a simple way to store CO_2 in the construction for many years and are easy to maintain and/or improve without replacement. In additional, they can efficiently combine heat savings, noise insulation, low environmental impact, aesthetics, and historical preservation.[1]

The study was conducted by thoroughly reviewing all of the requirements concerning energy loss through windows and takes various typical Danish window types into consideration. Since no similar studies on this topic from the other Nordic countries are known, the current building regulations in each country will thus be examined briefly in the same way.

The article also includes an overview with a discussion of whether any of the Nordic countries have more applicable regulations, or whether the picture is the same across the region.

KEYWORDS

Multi-frame windows, building regulations, energy loss, protected buildings

BACKGROUND

As part of the Master's programme in Cultural Heritage, Transformation and Restoration (KTR) at the Royal Danish Academy, I have previously examined the Danish Building Regulations, BR2015,[2] and the proposal for BR2018[3] and responded to them in the anthology *Robust*.[4] This was done because the BR2010[5] was already highly problematic when it came to small and/or multi-frame windows. The response was provided since the proposal for BR2015,[6] and later for BR2018,[7] was being based on the rules of BR2010, apart from a simple lowering of the limits for energy loss, and there was a risk that the problems would be even bigger in the final version.

With this study, the aim was to give building consultants and authorities, manufacturers and students a tool for understanding the pitfalls as well as the rather complex field of energy consumption in connection with small and/or multi-frame windows, as seen in the BR2015[8] and BR2018[9] within and/or for the specific field of energy consumption.

Traditional windows are usually designed with several frames and sometimes even with glazing bars, but the problems concerning multi-frame windows are the same for new windows if they are divided into multiple units. The hope is that this article will also help develop and/or rethink the design of windows in future buildings. It is therefore necessary to undertake a careful examination of the final edition of BR2018.[10] Finally, the article provides a brief, comparative overview of how building regulations in Finland, Norway, and Sweden deal with the same problems.

INTRODUCTION

Denmark's energy supply was based mainly on imported oil until the energy crisis in the 1970s. At that time, Denmark had hardly any oil or natural gas production and neither hydro- nor nuclear power. The energy crisis therefore emphasized the urgent need for energy savings in order to achieve a high level of energy security. Since approximately 40 per cent of all energy consumption in Denmark occurs in buildings and about one third of the energy consumed in buildings is lost through windows, this is a topic of great importance for the overall energy equation.

Until the BR1995,[11] all windows were treated equally with the very simple rule that the U-value, thermal transmittance, for the entire Window being used should be lower than 1.8 kWh/m^2. In subsequent building regula-

tions, however, the rules became much more complex, with the addition of a distinction between new windows with sealed units and windows with secondary glazing, whereby the latter, which are mostly used in traditional housing, have been treated more harshly than insulating glass unit (IG-unit) windows. The reason for this may have been that many new windows used for replacing older windows in traditional buildings, which have more than one frame and possibly glazing bars, did not fulfil the previously simpler legal requirements.[12]

In the BR2010,[13] windows with IG-units are treated completely differently from traditional windows with secondary glazing. Such windows are rated in relation to the U-value of the whole window in its actual form, size, and number of panes used, whereas windows with IG-units are rated based on a combination of the U-value and supplemental energy from the sun during the heating season, so-called energy gain (E). Furthermore, all windows with IG-units are supposed to be specified based on the energy gain of a reference window, E_{ref}, as though they were designed with only one single-frame window with a standard size of 1.23 by 1.48 metres. This applies regardless of the actual size of the window in use, the number of frames, whether it has mullions, transoms, and glazing bars, and whether it has noise reduction or solar-coated panes. All these different parameters have a huge impact on the total energy performance, which makes it very hard, if not impossible, to select the most energy-efficient windows based on the rules of the BR2018.[14] This shows that new windows with energy panes are given preferential treatment.

Until 2008, a minimum U-value for windows was mentioned in the regulations. However, that requirement disappeared in the BR2010[15]—apart from windows inside houses that open towards rooms heated to more than 5 Kelvin below the temperature in the specific room concerned. It is hard to see the logic in having rules for internal windows but not for windows in external walls. Since the tendency for many new houses is to make them look similar to old houses, this problem will thus affect new houses as well.

DEFINITION OF THE PROBLEM

The following extracts from the Building Regulations (marked in grey) are all direct quotes (without correction of potential spelling mistakes or ambiguities). The purpose of this article is to investigate whether the BR2018[16] meets the targets described in Chapter 11: Energy consumption:

> 250. Buildings must be planned, established, converted and maintained in order to avoid unnecessary consumption of energy for heating, domestic hot water, cooling, ventilation and lighting with due respect of the use of the building and the scope of the building work.[17]

The examination addresses the specific field of the energy consumption of windows, with a special focus on multi-frame windows. This article only examines Chapter 11 of the BR2018, which deals with energy consumption based on the associated guidelines concerning windows with a focus on housing.[18] This article focuses on describing the preconditions for understanding the design of different types of Danish windows and how the design influences the energy consumption.

The argument presented is that the BR2018[19] does not provide equitable tools that can assist building consultants, authorities, manufacturers, and consumers in selecting the most energy-efficient solutions. The competition parameter thus impedes the propagation of energy-efficient windows in traditional buildings as well as in new buildings equipped with multi-frame windows. Whether there are different requirements for windows with secondary glazing compared with windows with IG-units has also been examined as part of this.

The study was conducted—to the greatest extent possible—by collecting data from window manufacturers and then comparing these data for various typical window designs with the BR2018.[20]

REVIEW OF RELEVANT WINDOW TERMS[21]

Design of windows

Traditional Danish windows are often designed with more than one frame. This often makes it necessary to divide the casement with a mullion if two separate frames are needed, and perhaps a transom in the case of four frames. Various combinations of this are also possible. Mullions and transoms are thus part of the casement and/or window jamb. If a window has more than one frame, it is referred to as a multi-frame window in this article. If the glass should be divided within the frame, this is done with glazing bars.

Windows with secondary glazing or storm windows

Traditional windows were normally fitted with only one layer of glass. To insulate against energy loss and noise, windows were subsequently given a

secondary glazing in Denmark, at least since the start of the 1700s. While Danish windows nearly always open outwards, secondary glazing opens inwards. This hence necessitates removing potted plants or other items from the windowsill in order to open the window. Around 1900, linked frames became widespread. Here, the second pane is attached to the frame and opens along with it—with no need for potted plants et cetera to be removed.

When describing the construction of a window, the number of panes is specified through counting them from the outside. Thus, a window with only one layer of glass is called '1', while secondary glazing is referred to as '1 + 1'. Secondary glazing was traditionally made with ordinary glass but is now primarily made with energy panes. Energy panes consist of one layer of glass fitted with a hard energy-saving coating. The coating limits long-wave radiation between the two layers and thus reduces heat loss by close to 50 per cent. The hard coating is stronger than the glass, which means that the pane can be treated as normal glass.

To improve insulation, secondary glazing can be produced as a sealed unit with, for instance, two layers of glass. This is referred to as '1 + 2'. One of the

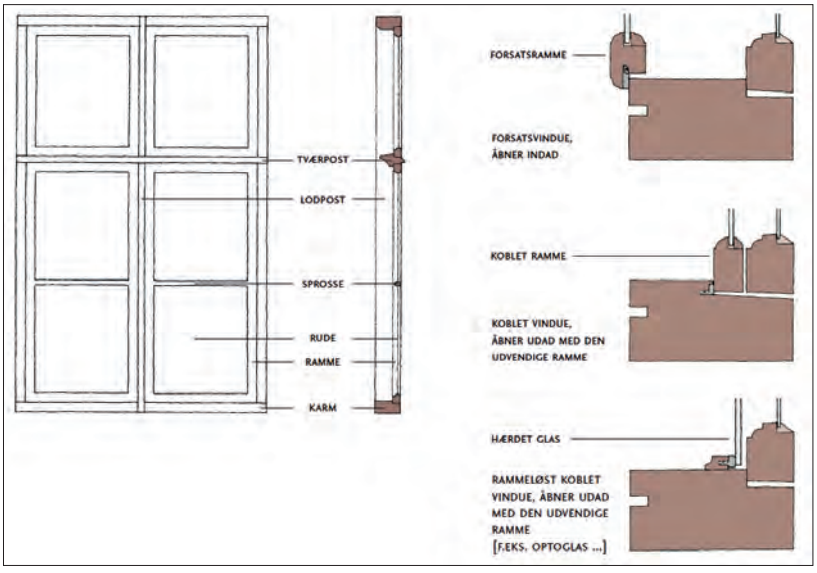


Figure 1. Design of a traditional Danish window. Source: Thomas Kampmann.

drawbacks of a window with secondary glazing is the difficulty of cleaning the individual surfaces as well as the fact that two frames have to be opened in order to let in fresh air. On the other hand, it is possible to clean all the surfaces, as opposed to the case of sealed units, in which the whole unit has

Figure 2. Typical Danish window with secondary glazing. Source: Thomas Kampmann.

to be replaced if the seal is broken. In addition, secondary glazing windows provide by far the best soundproofing, especially if there is an optimum amount of space between the two panes.[22]

Sealed-Unit Windows

Today, almost all windows have sealed units, in which two or three panes are joined together with a spacer. This is referred to as '2' or '3'. If one or more of the glass surfaces has an energy-saving coating, they are called insulating glass units (IG-units). While one benefit of a sealed unit is that there is no need to clean the surfaces facing the cavity, on the other hand, if the seal is broken and the insulating gas evaporates, the unit cannot be fixed, and has to be replaced entirely. Another benefit of IG-units is that because it is not possible to touch both sides of the layers it is thus possible to apply a very sensitive coating, a so-called soft coating, which is very effective. This construction, however, does not provide optimum soundproofing, since one of the most important parameters for soundproofing is the distance between the layers, which is not very large here.

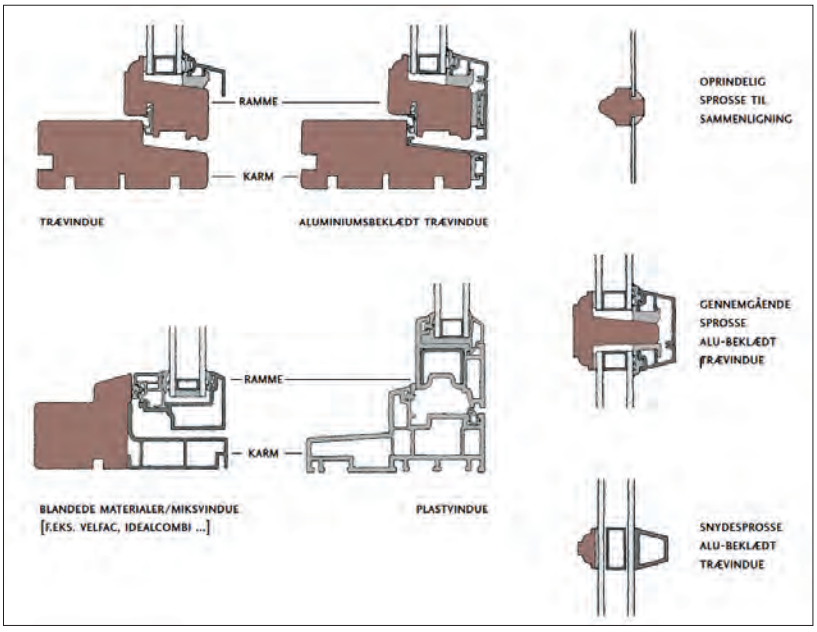


Figure 3. Details of typical Danish sealed-unit windows. Source: Thomas Kampmann.

Glazing bars in windows with IG-units can be constructed in two ways. Either with through-going glazing bars, which are very clumsy (due to the thick IG-units) and highly ineffective in terms of insulation, or with so-called fake glazing bars where the glass actually extends over the entire pane with several profiles glued or clipped to the glass. While fake glazing bars are much more energy-efficient, they nonetheless still pose problems. Naturally, they are much less visible than through-going glazing bars, especially when viewed perpendicularly to the window, but when viewed at an angle, the fake construction is obvious. Another problem with fake glazing bars is that they can easily fall off.

Since many new buildings are well insulated, there is often a problem with overheating. In order to reduce this problem, many windows with IG-units are given a solar-control coating in order to reduce the risk of overheating. But as this is a permanent construction, it also prevents energy gain from the sun when needed in the cold season, which makes this solution problematic in climates with a heating season.

ENERGY LOSS THROUGH WINDOWS

The U-value, thermal transmittance, is the rate of heat transfer through a structure per temperature difference across the structure. It indicates the energy loss resulting from a building component and is measured in W/m^2/K. For windows, the U-value (U_{window} or U_w) is divided into:

1. Energy loss through panes (the upper arrow), which depends on the surface area of the panes (U_{glass});
2. Energy loss through casement, mullion, transom, and glazing bars (the lower arrow), which depends on the area casement, mullion, transom, and glazing bars;
3. Energy loss through the edges of the pane (only for IG-units, since windows with secondary glazing have no spacer) (the middle arrow), which depends on the length of the edges of the panes (Ψ, the Greek letter psi) and is thus relatively much bigger for a multi-frame window than for a large, approximately square window.

As the U-value of the IG-units of today is different and often lower than the U-value of the casement, mullion, transom, and glazing bars, the ratio between the different 'arrows' changes dramatically depending on the design of the window. Hence, a circular window with no glazing bars will

have the highest share of energy-efficient panes and the relatively shortest edges around the panes. This share is somewhat lower for nearly square or rectangular windows and much lower for windows with mullions, transoms, and glazing bars. The share of the surface area of the panes will typically decrease from 75 per cent to 48 per cent in comparison with a single-frame window, and 1.23 by 1.48 metres compared with a window of similar size but with four frames and twenty panes. While it is quite simple to request the relevant U-values (from glass manufacturers), it is rather more complicated to calculate the U-value of the casement, mullion, transom, and glazing bars.

ENERGY GAIN THROUGH WINDOWS

When the sun shines, a certain percentage of the energy from the sun will pass through the window. The amount of energy that passes through the casement, mullion, transom, and glazing bars is negligible and is therefore omitted in the calculation of the total energy balance. The energy gained through the panes is referred to as the g-value, which denotes the percentage of solar energy that hits the panes during an average reference year and is

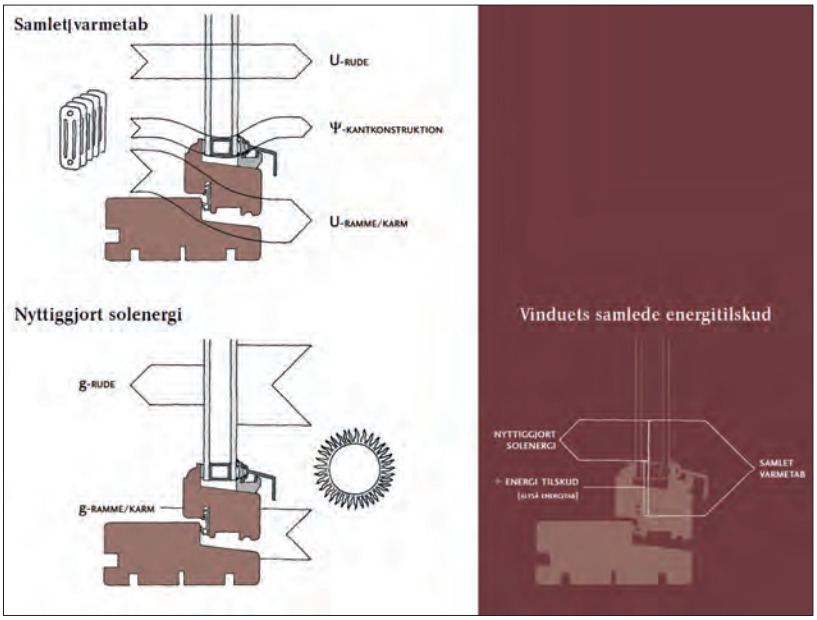


Figure 4. Energy loss and gain through windows. Source: Thomas Kampmann.

radiated into the interior, g_{glass}. The g_{window} is obtained by multiplying the g_{glass} by the ratio of the surface area of the panes to that of window as a whole.

TOTAL ENERGY BALANCE THROUGH WINDOWS

The total energy balance of a window is obtained by calculating the energy gained through the window during the heating season minus the energy lost through the window in the same heating season, and is referred to as E_{window}. As the energy gained through a window varies a lot depending on the orientation of the window, it is normally specified as a weighted average of the distribution of the surface areas of windows facing south. The unit is in kWh/m^2/year, and it is thus quite easy to calculate the yearly energy loss by simply multiplying the energy balance by the total sum of the surface area of the windows. The annual expenses are calculated by multiplying the total energy loss by the relevant energy price.

Since the total energy balance depends very much on the design of the window, the Danish Energy Agency has chosen to use a reference window consisting of only one frame, E_{ref} with a size of 1.23 by 1.48 metres. The official definition of the reference window follows below. Since the energy balance is highly dependent on the design of the window, E_{ref} cannot be used in calculating the energy loss, as will be explained in this article. A definition of the energy balance will follow as part of the explanation of the BR2018.[23]

ENERGY LOSS AS DEFINED IN BR2018

As Guideline 11, 1.6 of the BR2018[24] is still not available in English, the definition from BR2015[25] Appendix 6.2 (unpaginated) is shown instead, since they are much the same (calculation of energy gain through windows):

> For facade windows, see EN 14351 – 1 Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics, the window manufacturer calculates the energy gain as:
> $E_{ref} = I \times g_w - G \times U_w = 196.4 \times g_w - 90.36 \times U_w$
> where:
> I: Sunlight corrected for the variation of g value with angle of entry
> g_w : Total solar energy transmittance of the window. G: Kilo degree hours in the heating season based on an indoor temperature of 20°C.U_w: Thermal transmission coefficient of the window

> The solar heat gain I and the number of degree hours G during the heating season are determined on the basis of the reference year DRY (before the revision in 2014). The solar heat gain through windows depends on the orientation of the windows, and therefore a single-family house with the following distribution of windows is used as a point of reference:
>
> North: 26%
> South: 41%
> East/west: 33%
>
> The calculation uses a single-light opening reference window 1.23 m x 1.48 m. The energy gain E_{ref} is an appropriate expression to use in comparisons of the efficiency of different windows during the heating season. A separate assessment may need to be made with regard to nuisance due to solar heat gain and any overheating in summer.
>
> Even though E_{ref} is based on exploitation of solar heat gain through windows in a single-family house, E_{ref} is also used to compare windows for replacement in buildings other than dwellings. This does not apply to holiday homes as, according to the provisions of the Planning Act, they are only used for a short time during the heating season.
>
> New windows can lead to problems with overtemperature on sunny days, so an assessment should be made in many cases of the potential need for solar screening.[26]

The problem is that the calculations should be based on a so-called reference window with a fixed standard pane and not on the actual window used in each case. This is probably due to the fact that the energy performance changes to a great extent depending on the number of panes and glazing bars, the type of glass, and the use of special noise-reduction or solar-control glass (Appendix 1). Furthermore, the rules only apply to windows designed with IG-units, whereas the rules are completely different for windows with secondary glazing.

DIFFICULT TO OBTAIN DATA FOR WINDOWS

As part of this examination, preparing an updated survey of the energy consumption of typical Danish windows in various typical variants was planned. Unfortunately, it has not been possible to find a single manufacturer of

IG-unit windows that includes an energy calculator on their website, even though this was quite common just a few years ago. All the manufacturers should also be able to produce the values when they deliver windows.

All the manufacturers contacted mention that they are prepared to present the relevant data if requested. The Danish producers 'Velfac' and 'Rationel' were so kind as to send data from their window database when requested, whereas 'Idealcombi' could only refer to a local carpenter when asked for information.

A third Danish manufacturer, Bøjsø, Døre og Vinduer, provides the following information on the energy calculation for their windows on their homepage (translated by the author):

> When you receive offers and/or order confirmation from Bøjsø, we also specify the precise energy statistics for the specific window or door, which also includes a comprehensive calculation of the entire specification of average U-value. We can also send an energy fact sheet with the total energy calculation.[27]

It has only been possible to find a single website with an energy calculator, namely that of a manufacturer of secondary glazing.[28] All the data collected for g- and U-values as well as the total energy balance for a representative selection of typical window types is shown in Appendix 1. It has thus only been possible to update the energy survey with limited data, meaning that the energy diagrams shown are based on data that is somewhat obsolete. The data collected does nevertheless show that manufacturers of energy-saving windows now make windows with much better energy performance than in the past.[29]

INFERENCES FROM THE DATA COLLECTED

As Appendix 1 shows, traditional wooden windows provided with secondary glazing (green background colour in column A) have almost the same energy performance regardless of the window design. This is relatively poor for E_{ref} with only one frame in comparison with windows with IG-units, but much better for divided windows with mullion, transom, and glazing bars—as well as for noise-reducing panes. The main reason why the energy performance is somewhat worse with glazing bars is that the shadows cast by the glazing bars have a negative effect on the g-value. On the other hand, IG-unit windows have very good energy performance for E_{ref} and with a three-layer

IG-unit, they have an A-grade positive energy balance ($E_{ref} > 0$). However, for windows with two casements or more, the energy performance is poorer than for windows with secondary glazing.

If one takes the example of a traditional window with four frames and one glazing bar (column I), the recently introduced A-grade triple-pane 'Velfac Classic (3)' (row 16) has a 84 per cent greater energy loss than traditional windows (1+2) with secondary glazing with double coating (row 5) (energy gain ÷37.8 kWh/m^2/year compared with ÷20.5 kWh/m^2/year). For windows with two layers of glass, the C-grade 'Velfac Classic' double-pane window (2) (row 14) has an energy gain of ÷54.5 kWh/m^2/year and therefore only a 5.6 kWh/m^2/year better energy gain than traditional secondary glazing with one hard-coated energy-saving pane (row 7), with an energy gain of ÷60.1 kWh/m^2/year (1+1).

EXAMINATION OF THE BR2018, CHAPTER 11: ENERGY CONSUMPTION

Note that the guidelines for the BR2018[30] are still not complete—and not yet available in English translation. Chapter 11 deals with energy consumption in buildings and hence also energy consumption through windows. Windows, along with external doors, roof lights, skylight domes, glazed external walls, glazed roofs, and hatches facing the outside are often treated differently than the rest of the building envelope. This is presumably because these are 'weak' spots that are much thinner than walls and roofs and develop extensive thermal bridges. There is also an extra challenge associated with building parts that contain glass, namely how they gain energy from the sun, which will result in extra energy in the heating season and can cause overheating in the summer.

> 250. Buildings must be planned, established, converted and maintained in order to avoid unnecessary consumption of energy for heating, domestic hot water, cooling, ventilation and lighting with due respect of the use of the building and the scope of the building work.[31]

This first provision is very easy to understand and has a clear purpose; not least because there is a general understanding of global heating as a serious challenge that calls for a reduction of energy consumption and a securing of energy supplies. The more we reduce consumption, the lower the demand for energy will be.

> 251. Buildings must be planned, established, converted and maintained to ensure that the energy demand does not exceed the energy framework, which includes the total demand of the building for energy supply for heating, ventilation, cooling, domestic hot water and lighting. Energy supply from various energy sources must be added using the energy factors stated in ss. 252 and 253. Evidence must be provided based on the instructions of the Danish Building Research Institute 213 Energy demand in buildings.
>
> (2) For additions, changes in use, conversions, temporary movable pavilions and holiday homes, the provisions of ss. 267-292 can be applied as an alternative to the energy framework.
>
> 251. states that the energy demand for a building should not exceed the calculated energy framework. Again, this is a clear and logical requirement, and it seems obvious that one should use the actual energy data from the windows in use and not data from a reference window. Therefore, you need to know the exact energy performance of the actual window to make a correct energy performance framework for a building. This speaks in favour of the manufacturer having to make the calculations as well as disclose the data when providing quotes and/or receiving orders.[32]

The problem is that the rules for windows are rather confusing. The energy performance framework should be calculated for the entire building, and in 11, 1.4 [5] it is specifically mentioned that the calculation must take into account all thermal bridges (not only for windows). If the transmission loss is calculated without thermal bridges, it will normally be 50–70 per cent higher when compared with calculations in which the thermal bridges are included. These rather clear rules indicate that it is important to calculate as accurately as possible so as to get the right results in order to design buildings with energy demands that are as low as possible. On the other hand, paragraph 258 states that calculations should be made based on a reference window. However, as we have seen, windows perform very differently depending on their size, shape, design, and number of panes.

> 255. Buildings and building parts, including windows and doors, must be planned and established to ensure that heat loss is not increased to a significant degree as a result of: Moisture in structures. Unintended air flow though entrances in e.g. shops, offices and hotels.

2) Unintended air flow though building parts, e.g. heat insulation exposed to wind effects.
3) Thermal bridges.

256. For energy calculations, the following preconditions apply to the calculations:
1) In calculation of transmission areas, transmission loss and heat loss frameworks, DS 418 Calculation of heat loss from buildings must be applied.
2) The energy effect of thermal bridges must be included in the form of documentation of U values for each building part.[33]

Please note that the thermal bridges in, for instance, windows should be included in the calculations of heat loss is mentioned in particular. However, when a reference window is used, most of the calculations do not take this element into account, as seen in provision 258. Windows are mentioned specifically, presumably because there are major problems with thermal bridges in windows. The general minimum requirements for building envelops state that:

257. Each building part must be insulated to ensure that the heat loss coefficients do not exceed the values stated in Appendix 2, Table 1.
(. . .)
(2) Subsection 1 does not apply to ss. 267-270 and ss. 274-282.
(. . .)
Tables for Chapter 11 – Energy consumption
Table 1 – General minimum requirements for building envelopes
For gates and hatches opening to the outside or to unheated rooms and glass walls and windows adjacent to rooms heated to a temperature creating a temperature difference between the rooms of 5 °C or more:
U value [W/sq. metre K] 1.80.[34]

As becomes clear, there are no minimum requirements for windows in Table 1, except for windows inside buildings that are adjacent to rooms heated to such an extent that a temperature difference between the rooms of 5 °C or more results. See paragraph 268 below. This is exactly the same wording as in the BR2015,[35] and it is hard to see this rule having any practical application. The rules regarding the U-value for windows have been replaced with minimum requirements for the energy performance for a reference window. The general minimum requirements for windows, glass outer wall, skylights, and glass roofs state that:

> 258. Windows, glass outer walls, skylights and glass roofs must be in accordance with the following requirements for energy performance:
> For windows and glass outer walls, the energy balance for the reference window may not be lower than -17.0 kWh/sq. metre per year. The energy balance is calculated as $E_{ref} = 196.4 \times g_w - 90.36 \times U_w$.
> (. . .)
> Sound glass and other functional glass may be used if the reference windows fulfils the energy balance requirement. However, glass with a lower solar heat transmittance (g value) may be used if energy savings related to the solution can be proven.
> (2) The reference dimensions for windows, glass outer walls, skylights and glass roofs is 1.23 metres x 1.48 metres.[36]

Using soundproofed glass will generally result in a poorer U-value for IG-unit windows if the distance between the layers is reduced to less than 14 millimetres as a result of a thicker inner pane. This is often the case if the manufacturer's normal window has an interspace of around 16 millimetres, which is the optimal distance for minimizing the U-value. Likewise, using solar-coated glass will result in a dramatically poorer g-value and thus a significantly poorer energy balance for the actual window.

> The energy gain E_{ref} is an appropriate expression to use in comparisons of the efficiency of different windows during the heating season. A separate assessment may need to be made with regard to nuisance due to solar heat gain and any overheating in summer.[37]

As shown in Appendix 1, there can be a huge difference between the energy data for two given windows, which again confirms the objection that using a reference window does not give a true picture of the energy-related conditions of different types of windows. The energy frameworks for residential units, halls of residences, hotels et cetera state that:

> 259. For residential units, halls of residence, hotels, etc. the total energy supply demand of the building for heating, ventilation, cooling and domestic hot water per sq. metre heated floor area may not exceed 30.0 kWh/sq. metre per year plus 1,000 kWh per year divided by the heated floor area.
> (…)

> 267. In case of changes in use of a building or parts of a building which results in a significant increase in energy consumption, the energy demands may be observed by using the energy framework in ss. 259-266 or by following the requirements for U values in s. 268.[38]

And there are no rules for windows except the general rules of 259–66 or 268.

> 268. Building parts adjacent to heated rooms must be established with heat loss coefficients corresponding to the temperature to which the rooms are heated stated in Appendix 2, Table 2. Windows, glass outer walls, glass roofs and skylights must fulfill the requirements stated in ss. 257 and 258.[39]

Concerning windows, paragraph 268 only refers to ss. 257 and 258, which state that the calculation should made based on the deceptive reference window, and not based on the specific energy framework of the windows in question.

> 269. In case of changes in use of a building or parts of a building, structural circumstances may result in failure to fully observe s. 268. In that case, the missing capacity must be replaced by other energy solutions which compensate for this failure.

> 270. Structural changes must be in accordance with the requirements in s. 268. Changes which result in an increase in energy consumption may be carried out provided equivalent compensating energy savings are carried out.[40]

There are no rules for windows in the regulation Table 2—Minimum requirements for the building envelope in the case of changes in use. The energy requirements for additions (ss. 271–73) state that:

> 271. Additions must be planned and established in a way which ensures that the energy demand does not exceed the energy framework on calculation. If the energy framework is used for additions, the energy framework only applies to the addition. The size of the energy framework for the addition is calculated based on the area of the entire building. Alternatively, the requirements may be observed by observing the U values stipulated in s. 268 or the heat loss framework stipulated

in s. 272. It is a condition of the use of the U values in s. 268 that the total area of outer doors and windows, including skylights, dome lights, glass outer walls and glass roofs does not exceed 22 per cent of the total heated floor area.

272. The heat loss framework may be applied to additions if the heat loss of the addition does not exceed the heat loss which would have occurred if the U value requirements in s. 268 had been complied with.

(2) In this context, the heat loss framework only includes the addition. However, 50 per cent of the previous heat loss through the part of the facade on the existing building which is covered by the addition may be included in the heat loss framework.

273. Windows in the addition may be included in the heat loss framework as the actual windows or windows with a U value of 1.2 W/sq. metre K. The actual windows must be used in the calculation of the real conditions.[41]

How the last sentence in 273 should be understood is unclear. But, apparently, energy data for the actual windows should be used so as to calculate the real conditions. When asked directly, the Ministry of Transport, Building and Housing referred me to the Copenhagen municipality, which was asked as well but was unsure of what exactly was meant and could not provide a proper answer. The energy requirements in connection with conversions and the replacement of building parts are presented in ss. 274–79 and the corresponding table:

274. In conversions, energy savings must be carried out to the extent that they are financially viable and do not involve a risk of moisture damage. The energy demands in conversions may either be observed by fulfilling the requirements for all building parts affected in s. 279 or by observing the renovation classes for existing buildings in ss. 280-282. The renovation classes constitute an energy framework for existing buildings.

275. Conversions for which the annual savings times useful life divided by investment exceeds 1,33 are considered financially viable. If conversions are not financially viable, the lack of financial viability must be proven. If a conversion is not financially viable, it should be determined if a smaller conversion would be viable.

(2) In structures with room for insulation, e.g. sloping roofs with rafters, examinations must first be carried out to determine if insulation of the cavities are financially viable and then if reinsulation according to the requirements in s. 279 is financially viable.

276. Changes to buildings which involve an increase in energy consumption may be carried out if corresponding compensating energy savings are carried out.

277. If building parts or installations are replaced, the provisions in s. 279 and the installation parts must be maintained irrespective of their financial viability.

278. Churches and additions which form part of a listed ancient monument are exempt from the provisions of ss. 274-282.
(2) Listed buildings are exempt from the provisions of ss. 274-282 if observing the energy requirements in ss. 274-282 would be contrary to the architectural, cultural, historical or environmental values of the listed building.
(3) Buildings worthy of preservation which are included in a local preservation planning regulation or a registered preservation declaration or buildings appointed in the municipal plan as being worthy of preservation under s. 19(1) of the Danish Act on Listed Buildings are also exempt from the provisions in ss. 274-282 if observation of the requirement would be contrary to the plan or appointment in question.

279. Conversion or other changes to the building must be in accordance with the requirements for U values and linear thermal transmittance stated in Appendix 2, Table A. Windows, glass outer walls, glass roofs and skylights must fulfill the requirements stated in ss. 257 and 258.[42]

Paragraphs 274–82 address conversions and replacements of building parts and thus also the renovation or replacement of windows. The table above shows that a renovated secondary window should have a minimum U-value of 1.65. This is very sensible, as it can be achieved very simply by mounting a secondary glazing window with one layer of energy-saving glass. The problem arises when one reads the definition for a renovated secondary window. As the guideline from 2018 is still not available in English translation, what follows here is the definition from the BR2015:[44]

> Renovated secondary windows are windows which are dismantled, renovated and reinstalled in another building. In this context, the removal of windows for work which is comparable to regular maintenance, for example painting, puttying and repair is not a renovated window if the windows are reinstalled in the same building.
>
> No requirements are specified for the energy performance of secondary window frames which are fitted on existing, permanent windows.[45]

This definition of a renovated window is rather unusual, and this author is not aware of any actual examples such renovation. It would mean that there is a window opening in another building into which the renovated windows would fit exactly—which is considered somewhat unlikely. Presumably, they could only be installed in a brand-new building—which would have to follow the rules for the reference window. In that case, it would be more appropriate to call these recycled windows.

The provisions continue by specifically mentioning that there are no requirements for renovated secondary windows if they remain in a building. This is quite strange, since one of the most common and cost-effective ways to reduce energy consumption is to install energy glass in the secondary frame—a procedure that is even allowed in protected buildings. The energy consumption will thus be halved.

If one were to insert an energy pane with two coatings, the total energy consumption would fall to one sixth compared with the use of ordinary glass

Table 1. Building elements and U-values (Table 3 in Appendix 2 to the regulations)43

Building element	**U-value [W/m²K]**
(. . .)	*(. . .)*
doors/gates	*1.80*
hatches, new secondary windows and skylight domes	*1.40*
renovated secondary windows	*1.65*
(. . .)	*(. . .)*

in the secondary frames. Furthermore, it is clear that secondary windows will only be rated based on their U-value and the sun gain through the windows. Since a window with secondary glazing will gain even more energy from the sun than an IG-unit window, this seems discriminatory, since it shows that the requirements for windows designed as a window with secondary glazing are only supposed to apply to the U-value of the actual window size. There is no explanation for the difference and the, in this respect, incomprehensible discrimination in comparison with IG-unit glass windows.

If one takes into account that the energy loss through windows with secondary glazing will change relatively little if one compares the reference window with windows with many frames and panes, this is even more remarkable. New secondary windows are defined as new 1 + 2 windows, which means that the outer part of the window has one layer of glass, whereas the pane in the secondary glazing should be given an energy-saving pane. Otherwise, it is not possible to achieve a U-value of less than 1.40.

As is shown in Appendix 1, this type of window actually has a U-value of slightly less than 1.40, but has an energy gain for the actual window that is worse than that of a 1 + 1 solution with only one energy-saving glass in the secondary glazing. The far most energy-efficient window with secondary glazing is achieved with a 1 + 2 solution with an energy pane with two coatings. This design is also actually even better than that of equivalent new three-layer energy-saving panes—except in the case of the reference window! Here it should be mentioned that some manufacturers have had problems with thermal breakage when using energy panes with two coatings.

RESULTS OF THE EXAMINATION OF THE FINNISH BUILDING LEGISLATION OF 2013/2017

The Finnish building legislation for new buildings is from 2017 and for buildings undergoing renovation or alternations from 2013.[46] For windows, there are only requirements for the U-value: this should generally be less than 1.00 W/m^2/K. There are, however exceptions for:

> buildings to the extent to which they are protected, and where observing the provisions would change the protected parts in a way that cannot be considered acceptable;
> Additionally, here is a simple rule:
> If old windows and external doors are repaired, the thermal resistance

must be improved where possible.
If the windows are repaired, achieving the original or better level would be sufficient, but there would not be actual obligation to improve.[47]

If this law were adhered to according to its intention, this would suggest a very simple and energy-efficient way to preserve original windows. There are no requirements for energy gain from the sun, the g-value, but the energy amassed through the windows is often mentioned as a huge problem. The general advice is to acquire new windows with a low g-value in order to prevent overheating in the summer. This is astonishing advice in light of the quite cold climate of Finland. In Denmark, overheating is not a problem in older houses with a relatively small share of windows and solid brick walls, which balance the temperature. It must be recalled that a low g-value will apply throughout the whole year—also during the heating season. It should also be noted that there are no examples of windows with low g-value in Appendix 1—even though they have a very low energy performance.

NORWEGIAN BUILDING LEGISLATION OF 2017

The currently valid Norwegian building legislation is from 2017 and quite simple and clear with regard to the requirements for the insulation quality of windows.[48] There are only requirements for the U-value: this should generally be less than 0.80 and, at minimum, less than 1.2 W/m^2 K. There are no requirements for energy gain from the sun, the so-called the g-value. As Appendix 1 shows, it is impossible for common Danish windows to achieve a U-value as low as 0.80, apart from windows with only one frame and with a three-layer IG-unit. This, however, limits architectural freedom. But there are some exceptions for buildings with outer walls made of logs. For protected and conservation-worthy buildings, the following rule applies:

> In the case of projects where compliance with the requirements in this chapter is incompatible with the preservation of monuments of cultural and/or antiquarian value, the requirements apply insofar as they are appropriate.[49]

SWEDISH BUILDING LEGISLATION OF 2011/2018

The Swedish building legislation came into force in 2011, with various amendments until 2019.[50] The law deals with the overall energy framework, and states that energy gain from the sun through windows, the g-value, should be taken into account (translated by the author):

> Section 3: When calculating a building's energy use, the building's design, location and orientation are taken into account, including outdoor climate and passive solar radiation.
> If the building does not meet the requirements for the primary energy figure after changes have been made, the following U-values shall be striven for in changes to the building envelope. (BFS 2017:5).
> U_{window} 1.2 W/m^2, K.[51]

It appears that one is free to choose between various window solutions as long as the total energy framework is adhered to. If not, the maximum U-value must be 1.2 W/m^2 K. Though there are no specific requirements for energy gain from the sun, i.e. the g-value of the windows, energy gain is used in the overall energy framework—just as in Denmark. There is also a comprehensive description of the conditions of buildings worthy of preservation, 1:2213 Particularly valuable buildings:

> A building can be such a particularly valuable building referred to in Chapter 8, Section 13, PBA, either because it has such values itself or because it is an essential part of a particularly valuable built environment. What is stated here about buildings also apply for areas of built environment.
> A building can be particularly valuable if it clarifies earlier societal conditions. Examples of this are
> - buildings that represent an earlier common building category or structure that has now become rare.
> - buildings that illustrate earlier dwelling conditions, social and economic conditions, working conditions, different groups' living conditions, urban building ideals or architectural ideals and values and thought patterns, and buildings that have represented functions or activities important to the local community.
>
> A building can also be particularly valuable if it clarifies the societal progress. Examples of this are
> - buildings that e.g. illustrate the emergence of social movements, the breakthrough of mass car ownership, immigration or emigration,
> - buildings that have served as role models or in other ways been acclaimed in its time, and
> - buildings that are characterized by a strong architectural idea.

A building can also be particularly valuable if it in itself is a source of knowledge about older materials and construction techniques.

A building can be particularly valuable from an artistic point of view if it shows special aesthetic qualities or has a high level of ambition regarding architectural design or in construction and material choice or in artistic design and decoration.

The concept particularly valuable means that the building particularly well shall illustrate a certain condition or in its context have few counterparts that can illustrate the same condition.

Buildings from the time before the built environment expansion of the 1920s, that have its main character preserved, currently represents such a limited part of the building stock that most of them can be assumed to fulfill some of the criteria for particularly valuable building. (BFS 2016:6).

General recommendation
Windows: Windows are often of great importance for how the building is perceived and its cultural values. Reasons for deviation from the requirement for maximum U-value could be if the windows are manufactured specifically to meet the building's aesthetic or cultural values. Original windows should only be replaced using windows that in respect of materials, proportions, division and profiling are well suited to the character of the building. Windows may also have a highly significant cultural value to the extent that they should not be replaced unless there are exceptional reasons. Other measures to increase thermal resistance should be taken instead.[52]

If this law were adhered to based on its intention, this would suggest a very simple and energy-efficient way to preserve original windows, thus similar to the Finnish regulations. However, there is no mention of the very large energy-saving potential of energy-improving traditional windows.

RESULTS AND DISCUSSION

Denmark is the only Nordic country that makes direct reference to the total energy balance of a window in which both energy loss and energy gain from the sun are taken into account. In both Sweden and Denmark, it is necessary to calculate the total energy framework for an entire building, which,

for windows, includes the total energy loss and energy gain from the actual windows in the actual building. The calculations therefore show the actual energy performance of the windows, but since energy loss and gain are calculated separately, it is rather complicated to compare the total energy balance for windows with an alternative scenario—for instance, windows with secondary glazing—and it is feared that this is rarely done in practice.

The Danish BR2018[53] can be helpful when selecting the most energy-efficient windows with IG-units whose geometry corresponds to the single light/one-frame reference windows. However, if the windows, for instance, have more than one frame, this does not apply. Furthermore, the information regarding windows in the BR2018[54] is quite illogical and hard to understand. The BR2018[55] should thus be modified as far as windows are concerned, not least since round half of the windows used in Denmark are multi-frame.[56] The regulations should also stop using E_{ref}, and all windows, including windows with secondary glazing, should be rated based on the energy balance of the actual window in the actual design.

Based on discussions in the other Nordic countries about overheating in the summer caused by windows, which therefore recommend windows with a low g-value, it seems important to consider these factors as well. Windows with a low g-value will save energy for cooling in the summer but, on the other hand, increase the consumption of energy in the winter. Of course, unlike Denmark, the rest of the Nordic countries also have to take into account their large geographical range, which extends over several different climate zones.

Windows with secondary glazing have a similar energy performance to IG-unit windows for multi-frame windows. Since the majority of existing buildings have multi-frame windows, it seems far more important to make them as energy-efficient as possible, contrary to the practice in the past four decades, in which they have often been replaced with new windows. This might have a big impact on total energy consumption, and it is probably far more sustainable to improve the energy efficiency of existing windows in older building stock than to replace them with new ones.

CONCLUSION

None of the building regulations of the Nordic countries specifies the great potential of energy-optimizing original windows.

None of the Nordic building regulations requires a direct calculation of the energy loss and gain for the actual window in the actual design of windows.

The lack of energy calculators on manufactures' websites is a very big problem. In Denmark, window manufacturers are obligated to provide the actual energy data, but only if it is requested in connection with an offer. Since it is so cumbersome to find the most energy-efficient solution, it is feared that this does not happen in practice.

All companies should provide a publicly available energy calculator in order to receive an energy rating, so that it would be possible to find the right energy data before requesting an offer. There also needs to be an independent website, including for windows with secondary glazing, that addresses the sustainability (life-cycle analysis), maintenance, noise reduction, total economy, and energy performance of windows in typical designs and sizes.

If the Finnish rule 'If old windows and external doors are repaired, the thermal resistance must be improved where possible' were combined with reliable energy calculators to actually find the right energy data, the Nordic countries could most likely combine building conservation with massive energy savings.

NOTES

[1] Thomas Kampmann, *Heat loss through windows*, Centre for the Restoration of the Built Heritage, Raadvad, Copenhagen (*Vinduers Varmetab*, RAADVAD – Nordisk Center til Bevarelse af Håndværk) (Lyngby, 2002), https://www.bygningsbevaring.dk/uploads/files/vintab12slutrapport2.pdf; Thomas Kampmann, *Noise nuisance! How to achieve the best noise insulation of windows?*, Centre for the Restoration of the Built Heritage, Raadvad, Copenhagen (Støjgener! Hvordan opnås den bedste støjisolering af vinduer?', Center for Bygningsbevaring i Raadvad) (Lyngby, 2004), https://www.bygningsbevaring.dk/uploads/files/vinduers_lydisolation_GI_arktikel_2.pdf; and Thomas Kampmann, *Total environmental impact of windows, Life cycle analysis of four window types – or how to costeffective and conveniently reduce CO2 emissions significantly!*, Centre for the Restoration of the Built Heritage, Raadvad, Copenhagen (Vinduers samlede miljøbelastning, Livscyklusanalyse af fire vinduestyper – eller hvordan man billigt og bekvemt begrænser CO_2 udslippet mærkbart!', Center for Bygningsbevaring i Raadvad) (Lyngby 2004), https://www.bygningsbevaring.dk/uploads/files/vinduers_livscyklusanalyse_GI_artikel_2.pdf (if not otherwise mentioned, all URLs accessed in May 2021 unless otherwise noted).

[2] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*.

[3] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*. (Trafik-, Bygge- og Boligstyrelsen, *Bygningsreglementet 2018*).

[4] Thomas Kampmann, 'Through the Looking-Glass: Why Current Building Code Employs Double Standards When Relating to Existing Windows', in *Robust, Reflections on Resilient Architecture*, edited by Albert Algreen-Petersen and Søren Bak-Andersen (Prague: GEKKO Publishing, 2017).

[5] *Guidance for the Danish Building Regulations 2010*. (*Anvisning om Bygningsreglement 2010*), https://sbi.dk/anvisninger/Pages/Anv230-Anvisning-om-Bygningsreglement-2010-udgave-4.aspx.

[6] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*.

[7] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018* (Trafik-, Bygge- og Boligstyrelsen, *Bygningsreglementet 2018*).

[8] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*.

[9] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*.

[10] Ibid.

[11] Ministry of Transport, Building and Housing, *Danish Building Regulations 1995*, p. 88. (Trafik-, Bygge- og Boligstyrelsen, *Bygningsreglement 1995*, p. 88.)

[12] Thomas Kampmann, *Vinduers Varmetab*.

[13] *Guidance for the Danish Building Regulations 2010* (*Anvisning om Bygningsreglement 2010*).

[14] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018* (Trafik-, Bygge- og Boligstyrelsen, *Bygningsreglementet 2018*).

[15] *Guidance for the Danish Building Regulations 2010* (*Anvisning om Bygningsreglement 2010*).

[16] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018* (Trafik-, Bygge- og Boligstyrelsen, *Bygningsreglementet 2018*).

[17] Ibid., p. 54.

[18] Ibid.

[19] Ibid.

[20] Ibid.

[21] Thomas Kampmann, *Vinduers Varmetab*.

[22] Thomas Kampmann, 'Støjgener! Hvordan opnås den bedste støjisolering af vinduer?'.

[23] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*.

[24] Ibid.

[25] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*.

[26] Ibid., p. 117.

[27] See Bøjsø, 'TECHNICAL INFO: Energy' ('TEKNISK INFO: Energi'), https://boejsoe.dk/teknisk-info/energi/. The information on the homepage has been changed since 2017 or the passage cited has been deleted.

[28] Energiforsatsgruppen, Glazierguild [A *laug* (guild) is an old Danish term for an association of craftsmen in the same profession], Glarmesterlauget, Denmark, https://glarmesterlauget.dk/om-glarmesterlauget/energiforsatsgruppen (downloaded on 20 May 2017).

[29] Thomas Kampmann, *Vinduers Varmetab*.

[30] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*.

[31] Ibid., p. 54.

[32] Ibid.

[33] Ibid.

[34] Ibid.

[35] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*.

[36] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018* (BR18), p. 55.

[37] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*, p. 117.

[38] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*, pp. 55–57.

[39] Ibid., p. 57.

[40] Ibid.

[41] Ibid.

[42] Ibid., p. 58.

[43] Ministry of Transport, Building and Housing, *Danish Building Regulations 2015*. See Table 3 in Appendix 2, p. 127.

[44] Ibid., p. 79.

[45] Ibid.

[46] *Ministry of the Environment Decree on Improving the Energy Performance of Buildings Undergoing Renovation or Alteration* (2013), and *Decree of the Ministry of the Environment on the Energy Performance of New Buildings* (2017).

[47] *Ministry of the Environment Degree on Improving the Energy Performance of Buildings Undergoing Renovation or Alternation, Explanatory Memorandum*, p. 35.

[48] *Regulations on Technical Requirements for Construction Works* (2017).

[49] Ibid. p. 58.

[50] 'Boverket's building regulations – mandatory provisions and general recommendations on determining the building's energy use during normal use and a normal year (Boverkets författningssamling, Boverkets föreskrifter och allmänna råd om fastställande av byggnadens energianvändning vid normalt brukande och ett normalår), BEN', in BFS 12 (2016), and 'Boverkets föreskrifter om ändring i verkets byggregler 6 (2011)—föreskrifter och allmänna råd', in BFS 4 (2018).

Boverket = National Board of Housing, Building and Planning

[51] Ibid. This is the paragraph in Swedish language: '3 § Vid beräkning av byggnadens energianvändning ska byggnadens utformning, placering och orientering beaktas, inklusive utomhusklimat och passiv solinstrålning.'

[52] Boverket's mandatory provisions and general recommendations on determining the building's energy use during normal use and a normal year (Boverkets föreskrifter och allmänna råd (2016:12) om fastställande av byggnadens energianvändning vid normalt brukande och ett normalår, BEN). Ibid., p. 3.

[53] Ministry of Transport, Building and Housing, *Danish Building Regulations 2018*, proposal.

[54] Ibid.

[55] Ibid.

[56] Thomas Kampmann, 'The Future 2015 Danish Building Regulations Concerning Energy Performance of Multi-Frame Windows', paper for the conference *7. Passivhus Norden: Sustainable Cities and Buildings*, Copenhagen, 20–21 August 2015.

[57] Energiforsatsgruppen, Glazierguild, Denmark.

APPENDIX 1

Diagram showing the energy loss (U-value), energy gain (g-value), and total energy balance of the entire window for typical Danish windows. The figures for sealed-unit windows and for 'Bøjsø' were obtained from the manufacturers. The numbers of windows with single-layer glass or secondary glazing come from the 'Energiforsatsgruppe', as association of manufacturers of windows with secondary glazing.[57] Source: Thomas Kampmann.

	A	C	D	E	G	H	I	K	L	M	O	P	Q	S	T	U	W	X	Y	AA	AB	AC	AF
1	Survey of typical Danish window sizes and divisions for a quick overview of energy conditions in relation to legislation and lowest heat loss																						Energy labelling, the class is determined by the energy balance for a single-frame window E reference 1.23 x 1.48 m
2	Windows, size 1.23 x 1.48 m or 1.18 x 1.18 m (CEN product standards)	Four frames many glazing bars 1.23 x 1.48 m			Four frames one glazing bar 1.23 x 1.48 m			Four frames without glazing bars 1.23 x 1.48 m			Two frames many glazing bars 1.18 x 1.18 m			Two frames two glazing bars 1.18 x 1.18 m			Two frames without glazing bars 1.18 x 1.18 m			One frame without glazing bars reference window 1.23 x 1.48 m			
3	U-value, for the entire window, g-value, energy gained from the sun Energy balance, for the whole window during one year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	U W/m²/K	g %	Energy-balance kWh/m²/year	
4	New 'Bøjsø' window, linked frames with IG-units (1+2)	1.38	0.3	-64.7	1.38	0.34	-58.4	1.38	0.34	-57,0	1.35	0.32	-59.4	1.35	0.35	-53.8	1.35	0.37	-50.2			3,0	Energy class A $0 \le E_{ref}$
5	Traditional / new window with secondary glazing provided with IG-units with double energy coating (1+2)	0.94	0.3	-25.6	0.94	0.33	-20.5	0.94	0.34	-18.2	0.97	0.32	-25.3	0.97	0.34	-20.7	0.97	0.36	-17.8	1.03	0.42	-9.8	
6	Traditional / new window with secondary glazing provided with IG-units (1+2)	1.42	0.29	-70.7	1.42	0.32	-65.6	1.42	0.33	-63.5	1.37	0.31	-63.5	1.37	0.33	-59,0	1.37	0.34	-56.2	1.25	0.42	-31,0	Energy class B $-17 \le E_{ref} < 0$
7	Traditional / new window with secondary glazing provided with one energy pane (1+1, 4-mm thick energy pane)	1.66	0.42	-67.2	1.66	0.46	-60.1	1.66	0.47	-57.7	1.68	0.44	-65.6	1.68	0.47	-59.3	1.68	0.49	-55.4	1.77	0.58	-45.6	
8	Traditional / new window with secondary glazing provided with one energy pane (1+1, 6-mm thick energy pane for 44 dB soundproofing)	1.64	0.41	-67,0	1.64	0.45	-60.1	1.64	0.46	-57.8	1.67	0.43	-65.9	1.67	0.46	-59.7	1.67	0.48	-55.8	1.77	0.57	-46.8	Energy class C $-33 \le E_{ref} < -17$
9	Traditional / new window with linked 'Optoglas®' provided with one energy pane (1+1)	1.74	0.42	-75.1	1.74	0.46	-68,0	1.74	0.47	-64.9	1.74	0.44	-70.7	1.74	0.47	-64.4	1.74	0.49	-60.5	1.73	0.58	-41.9	
10	New 'Bøjsø' window, linked frames with one energy pane (1+1)	1.73	0.39	-79.9	1.73	0.43	-71.9	1.73	0.44	-70.1	1.73	0.41	-76.5	1.73	0.44	-69.5	1.73	0.46	-64.9			-41,0	Energy class D $-55 \le E_{ref} < 33$
11	New 'Bøjsø' window, double glazing IG-units, energy glazing bar, with warm edge (U-value glass 1.1 W/m²/K) (2)	1.88	0.3	-110,0	1.65	0.36	-78.2	1.59	0.37	-70.5	1.88	0.31	-108.5	1.68	0.36	-80.7	1.55	0.4	-61.8			-32,0	
12	New 'Rationel Forma Basic' wooden window, double glazing IG-units, energy glazing bar, with warm edge (U-value glass 1.21 W/m²/K) (2)	1.54	0.34	-71.5	1.45	0.39	-53.3	1.43	0.40	-49.8										1.32		-13.2	Energy class E $-60 \le E_{ref} < 55$
13	New 'Rationel Forma Premium' wooden window, triple glazing IG-units, energy glazing bar, warm edge (U-value glass 0.53 W/m²/K), (3)	1.09	0.25	-48.1	0.99	0.29	-32.9	0.97	0.30	-30,0										0.78		6.5	
14	New 'Velfac classic' wood/alu window, double glazing IG-units, energy glazing bars, warm edge (U-value glass 1.21 W/m²/K) (2)	1.61	0.35	-76.7	1.46	0.39	-54.5	1.42	0.40	-49.5	1.62	0.38	-71.8	1.48	0.41	-53.4	1.39	0.43	-41.0	1.31	0.54	-12.3	Energy class F $E_{ref} < 60$
15	New 'Velfac classic' wood/alu window, double glazing soundproof IG-units, energy glazing bars, warm edge (2)																			1.29	0.53	-11.9	
16	New 'Velfac classic' wood/alu window, triple glazing IG-units, energy glazing bars, warm edge (U-value glass 0.53 W/m²/K) (3)	1.09	0.25	-48.5	1.04	0.29	-37.8	1.02	0.29	-34.9	1.06	0.28	-41.7	1,00	0.30	-32.1	0.97	0.31	-26.2	0.8	0.39	4.7	
17	New 'Velfac classic' wood/alu window, triple glazing soundproof IG-units, energy glazing bars, warm edge (3)																			0.84	0.39	1.1	
18	Traditional / new window with secondary glazing provided with ordinary glass (1+1) – used in Denmark since 1731	2.32	0.43	-124.9	2.32	0.47	-117.7	2.32	0.48	-116,0	2.36	0.45	-124.8	2.36	0.48	-118.4	2.36	0.5	-114.3	2.52	0.6	-110.3	
19	Traditional / new window without secondary glazing (1)	4.46	0.49	-307.3	4.46	0.53	-299.1	4.46	0.54	-299.1	4.58	0.51	-313.4	4.58	0.55	-306.2	4.58	0.57	-301.6	4.99	0.68	-318.6	

NAF 2019, Biased Building Regulations for Windows, APPENDIX 1, *Source: Thomas Kampmann*

DEVELOPING STATION COMMUNITIES: ALTERNATIVE APPROACHES AND PERSPECTIVES ON ACCESS

Ann Legeby

ABSTRACT

The region of Västra Götaland has investigated the possibility of opening a number of new train stations in the region, with the aim of strengthening local labour markets and promoting sustainable commuting possibilities and development outside of metropolitan areas. This article explores the possible impacts of this directive on the development of sustainable and vibrant communities, with a focus on *urban form* and its *configurative properties*. Today, there is almost unanimous agreement within planning practice regarding the use of 'concentric centrality' as a model for urban development near stations, whereby high densities are encouraged within one kilometre of stations. In this article, the relevance of the Station Proximity Principle (and its use in the Transit-Oriented Development, or TOD, model) is questioned with respect to small communities. Taking Svenshögen as an example, the article advocates taking landscape conditions, barrier effects, and visibility and access in relation to key functions into account as well. A shift from node thinking to network thinking is needed. The alternative approach put forward here draws on space syntax theories and point-line-field conditions, opening up design strategies that are relevant for small communities and that take aspects crucial for their development and viability into consideration and avoid a narrow focus solely on transportation aspects.

KEYWORDS

Station communities, centrality, urban form, node networks

INTRODUCTION

Metropolitan regions in Sweden are growing; as a result, challenges related to sustainable development, including climate change, social inequalities, and social polarization, are becoming increasingly urgent. Recent decades have witnessed the concentration of investment and development in larger cities in Sweden, as a result of unfortunate interurban competition and regional imbalances. 'Densification' is a buzzword in planning debates and planning practice.[1] However, even as Sweden's cities grow, it is possible to see two partly contradictory tendencies emerging in parallel: on one hand, an increasingly densifying inner city, and, on the other, the production of continuous sprawl.[2] These tendencies can be seen in the Gothenburg region, where land in the centre of the city of Gothenburg is experiencing increasing development pressure, whilst peripheral locations are simultaneously witnessing on-going expansive urban development, which makes it difficult to fulfil municipal goals related to ensuring 'green, fair, and accessible' cities.[3] A strategy for dealing with these patterns within the Västra Götaland region has been to try to relieve the development pressures on the metropolitan area by constructing new railways stations. Today there are about 100 train stations in the region, and the region of Västra Götaland has investigated the possibility of opening (or reopening) forty new stations in smaller communities, with the aim of strengthening the labour market, improving access to education opportunities, and supporting and providing sustainable commuting options. The regional governing body sees train station communities as generators for positive, sustainable development outside of metropolitan areas.[4] Planning for these communities often follows a principle of encouraging high densities in proximity to the station (e.g. within one kilometre of the station), with densities decreasing as distance from the station increases.

The sustainability challenges that cities and regions are facing today call for increased critical reflection on how we should plan for growing regions in the future. One of the strategies that must be examined is the development of new and existing 'station communities' (a term used to describe settlements with a train station at their centre).[5] This article addresses the development of sustainable train station communities, specifically aiming to identify urban models for their development that extend beyond aspects related to energy-efficient public transportation. The article discusses how centrality and accessibility are understood in these models, showing how, based on the example of Svenshögen, an alternative model might play out in a station community along the Bohusbanan railway line. Which urban models are

capable of going beyond simple measures of energy-efficient public transportation to also incorporate social aspects and aims in the task of creating sustainable communities?

The article questions the principles currently being applied in developing station communities. Prevalent principles and theories that are often raised in relation to the development of cities linked to railways include: the Station Proximity Principle developed in the Copenhagen metropolitan area according to Hartoft-Nielsen[6] and Naess,[7] Transit-Oriented Development as originally developed by Calthorp,[8] and also various versions of the Neighbourhood Unit Planning from the 1940s and 1950s, which has had an enormous impact on the urban landscape in Sweden.[9] It is important to acknowledge that these models all emerged from studies of cities, or at least of larger communities and neighbourhoods. All three of these principles are also based on an idea of centrality that perceives it as being focused on a core, a point, or a node, thus conceiving urban form as following a concentric distribution from this point. The conditions that characterize the existing station communities investigated by Region Västra Götaland, however, differ considerably from those in cities, where centrality functions in a nodal manner; in these smaller communities, the population density is low, the pressure and/or demand to build is often limited, barrier effects exist as communities are often located on *one* side of the railway line and station, and other amenities and important functions are both limited and not necessarily found in proximity to the station. This article argues that the strategy of building and densifying in a circle around a train station—a principle based on findings generated in relation to conditions found in cities and not in smaller settlements—overlooks the importance of good access to other amenities besides the station and does not take landscape prerequisites into consideration to a sufficient extent. Adequate access to a multitude of amenities is essential to support social sustainability and the development of vibrant smaller communities.

Prevailing thinking about the development of station communities is also strongly influenced by ideas about density and land use. Whilst these ideas are reviewed in this article, the focus of this study is instead on urban form, and, more specifically, on configurative properties that may support the sustainable development of smaller communities beyond simply providing good accessibility to public transportation or access to the regional core. The focus on urban form speaks to one of the core concerns of planning and urban design practice and is linked to an interest in living conditions and

the creation of vibrant communities in ways that could, from a longer-term perspective, contribute to the creation of a more diverse region. In proposing an alternate approach, the study explores a range of existing approaches and theories that highlight the social and cultural aspects of communities and the everyday life activities they accommodate. In this task, the article draws on work, for example, on centrum-periphery relations, as well as on scholarship about how centrality emerges as a result of urban form, using theories found in space syntax[10] as well as concepts like point-line-field conditions.[11] Taken together, such approaches, it is argued, open up alternative design strategies for small cities and communities, where key amenities are recognized as a crucial element in the development of a local community that is not only a residential suburb dependent on commuting. The study also seeks to identify an approach capable of looking beyond travelling for job opportunities, and of taking into account access to and between the other amenities that are important for everyday life.

Svenshögen in the Stenungsund municipality is used to exemplify how such an approach may be applied and how it could contribute to the discussion about sustainable 'rurban' development.[12] A configurative approach and understanding of centrality and of the centre-periphery relation can serve as an alternative to the prevailing urban models used in planning practice today. A shift from node thinking to system-network thinking is, it is argued, required if we are to facilitate the development of station communities and ensure that social aspects and accessibility to essential functions and amenities besides the train station are both taken into account. In the long term, this is of great importance for achieving sustainability in small communities.

BACKGROUND: PLANNING STATION COMMUNITIES IN VÄSTRA GÖTELAND AND STENUNGSUND

Regional Planning Strategies

Two regional public actors are involved in the planning of infrastructure systems, including the locations of train stations: Gothenburg Region and Region Västra Götaland. Investments in the Gothenburg region have aimed to strengthen the city of Gothenburg, developing it in its role as the strong core of the region. From this core, transport corridors extend out into the region, with highways and/or railroads providing efficient opportunities for transportation.[13] Along these corridors there should be '. . . several strong and attractive sub-region centres.'[14] Of the total estimated population growth of 180,000 people, the aim is to concentrate 25 per cent (45,000 people) in

the core and distribute 75 per cent (135,000 people) along these transport corridors and in existing urban developments.

Region Västra Götaland[15] is the actor that has formulated strategies for sustainable transportation, including the further development of the railway system. In 2035, the region is expected to accommodate 1.9 million inhabitants (it is home to 1.6 million today). The region proposes that train traffic will play a key role in relation to future development; it is a means to enlarge the region as well transform the transport system and make it more environmentally friendly. Based on the argument that rail has the greatest potential within public transportation,[16] an investigation of the possibility to open a number of new stations has been carried out.[17] The aim of opening new stations (or reopening closed ones) is to strengthen the region as a whole, support local labour markets, and provide opportunities for sustainable commuting. Today more than a third of the region's inhabitants commute to another municipality. Development in proximity to train stations is seen as a way to achieve the goals formulated in the policy document 'Vision for the Västra Götaland Region' (2005).[18]

There is a risk that too strong a focus on development in Gothenburg could result in a regional imbalance and a concentration of resources that may lead to increased polarization and unequal living conditions. Such imbalances, in terms of both centre-periphery and urban-rural relations, have long been debated, and how they are understood impacts the strategies that are employed in relation to development outside of cities. An obvious risk is that whilst a well-functioning commuting system has great potential to connect communities further out in the region to workplaces and services, increased access to the metropolitan core could have the effect of draining local communities and local services, as people go elsewhere to work, study, shop, and engage in leisure.

Bohusbanan

The 180-kilometre-long Bohusbanan railway line connects Gothenburg with Strömstad. The railway line, which opened in 1903–07, was initially built to connect Gothenburg with Oslo, two important cities in what at that time was part of the union between Sweden and Norway. There were initially nearly forty stations, but only seventeen of them remain today.[19] The idea of connecting the Swedish and Norwegian railway systems became less interesting when the union dissolved in 1905. The southern part was electrified in 1939

and the northern part in 1950. Today, Bohusbanan carries regional traffic and freight (the latter only in the part that is north of Dingle).

Comprehensive Planning in Stenungsund

The municipality of Stenungsund has 25,500 inhabitants (2017) and a comparatively high number of workplaces (3,000), resulting in a balance of commuting flows. One aim of the proposed 'Comprehensive Plan for Stenungsund' (2018) is to build 170 new housing units each year. The majority of these dwellings will be built in existing communities with a high level of access to public transportation.[20] Today, there are three train stations—Svenshögen, Stenungsund, and Stora Höga—with a fourth (Jörlanda) suggested for reopening. According to the plan, new development around the train stations should primarily be located within a one-kilometre radius of the station. This area is marked as a circle in the plan and is thus in line with concepts in transport planning that are elaborated further in this article. Public transportation via bus is well developed and to some extent serves the same destinations and routes as the railway system. The 'Comprehensive Plan' proposes a new double line for the Bohusbanan, a new bridge to Orust (Svanesund), commuting ferry lines between the coastal municipalities, and a new travel hub in the centre of Stenungsund, 500 metres south of the existing station. An expansion of the bicycle network is proposed to connect the communities and cover the whole municipality. Taken together, developed plans exist for extensive investments in infrastructure, on both regional and municipal levels. Such investments will have impact in ways that extend well beyond the transportation aspects of the plan, and for this reason it is important that the concepts and models applied to development—particularly around train stations—be interrogated.

Theoretical Framework

How cities and communities are designed is critical to their sustainability, as it affects the access that they afford to amenities and resources. A number of prevailing concepts related to density, accessibility, and land use that have influenced the development of station communities in the Västra Götaland region, are presented below.

Many of the studies addressing location, land use, and density in relation to railway stations, it can be argued, have been based on forms of *node* thinking, whereby urban development is understood as following a nodal logic. Such studied have concerned themselves with identifying a core and organizing

development around that core in a concentric form, with land use and density depending solely on distance from the station. Many of the concepts that such an approach is built upon are derived from studies of larger cities rather than small cities or communities.[21] In contrast to smaller communities, large cities typically maintain high building densities in proximity to stations, a high level of mixed use, and, most importantly, a large hinterland of urban development that extends out several kilometres and has an effect on the core. In small cities or communities, this hinterland is often undeveloped. In many planning strategies that deploy such node thinking, the designation of the 'centre' is also influenced by a transportation logic.

In this study, alternative ways of understanding centrality are introduced, and thus highlight a social logic of space. A different understanding of proximity is, I argue, needed when designing station communities in line with sustainability priorities. We need to be more aware of urban form and the spatial relations that are created, and to pay greater attention to site conditions and the location and nature of existing amenities.

Urban Models in Economics

It is possible to see that models from urban economics have, historically, heavily impacted urban development strategies. Such models are relevant to the development of station communities and the centre-periphery relations between areas of high concentration and areas of low concentration. Originally a model for agricultural land use, von Thünen's location model of 1826 provides one example of such a model. Assuming that the terrain was flat and that each market or city was isolated from the others and self-sufficient, the model described the way in which land close to marketplaces, the centres of settlements, is more expensive because of transportation costs. Even today, the model illustrates to some extent the balance that must be achieved between land costs and transportation costs and the how the price of land increases as one gets closer to a city. A second historically important model is Walter Christaller's Central Place Theory, which he formulated in the 1930s.[22] The theory was based on studies of cities and communities undertaken through an economic lens; it holds that people gather to share goods and ideas, and that those central places/communities thus exist for economic reasons. Christaller identified five types of communities of different sizes, as a result of which each had different reach/catchment areas. The importance of transport costs continues to be emphasized in more recent studies—for example, the New Economic Geography developed by Paul Krugman.[23]

Contemporary theories of this sort highlight the importance of cities for the concentration of human capital and economic flows, and explain that cities are not spread out evenly because production tends to concentrate in places, regions, or cities—such places are, as a result, likely to be more densely populated and to have higher levels of income.

The Station Proximity Principle

A Station Proximity Principle was developed in Copenhagen and has been part of the regional plan since 1947.[24] The so-called 'finger plan'—which proposed a radial structure made up of railway lines extending outwards from the core, with green wedges (left free of development) in between them—has been developed over the years and remains the guiding principle for urban development in Copenhagen.[25] The plan from 1989 included what was termed a policy directive for 'common transport and localization', which stated that services should be located in close proximity to stations, with workplaces within 600 metres[26] and housing within two kilometres. The argument for this strategy was that such a structure provides a high level of access to urban functions, preserves green wedges, prevents sprawl, decreases traffic congestion, reduces car traffic, increases the use of public transport, and improves the economic performance of public transport.[27] More recent versions of the 'finger plan' were launched in 2007 and 2013.[28] The plan includes restrictions regarding land use with relation to proximity to stations, with workplaces and other more intense urban functions placed within 600 metres and a distance of one kilometre regarded as a maximum for urban development.[29] What governs these distances is clearly a transport perspective, and the aim is to enable people to use public transportation and, most importantly, to avoid taking the car. Hence, priority is given to urban development that provides easy access *to and from* the station, with other service et cetera located in proximity to the station in order to secure a high level of access. The strategies adopted by the Gothenburg region in 2013 strongly align with the plan for the Copenhagen region.

Transit-Oriented Development

Transit-Oriented Development (TOD) is a concept that was developed in North America.[30] Typically, it proposes that a station or a communication node be surrounded with dense urban development and that density should decrease as distance to the travel node increases. Land uses are rather segregated; residential uses are separated from offices and retail (see fig. 1). The concept may be described as a normative model, and very little focus is put

on how the urban form or design might be related to particular properties or outcomes. It could be said that the concept is derived from Howard's model of the Garden City.[31] Other related terms used are 'transit villages', 'transit-supportive development', and 'transit-friendly design'.[32] More recently, traffic congestion, air pollution, and urban sprawl have resulted in a new wave of initiatives inspired by the TOD concept. When one looks at some of the early diagrams it is possible to see a strong relationship to the Neighbourhood Unit Planning concept. Moreover, even though such communities could be described as 'transportation friendly,' the concept tends to create satellites, which are highly dependent on their connection to urban places that threaten to put competing local services and amenities out of existence.

Neighbourhood Unit Planning

Neighbourhood Unit Planning became the model for expansion in Sweden starting in the 1940s. The intention was to provide housing with high standards in order to cope with a severe housing shortage. Units were located outside of the built-up area of the city and this model thus supported urban expansion. The neighbourhood was organized around a train, tram, or subway station and included public and commercial services, parks for recreation, workplaces, and housing. The units, which were often planned for between 20,000 and 30,000 inhabitants, were supposed to have a higher density (i.e. multifamily housing) close to the core, and a lower density at longer distances from the centre. In relation to contemporary ideas for developing new cities and station communities, it is relevant to highlight the separation of land uses—i.e. the separation of housing from workplaces and industry, and even the separation of multifamily and single-family dwellings.[33]

The urban models and concepts based on node thinking prioritize transportation aspects based on the finding that people living in proximity to stations use public transportation to a higher degree. For example, studies of Strängnäs show that the share of those who use public transportation is higher among those living within one kilometre from the station (29 per cent) than among those living at greater distances from it (9 per cent).[34] Moreover, these studies also indicated that the number of trips using public transportation increased rapidly among those who lived within walking distance of the station, indicating that it could be advantageous to also plan housing in proximity to the station. To some extent, a strategy that increases the number of workplaces around the station may be contradictory, since residential use might be pushed farther out. Again, it is important to be aware

of the size of the city when implementing such ideas. In cities with a large and dense catchment area, it may be more relevant to concentrate and prioritize workplaces in proximity to stations, while in other communities a mixed-use solution may be both more realistic and more sustainable.

Figure 1. Principle from the 'finger plan' (Egnesplankontoret 1947), the TOD model (Calthorpe 1993), and models based on the Neighbourhood Unit Planning principle (Markelius 1946 and General Plan for Stockholm 1951).

Edelsvärd's Ideal City

One historical reference with relevance for the Swedish context is Edelsvärd's plan for the *Ideal City,* a model for cities along railway lines in Sweden in the mid-nineteenth century.[35] This model is arguably based primarily on node thinking on a regional scale, but combines it with a more stretched centrality

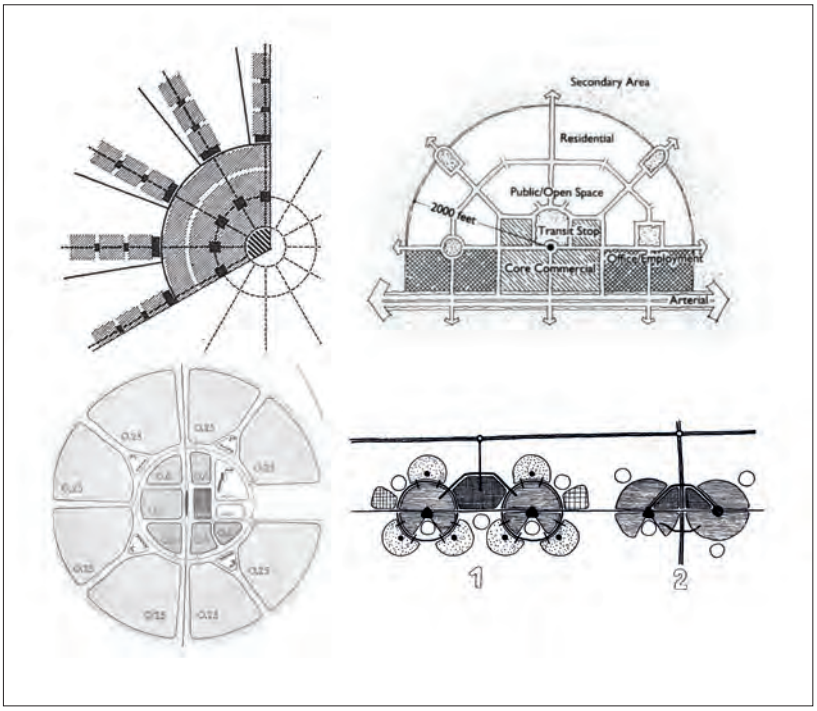


Figure 1. Principle from the 'finger plan' (Egnesplankontoret 1947), the TOD model (Calthorpe 1993), and models based on the Neighbourhood Unit Planning principle (Markelius 1946 and General Plan for Stockholm 1951).

on the local scale. The train station is one of many other important functions, which are organized in an urban form that results in both a strong axis and also a kind of 'field condition', to use Allen's terminology.[36] The central axis links the train station with an important facility (e.g. a church). Public spaces with squares and parks, as well as denser development, are all located in the more central parts, where non-residential uses are also located, thus promoting mixed use.[37] Today traces of such ideas can be seen in cities like Nässjö and Hässleholm, where the church and the station constitute endpoints of a main axis. Such cities were often built on one side of the railway to avoid barrier effects, yet with a rather dense and urban character. This is arguably even more relevant when it comes to small cities or communities. Moreover, the stretched linearity found in this model, which also includes non-residential uses, is, interestingly enough, built up by means of an urban grid (including several parallel streets) that is well connected to the surroundings. Hence, it is the context that defines and produces the properties of this centrally located stretch (see below).

Centrality That Emerges as a Result of Urban Form

The space syntax theory highlights the role of spatial relations in the built environment, whereby urban form defines centrality. Centrality, or spatial integration, is the result of the relation of one street, path, or space to every other street, path, or space in a system. Thus, space syntax approaches are based on network thinking rather than node thinking, and urban spaces are described in relation to the system as a whole, thus defining nuances in spatial integration and segregation. This theoretical position implies that the configurative properties are not determined by land use—instead, such properties are the result of the urban form itself. At the same time, the configurative properties in turn provide particular conditions that correspond to various social, economic, and cultural outcomes. Various land uses, property prices, or movement flows tend to correspond to specific configurative properties: integrated spaces with high accessibility are beneficial for some activities, while segregated, less accessible spaces provide conditions and qualities that are more suitable for other kind of activities.

The concept of *foreground and background* networks within space syntax theory describes how centrality is distributed. The foreground network distributes high accessibility throughout the system and thereby facilitates socioeconomic exchange—that is, streets with high centrality. The background network provides segregated and secluded spaces that facilitate the socio-

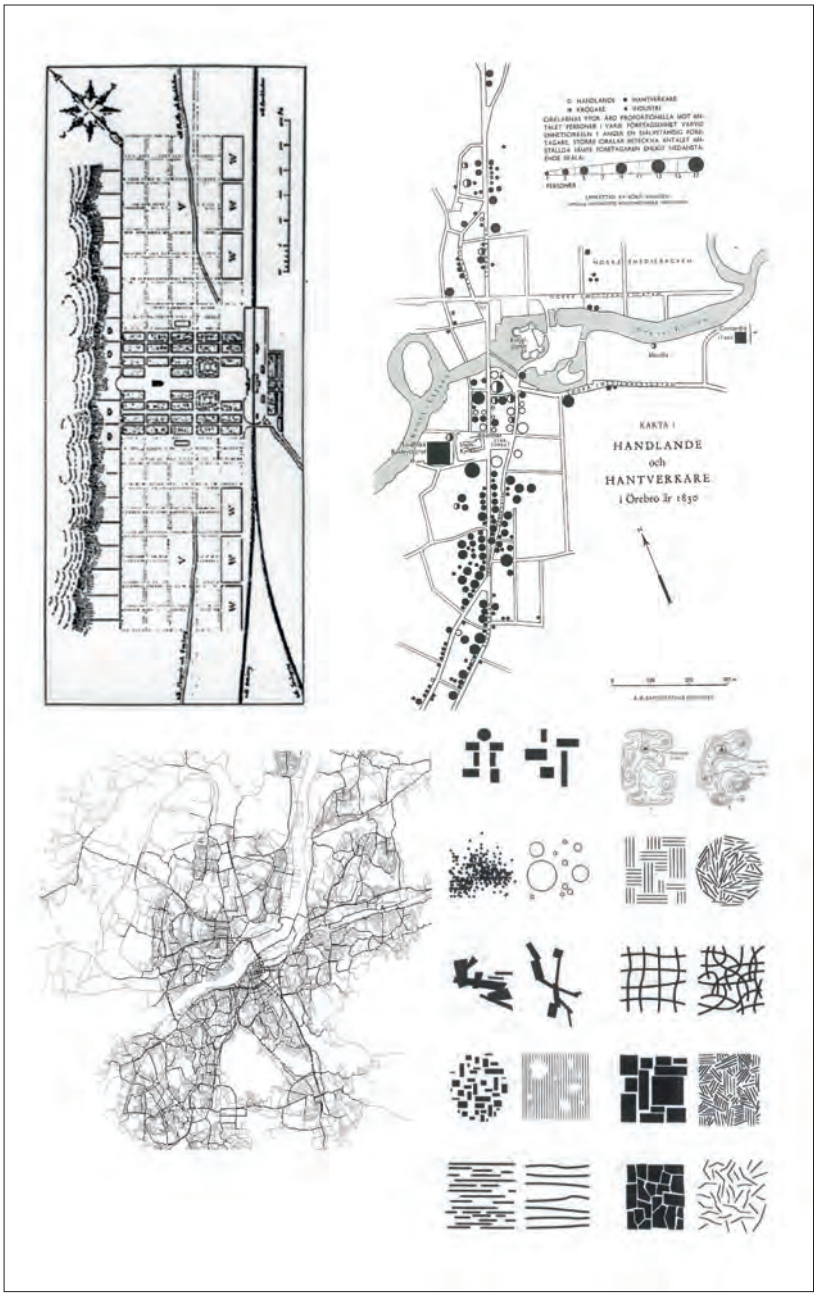


Figure 2. Top: historical references: the ideal city of Edelsvärd and the location of trade in Örebro 1830 (Paulsson 1950). Bottom: foreground-background network (Legeby et al. 2015), and field conditions (Allen 1999).

cultural continuity and reproduction favoured by lower accessibility.[38] This identifies centrality not as a node phenomenon, but conversely as a linearity that emerges in a bottom-up manner from the system itself. Because this type of centrality is system dependent, changes within structures may result in modifications of the centrality pattern at very distant locations. One example of how land use follows the configurative properties of urban spaces is seen on a map from the mid-nineteenth century, which illustrates the economically active foreground network, in which craftsmen, trade, production, and similar activities were located along a linear strip in the city.[39]

Pervasive centrality is an important concept within space syntax. Hillier argues that the foreground network in London identifies the main structure of global routes (i.e. on the city level) and includes the largest centres,[40] emphasizing that such structures are both the result of, and reproduced by, an interaction between economic and social factors. Centrality pervades the urban grid in an intricate way and as centrality appears on different scales, it constitutes the foreground network and should be regarded as having a pervasive function in cities.[41] This type of urban form is, according to Hillier, sustainable since it minimizes 'travel distances',[42] meaning that distance between high centrality lines is important in decreasing the distance to many different functions (which are not limited to transportation facilities). The configurative properties influence patterns of pedestrian movement, which in turn have an impact on retail and other movement-driven activities.

In a study of London's suburban centres, Vaughan et al. applied a bottom-up perspective on urban centrality and found that smaller centres contain a complex and dense layering of non-residential activity. Whilst larger scale retail activities tend to be strongly linear, a more differentiated pattern emerges on a local scale.[43] It is suggested that town centres tend to have a 'fatter' structure overall and that sources of vitality stem from the diverse socioeconomic and cultural activities that take place beyond the main retail hub, an extended area that is identified as the 'active centre'. Clearly, this way of reasoning can be related to the reasoning of Stan Allen and what he calls 'field conditions'. It also contributes to the discussion of 'vibrant centres', which are important in the station community discussion: What urban form might support the development of communities beyond being merely places of residential use dependent on commuting (suburbia)? In this connection, it is relevant to note the differences in characteristics that are found when comparing larger-scale retail with activities typically found in more peripheral locations like suburbs.

Point-Line-Field Conditions

This article draws on theories formulated by Allen[44] and McMorrough[45] to discuss centrality and accessibility. These concepts are argued to have relevance for social life and for relations that may emerge *between* different amenities that are important for local and/or public life. According to McMorrough, a *point* in an urban setting is something that one can move to and from—hence it serves as either a destination or an origin and generates very little movement (or relations) in its surroundings. Hence, there are no 'spill-over effects' that might potentially favour other business, services, or urban life in such urban structures. The *line*, according to McMorrough, is an element with a stretched linearity that is not a simple connecter between two points but an element that connects and aggregates points along a certain stretch. According to Allen, *field conditions* are the result of lines, which are individually connected with points and aggregated into clusters. That a point rarely creates 'spill-over effects' is of great relevance when planning smaller cities, communities, and neighbourhoods, where there are comparatively few goal points. If the few facilities that exist are organized along a line, then accessibility to amenities for the community as such may be increased. A line also implies greater robustness compared with a point, since more plots potentially retain a good location, not only those in direct proximity to the station.

These concepts and phenomena identify very different performative properties; they are therefore concepts that may be used to 'think with' (generative theories) when developing station communities, rather than acting as concepts to 'think of' (normative theories). These point-line-field conditions emerge as a result of urban form and they are dependent on how the system is configured. If one wants to develop vibrant communities, according to this theory it would be counterproductive to look for urban configurations that promote rationality, like the point, and support utilitarian walking in the way that Choi describes.[46] On the contrary, a line configuration seems to have a greater potential, since it generates movement between points along lines, thus stretching out centrality—what is origin and what is destination is not that easy to detect in such a situation. A line also implies that a larger geographical area is more likely to gain high access to such centrality. Furthermore, a line also provides a stretch with variations of intensity, providing locations that may possess a higher diversity than a point, which has a more clear-cut character, whereby things are either 'in' or 'out.' The level of intensity influences the potential for exchange and/or encounters, which can also be understood if density

in a community is also taken into account. The field condition demands a rather large number of lines, in fact: a field is created by a hinterland, and field effects thus rarely emerge in smaller communities with limited grid networks and/or few inhabitants. Here, interval, repetition, and seriality are key aspects and are more related to urban contexts than to rural or rurban contexts. These characteristics of point-line-field can be captured and described more precisely using a space syntax analysis.[47]

Methods and Case Study

This study explores how an analysis of urban form and local conditions can contribute to understanding both centrality and accessibility in relation the sustainable development of station communities. Stenungsund is one of three municipalities addressed by the 'Collaborative Planning' research project.[48] There are three existing train stations in Stenungsund, and, of them, Svenshögen was identified as the most relevant to study for future development by the municipality during the co-creation phase of the research project. Svenshögen was established when the railway was built and today is home to approximately 1,100 inhabitants. Its location, by the lake Hällungen, was considered advantageous in relation to steam trains' need for water.[49] Shortly after the opening of the station, Svenshögen was identified as a suitable location for a sanatorium, which opened in 1911 and functioned as a hospital until 1989. The sanatorium was located, very intentionally, at a distance from the railway station, about a kilometre to the south. To place such an institution (a hospital with many working places) at a distance from the station has of course shaped the community over time, and stretched the 'centre' of the community towards the south.

A number of analyses were undertaken in relation to the case study of Svenshögen. The aim of these analyses was to capture 'centrality' in ways that provide a more nuanced alternative to the ubiquitous one-kilometre circle that is used in contemporary planning practice to describe the centrality of a station (the circle that appears in the current municipal plan). First, a configurative analysis was used to identify the performative properties of Svenshögen's urban form; measuring integration and betweenness allowed us to identify the core of centrality, variations of integrated and segregated streets, and barrier effects. Second, an accessibility analysis revealed the extent and form of the catchment area of the station and the amenities clustered along the central route. The other accessibility analysis reveals how many of the amenities—besides the station—are within access of buildings

in Svenshögen. Finally, an attraction reach analysis, using the street system as a starting point, was employed in order to better understand the degree of access to buildings from segments of the street. The results of these methods are discussed below.

Figure 3. Top: catchment area from the train station, highlighting buildings (left) and street segments (right). Bottom: catchment area from the station (metres and change of directions).

Results: The Example of Svenshögen

The Municipal Strategy for Development

In Stenungsund's comprehensive plan of 2018, a circle marks a one-kilometre radius around the train station. New development should be concentrated within this area if it is to align with the TOD model and the Station Proximity Principle, as well as the directives of the comprehensive plan. In the task of balancing sustainable transportation with social sustainability (a goal which might include providing access to other services and amenities), the one-kilometre development circle can be questioned, and alternate approaches may in fact be more suitable.

The community of Svenshögen developed along the Brattefors valley, on the eastern side of lake Hallungen, following Road 660. The community forms two clusters; in the north, it extends from the train station on the eastern side down to the lake and the former sanatorium. Most amenities are located adjacent to this strip, including sport fields, the parish house, the bus stop, and the preschool, et cetera. The terrain is steeper to the east and houses are located on lower-lying land along the road. To the south, second home areas have been transformed into permanent housing (Sågen and Svartehallen). The railway forms a strong barrier to the west, an area where a few farms, valuable agriculture land, and wetlands are located.

Analyses

The first analysis was undertaken in order to identify the *form* of that catchment area. The walking distance from buildings and from streets/segments to the train station is illustrated in figure 3. The form of the catchment area is clearly stretched in a north-south direction. It is evident that the railroad, which has only one crossing roughly 300 metres north of the station, constitutes a barrier. The wetlands, steep terrain, the lake, and valuable agriculture land found there all constitute important landscape constraints.

The results of our analysis of the configurative properties, measured in terms of spatial integration, show the northern part of the community to be highly integrated on a broader scale (thirty steps following the street network). Two weakly connected clusters of development could be identified in a smaller radius six steps). The analysis of local integration (six steps) shows clusters of high integration along the valley of Brattefors and/or the main road, some of which also appear in larger radii. Centrality has linear characteristics in Svenshögen. The results of the betweenness analysis revealed some loops of

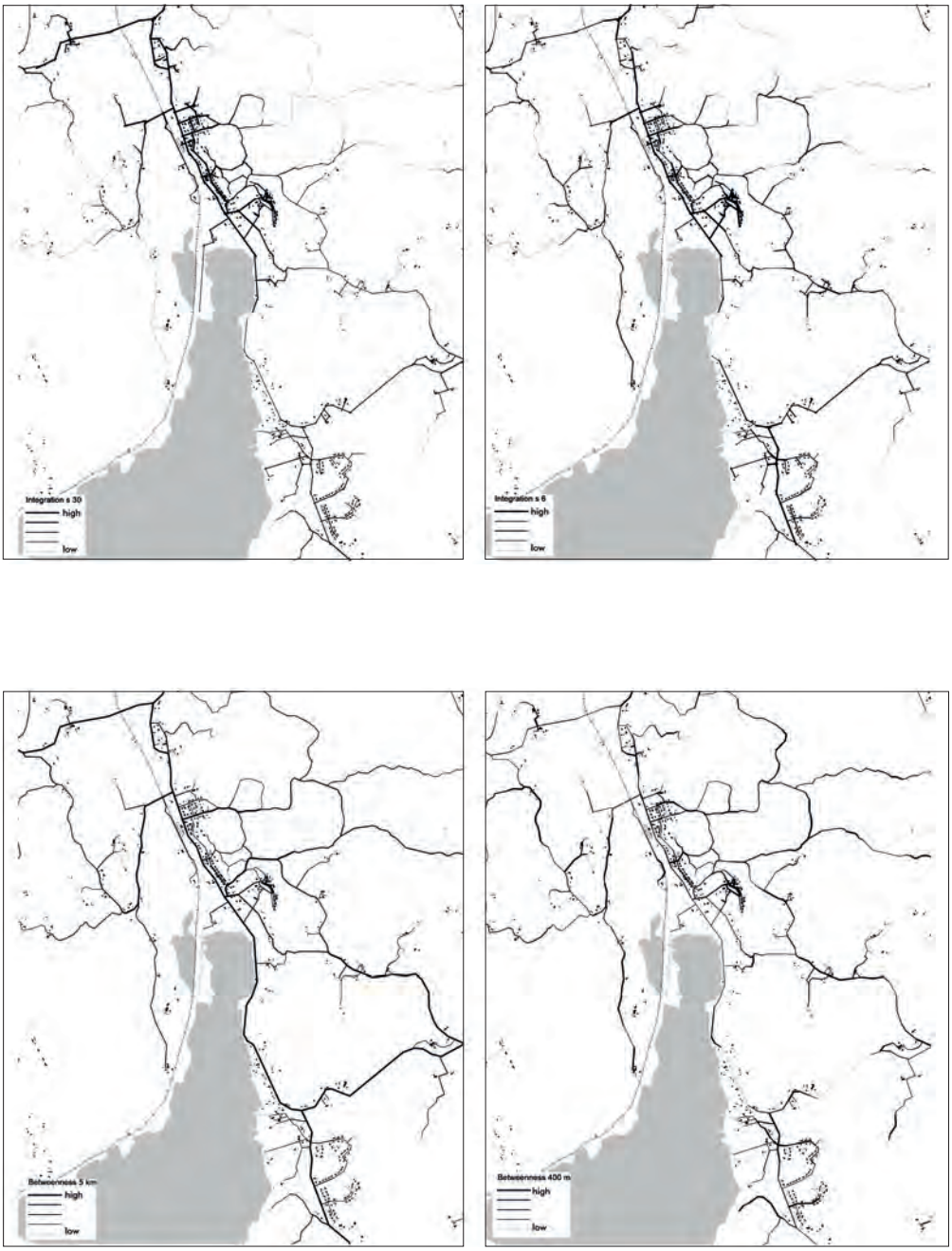


Figure 4. Configurative analyses: integration analysis on top (radius of thirty and six steps) and betweenness analysis at the bottom (5 km and 400 m).

centrality, with the main road performing as a strong (single) link between the two agglomerations of development.

Goal points, services, and amenities were primarily found located along the emerging high street, which extends about one kilometre between the station in the north and the bus stop and sport fields near the lake in the south. Hence, from the local perspective, buildings located close to this main road, a one-kilometre-long strip, may all be described as being 'centrally' located and as maintaining a high level of access to amenities and goal points. This illustrates that the centrality logic in Svenshögen is inherently linear, an example of the *line phenomenon*, drawing on Allen and McMorrough.

The results of our analysis of attraction reach—that is, of how many amenities are found within a radius of two turns from each building—illustrate that while access varies along the strip, buildings at a distance from the train station still afford similar access to amenities as those in the north, which are in close proximity to the station. This is a typical effect of the line phenome-

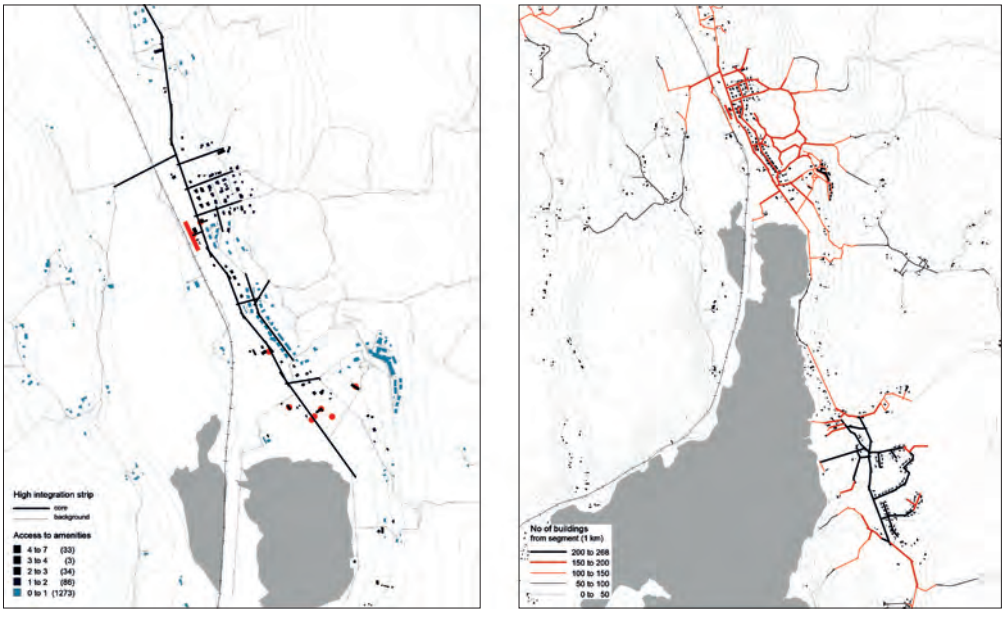


Figure 5. Attraction reach. Left: the number of amenities (red) within 2 steps of each building superimposed with the integration core. Right: the number of buildings within reach from each street segment.

non; locations along this stretch could be described as having rather similar advantages in terms of access to centrality, where amenities tend to cluster. Hence, a house located further away from the train station does not necessarily mean poorer access to amenities on the whole.

The analysis of density accessible from segments of the street included buildings that are within one kilometre of each segment. Two high-density clusters were identified. Interestingly, access to buildings was found to be higher in the southern cluster than in the cluster closer to the station.

The Larger Catchment Area

In many analyses that are carried out on a regional level, the catchment area of a train station is often limited to the specific community in which it is located.[50] In the case of Stenungsund, there is reason to acknowledge a larger context that the train stations potentially could serve. The municipality of Stenungsund aims to build about 170 new dwellings every year, some of which may find the Svenshögen station attractive. In addition, it could be interesting to see what neighbouring municipalities like Orust and Tjörn can add in terms of commuters and/or travellers. Historically, there is also an exchange with Lilla Edet, even though this municipality now has access to another railway line (Norge-Vänerbanan). If the analysis is broadened to include neighbouring municipalities, another image of the catchment area emerges. Orust aims to build fifty to sixty new housing units every year, Tjörn twenty to forty, and Lilla Edet 110.[51] People who live in Tjörn have a close relationship to the central parts of Stenungsund, predominantly as a result of the bridge located south of the centre. Commuting flows from Tjörn tend to go either to Stenungsund Centre or to Stora Höga. However, there is often congestion on the roads leading to these places. People living in Orust have the option to either go south, via Tjörn (to the central part of Stenungsund), or via the Svanesund ferry, which connects the mainland just north of the centre and then continues on to Svenshögen station.

In discussing the future development of station communities in Stenungsund, we believe that it is relevant to take into account the planned expansion of the housing stock in neighbouring municipalities, since potential travellers may live at a greater distance from train stations. Those living farther away from railway corridors often use other modes of transportation in order to reach a railway line that then provides efficient mobility in the larger region, a tendency that will affect the development of train station communities

in Svenshögen, Stenungsund, and Stora Höga, as well as in Jörlanda and Ödsmål, if they are reopened. For Svenshögen, the development in Orust is relevant to acknowledge, especially as a new bridge to replace the ferry is proposed. What might this imply for Svenshögen station? Will travellers turn to Stenungsund station? Will such development result in more car traffic?

By summarizing the results of the analyses of Svenshögen undertaken in this study, we can identify a number of inherent constraints: steep terrain to the east, valuable agriculture land and wetlands to the west, and the railroad itself constituting a strong barrier. If a strict station-proximity approach or node thinking is applied, many of these more difficult and sensitive areas would be subject to development, as they are located within the one-kilometre circle. However, taking into account the landscape constraints and the location of other amenities and/or facilities, other development strategies appear to be more sustainable—for example, concentrating development in proximity to the stretch to the south of the station, where a lot of other amenities are also located. Such development would most likely be perceived as more central, even though it might be farther away from the station in comparison with development in the north. Hence, such linear development on the one hand will result in longer distances to the train station for many buildings, but on the other hand will provide high access to other amenities and meeting places in the community. Such a strategy appears to be more beneficial from a sociocultural perspective.

DISCUSSION AND CONCLUSION

A high level of development pressure is currently being placed on the core of the Gothenburg region; as such, it is important to find alternative locations for future urban development. This article suggests that the station communities in the region carry great potential for sustainable urban expansion, but that the urban models applied in planning practice provide limited support when the aim is to design sustainable communities. Beyond mobility and proximity to train stations, social implications and sustainability aspects also need to be taken into account. This calls for an alternative understanding of centrality and accessibility. This article has suggested that a greater awareness of landscape conditions, existing urban form, barrier effects, and access to sociocultural amenities is needed in the design and planning of new development. In smaller communities, there are often very few goal points. The railway station is without doubt a highly important goal point, especially for people who are dependent on going elsewhere to work or school and/

or training, but on the local scale, other goal points are also crucial to identity, local life, and culture. An urban form and structure that supports the development of nodes or points tend to foster 'to-and-from' movement (utilitarian walking), and the development of such nodes therefore risks being counterproductive from a social and cultural perspective.

In smaller communities, amenities and services that need to be taken into account include schools, grocery stores, shops, sport fields, local workplaces, cultural facilities, and other places for recreation or social activities. From a local perspective, these kinds of amenities are likely to generate more movement flows and visits than the train station and are essential for supporting local life and social processes. Using ideas of linearity drawn from the foreground network and line conditions from space syntax theory, it is suggested that these facilities be located along such a line and/or network, or that the street structure be modified in order to strengthen existing locations. A sound distribution of such facilities is important for sustainability and supports local sociocultural development.

In larger station communities where there is enough density to support more diverse economic activities, linearity may be complemented with a structure that can facilitate circular movement and thus support the emergence of field conditions. Such a combination can avoid the problems with barrier effects that node thinking brings, thus preventing point effects whereby movement flows end up in a limited pattern of 'to and from', which primarily supports utilitarian and rational walking.[52]

This article has emphasized the fundamental differences between the conditions found in small cities and/or communities and those that characterize larger cities such as Gothenburg, Copenhagen, or London. The urban system produces not only patterns of high centrality and fields of background: the high density and size of systems also provide conditions for urban diversity, retail, et cetera, which are difficult to recreate in smaller communities.

A shift in thinking in planning and urban design is therefore required when it comes to the development of sustainable station communities; we must move away from node thinking, which favours concentric development and emphasizes proximity to stations, and instead employ network thinking, wherein centrality is distributed and has a linear and a network character, hence creating a greater variety of centrally located spaces. In producing one goal point,

nodal urban form fosters 'to-and-from' movement flows or utilitarian walking rather than so-called social or recreational walking.[53] The limited diversity of locations within such a binary model is also difficult to adjust so as to reflect the nuances of landscape constraints. Moreover, expanding development on both sides of a railway line often denote the creation of a barrier. This is especially problematic in smaller communities, since building a tunnel or bridge to minimize barrier effects constitutes a large investment in itself.

Whilst node thinking may work on an abstract conceptual (planning) level, when it comes to design practice, a higher level of complexity is needed, both in terms of natural constraints and regarding how centrality is understood as emerging as a result of urban form. Network thinking opens up new urban models for the development of station communities based on an inherently different understanding of centrality and accessibility. An urban form that supports the emergence of a network and a distributed centrality arguably responds more accurately to sustainability goals by going beyond the singular goal of mobility and instead creating more favourable conditions for local everyday life. As a foreground network emerges, what is produced is a linearity of high centrality that retains high proximity to a background network. Exactly where along this strip or within the foreground network certain amenities are located becomes less important, since centrality is more distributed than it would be if conceived as a node at which things are either in or out, central or non-central.

This article emphasizes the importance of the *configurative properties* of *urban form*. It has suggested that urban form that is designed to produce a *pervasive centrality by means of different scales* holds configurative properties that could arguably be sustainable from many different perspectives—social, cultural, and also economic. There are thus certain thresholds where linear development could grow and create a field condition, obviously related to size and density. As such, streets may be designed in such a way as to be able to progress from 'line conditions' to what Vaughan et al. calls a 'fatter' structure or what Allen calls 'field conditions'. To plan and design for continuous development over time by remaining flexible in relation to future expansion is, I argue, to plan and to design sustainably.

The effect of potential travellers in the areas surrounding a particular settlement also needs to be acknowledged. Travellers living far away from a station are seldom included in economic models. In Stenungsund, the

potential in the catchment area, including neighbouring municipalities, is significant, and there is reason to plan for better accessibility for potential travellers living at greater distances from the station. Such potential should be acknowledged when investigating and deciding which stations that should be opened along the Bohusbanan in future. This calls for closer collaboration between the municipal, regional, and national planning levels.

NOTES

[1] Madeleine Granvik, Per G. Berg, Annie Vartika, and Claus Bech-Canielsen, 'Densification as a Planning Strategy—Editors' Notes', *Nordic Journal of Architectural Research* 2 (2014), pp. 5–10.

[2] Tony Svensson, *Varför gör vi inte som vi säger? Retorik, realitet och dialektik i svensk stadsutveckling med fokus på energi och fysiska strukturer*, PhD diss., Stockholm, KTH, 2015; Meta Berghauser Pont et al., 'The Spatial Distribution and Frequency of Street, Plot and Building Types across Five European Cities', *Environment & Planning B* 46, no. 7 (2019), pp. 1226–42.

[3] *Översiktsplan för Göteborg*, Samrådshandling, December 2018.

[4] In total, forty stations were included in this examination. *Västtågsutredningen huvudrapport: en komplettering av Målbild Tåg 2035 med nya stationer*, Västra Götalandsregionen, 2017.

[5] Oskar Fröidh, Marcus Adolphson, Daniel Jonsson, and Josef Andersson, *Lokalisering av järnvägsstationer—effekter för samhällsplanering, resande och tillgänglighet* (Stockholm: KTH, 2018); Alice Dahlstrand, Joakim Forsemalm, and Karl Palmås, 'Det urbana stationssamhället', *Mistra Urban Futures Report* 3 (2013).

[6] Peter Hartoft-Nielsen, 'Metroens effekt på ansattes transportadfærd: virksomheder ved metroens 1. og 2. etape; fjerde og femte delundersøgelse. Center for Skov', *Landskab og Planlægning*, Den Kgl. Veterinær- og Landbohøjskole, Arbejdsrapport / Skov & Landskab, 3 (2004).

[7] Petter Naess, *Urban Structure Matters: Residential Location, Car Dependence and Travel Behaviour*, RTPI Library Series (2016).

[8] See, for example, Peter Calthorpe, *The Next American Metropolis: Ecology, Communities, and the American Dream* (New York: Princeton Architectural Press, 1993); or Luda Bertolini, Carey Curtis, and John Renne, 'Station Area Projects in Europe and Beyond: Towards Transit Oriented Development?', *Built Environment* 38, no. 1 (2012), pp. 31–50.

[9] Sven Markelius, *Det Framtida Stockholm: Riktlinjer för Stockholms Generalplan* (Stockholm, 1946). The Neighbourhood Unit Planning model is discussed in Ann Legeby, *Urban Segregation and Urban Form: From Residential Segregation to Segregation in Public Space* (Stockholm: KTH, 2010).

[10] Bill Hillier and Julienne Hanson, *The Social Logic of Space* (Cambridge: Cambridge University Press, 1984); Bill Hillier, Aladair Turner, Tao Yang, and Hoon-Tae Park, 'Metric and Topo-Geometric Properties of Urban Street Networks', *Proceedings to the 6th International Space Syntax Symposium*, edited by Ayşe Sema Kubat, Özhan Ertekin, Yasemin Ince Güney, and Engin Eyüboğlou (Istanbul: ITU Faculty of Architecture, 2007), 001:1–001:22; Bill Hillier, 'Spatial Sustainability in Cities Organic Patterns and Sustainable Forms', *Proceedings to the 7th International Space Syntax Symposium*, edited by Daniel Koch, Lars Marcus, and Jesper Steen (Stockholm: KTH, 2009).

[11] Stan Allen, *Points + Lines: Diagrams and Projects for the City* (New York: Princeton Architectural Press, 1999); John McMorrough, 'City of Shopping', *The Harvard Design School Guide to Shopping/Harvard Design School Project on the City 2*, edited by Chuihua Judy Chung, Jefferey Inaba, Rem Koolhaas, and Sze Tsung Leong (Cologne: Taschen, 2001).

[12] See, for example, documentation from 'Rurban Planning Talks' in 2018.

[13] The so-called *structure image* was adopted in 2008.

[14] *Hållbar tillväxt: mål och strategier med focus på regional struktur*, Göteborgsregionens kommunalförbund (GR), June 2013, p. 9.

[15] The governing body that oversees forty-nine municipalities.

[16] *Västtågsutredningen huvudrapport: en komplettering av Målbild Tåg 2035 med nya stationer*, Västra Götalandsregionen, 2017, p. 9.

[17] *Västtågsutredningen huvudrapport: en komplettering av Målbild Tåg 2035 med nya stationer*.

[18] The development in Skåne, where twenty-one new stations were opened between 2011 and 2015, and with an increase in train commuting, is regarded as a relevant example; see *Västtågsutredningen huvudrapport*.

[19] There are seventeen stations today along the Bohusbanan. Between 1961 and 1978, as many as twenty-one stations were closed. The station buildings along the Bohusbanan were designed by Folke Zettervall, most of which were sold to private owners.

[20] Bostadsförsörjningsprogram 2017–20 aims at a population increase of 1 per cent each year and 135 to 140 new dwellings per year. In the proposal for a new Comprehensive Plan (2019), the aim is 170 new housing units every year.

[21] Hartoft-Nielsen, Peter. 'Stationsnaerhedspolitikken i Københavnsregionen, baggrund, effekter og implementering', *Nordisk forskningskonferens om "baerkraftig byutvikling"*, Oslo 2003-05-16.; Petter Naess, *Urban Structure Matters: Residential Location, Car Dependence and Travel Behaviour*; Bertolini, Curtis, and Renne, 'Station Area Projects in Europe and Beyond: Towards Transit Oriented Development?', pp. 31–50.

[22] Walter Christaller, *Central Places in Southern Germany*, trans. Carlisle W. Baskin (Englewood Cliffs, NJ: Prentice-Hall, 1966).

[23] Paul Krugman, 'Increasing Returns and Economic Geography', *Journal of Political Economy* 99, no. 3 (1991); Paul Krugman, *The New Economic Geography, Now Middle-Aged*, prepared for presentation to the Association of American Geographers, 16 April 2010.

[24] *Skitseforslag til Egnsplan for Storkobenhavn*, Udarbejdet 1947 af egnesplankontoret, 1947.

[25] See, for example, *Fingerplan 2013*, www.naturstyrelsen.dk.

[26] In the plan, it is explicitly stated that it is 600 metres as the bird flies and not walking distance through the street network. At the same time, the 600 metres is said to be an approximately ten-minute walk (Region plan of 1989, referred to in TRAST, 2015).

[27] Peter Hartoft-Nielsen, 'Stationsnærhedspolitikken i hovedstadsområdet: baggrund og effekter', *Ny-og landskpaserien*, 18 (Hørsholm, 2002).

[28] *Fingerplan 2013: Landsplandirektiv for hovedstadsområdets planlægning*, Miljöministeriet, Naturstyrelsen, 2013.

[29] What is within 600 metres is defined as 'stationsnære kernområde' and what is within 1,000 metres as 'stationsnære område', *Fingerplan 2013: Landsplandirektiv for hovedstadsområdets planlægning*, p. 49.

[30] See, for example, Peter Calthorpe, *The Next American Metropolis: Ecology, Communities, and the American Dream*.

[31] Ebenezer Howard, *Garden Cities of Tomorrow* (1903; repr., London: Faber and Faber, 1965).

[32] Reid Ewing and Robert Cervero, 'Travel and the Built Environment: A Synthesis', *Transportation Research Record: Journal of the Transportation Research Board* (2001).

[33]Stockholms Stads Stadsplanekontor. 1952. Stadsplanekontorets förslag till generalplan för Stockholms stad 1952. Stockholm: Stockholms Stads Stadsplanekontor; Sven Markelius, *Det Framtida Stockholm: Riktlinjer för Stockholms Generalplan*.

[34] Oskar Fröidh, *Introduktion av regionala snabbtåg: En studie av Svealandsbanans påverkan på resemarknaden, resbeteende och tillgänglighet* (Stockholm: KTH, 2003).

[35] Greger Paulsson, *Svensk stad D. 1 Liv och stil i svenska städer under 1800-talet* (Stockholm: Bonnier, 1950).

[36] Allen, *Points + Lines: Diagrams and Projects for the City.*

[37] Paulsson, *Svensk stad D: 1 Liv och stil i svenska städer under 1800-talet*.

[38] Bill Hillier, *Space Is the Machine: A Configurational Theory of Architecture* (Cambridge: Cambridge University Press, 1996); Bill Hillier, 'Centrality as a process: Accounting for Attraction Inequalities in Deformed Grids', *Urban Design International* 4 (1999), pp. 233–50; Hillier, 'Spatial Sustainability in Cities Organic Patterns and Sustainable Forms'; Hillier et al., 'Metric and Topo-Geometric Properties of Urban Street Networks', pp. 258–79.

[39] Paulsson, *Svensk stad D: 1 Liv och stil i svenska städer under 1800-talet*.

[40] Bill Hillier, 'Centrality as a Process: Accounting for Attraction Inequalities in Deformed Grids', pp. 233–50; Hillier, 'Spatial Sustainability in Cities Organic Patterns and Sustainable Forms', K01:4.

[41] Hillier, 'Spatial Sustainability in Cities Organic Patterns and Sustainable Forms'.

[42] Hillier et al., 'Metric and Topo-Geometric Properties of Urban Street Networks', pp. 258–79.

[43] Laura Vaughan, Catherine Emma Jones, Sam Griffiths, and Mordechai (Muki) Haklay, 'The Spatial Signature of Suburban Town Centres', *The Journal of Space Syntax* 1, no. 1 (2010), pp. 77–91.

[44] Allen, *Points + Lines: Diagrams and Projects for the City*.

[45] McMorrough, 'City of Shopping', pp. 193–203.

[46] Eunyong Choi, *Walkability as an Urban Design Problem: Understanding the Activity of Walking in the Urban Environment*, Licentiate thesis (Stockholm: KTH, 2012).

[47] Ann Legeby, Daniel Koch, and Pablo Miranda Carranza, 'Characterizing Urban Centres: Reading Configuration as Point, Line, Field', *Proceedings of the Eleventh Space Syntax Symposium*, edited by Teresa Heitor, Miguel Serra, João Pinelo Silva, Maria Bacharel, and Luisa Cannas da Silva (Lisbon: Instituto Superior Técnico, 2017), pp. 78.1–78.16.

[48] Samskapande Samhällsplanering, 2017–20.

[49] The railroad was electrified in 1939.

[50] For example, the number of inhabitants (potential travellers) is limited to those living in the specific community, while people living on the countryside or elsewhere, who may also take the train from the station, are not included.

[51] Results from a workshop with the municipalities held in October 2018.

[52] Choi, *Walkability as an Urban Design Problem*.

[53] Ibid.

A CAS PERSPECTIVE ON PLANNING FOR ENERGY-EFFICIENT STATION COMMUNITIES

Tony Svensson

Abstract

Urban planning is often highlighted as an important tool for the transition towards energy-efficient and sustainable futures, but faces great complexity and challenges such as strong sectoral perspectives, weak contact between different planning levels, and a very growth-oriented discourse. This article discusses how a transition can be facilitated by means of a complexity-theory perspective on urban planning for energy-efficient and sustainable station communities. As complex adaptive systems (CAS), cities and regions are characterized by a diversity of niches, regimes, and landscapes—built structures and planning actors—that interact across different scales and boundaries in cyclically recurring development phases. Such systems are also characterized by unpredictability, multiple stable states, self-organization towards emergent diversity, and an increasing number of levels of order. Co-creative planning in Västra Götaland, a Swedish region that is undergoing complex, spatially uneven development, is used as a case study. The study exemplifies how the CAS perspective opens up the possibility to apply resilience-theory concepts and transdisciplinary and experimental multi-level planning that explores possible futures, and thus advocates for the development of more network- and node-oriented structures. Station communities can then be understood as the network's independent but contextually influenced and mutually interacting nodes, which thus opens up new approaches to supporting the transition.

KEYWORDS

Complex adaptive systems (CAS), resilience, station communities, urban planning

INTRODUCTION

Handling Energy and Climate Issues in Complex Urban and Regional Development

The global increase in energy use[1] and the exceeding of planetary boundaries[2] due to increased urbanization and economic growth underscore the importance of sustainable urban and regional development. Sweden is in a favourable position due to its moderate population growth and is seen as a forerunner in the transition to sustainability as a result of its balancing of a distribution economy and the free market and its having decoupled growth and environmental impact.[3] The country has succeeded relatively well in terms of limiting energy use in the building stock. However, energy use and emissions of the transport sector have decreased only marginally, despite far-reaching goals and ambitions.[4] With respect to the built environment's transport-related energy use and climate impact, there is still a gap between policy rhetoric and the development reality as a result of various physical-structural path dependencies and a complex fabric of institutional structures and mechanisms in a dialectic imbued with power games and strong mental models and discourses in planning and decision-making.[5]

Planning and developing the built environment are characterized by complexity.[6, 7] The increasingly uneven geographical development entailed by the globalized economy only contributes to this complexity.[8] The New Economic Geography (NEG)[9] with its self-reinforcing agglomeration of activities and their location[10] puts larger cities under pressure as a result of increased spatial competition in central areas and the extrusion and dispersion effects that this leads to on the urban fringe. Regionally, there are potentials weaknesses as well as loch-ins in areas between larger cities and an increased polarization between strong and fragile urban landscapes.[11] Regional structures of radial settlement and transport corridors from big cities give the impression of increasing dominance and monocentricity. In parallel, an increased diversification of economic activity and a more differentiated functionally and relationally conditioned polycentrism with increased exchange between cities on a regional level[12] have created a more spatiotemporally complicated pattern of distributed mobility, with a lack of correspondence between services, workplaces, housing, and activities.[13] These two tendencies—monocentric concentration and scattered polycentric development—are the consequences of complex spatial dynamics in recurring cycles of urbanization, suburbanization, deurbanization, and reurbanization on various scale levels.[14] *Concentration* can have a favourable impact up to a certain

limit[15] on reducing the length and amount of travel through increased proximity between people and destinations and a larger share of travellers with sustainable modes of transport, which thus provides a basis for a diversity of amenities and a viability that increases attractiveness, safety, and opportunities for social co-presence.[16] *Dispersion* leads to an increase in length of travel and to reduced centrality, reduced amounts of walking, cycling, and travel by public transport, structural car dependency, induced car traffic, and complex travel patterns.[17] Too high density in central areas creates extrusion that contributes to the dispersion in peripheral locations, while dispersion results in more commuting to central areas, which increases the competition for space and thus leads to further extrusion.[18] Previous research has pointed out that this process is largely incremental, unpredictable, self-reinforcing, and path-dependent,[19] which makes it important to find a conceptual apparatus that facilitates understanding and addresses the underlying 'mechanisms' of urban development rather than the symptomatic physical changes in geometric space that planning usually deals with.

Station Communities as a Planning Strategy

It is estimated that urban planning and the design of buildings and transport systems hold the potential for increased energy efficiency and the delimiting of GHG emissions for the transport sector by10 to 20 per cent in the long term,[20] primarily by reducing transport demand through increased proximity, reduced length of travel, and a shift from cars to more sustainable modes of transport.[21] A paradigm shift has long been an ongoing, changing focus of an NEG-analogous *mobility of flows between nodes* to *accessibility to places, qualities and functions*.[22] Here, the accessibility perspective could be the starting point for a relational understanding of how the interaction between travel and living environments can be developed in a sustainable way and also support a transition to more energy-efficient urban structures.

The development of cities and regions over the past 100 years has been based on the car as a means of transport, with an increasingly energy- and resource-inefficient, dispersed urban system as its outcome.[23] Railways and station communities, on the other hand, have often constituted a synthesis of node and place by bringing together important functions and potentials in the regional geography.[24] These node-places usually have high accessibility in locations with high centrality in relation to population concentrations nearby, which thus favours the possibility of shorter travel distances, increased proximity between housing and important functions, and an increased share of

pedestrians, cyclists, and public transport passengers. The polycentric development tendency here creates potential for the development of passenger rail transport[25] and enhanced place development, which can further promote stronger links between urban development and sustainable travel. Railways are increasingly being promoted as a climate-smart and energy-efficient means of transport, in combination with multimodal transport nodes as parts of a sustainable transport system.[26] Not least, proximity to transport nodes (closer than 600 to 700 metres) in larger city regions has been shown to lead to a larger proportion of workers using public transport.[27] Station proximity is a key component of Transit Oriented Development (TOD), in which high population and building density, a mix of functions, multimodality, and the integration of the station area within the surrounding urban structure are properties for sustainable urban development in a combined node and place perspective.[28] Based on this, local and regional development of station communities has been highlighted as a strategy for smart growth—decentralized concentration on a regional level and development near the station on a local level—in different regions round the world.[29]

Västra Götaland as an Example of the Ongoing Development

The aforementioned conditions are reflected in the Swedish region of Västra Götaland, where the metropolitan area of Gothenburg as a central city, with just under 600,000 inhabitants, has grown strongly in relation to the rest of the region. Gothenburg, with its hinterland, constitutes a mainly monocentric city region, while the larger Västra Götaland region, as a conglomerate of mutually distinct, subregional geographies, exhibits varying degrees of polycentrism.[30] Near Gothenburg, there is strong population and settlement development, while, further away, it is mainly a number of medium-sized towns and coastal zones that are growing. A structural development vision for the Gothenburg subregion that communicates a radial corridor development from the city of Gothenburg, and applies the NEG perspective in regional and national infrastructure planning contributes to a continued concentration on larger cities, while the region in between displays 'white spots'. These factors also reinforce suburbanization on the periphery of larger cities and in their nearby hinterlands in the form of sparse, car-dependent, and monofunctional residential areas.[31]

In the Västra Götaland region, initiatives have been taken on the subregional level to strengthen station communities, with the aim of achieving more sustainable travel and implementing the structural development vision. The

Urban Station Community (2012 to 2020) knowledge process, which included eleven municipalities situated along railway lines extending radially outwards from Gothenburg, has led to an increased focus on station communities as places to establish housing and workplaces, and on the design of station areas and co-creation in transdisciplinary projects involving municipalities, universities, authorities, and the business sector. The regional planning body, Region Västra Götaland (RVG), and the public transport operator, Västtrafik, are investigating the possibility of developing a more train-based transport system by studying how some thirty new and further developed existing station locations could contribute to an increase in train travel.[32] Implementation is, however, costly and requires extensive contributions from state resources, whereby the national planning process for infrastructure investments sets the framework for what is possible. The planning for realization is complex and requires coordination between the municipalities' comprehensive planning, consensus and interregional coordination around agreed strategies for land use and transport systems, harmonization with regional strategies, and adaptation to planning conditions on the national level.

Assumptions and Research Issues

Developing station communities can be seen as a strategy to balance, integrate, and optimize the region as part of a sustainable system of transport, buildings, and land use. It is believed to contribute to a developed functional urban hierarchy with stronger links between local urban structures and a combined local and regionally sustainable transport system. This is assumed in turn to contribute to more robust and evenly distributed development. The development is resulting in more complex urban areas, planning systems and institutional structures and the institutional structures entails the need for a conceptual apparatus in planning and design that clarifies this aspect of development.

This article proposes that the various underlying 'mechanisms' of complexity can be made visible and utilized by making use of concepts from complexity and resilience theory to identify problems, needs, and opportunities, and to formulate strategies for strengthening planning organizations and planning processes that might facilitate the transition towards an energy-efficient, climate-smart, and sustainable society. This issue is examined, partly by studying Västra Götaland's development and the collaboration of actors in the region and their planning for energy-efficient and sustainable station communities, and partly by applying the conceptual apparatus of complexity and resilience theory in the form of a discussion on the results of the study.

THEORETICAL BASIS

Complexity Theory as a Basis for Analysing Cities, Regions, and Planning Processes

Cities and regions can be understood as complex adaptive systems (CAS),[33] meaning that they develop in a self-organized and nonlinear (unpredictable) fashion over time, with a diversity of processes and structures developed from small-scale systems, and with an emergence of stable, qualitatively distinct levels of order. The same can be said of organizations such as private companies as well as of public authorities and their exercise of governance.[34]

Cities and regions can also be said to be dissipative structures—open systems with a constant through-flow of materials and resources, people, events, and information—that can only maintain their integrity with a supply of large amounts of energy,[35] increasing per capita with the size of the city or region.[36] The evolution of cities implies the successive build-up of a relatively high degree of order (low entropy) locally, while simultaneously leading to the consumption of resources from a large hinterland, hence contributing to an overall increase in entropy as a result of the process of transforming pure forms of energy to ever lower and less accessible forms.[37]

CAS constitute both structures and processes at the same time and, as *processes*, can be described as being in constant flux, analogous to how ecosystems develop in adaptive cycles of releasing resources, establishing conditions, developing diversity, and a consolidation and stagnation that ultimately triggers crises that lead to new a release of resources. This occurs at different scale levels, with different paces, and with continuous interaction between different systems—panarchy.[38] As *structures* (which can be understood as a stable state of a process), they tend to develop in a fractal fashion, i.e., by repetition of the structure's properties at different scale levels.[39] The different levels of order that develop retain a relative stability due to the existence of different forms of 'attractors'.

Both cities, regions and organizations are adaptive in the sense that people form part of the system and are able to learn from experience and adapt to changing conditions.[40] Feedback from previous processes is an important mechanism for the development of emergent diversity and for avoiding lock-ins and path dependencies[41] that might bring the system into an irreversible, permanent, low-value state.

The CAS perspective as such offers the possibility of a manageable and delimited description of the complexity in which the various aspects interact and in which the system components—the various physical building blocks of the urban structure and the various hierarchical decision levels and collaboration networks governing its organization—are opened up for analysis and experiments.[42] Panarchic system interaction is usually described as operating between at least three bound levels—niche, regime, and landscape—which differ from one another in terms of duration, rate of change, and impact on the panarchy. Small-scale systems (niches) are fast-changing, short-lived, and affect higher system levels through revolt. Large-scale systems (landscapes) are often slow-changing, persistent, and affect lower system levels as a result of their a 'conservating memory'.[43] Drawing on Holland (1995), the development of increasing diversity, complexity, and bound levels of systemic, multiple 'steady' states can be understood as facilitated by different mechanisms and properties of the system, regardless of its social or ecological characteristics[44] (fig. 1). The very existence of bound levels gives the panarchic system as a whole a stability that enables it to withstand innovative events (creative destruction) without losing its qualitative integrity. At the same time,

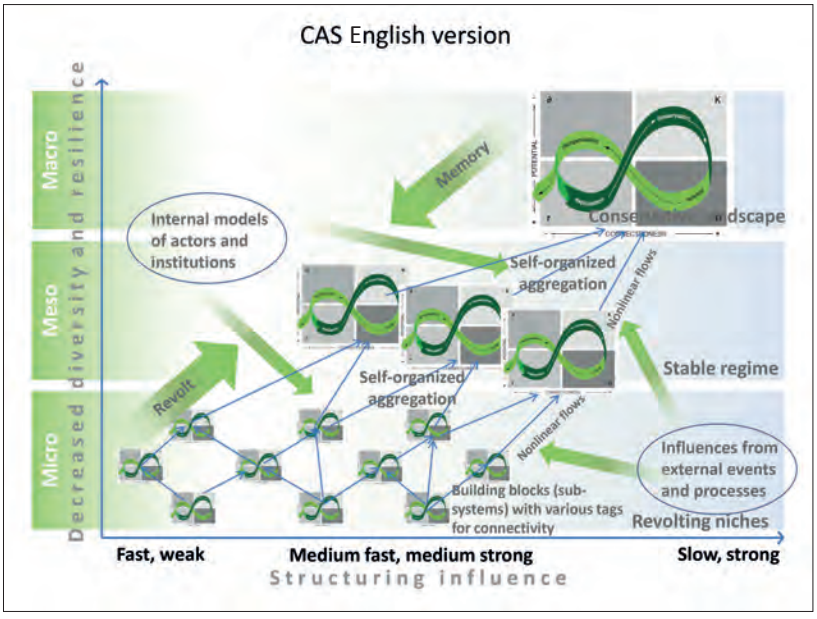


Figure 1. Panarchy as described by Svensson, 2015, based on Gunderson & Holling, 2002.

system deficiencies, influences of the internal mental models of actors in the system,[45] or major external stresses—including climate change, technological revolutions, or major demographic changes—may give rise to completely new system states with radically different characteristics and performance.[46]

Similarities and synergies between social, ecological, and spatial systems have been emphasized with the emergence of the system-ecology and complexity-theory paradigm. Marcus and Colding[47] point out, like Svensson,[48] how cities, like ecosystems, develop nonlinearly, and that the urbanization dynamics that generate increased densification, extrusion, and dispersion are expressions of the various phases of the adaptive cycle. The ability to influence urban and regional systems in a sustainable direction is dependent on the complex system's ability to harness innovation, learning, adaptation, and evolutionary change—hence, its resilience.[49] In the experienced social space of everyday life, this occurs largely as part of natural or social processes, while for urban systems in planning contexts such as mentioned by Marcus and Colding,[50] it arises indirectly as result of intermediary aspects such as discourses, institutions, and spatial form.

System resilience, although examined critically with respect to its relevance and usefulness,[51] has been raised as a planning strategy for responding to the challenges posed by complexity, since it emphasizes critical thresholds and events in the development of cities, regions, or organizations, and managing them by means of learning, adaptation, or transition based on situationally developed visions, goals, and strategies.[52] A number of factors have been identified as important: robustness, diversity, flexibility, self-organization, connectivity, attitudes, knowledge, and memory[53] (fig. 2), which will be addressed in the rest of this article.

Complexity, Resilience, and Spatial Morphology of Station Communities and City Regions

In the case of cities, urban regions, and the spatial structure made up of buildings, transport systems, and land use, three properties that form the basis of spatial capital for exploiting opportunities from a spatial perspective have been identified in particular: distance, density, and diversity.[54] They concern the availability of urban spaces, the potential of cities for people and the activities that can occur, and the diversity of activities and functions. These aspects are also essential for the functioning of ecosystems in nature and facilitate an interconnection with both social-ecological system theory and resilience

theory as well as complexity theory as a result of the fact that connectivity (and circuitry as a property of network connectivity[55]), potential, and diversity are aspects of the resilience of the system (see fig. 2 for basic relationships) in its various phases in the adaptive cycle.[56] They also affect the amount of transport and the modal split in the transport system, which are important for GHG emissions and energy use in the transport sector.[57] For station communities, previous research has shown that their role from an energy and climate perspective is about offering accessibility and centrality for the immediate surroundings in order to reduce travel and transfer shares of travel from car travel to walking, cycling, and public transport.[58] This can be influenced by planning and design through short distances between the station and other destination points, a high diversity and density of workplaces and other functions, and housing located concentrically to or in urban corridors from the station. Linked to these factors are additional supportive qualities such as limited parking, priority for non-motorized user of the road network, the richness of impressions in public spaces, and the experience of safety.[59]

Distance, density, and diversity are aspects of a station community's geometry, configuration, and constitution. The conceptual apparatus of complexity theory focuses on these aspects, which are rarely handled in a system-oriented way in planning since they are usually implicit and 'dormant' in the spatial morphology of the station area. Although the concepts of distance, density, and diversity have so far been used to describe and understand spatial morphology at the regime level (the individual city), in accordance with the notion of the systemic fractal properties of cities and urban regions, the same concepts reoccur on the regional 'landscape' level. The urban economic and geographic models that describe hierarchy, concentrations, and variations in the systems of central places and supporting towns are based on the laws of power and entropy,[60] in which distance, density, and diversity are decisive variables for how urban regions perform and function.

While larger station communities often constitute central places where node and place qualities coincide, as a functional urban type, smaller station communities differ in relation to other types of cities. The accessibility and centrality that the railroad provides is not always proportionate to the surrounding vicinity. Established TOD concepts do not always account for the land-use development of small towns, where agriculture and other local industries remain within the framework of a subsequent modernist, car-based urban planning.[61]

Complexity, Resilience, and Institutional Capacity of Planning Organizations

In planning organizations, resilience can be expressed by the intermediary processes that Marcus and Colding[62] describe in terms of *institutional capacity*—the organization's knowledge resources (attitudes, knowledge, memory), relational resources in terms of social networks and social capital (diversity, connectivity, and robustness), and its mobilizing capacity (flexibility and self-organization)[63]—see Figure 2 for basic relationships. This concept has been defined in the planning context, perhaps most clearly by Healey et al.,[64] as the ability of actors to make decisions in line with assumed objectives, to create the conditions for implementing them in accordance with the decisions taken, and to avoid path dependencies. Healey[65] has also described it as the strategic ability that is amassed when various actors manage to come up with a unified conception of the 'common game they want to play'. Magalhães et al.[66] further develops the three aspects mentioned above.

Knowledge resources are about the available range of knowledge regarding what, why, and how something should to be done, and about a recurring development of the frames of reference that affect what is considered meaningful and how planning issues and problems are understood. The knowledge and frames of reference need to be implemented to as great an extent as possible amongst the actors involved. There also needs to be an openness and ability to learn about new ideas. The knowledge and frames of reference reflect the discourses and mental models that exist in society as a whole and within the relevant professional planning cultures in particular. They differ among experts as well as between experts and laypeople. The preference and dominance of certain discourses is a power struggle for the definition of knowledge and truth in the local context, but is also influenced by structural factors of an economic, political, physical, social, and cognitive nature.

Relational resources concern the existence of networks and social relations among actors and how they are structured and function, the integration of various social networks, and the relationship between networks and the formal decision-making power. Another prerequisite for the functioning of actor networks is the existence and extent of social capital with respect to trust and the experience of reciprocity. Various forms of governance through collaboration—ranging from public-private partnerships to more hierarchically formalized urban regimes—are expressions of this.

Mobilization capacity is about being able to mobilize knowledge and social relations through networks of actors so as to challenge established planning practice and bring about change in a desired direction. It is moreover about understanding the various undertows in the process of planning and implementing idea-flow, political viability, and favourable external conditions, and, as a result of timing and tactical action, about orchestrating the knowledge, relationships, mandates, and resources connected with different actors, places, and situations. These factors form a structure of opportunity for joint action. At the same time, mobilization capacity is also about channelling change to different change arenas, where resources and power are gathered and where the actors can meet and jointly formulate strategies.

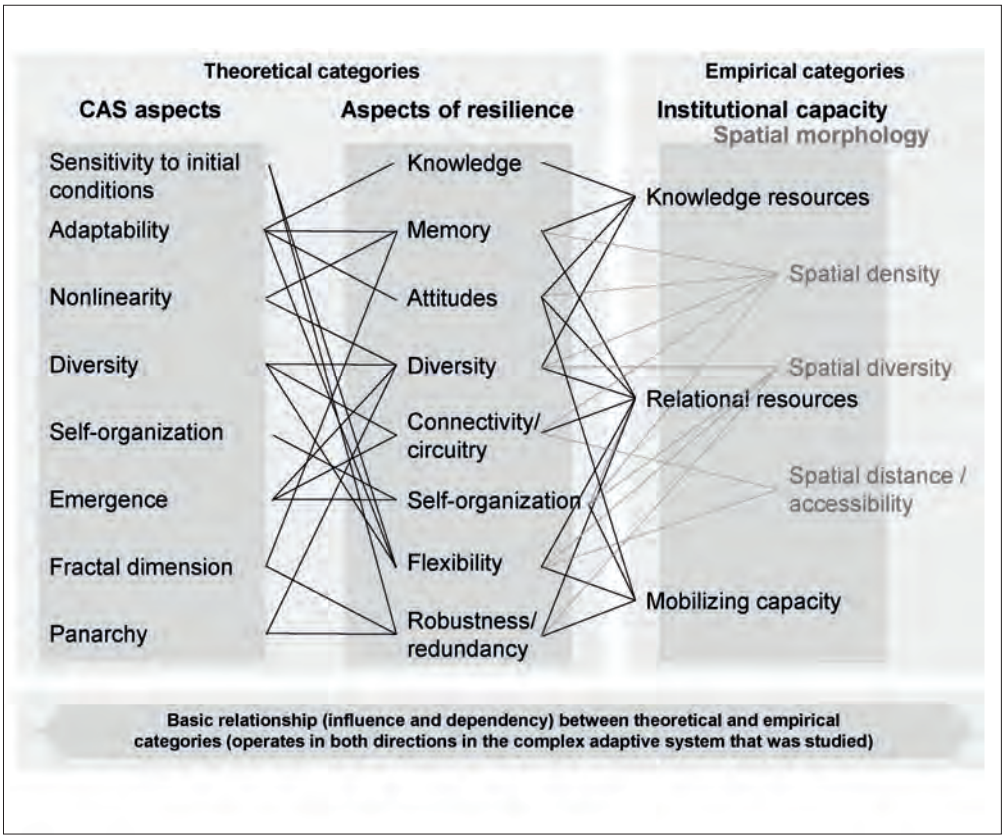


Figure 2. Illustration of basic relationships between aspects of complex adaptive systems (CAS), resilience, institutional capacity, and spatial morphology, drawing on Levin et al. (2013), Magalhães et al. (2003), and Marcus and Colding, 2014.

METHODS

Based on the premise that co-creation among actors on different levels of planning can be a way to facilitate a panarchic learning and development process, interventions have been carried out in selected planning situations within the framework of the R&D project *Co-creative urban planning for energy-efficient and sustainable station communities*. The aim is to develop knowledge about critical factors, urban form, and methods and tools for the planning of energy-efficient and sustainable station communities. Here, the theoretical CAS resilience framework presented above has served as a point of departure for the conception of planning as something context-dependent that requires investigation on site and activated local knowledge in the research on the issues raised in the project. Four academic bodies have collaborated on the development of existing and new small (<5,000 inhabitants) and medium-sized (5,000 to 25,000 inhabitants) station communities on the local and regional level in one Swedish region, in cooperation with the county

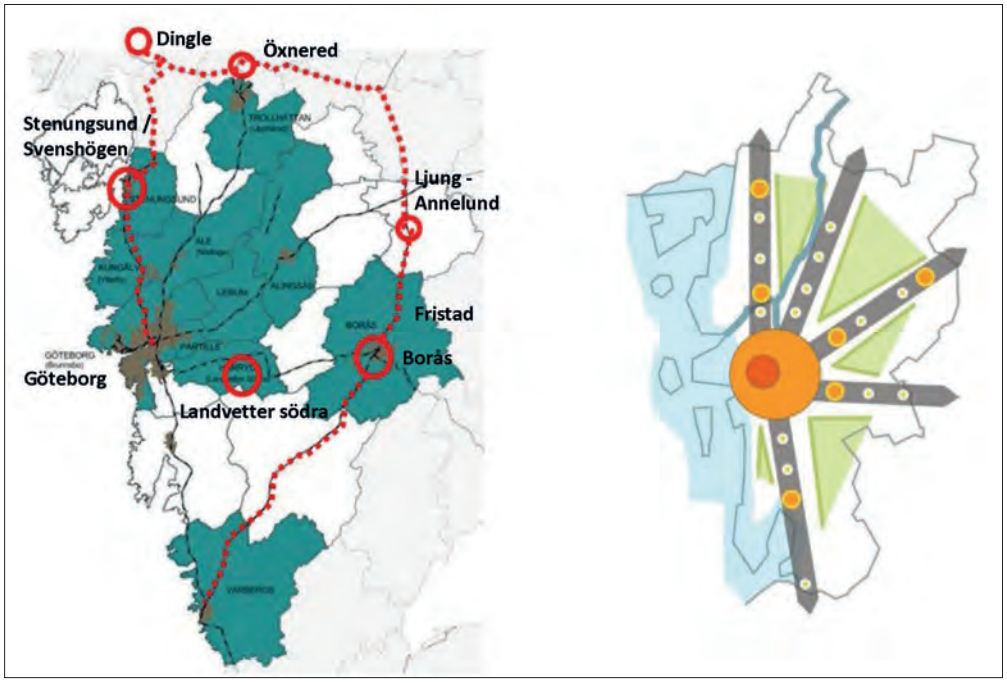


Figure 3. Investigation area in the research project Co-creative urban planning for energy-efficient and sustainable station communities (left; source: the Urban Station Community, Mistra Urban Futures; modified by the author). The GR conceptual development plan (right; source: Gothenburg Region).

council of Region Västra Götaland and the municipalities of Borås (City of Borås and Fristad), Herrljunga (Ljung-Annelund), Härryda (Landvetter Södra and Mölnlycke), Munkedal (Dingle), Stenungsund (Stenungsund and Svenshögen) and Vänersborg (Öxnered).

Guided by case study methodology—which is deemed useful in complex situations with many variables and several units being studied[67]—action research, interviews, and document studies have been the core methods for developing empirics. Design-oriented action research[68, 69] has been carried out and design-oriented methods and tools[70] employed in a cooperative, transdisciplinary working process so as to mobilize the tacit knowledge of the actors involved[71] and to give rise to innovations in collaboration with actors outside of research.[72] Each of the planning actors (the RVG and the aforementioned municipalities), in connection with a current planning situation, constituted a case study unit. They were chosen based on their previous involvement in the 'Urban Station Community' subregional knowledge platform.[73] However, some of the case study units (small station communities along two regional railway lines in Västra Götaland) were chosen as a result of initial participatory analyses in cooperation with planners from the region's municipalities.

As part of the project, ongoing planning processes for the case study units selected have been stimulated, while empirical material resulting from interaction with the planning actors has been obtained as a basis for the analysis of both the procedural and substantial content of the planning. Subsequent reflection has led to knowledge development that can be used for further work in the local planning context, but also to partially generalizable and 'forwarded' knowledge.[74]

The co-creation process has taken place in joint seminars and workshops involving analyses of the planning situation and explorative scenarios[75] for the future development of station communities on a local and regional level. The resulting material has then been analysed through further design processing, both jointly by researchers and practitioners and also by the researchers on their own. In addition to this, document studies of various planning and strategy documents supplement the action research with a focus on narratives about land use, the development of station communities and building and transport systems, along with semi-structured interviews thematically centred around the concepts of institutional capacity and the spatial

morphology of station communities as defined in the theory section of this article. The interviews were conducted with officials from the RVG and the municipalities involved and interpreted using the bricolage technique.

The empirics from seminars, workshops, documents studies, and interviews were brought together for a first cycle of synthesis through triangulation by comparing each type of empirics. The emerging body of results could then be abductively analysed further in a cyclical fashion both within and between the case study units so as to develop 'thick' material for discussion. In this

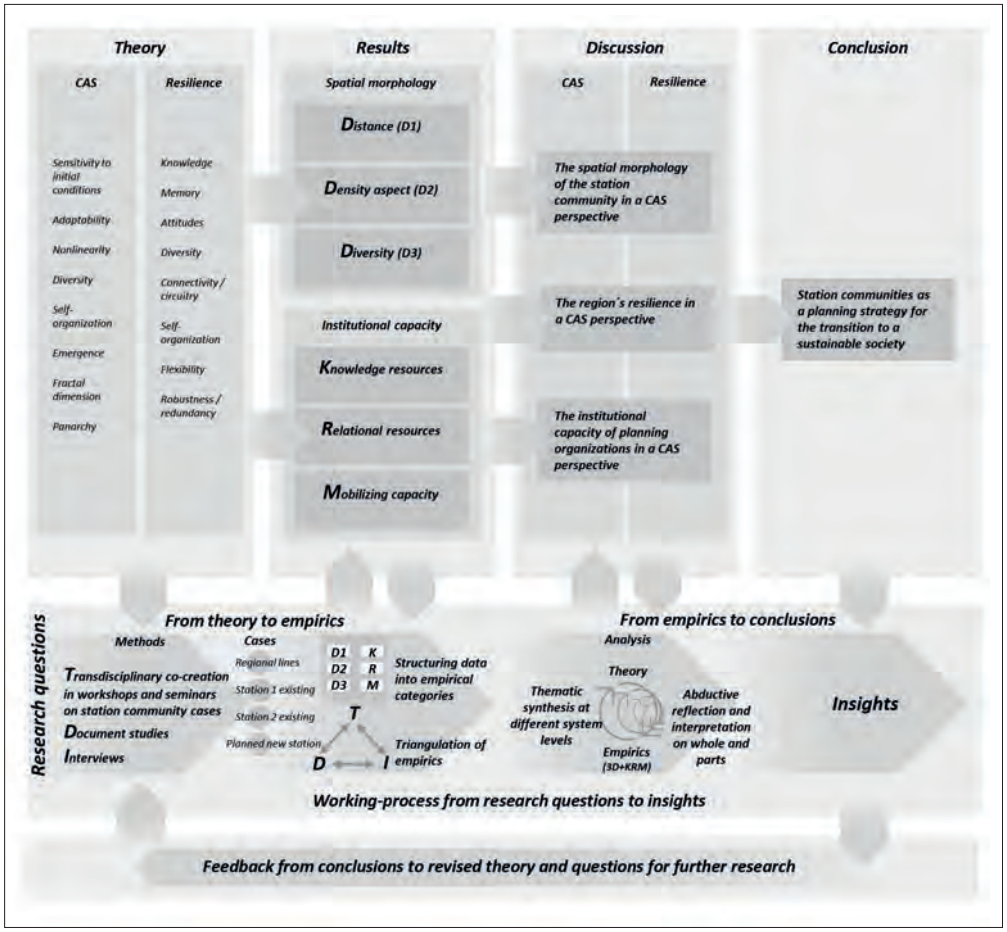


Figure 4. Research design. Arrows show the interplay and influence between different parts of the design.

process of reflecting and bringing the materials together in thematic descriptions, the *theoretical* categories of CAS and resilience were used to track traces of traits from the various aspects of these categories in the results. In the analysis, institutional capacity and spatial morphology were regarded as *empirical* categories that served as the basis for structuring the results and the discussion, thus leading to conclusions and insights for the further development of theory and research.

RESULTS

The Spatial Morphology of Station Communities

The distance aspect appears to be largely a question of accessibility. From the perspective of energy and sustainability, the actors deem accessibility by walking, cycling, and public transport within station communities to be of particular interest. The station communities studied show great variation in the geometric form of their transport networks, the topological relationship between the station and other destination points, and with regard to the constitution of the road network in terms of transport function in a hierarchy of various paths. The established representation of station communities, in which the station is centrally located adjacent to a centre, rarely turns out to hold true. Instead, the urban structure is often located along one side of the railway (Stenungsund, Öxnered, and Svenshögen), and destination points are scattered along streets rather than concentrated in an area near the station (Stenungsund, Svenshögen, and Ljung). Accessibility is not distributed in space as a homogeneous field, but instead along paths that can sometimes extend relatively far away from the station (Fristad, Stenungsund, and Svenshögen). For the smallest station communities, the importance of proximity to the station declines in favour of accessibility in a large-scale road network, where destination points are spread out over a larger area (Ljung, Svenshögen, and Dingle). The station here is a transit point to a region beyond the closest surrounding vicinity of the station community, whereas the proximity of the station area is considered to have a greater relative importance in medium-sized station communities as a result of a more field-distributed accessibility within a more fine-meshed network of streets (Fristad and Landvetter södra). On a subregional level, other connections than railway lines appear to be important for the development of station communities (Svenshögen); an intersecting network of road links in relation to the railway lines that creates subregional contexts of work, experiences, social contacts, and the exchanges of goods and services. Medium-sized station communities are important here as central

places for a range of service and experiences, while small station communities are to a greater extent only bypass or entry points.

The density aspect is reflected in larger and medium-sized station communities by a concentration of workplaces and housing within a central area (Borås and Stenungsund). In the planning of new station communities, one ambition is to achieve a density that supports a higher proportion of travellers by public transport (Landvetter södra, planned for 25,000 inhabitants). For existing station communities, there is considerable potential for densification near the station, which has not been taken advantage of efficiently due to low development pressure. Density near stations is commonplace as a normative planning concept among planning actors. But density need not be concentric from the station, but can instead also develop in corridors of up to 3 kilometres from the station (Borås). The local population density in relation to the city centre can be eccentric in some cases (Borås, Stenungsund, and Öxnered). In small station communities, the densification potential does not appear to have attracted attention other than in a schematic, traditional TOD-based perspective, in which it is represented as concentric areas in the comprehensive plans. One reason for this is that even though the stations are seen as identity bearers, the development pressure is weak, which limits both the development rate and the view of the station communities as being possible to develop.

The diversity aspect is considered to depend on a sufficiently large population base in the immediate area, as well as on locations with high availability for travellers, who can benefit from the supply on site. Redundancy (supply surplus) and the diversity of functions are generally lower the smaller the station community is. Empirics show that the presence of workplaces and a functional mix at block level is perceived as important for the establishment of housing and for an urban environment to be considered successful (Landvetter södra). Certain functions, such as education, cultural activities, and multimodal transport nodes, also appear to be of importance for the occurrence of and connections to other, secondary, functions. In the smallest station communities (Svenshögen, Dingle, and Ljung), social and cultural functions become important identity bearers and meeting places, which, considered together—rather than separately—are perceived as contributing to the attractiveness of the station community. The importance of the reachability of the station seems to decrease in relation to the possibility of reachability between the functions themselves. The significance of having an

urban centre also decreases, and the destination points, which can be relatively scattered, create a relational field within which accessibility as a whole is deemed important (Svenshögen and Fristad).

For Landvetter södra, distance, density, and diversity have been used as planning indicators for an energy-efficient urban structure so as to evaluate the explorative scenarios developed across sectors. Analysis of the results shows that proximity to public transport, the presence of public spaces and meeting places, and walkability in the urban structure along with care for the natural environment, an urban structure with several functional centres, a small-scale, rich functional diversity, and high population density in proximity to the station area were considered important aspects.

The Institutional Capacity of Planning Organizations

The capacity of planning actors to undertake planning and implement the development of sustainable and energy-efficient station communities emerged in several ways in interviews, planning documents, and workshops. The following section describes how the municipalities and the RVG perceive their situation.

As far as knowledge resources are concerned, the RVG as well as the larger municipalities of Borås and Härryda have a supply of competence that enables them to undertake continuous and long-term planning with a focus on structural aspects of the built environment. For smaller municipalities, a scarcity of resources and a tendency to prioritize the short term and spatially delimited, detailed planning over strategic and structure-oriented planning constitutes a limitation. One reason is that insufficient resources are allocated for urban planning, but also that the available resources are prioritized for the superordinate housing supply issue. This contributes to a significant turnover of planning personnel, leading to the creation of both a regional network of planners and a long-term, 'collective' knowledge-base, but also makes it difficult for municipalities to achieve continuity in the knowledge of their own planning.

There is a difference between planning and development—planning departments and spatial planners are responsible for planning according to the Planning and Building Act (PBA), while business, property, and development departments are responsible for development issues. In the municipality of Härryda, a special development company has been created to manage the

establishment of Landvetter södra. There is, however, a difference of opinion between the municipality and the company with respect to perspectives on the benefits of development, professional discourses, and how to manage market actors. Both have a mandate to act independently by virtue of their professions and the frameworks of given assignments, but planners are seen more as representatives of legislation and thus as a group that focuses on constraints, while developers are perceived as describing opportunities. There are also differences in views between politicians and officials. Politically, there is a great sensitivity to initiatives that lead to the establishment of jobs or housing. This sensitivity often outweighs long-term strategies in the comprehensive plans.

Station communities have previously not been considered so clearly in the municipalities' comprehensive plans and development strategies. In recent years, however, interest has increased as a result of the RVG's vision for the development of train transport, which aims at a tripling of train travel. The Gothenburg Region's structural development vision also points to strong development along a few railway lines originating from Gothenburg. At the same time, the perspective has been strongly mobility-oriented and there is also a decoupling of local physical planning and regional development planning, in which station communities are mainly dealt with as part of sectoral public transport planning. There is no corresponding land-use planning or regional housing planning.

With respect to relational resources, the regional planning level acts in close reliance on the Swedish Transport Administration's national investment planning. The connection to the local level is indirect because the RVG communicates via subregional associations representing the municipalities in the region. The development of station communities thus becomes dependent on investments that are decided in other contexts than the municipalities themselves.

Coordination between the municipalities regarding urban development, the location of transport-intensive functions, and housing planning is considered weak. The subregional associations are not active in weighing, balancing, or distributing the municipalities' claims and needs among themselves. Synergies and consensus on important issues are partly lacking due to geographical conditions (natural geographical formations and the historical pattern of urban areas and natural resources) and lack of connections in intermu-

nicipal infrastructure. But administrative boundaries between subregional associations and municipalities also limit what one or the other municipality 'sees' and considers itself able to influence. At the same time, the subregional associations have been active in creating networks for knowledge exchange and dialogue between the municipalities with the Urban Station Community project as one of the clearest examples.

Most municipalities want to be part of investments in railway networks and the development of transport. This denotes competition for insufficient resources, which sometimes becomes an obstacle and a lock-in for conducting discussions on coordinated land use and development along railway lines that go beyond the specific municipality and its planning. At the same time, it has been stated that there is good social capital between officials, between politicians and civil servants, as well as between the subregional and regional level with respect to infrastructure and public transport planning.

Concerning mobilizing capacity, the actors have generally not studied alternative futures based on various external conditions or local scenarios for the built environment. The future is therefore largely perceived as a projection of current conditions and trends; there is also caution and uncertainty regarding the development of transport systems. While energy and climate perspectives have been addressed in planning documents, they have not been linked to station communities. The connection between transport and land-use development is often described, but is not handled consistently. The connection between the municipalities' comprehensive planning and regional transport and growth strategies is also unclear. Despite this, the actors claim that there are arenas for interaction between the planning levels.

There are various opinions on where in the region state-level support for investment in the railway infrastructure should be directed and which measures should be prioritized. Opinions differ with regard to, among other things, which railway lines the individual municipality lies along, how one perceives cooperation and competition between neighbours, where the boundaries for different subregional associations are, and how the subregional natural geography has influenced development historically.

The national level can act vigorously. In addition to the national investment budget, the Swedish Transport Administration also has instruments in the form of, inter alia, urban environment agreements, the so-called Swedish

negotiation (in which state infrastructure investments are conditional on municipal planning for housing construction) and the possibility of allowing municipalities to advance funds for state infrastructure projects. Interaction with both the regional and local level, however, sometimes fails, and sudden initiatives from the state level can create difficulties in the municipalities' ability to plan strategically. The crisis for the automotive industry during the first decade of the twenty-first century meant, for example, that the government quickly decided on a motorway between the automotive industrial cities of Trollhättan and Gothenburg in order to save jobs, which then had a negative impact on train travel.

DISCUSSION

Here the results are discussed based on the aforementioned complexity- and resilience-theory apparatus (fig. 4).

The results show that the solidly established forms of planning and institutional structures are a response to prevailing discourses on development that are adequate under 'normal' (system-stable) circumstances, but which limit the transition to sustainability. To enhance the possibilities for such a transition and the resilience of structures, processes, and actors in implementing it, the CAS/resilience-concept apparatus (fig. 2) can be regarded as a set of concepts that might serve as a basis for resilience planning approaches (see e.g. Wilkinson, 2011[76]) that could be supportive in handling system transformation, shifting between stable states, and harnessing novelty, surprise, and revolt in a feasible way so as to maximize energy-efficiency and minimize the increase in entropy in regional built structures, railways, and station communities, as well as in the systems of planning bodies. In practice, this means developing the distance, diversity, and density of the spatial morphology of station communities as well as the knowledge resources, relational resources, and mobilization capacity of planning organizations.

But when applying such approaches, it is deemed necessary to first adopt an analytical perspective in order to achieve an understanding of how the aspects and mechanisms of CAS operate in and between systems on different scale levels, while taking into consideration the holding-back of entropy (energy-inefficiency) and the balancing-out of uneven geographic development. Therefore, the aim in the rest of the discussion is to demonstrate how complexity and resilience theory can be useful in highlighting certain features in planning processes, organizations, and how cities and regions

develop in order to inform planners and decision-makers on what aspects or mechanisms are important.

The region's resilience in a CAS perspective consists of both Västra Götaland itself and the planning of the region and its municipalities, thus forming several *levels of stable system states* with many *niches* (station communities and cities) and a number of *regimes* (municipalities and subregions) and *landscapes* (the larger region and the state). These levels are *fractal* in the sense that the physical structures and the planning bodies reflect each other in terms of *spatial structure* and *organizational structural,* with respective trait-like subdivisions into similar morphological patterns, land-use patterns, and sectoral competence.

As in the *panarchic system model*, the most strategic and slowest changes occur on the regional level, while municipal planning decisions sometimes affect the system from below in a *revolting* manner (Landvetter södra). At the same time, the interplay sometimes 'bypasses' the regime level, thus disrupting the panarchy. The interconnection of urban areas with transport routes is manifested in both branches leading out of big cities and in networks between smaller towns, thus providing a *robustness* to counter potential disruptions in the network. For rail-based public transport, however, the radiating branch structure is the dominant one, which is problematic because it involves low *redundancy* and *flexibility* for trains, and leaves the car as a dominant means of transport for achieving network *connectivity*.

The regional railway lines and regional-topographical conditions create subregional '*ecologies*' and various conditions for station communities. These ecologies and their interfaces and boundaries only become visible when a *scale-transversal* systems perspective is established.[77] Understanding them necessitates an analysis of the potentials of these areas and a mapping of possible overlaps. The development of individual station communities and their 'accessibility structure' seem to be influenced by what can be reached and activated within reasonable ranges. A station community's internal configuration and functions are thus integrated with the region in a relational manner.

The structural spread on the urban peripheries means that the region as a CAS appears to be in a slow, largely (despite the overall planning) *self-organized system crisis*, with an increasing transport demand and a structural car

dependency that can be said to be *path-dependent*; increased travel intensifies inner cities as focal points, but also makes the periphery even more attractive for continued development, since congestion and conflicts are relatively limited there. Here, the case of Landvetter södra can appear natural from a municipal viewpoint, but becomes part of the dispersion dynamics if the new city is not strongly linked from a regional perspective to the overall public transport system. Interventions in development through planning are an expression of how the system can *learn* from previous development and *adapt* or undergo more radical *transitions* to new system states. Here the region displays prerequisites for panarchy, which, through frequent connections and *interaction across scales*, can create robustness, diversity, and redundancy in the range of environments and actors, connectivity between localities and actors, and thereby the conditions for sustainable self-organization and positive path dependencies.

The spatial morphology of the station community in a CAS perspective displays a greater diversity of local place conditions than is asserted by the prevailing general TOD principles. This seems to apply to a greater extent to small station communities than to large ones, which are characterized by high connectivity within central areas. The general principle of morphological fractal repetition also seems less significant for very small stations, where local contextual factors instead become dominant. The slow development rate here reduces the likelihood of unpredictable, *nonlinear development*. In the case of Landvetter södra, there is great *sensitivity to the initial conditions*—a window of opportunity in that a new city is being designed, but also great uncertainty. For example, it is still not known whether the nationally planned high-speed railway between Stockholm and Gothenburg will become a reality or not, or if it will have any station for Landvetter södra. Both are key conditions for the station community. Alternative approaches—planning redundancy and flexibility—are needed to address different possible futures.

The changing functional geography and the variation in the morphology of station communities mean that they are to a large extent unique cases and cannot simply be subjected to general representations of an 'ideal station community'. This justifies a systems perspective in which station communities complement and support each other. This also means that there is a need not only for a reinforced corridor function for the railways that connect the station communities, but also for a greater number of connections transversely between station communities by means of complementary modes of transport.

The observation that the internal structure of station communities is not concentric also points to the need for developed public spaces between the station and other important destination points. Here, both high spatial connectivity and functional diversity and redundancy with respect to the density of functions are important factors. It also indicates that the station could have more functions than today and that its immediate surroundings would then have to be designed for these needs. A third focus is on strengthening paths that bring together scattered functions so as to create a more station-integrated structure.

The institutional capacity of planning organizations in a CAS perspective denotes the formation of collaborative bodies and networks of social links and actor nodes, which thus gives the institutional structure of the region high diversity, connectivity, and redundancy in information exchange, collective memory, flexibility, and robustness. However, there is genuine uncertainty in the often indirect and weak links between planning levels, which, in combination with contextual factors, gives rise to nonlinearity in organizations and processes. The uneven economic development contributes not only to unpredictability and the gradual creation of new niches that revolt against the system, but also to lock-ins for weak and fragile parts of the region. This development nevertheless seems to be given a direction owing to the strong path dependencies of structures that have already been built. Lock-ins and new increments also arise as a result of the design and application of planning instruments and the consolidation of strategies, discourses, and mental models that reproduce the ongoing development. One example is the use of the socio-economic assessments (with a node-based mobility perspective on railway stations) that form a basis for the national planning of infrastructure investments and how local planning seems to adapt to it. The multilevel structure initially identified suggests the possibility of panarchic system dynamics, which could lead to increased resilience in planning processes and the implementation of sustainable and energy-efficient station communities.

CONCLUSION

In order to be energy-efficient from a transport perspective, the question of both the accessibility of the station community (distance) to social functions (diversity) and the proximity between functions and those who live and work in a station community (density) needs to be addressed along with the size and context of the station communities. In continued research, it will be interesting to analyse at which threshold values for distance, density,

and diversity a station community as such becomes resilient, which context factors affect these threshold values, and what is necessary to reach them.

This article's focus on station communities as a planning strategy for the transition to a sustainable society implies that a concentration on urban areas with high accessibility to a station provides better conditions for energy-efficient and sustainable travel. This means that the hierarchy of locations of different sizes and economic significance in a region could be less significant vis-à-vis a more symmetrically distributed regional polycentricity. This could strengthen a panarchic, multilayered urban system and increased robustness in niches, regimes, and landscapes, and thus also increase the resilience of the regional urban system in terms of reduced sensitivity to disturbances and sudden system shocks.

The mutually varying morphology of station communities reflects a diversity of social and functional niches. The fact that they are also part of various subregional ecologies that arise from networks of communications in addition to the railways indicates that they have flexibility and a dormant development potential, but at the same time also a fragility vis-à-vis changed conditions due to, for example, the closing of workplaces or services. The smaller and more specialized a station community is, the greater the need for multiple and strong connections to the surrounding functional context. Several niche station communities in collaboration with other places can form new and more diverse ecologies that can become more or less resilient depending on their configuration and functional complementarity. In contrast to this, larger station communities display a density and functional diversity that makes them robust in themselves, but also important for their surroundings as central places. CAS- and resilience-based thinking seems to advocate the development of more network-and node-oriented structures. Station communities can then be understood as the network's independent but contextually influenced and mutually interacting node-places, which consequently opens up new approaches that support the transition to a more sustainable society.

If urban and regional development is to handle transition, the increasing developmental, structural, and processual complexity needs to be managed by means of scale-transversal, transdisciplinary, co-operative urban planning that integrates a variety of perspectives, stages, scale issues, and physical-spatial systems. Without developing how this can be orchestrated

in detail, this article shows that urban and regional development, organizations, and flows of capital and resources can be described and understood in terms of complex adaptive systems, with the adaptive cycle as an illustration of the development dynamics, based on the theoretical conceptual apparatus that has been presented as well as empirical results. A first step, however, could be to raise awareness of the different aspects of complexity, to describe and analyse spatial morphology, institutional capacity, and the planning process using the conceptual apparatus as a 'planning language' at an early stage, and to continuously monitor and learn from the rest of the process. Derived from this, strategies and approaches as well as continued research needs can be formulated.

NOTES

[1] International Energy Agency, *Global Energy & CO2 Status Report: The Latest Trends in Energy and Emissions in 2018* (IEA, 2018).

[2] Johan Rockström, Will Steffen, Kevin Noone, Åsa Persson, Stuart Chapin, Eric F. Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Björn Nykvist, Cynthia de Wit, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K. Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J. Fabry, James Hansen, Brian Walker, Diana Liverman, Katherine Richardson, Paul Crutzen, and Jonathan A. Foley, 'A Safe Operating Space for Humanity', *Nature* 461 (2009), pp. 472–75.

[3] Magnus Jiborn, Astrid Kander, Viktoras Kulionis, Hanna Nielsen, and Daniel D. Moran, 'Decoupling or Delusion? Measuring Emissions Displacement in Foreign Trade', *Global Environmental Change* 49 (2018), pp. 27–34.

[4] Naturvårdsverket, *Fördjupad analys av svensk klimatstatistik 2018: Rapport 6848* (Stockholm: Naturvårdsverket, 2018).

[5] Delegationen för Hållbara Städer, *Femton hinder för hållbar stadsutveckling*, SOU M 2011:01/2012/66 (Stockholm, 2012).

[6] Michael Batty, *The New Science of Cities* (Cambridge, MA, and London: The MIT Press, 2015).

[7] Judith E. Innes and David E. Booher, *Planning with Complexity: An Introduction to Collaborative Rationality for Public Policy* (Abingdon-on-Thames: Routledge, 2010).

[8] David Harvey, *Den globala kapitalismens rum: På väg mot en teori om ojämn geografisk utveckling* (Hägersten: Tankekraft Förlag, 2006).

[9] Paul Krugman, 'Increasing Returns and Economic Geography', *Journal of Political Economy* 99 (1991), pp. 483–99.

[10] Michael Batty, *Cities and Complexity: Understanding Cities Using Cellular Automata, Agent-Based Models and Fractals* (Cambridge, MA: The MIT Press, 2005).

[11] Nils Björling, *Sköra stadslandskap: Planeringsmetoder för att öppna urbaniseringens rumsliga inlåsningar*, PhD thesis, Institutionen för Arkitektur, Chalmers Tekniska Högskola, Göteborg, 2016.

[12] Evert Meijers, 'Polycentric Urban Regions and the Quest for Synergy: Is a Network of Cities More than the Sum of the Parts?', *Urban Studies* 42, no. 4 (2005), pp. 765–81.

[13] Manuel Castells, *Nätverkssamhällets framväxt*, vol. 1, *Informationssamhällets framväxt: Ekonomi, samhälle och kultur* (Göteborg: Bokförlaget Daidalos, 1996).

[14] Tony Champion, 'Urbanization, Suburbanization, Counterurbanization and Reurbanization', in *Handbook of Urban Studies*, edited by Ronan Paddison (London: Sage Publications, 2001).

[15] Steffen Lohrey and Felix Creutzig, 'A "Sustainability" Window of Urban Form', *Transportation Research Part D: Transport and Environment* 45 (June 2016), pp. 96–111.

[16] Reid Ewing and Robert Cervero, 'Transport and the Built Environment: A Meta-Analysis', *Journal of the American Planning Association* 76, no. 3 (Summer 2010).

[17] Franz Dieleman and Michael Wegener, 'Compact City and Urban Sprawl', *Built Environment* 30, no. 4 (2004), pp. 308–23.

[18] Lohrey and Creutzig, 'A "Sustainability" Window of Urban Form'.

[19] Batty, *The New Science of Cities*.

[20] Robin Hickman and David Banister, *Transport and Reduced Energy Consumption: What Role Can Urban Planning Play?*, Working paper no. 1026 (Oxford University, Centre for the Environment, Transport Studies, 2007).

[21] Ewing and Cervero, 'Transport and the Built Environment: A Meta-Analysis'.

[22] Mattias Qviström, 'Putting Accessibility in Place: A Relational Reading of Accessibility in Policies for Transit-Oriented Development', *Geoforum* 58 (2015), pp. 166–73.

[23] David Banister, 'The Sustainable Mobility Paradigm', *Transport Policy* 15, no. 2 (2008), pp. 73–80.

[24] Luca Bertolini, 'Spatial Development Patterns and Public Transport: The Application of an Analytical Model in the Netherlands', *Planning Practice and Research* 14, no. 2 (1999), pp. 199–210.

[25] Hugo Priemus, 'Urban Dynamics and Transport Infrastructure: Towards Greater Synergy', in *Railway Development: Impacts on Urban Dynamics*, edited by Frank Bruinsma, Eric Pels, Hugo Priemus, Piet Rietveld, and Bert Van Wee (Heidelberg: Physica-Verlag, 2008).

[26] Bertolini, 'Spatial Development Patterns and Public Transport'.

[27] Peter Hartoft-Nielsen, *Stationsnaerhedspolitikken i Köbenhavnsregionen, baggrund, effekter og implementering*, Paper till Nordisk forskningskonferens om 'baerkraftig byutvikling' (Oslo, 16 May 2003).

[28] Peter Calthorpe, *The Next American Metropolis: Ecology, Community and the American Dream* (New York: Princeton Architectural Press, 1993).

[29] Carey Curtis, John L. Renne, and Luca Bertolini, eds., *Transit Oriented Development: Making It Happen* (Ashgate: Routledge, 2009).

[30] Stefan Wing, Emma Andersson, Stina-Kajsa Andersson, and Monica Sjölund, *Västra Götalands funktionella geografi—befolkning, arbete och boende* (Göteborg: Länsstyrelsen Västra Götalands län, and Västra Götalandsregionen, 2017).

[31] Anders Hagson and Lars Mossfeldt, *Analys av tillgänglighet, trafikarbete och färdmedelsval som funktion av väginvesteringar: Rapport 2008:2* (Göteborg: Chalmers Tekniska Högskola, Tema Stad & Trafik, 2008).

[32] Västra Götalandsregion, *Målbild Tåg 2035—utveckling av tågtrafiken i Västra Götaland* (Göteborg, Västra Götalandsregionen, 2013).

[33] Michael Batty, 'The Size, Scale and Shape of Cities', *Science* 319 (2008), pp. 769–71.

[34] Simon Levin, Tasos Xepapadeas, Anne-Sophie Crépin, Jon Norberg, Aart de Zeeuw, Carl Folke, Terry Hughes, Kenneth Arrow, Scott Barrett, Gretchen Daily, Paul Ehrlich, Nils Kautsky, Karl-Göran Mäler, Steve Polasky, Max Troell, Jeffrey R. Vincent, and Brian Walker, 'Social-Ecological Systems as Complex Adaptive Systems: Modeling and Policy implications', *Environment and Development Economics* 18 (2013), pp. 111–32.

[35] Illya Prigogine, 'Time, Structure and Fluctuations', *Science* 201 (1978), pp. 777–85.

[36] David Bristow and Christopher Kennedy, 'Why Do Cities Grow? Insights from Nonequilibrium Dynamics at the Urban and Global Scales', *Forum* 19, no. 2 (2015), pp. 211–21.

[37] Nicholas Georgescu-Roegen, 'The Steady State and Ecological Salvation: A Thermodynamic

Analysis', *BioScience* 27, no. 4 (1977), pp. 266–70.

[38] Lance H. Gunderson and Crawford Stanley Holling, eds., *Panarchy: Understanding Transformations in Human and Natural Systems* (Washington, DC: Island Press, 2002).

[39] Batty, *Cities and Complexity.*

[40] Juval Portugali, 'Learning from Paradoxes about Prediction and Planning in Self-Organizing Cities', *Planning Theory* 7, no. 3 (2008), pp. 248–62.

[41] Paul Pierson, 'Increasing Returns, Path Dependence, and the Study of Politics', *American Political Science Review* 94, no. 2 (2000), pp. 251–67.

[42] Thilo Lang, 'Urban Resilience and New Institutional Theory: A Happy Couple for Urban and Regional Studies?', in *Urban Regional Resilience: How Do Cities and Regions Deal with Change?*, *German Annual of Spatial Research and Policy 2010*, edited by Bernhard Müller (Berlin and London: Springer, 2010), pp. 15–21.

[43] Crawford Stanley Holling, 'Understanding the Complexity of Economic, Ecological and Social Systems', *Ecosystems* 4, no. 5 (2001), pp. 390–405.

[44] John H. Holland, *Hidden Order: How Adaptation Builds Complexity* (New York: Basic Books, 1995).

[45] Arthur T. Denzau and Douglass C. North, 'Shared Mental Models: Ideologies and Institutions', *Kyklos* 47, no. 1 (1994), pp. 3–31.

[46] Gunderson and Holling, *Panarchy: Understanding Transformations in Human and Natural Systems*.

[47] Lars Marcus and Johan Colding, 'Towards an Integrated Theory of Spatial Morphology and Resilient Urban Systems', *Ecology and Society* 19, no. 4 (2014).

[48] Tony Svensson, *Varför gör vi inte som vi säger? Retorik, realitet och dialektik i svensk stadsutveckling med fokus på energi och fysiska strukturer*, PhD thesis, Kungliga Tekniska Högskolan, Stockholm, 2015.

[49] Jianguo Wu and Tong Wu, 'Ecological Resilience as a Foundation for Urban Design and Sustainability', in *Resilience in Ecology and Urban Design: Linking Theory and Practice for Sustainable Cities*, edited by Stewart T. A. Pickett, Mary L. Cadenasso, Brian P. McGrath, and Kristina Hill (Dordrecht: Springer, 2013).

[50] Marcus and Colding, 'Towards an Integrated Theory of Spatial Morphology and Resilient Urban Systems'.

[51] Simin Davoudi, Keith Shaw, Jamila L. Haider, Allyson E. Quinlan, Garry D. Peterson, Cathy Wilkinson, Hartmut Fünfgeld, Darryn McEvoy, and Libby Porter, 'Resilience: A Bridging Concept or a Dead End?', *Planning Theory & Practice* 13, no. 2 (2012), pp. 299–333.

[52] Cathy Wilkinson, 'Social-Ecological Resilience: Insights and Issues for Planning Theory', *Planning Theory* 11, no. 2 (2011), pp. 148–69.

[53] Ulf Ranhagen, *Resan mot stärkt hållbarhet: Analys, slutsatser och rekommendationer för fortsatt arbete med RUFS 2050*, Arbetsmaterial 2015:9 (Stockholm: Stockholms Läns Landsting, Tillväxt- och Regionplaneförvaltningen, 2015).

[54] Marcus and Colding, 'Towards an Integrated Theory of Spatial Morphology and Resilient Urban Systems'.

[55] Margot D. Cantwell and Richard T. T. Forman, 'Landscape Graphs: Ecological Nodeling with Graph Theory to Detect Configurations Common to Diverse Landscapes', *Landscape Ecology* 8, no. 4 (1993), pp. 239–55.

[56] Marina Alberti, *Advances in Urban Ecology: Integrating Humans and Ecological Processes in Urban Ecosystems* (New York: Springer Academic + Business Media LLC, 2008).

[57] Ewing and Cervero, 'Transport and the Built Environment: A Meta-Analysis'.

[58] Hiroaki Suzuki, Robert Cervero, and Kanako Iuchi, *Transforming Cities with Transit: Transit and Land Use Integration for Sustainable Urban Development* (Washington DC: The World Bank, 2013).

[59] Ulf Ranhagen, Elisabetta Troglio, and Björn Ekelund, *Klimatsmarta och attraktiva transportnoder* (Stockholm: Kungliga Tekniska Högskolan, 2015).

[60] Alan G. Wilson, *Complex Spatial Systems: The Modelling Foundations of Urban and Regional Analysis* (Edinburgh Gate: Prentice Hall, 2000).

[61] Mattias Qviström and Jens Bengtsson, 'What Kind of Transit Oriented Development? Using Planning History to Differentiate a Model for Sustainable Development', *European Planning Studies* 23, no. 12 (2015), pp. 2516–34.

[62] Marcus and Colding, 'Towards an Integrated Theory of Spatial Morphology and Resilient Urban Systems'.

[63] Claudio De Magalhães, Patsy Healey, and Ali Madanipour, 'Assessing Institutional Capacity for City Centre Regeneration: Newcastle's Grainger Town', in *Urban Governance, Institutional Capacity and Social Milieux*, edited by Göran Cars, Claudio De Magalhães, Patsy Healey, and Ali Madanipour (Aldershot: Ashgate Publishing Ltd., 2002).

[64] Patsy Healey, Claudio De Magalhães, Ali Madanipour, and John Pendlebury, 'Place, Identity and Local Politics: Analysing Initiatives in Deliberative Governance', in *Deliberative Policy Analysis: Understanding Governance in the Network Society*, edited by Maarten A. Hajer and Hendrik Wagenaar (New York: Cambridge University Press, 2003).

[65] Patsy Healey, *Collaborative Planning: Shaping Places in Fragmented Societies*, 2nd ed. (1997; repr., London: Palgrave Macmillan, 2006).

[66] De Magalhães et al., 'Assessing Institutional Capacity for City Centre Regeneration: Newcastle's Grainger Town'.

[67] Rolf Johansson, 'Ett explikativt angreppssätt: Fallstudiemetodikens utveckling, logiska grund och betydelse i arkitekturforskningen', *Nordisk Arkitekturforskning* 15, no 2 (2002), pp. 19–28.

[68] Matthew T. Mullarkey and Alan R. Hevner, 'An Elaborated Action Design Research Process Model', *European Journal of Information Systems* 28, no. 1 (2019), pp. 6–20.

[69] Linda Groat and David Wang, *Architectural Research Methods* (Hoboken, NJ: John Wiley & Sons, Inc., 2002).

[70] Ulf Ranhagen, Alice Dahlstrand, and Amie Ramstedt, *Co-Creation in Urban Station Communities: Findings from Working Seminars Involving the Collaboration of Transdisciplinary Agents, 2015–2016* (Göteborg: Mistra Urban Futures, 2017).

[71] Donald A. Schon, *The Reflective Practitioner: How Professionals Think in Action* (London, Avebury: Ashgate Publishing Ltd., 1983).

[72] Merrit Polk, 'Institutional Capacity-Building in Urban Planning and Policy-Making for

Sustainable Development: Success or Failure?', *Planning Practice and Research* 26, no. 2 (2011), pp. 185–206.

[73] Ranhagen et al., *Co-Creation in Urban Station Communities*.

[74] Ylva Gislén, *Rum för mening: Kollaborativt berättande i digitala medier*, Dissertation Series No. 2003:04, Blekinge Institute of Technology, Karlskrona, 2003.

[75] Lena Börjeson, Mattias Höjer, Karl-Henrik Dreborg, Tomas Ekvall, and Göran Finnveden, 'Scenario Types and Techniques: Towards a User's Guide', *Futures* 38 (2006), pp. 723–39.

[76] Wilkinson, 'Social-Ecological Resilience: Insights and Issues for Planning Theory'.

[77] Willem Salet and Andy Thornley, 'Institutional Influences on the Integration of Multilevel Governance and Spatial Policy in European City-Regions', *Journal of Planning Education and Research* 27 (2007), pp. 188–98.

POTENTIALS OF LIGHT IN URBAN SPACES DEFINED THROUGH SCENOGRAPHIC PRINCIPLES

Mette Hvass and Ellen Kathrine Hansen

ABSTRACT

In urban spaces, lighting is often designed based on legal requirements that ensure it is possible to navigate and feel safe. This article examines how scenographic principles for the use of lighting in the theatre can provide inspiration for designing lighting that supports everyday activities in urban spaces. In scenography, light is a poetic tool that enhances the experience, which can be defined as a relation between the actor, the space, and the light. Hereby, the light creates an atmosphere that amplifies the drama. The focus of this article is to investigate whether it is possible to use scenographic principles to create a connection between space, people, and light.

Through a literature search, theories are explored within scenography, urban design, social science, and lighting design. A literature analysis leads to the definition of the architectural and social potential of light. The aim is that these potentials will inspire the design of lighting in the urban context by including the visual connection among people, space, and light, which we know from the theatre, and thereby provide an improved visual and social experience of the illuminated urban space.

KEYWORDS

Urban lighting design, scenography, potential of light

INTRODUCTION

The intention of unfolding the potentials of light in urban spaces is to create awareness of how light can support the architectural and social potentials of the urban nightscape. These potentials may be used for analysing and designing lighting and lighting control in support of everyday life in the nocturnal urban environment.

Outdoor lighting around everyday activities in the urban space is often designed to comply solely with the requirements of brightness levels to help people navigate and feel safe, while perceived qualities of light are not utilized and adapted to the use of the city. Roads, sidewalks, bus stops, et cetera, are illuminated in relation to functional legal requirements for traffic; the illumination of everyday activities and the perceived qualities for pedestrians are often not considered and adapted to the urban space. On the other hand, in the theatre, scenographic lighting is designed to create an aesthetic expression and a mood that amplifies the drama of the action and creates coherence. Lighting in theatres is carefully designed considering the space, the actors, and the content of each scene. Lighting in a theatre is used as a poetic device.

According to the lighting designer Hervé Descottes, the instruments of light can be divided into six principles of lighting: illuminance, luminance, colour and temperature, height, density, and direction and distribution.[1] These light principles are measurable and can meet regulatory requirements for minimum lighting values in urban spaces. However, lighting also has non-measurable potentials that provide aesthetic expressions and atmosphere to a space. Christopher Cuttle calls this 'visibility vs appearance'—that is, lighting designed to fulfil the visual performance needs (measurable) versus lighting that enhances the appearance of surroundings (non-measurable).[2] In scenography, light is used exclusively to enhance appearance and to convey a message in a drama. Therefore, scenography was used as inspiration for this study.

In this article, the term *scenographic principles* refers to how lighting is an integrated tool in the theatre. The term 'scenography' is of Greek origin; *skēnē* means 'stage/scene building' and *grapho* means 'to describe'. In short, the two terms point to the act of 'describing the stage'. In relation to the focus of this article, the scenographic principles refer to how to use the aesthetic and affective values of light to define a correlation between actor, space, and light. Gernot Böhme uses scenography to describe how atmosphere, meaning the tone or mood of a place or a situation, has been produced in the

theatre throughout history (e.g. with light). When specifically talking about light on stage, Böhme states that 'the mastery of the light and sound through electrical technology . . . *tunes* the whole performance . . . [and] has made it possible for the art of the stage set to leave the stage itself and spill over into the auditorium, or even into space itself.'[3]

Urban space and life provide the framework for this study and the everyday activities that take place in the city after dark. The study asks how we can illuminate complex urban spaces and movements through space, inspired by scenographic lighting principles, so that light supports people's actions and provides an aesthetic complement to the visual experience of moving through the city.

The term *lighting potential* refers to the ability of lighting to create space, mood, and atmosphere. Lighting in urban spaces is often designed to meet functional needs, while scenographic lighting aims to reinforce the perceived qualities of light and take advantage of the aesthetic and affective values of lighting.

Aim

This study investigates differences and similarities between principles of scenographic and urban lighting through literature. The aim is to take inspiration from scenographic lighting, where light is used as an aesthetic and affective tool that creates moods and atmospheres and enhances a play. The intention is to translate this knowledge into potentials for how lighting around everyday activities in the urban space can be designed to enhance architectural qualities and support social interaction.

Method

To be able to collect knowledge in relation to the outlined problem, an overall research question was defined:

> How can principles of scenography inspire the definition of the correlation between urban space, people, and lighting and thereby describe architectural and social potentials of light in urban spaces?

To answer the question, a literature search was conducted based on knowledge from literature and research within the fields of scenography, urban design, social science, and lighting design. As shown in Figure 1, the literatu-

re is divided into three themes: 1) scenography and scenographic lighting, 2) urban space and life, and 3) urban lighting design. The selected literature is a mix of classics within urban design and sociology supplemented with literature on lighting design and scenography. To search for knowledge about the link between scenographic lighting and urban lighting, the survey was supplemented with a literature search of peer-reviewed papers using the search words 'scenography', 'urban space', and 'lighting design'. To collect knowledge from a broad range of research fields, the ProQuest, Scopus, and Web of Science databases were chosen. The search resulted in twenty peer-reviewed papers, four of which were included in this article. To add supplementary literature, a literature search was conducted in Google Scholar using the search string 'scenography and light in the urban space'. Fourteen papers and texts were identified and three peer-reviewed papers were included.

The papers were chosen because they related to the three themes and addressed the correlation between urban space, people, and lighting. The articles distinguished themselves by creating a link between Themes 1 and 2 by focusing on urban scenography and how the scenography or performance practice can be used as a lens through which to consider urban space and life.

The results from the search led to an analysis of the literature where the correlation between people, space, and light is discussed. A series of concepts was derived from the texts and collected in a selection of recommendations for lighting and for the use of the architectural and social potential of light.

LITERATURE ANALYSIS

Scenography and scenographic lighting

Traditional scenography has undergone major changes, from only being associated with the design of settings for a performance on a stage to now being able to assume many forms inside and outside of the theatre. Contemporary forms of scenography reflect the political, social, cultural, or ecological impact that scenographic interventions have through multisensorial performance events that blur the boundaries between the audience and the actors. The characteristics of *expanded scenography*, as this development within scenography is called, are evolving rapidly, especially since the turn of the millennium.[4]

This development has also happened within scenographic lighting. In his book *Light: Readings in Theatre Practice*, Scott Palmer describes light as a

Known Literature and Research **Literature on Scenography and Scenographic Lighting, Urban Space and Life, and Urban Lighting Design**			
Authors	Theme 1 Scenography and scenographic lighting	Theme 2 Urban space and life	Theme 3 Urban lighting design
Böhme, G.	x		
Fischer-Lichte, E.	x		
Keller, M.	x		
McKinney, J. Palmer, S.	x		
Palmer, S.	x		
Gehl, J.		x	
Goffman, E.		x	
Jacobs, J.		x	
Jensen, O. B.		x	
Lynch, K.		x	
Brandi, U.			x
Cuttle, C.			x
Descottes, H.			x
Wasserfurth-Grzybowski, N. W.			x
Mende, K.			x
Narboni, R.			x
Search Results for ProQuest, Scopus, Web of Science, and Google Scholar			
Authors	Theme 1 Scenography and scenographic lighting	Theme 2 Urban space and life	Theme 3 Urban lighting design
Brejzek, T.	x	x	
Edensor, T.	x		
Gröndahl, L.	x		
Lavrinec, J.	x	x	
Sánchez, M. J. M.	x	x	
Thibaud, J. P.	x	x	
Wilkie, F.	x	x	

Figure 1. Matrix of texts relative to the three themes listed in the literature.

creative element in the theatre experience and explains how the technological development of light has had an impact on the use of light in theatre throughout history. Up until the end of the nineteenth century, the theatre scene was two-dimensional, because theatre lights were attached to the stage front edge and projected upwards onto the actors. In the late nineteenth century, the stage designer and theatre theorist Adolphe Appia was one of the first to combine his scenographic creativity with the latest lighting technology, thus managing to add three-dimensionality to the stage by means of light.

As cited in Palmer, Appia stated that 'Light has an almost miraculous flexibility . . . it can create shadows, make them living, and spread the harmony of the vibrations in space just as music does. In light we possess a most powerful means of expression through space, if this space is placed in the service of the actor'.[5] Palmer concludes, 'So, here we have our normal, established hierarchy: The actor presenting the drama, space in three dimensions, in the service of the actor's plastic form, light giving life to each.'[6]

Appia formulates a hierarchy consisting of the actor who presents a drama, the space in three dimensions, and the lighting that makes the interaction come alive. The actors and the play constitute the focal point, to which the space and light are related.

This hierarchy inspired the pointing out of the three components used in this article, here presented in relation to the urban comparison:

The actor is an individual (i.e. a pedestrian and his or her actions in the urban space).

The space is the urban space in the nightscape (i.e. urban facades, roads, and pavement, and objects and the materials they consist of).

The lighting is urban lighting design.

The actor presenting the drama is often the focus, or the scenographic lighting is planned to reveal details about the actor and the performance. Contrary to this, in the urban scene the functions of the setting, rather than the actor, are in focus (e.g. the distribution of sufficient light for a pedestrian to cross the road safely). The pedestrian in the urban space is both actor and audience, moving through a space or watching others moving through spaces. At the

theatre, lighting cues and dynamically programmed light are tuned to underline the drama, whereas the lighting in an urban space is controlled to fulfil regulations about a sufficient level of light.

The space in the theatre scene is illuminated from many directions. The materials and colours of the setting are dominant because of high contrasts and directed light, whereas the setting in the urban scene is lighted to facilitate transport functions. Although some buildings stand out to a viewer because of the light in the windows, the materials and colours of the facades and urban objects are generally blurred because of the diffuse and low-level light.

The light in the theatre scene comes from many angles, and directed light at a high light level creates shadows that help to define the forms of objects. The light and the programming of the light are designed to support the play and the actors performing. The focused light makes the audience look at the play and nothing else. The light creates an atmosphere, and a change in the lighting helps the audience understand and prepare for the next scene. In the urban scene, the lighting is designed to support the functions of the city and illuminate the pavement, the road, and urban functions such as traffic structures. Light from road lights is sometimes projected onto facades, making patterns of light that were not intended, blurring the surfaces of the urban space in the nightscape.

The following analysis is structured within the three components; actor, space, and light.

Actor

The aim of describing architectural and social potentials of lighting in urban spaces is to contribute to the creation of nightscapes that are not only functional but also liveable—such as by being more welcoming (densifying) and more conducive to social interaction. Safety is needed in the nightscape, and light can provide safety when designed according to the context. However, light can also enhance the social quality of meetings between people and create the basis for safer and better social interaction. Thus, lighting may make eye contact and mutually acknowledging nods more plausible or facilitate conversation while waiting for a bus. Lighting should be designed to support such meetings. Therefore, we need to analyse the visual perception of spaces. The following texts explain how sociologists and psychologists

analyse everyday social interactions and how the way in which we perceive our surroundings is part of a complete visual system, including our bodies and the surrounding spatial context.

The sociologist Erving Goffman developed a 'dramaturgy metaphor' as a tool to understand everyday social interactions in the city. With a reference to the theatre, he argued that 'social agents' play roles in accordance with more or less self-conscious scripts for social interaction in the urban space.[7] Goffman talks of 'front stage' and 'back stage' regions of the city when describing the dividing line between public and private city spaces. In the front-stage identity, we perform in front of other people, while our back-stage identity is where we do not have to perform but can relax.[8]

Another concept used by Goffman in relation to face-to-face interaction in everyday life is 'face'. Everybody has a self-image—a 'face'—that they seek to communicate in social situations. This is how we 'read' situations and other people, by doing what Goffman calls 'facework' or face-to-face interaction.[9] This theatre of everyday life applies one set of codes during daytime and another during night-time. In the dark hours, the illumination of such 'face' meetings between people should be taken into consideration.

Whereas Goffman's focus may be said to rest on eye contact and communication by means of facial expressions, James J. Gibson directs his attention towards our tactical perception of space. According to Gibson, visual perception is closely related to other sensory perceptions of the physical context: 'We are told that vision depends on the eye, which is connected to the brain. I shall suggest that natural vision depends on the eyes in the head on a body supported by the ground, the brain being only the central organ of a complete visual system.' When designing lighting for the theatre, thinking about the context (and actors' bodies in the context) is a part of making the visual image relate to the play. In his work with visual perception, Gibson defines the ecological laws of surfaces, which describe how we perceive surfaces and textures. Again, finding inspiration from the theatre, lighting can be adjusted in detail according to the material upon which the light is reflected, which is often not the case in the urban space.[10]

The movements of individual persons take place in the framework that an urban space provides. Pedestrians move on the pavement and at night-time in the areas that are lit. By analysing the rhythms of space, time, and everyday

life, both natural (daylight, time of year) and social (rush hour, weekends) lighting can be designed to support the movements of people or redirect them. The lighting system should be looked upon as a whole, a code that includes all information and is designed to support the 'actors on stage'.

The texts cited in the following explain how sociologists, planners, philosophers, and researchers within performance studies analyse the dynamic rhythms and movements of people and the dynamics of light.

Addressing the everyday scope of actions of people in a city, mobilities and the ability of city planners to imbue urban spaces with meaning are the focus of this article. According to Ole B. Jensen, 'mobilities are carefully and meticulously designed, planned, and staged (from above). However, they are equally importantly acted out, performed, and lived as people are "staging themselves" (from below). Staging mobilities is the dynamic process between being staged (being stopped at a traffic light) and the mobile staging of interacting individuals (negotiating a passage on the pavement).'[11] Lighting should be designed to support movements in the urban space, whether they be staged 'from above' according to regulations or 'from below' according to how people prefer to use spaces and interact in them.

According to Maria José Martinez Sánchez, it is essential to understand that the movement of cars, bikes, people, and other flows in the city is a parameter to consider when establishing a spatial configuration in urban design. In the paper 'Dynamic Space, Complex Contexts', Sánchez states that 'the spatial configuration determines the dynamic qualities of the space, so by analysing movement analyses we could determine those relationships.' Using movement analyses, we can find order in what may at first seem like chaos. Sánchez also refers to Jane Jacobs and her choreography of pedestrian 'ballet dancers'.[12] The interplay between the setting and the play is in focus.

Dynamic lighting scenarios for the city should be designed according to the monitored movements of people in the urban space, as described by Jensen. In addition, they should be designed according to the overlapping rhythms of the city and of nature, as described by Henri Lefebvre in his book *Rhythmanalysis: Space, Time and Everyday Life*. According to Lefebvre, patterns of movement are created as the rhythms of 'days, nights, seasons, waves and tides' meet with those of 'human structures'. Through reference to the theatre, Lefebvre describes the layers of rhythms and the interaction between people:

'The everyday is simultaneously the site of, the theatre for, and what is at stake in a conflict between great indestructible rhythms and the processes imposed by the socio-economic organization of production, consumption, circulation and habitat.'[13]

The rhythm of a play or the rhythms of everyday actions are important factors to consider in establishing meaning, whether in the action of the play as perceived by the audience or in guiding the flow through the urban space of pedestrians. When working with light in the urban space, the existing rhythms of the place should be analysed, and visions for the staging from above of the future rhythm of that space should consider the supportive use of dynamic lighting.

In the article 'Performance and the Spatial Turn', Fiona Wilkie reviews and discusses four books about the relationship between space and performance. The books make a strong case for performance practice as an ideal lens through which to consider the politics of place. Wilkie suggests three main directions: detailed attention to the complexity of mobile citizenship, use of theories of memory, and an increased awareness of the politics of visible and invisible space. The work of Henri Lefebvre appears in all books, especially his thoughts about citizens' 'right to the city' and his claim that '(social) space is a (social) product'. Wilkie argues that space is socially produced by people, and what she describes as 'social performance' plays an active role in the production of a space.[14]

Based on the literature study, on 'the actor', several concepts have been pointed out because of their reference to scenographic principles and the possibility of using these concepts to define the potentials of lighting in urban spaces. The concepts pointed out include the following: facework, scripts for social interaction, front stage/back stage (Goffman), visual perception (Gibson), mobilities (Jensen), rhythms (Lefebvre), movement analysis (Sánchez), and socially produced space (Wilkie).

Space

In the urban space, the setting is not easily changed; buildings facades, surfaces, and objects such as street signs are fixed and stationary, unlike those on a theatre stage. Though different light settings can change the identity of the nightscape, the frame remains static. The following texts explain how urbanists and architects use various concepts to analyse an urban space and

the people using that space, as well as how they refer to scenography to define the potentials in relation to designing liveable cities.

Kevin Lynch uses the concept of imageability in his book *The Image of the City*. Lynch states, 'The definition of what might be called imageability [is] the quality in a physical object which gives it a high probability of evoking a strong image in any given observer.'[15] This is similar to the theatre, where the intention is to create a link between what happens on stage, what the audience observes, and the memories and images that may be evoked in each observer. To handle visual form at the urban scale, Lynch formulated an architectural method, a structure to establish an overview of the city, constituting five types of city elements: paths, edges, districts, nodes, and landmarks. On the theatrical stage, we also see elements in a certain structure to establish an overview, supporting the play and actions on stage.

Jan Gehl introduced the concept of eye level. According to Gehl, an urban space can be designed in a logical way, by analysing people's actions and observing them at eye level: What are they doing, and how do they prefer to do it? The architecture of the urban space affects people and their actions: 'First we shape cities and then they shape us.'[16] Gehl's work focuses on the relationship between urban spaces and individuals.

Jane Jacobs provides a framework for assessing cities' vitality. Her work is about the roles of the actor and the action within the context of the city. When describing safety on sidewalks, Jacobs explains the complex order of movement on the sidewalk and the constant meetings between people. 'This order is all composed of movement and change . . . we may fancifully call it the art form of the city and liken it to the dance . . . an intricate ballet in which the individual dancers and ensembles all have distinctive parts which miraculously reinforce each other and compose an orderly whole.'[17] Thus, Jacobs introduces the choreography of 'the dancers' (the pedestrians) as a lens through which to look at the actions on the sidewalk in a new way, with references to the theatre.

According to Jacobs, the pedestrians play distinctive parts that comprise an orderly whole. David Leatherbarrow also uses the metaphor when applying the phrase 'the part and the whole' to describe the connection between architecture and urbanism. The disciplines are often developed separately from each other, a gap which Leatherbarrow seeks to bridge with a reference to

Aldo van Eyck, 'Tree is a Leaf and Leaf is a Tree', meaning that a tree and a leaf have the same structure and are connected to and dependent on each other, as are, indeed, architecture and urbanism.[18] Likewise, the quality of light depends on the surface it illuminates and can only be assessed in relation to the function or the social interaction it is meant to support.

Jekaterina Lavrinec describes the concept of urban scenography as the interconnections taking place in urban settings between spatial configurations and everyday scenarios. This suggests that spatial structures influence behaviour and emotional experience and, for example, can encourage citizens to be active.[19] By contrast, Thea Brejzek explains how urban interventions can provoke a critical dialogue between the built environment and its inhabitants. By using the urban space as the scenography and provoking people with interventions, the space is transformed, and value is added.[20]

An intervention can change the moment and provide an experience, but when an artistic light installation becomes a permanent part of a place in the city, for example, the atmosphere in that place is enduringly changed. Jean-Paul Thibaud discusses the backstage of urban ambiance and what atmospheres pervading everyday experience does to citizens. This urban transformation affects everyday urban situations and daily social activities in which urban development no longer only concerns built forms and spaces but also the designed sensory environment that people experience while moving through the urban space.[21]

Based on the study above, several concepts related to 'space' were selected because of their reference to scenographic principles and the possibility of using these concepts to define the architectural and social potentials of light in urban spaces. The concepts pointed out are imageability and city structure elements (Lynch), eye level (Gehl), choreography of people (Jacobs), the notion of the part and the whole (Leatherbarrow), urban scenography (Lavrinec), urban interventions (Brejzek), and urban ambiance (Thibaud).

Light

The following analysis discusses how architects, lighting designers, and researchers of performance analyse and describe the use of lighting in urban spaces and on stage, in order to examine light as a tool that can change a space's identity and thereby impact uses of the space and social interaction.

The lighting designer Roger Narboni distinguished between two ways of designing urban lighting. 'Light urbanism' represents urban lighting design made in lighting master plans, which include lighting for a city's functions (e.g. roads and sidewalks), its historical buildings, and its meeting places. On the other hand, 'nocturnal urbanism' is about adapting the lighting to the urban space's actual use at night as well as creating or supporting certain atmospheres and nocturnal identities. Narboni states that all cities look the same at night because of the same regulations for light and the use of the same fixtures and light sources. He asks, 'How [does one] imagine a night identity for cities [that is] different and special, according to their history, their culture, their geographical location, their climate, and the diversity of their inhabitants? . . . The nocturnal identity is for me related to people present in the space at night, to the diverse nocturnal uses, during different periods of the night and of the year. And all these components are related to night time only.'[22] Narboni then calls for a connection among the light, the use of the space at night-time, and the space's users.[23]

Ulrike Brandi outlines how a typology of city spaces can be created by monitoring 'hotspots of perception', consisting of selected sceneries where everyday lighting seems to affect city dwellers: 'Which story does the light tell about the city, how is the light perceived and how are the different light scenes linked to a function in the city?'[24] The hotspots in the city are explained in sketches, seen from a car as the view of a pedestrian moving through the city. Another series of sketches describes the city through the eyes of a lighting designer when arriving by plane, driving a car, and reaching his or her hotel by foot. The sketches show how lighting forms the city by night.[25] In Brandi's sketches, a link to the play on stage is discernible, as she explains the scope for action in different settings and the perceived impacts of changes in lighting.

Kauro Mende has been designing with a focus on shadow, rather than light, throughout his career as a lighting designer: 'Though the world we see is made up of layers of light and shadow, it is shadow not light that is usually in [the] focus of our gaze. Rather than the angle of the sun, we focus on the shadow of objects cast by the sun.'[26] At the theatre, shadow is a strong tool used to design the setting, to reveal details about the actors, and to make impressions that connect to the play. Mende pinpoints the importance of the balance between light and shadow as well as between static and dynamic light. Thus, at the theatre, the balance between static and dynamic light is used to create progress in the story and enhance the play.

The development of lighting technology and the increased ability to shift between static and dynamic light has enormously impacted scenographic practices. Laura Gröndahl, a scenographer and professor in stage design, discusses the influence of stage lighting on the processes of scenic design and the functioning of the performance space: 'Light can no longer be thought of as a necessity that can just be added to the performance. It has become one of its basic visual elements, directing and focusing the spectator's gaze. The rhythm of changing lighting cues creates a visual dramaturgy, which has turned visual design from solid constructions to a score of temporal events.'[27] The technical advances have given light a prominent role in theatre practice, whereas light used to be added at the end when setting up a play. Referring to controlling light, Gröndahl continues: 'Because of the dramaturgical function of lighting cues, the whole scenography had to be thought of in temporal terms and not as a purely spatio-visual, solid environment. It was not enough anymore to design the architectural structures and visual atmospheres; you had to think of it as a dynamic event.'[28] This dynamic event is linked to the programmed light. In this article, the intent is to show that programmed light in urban spaces can tie the space, the people, and their actions together in new ways and thereby support specific uses of the urban space.

When Gröndahl links the stage to urban spaces, she argues that 'today's intermedial scenography can be seen as a parallel to the contemporary experience of our spatio-visual environment in everyday life, echoing the changes that happen in our ways of perceiving and conceptualizing the world.'[29]

In practice, choices about the location of the light, the angle, and the chosen type of light source have great significance in relation to what one is intending to visualize on the scene. The lighting designer Max Keller explains how lighting designers adapt the light to action and the atmosphere. Light can be adapted to the scene's details, the actor's expression, or what the actor must do. The lighting designer decides when to illuminate with a spotlight rather than a diffuse light, how to work with contrasts and shadows, and how the dynamic transitions (light cues) are programmed between moods or scene changes.[30] In his book *The Light Code*, Norbert Werner Wasserfurth-Grzybowski describes light in the urban space as a system of signs that can be understood in codes: 'The city is a semiotic system of signs that can be decoded or encoded. The resulting light code plays a key role in the way a town or a city is perceived in social, cultural and economic terms.'[31] Wasserfurth-Grzybowski defines the city's urban light code as its DNA: 'The urban

realm is dynamic—it is alive and in a constant process of change. Behind all this is a code that connects everything together, and this needs to be elucidated as a common effort since we can only plan and design what we are aware of.'[32] Thus, the 'light code' supports or creates collective visions for the city.

Erika Fischer-Lichte explores the range of complex meanings that light can add to a play and encodes the importance of light in using semiotics as a tool. Lighting is a spatial sign, says Fischer-Lichte, with reference to the theatrical code as a system. Light has both a practical and a symbolic function. The practical function of light as a spatial sign rests on the basis of four factors: intensity, colour, distribution, and movement. If one of these factors is changed, then the meaning implicit in the light design can also change. In the urban space, the practical function is related to the choice of fixture, the light source, and the lamp's positioning, for example.

Light symbolically functions as a system which generates meaning; light can isolate an object, induce significance into a place, be related to a character's personality, be related to an atmosphere, and represent a mood or even an idea.[33] In the urban space, the symbolic functions of light are related to, for example, the atmosphere one intends to create with light or to objects or places one would highlight.

In the article 'Light Design and Atmosphere', Tim Edensor touches upon how light and darkness can act as powerful agents in producing an atmosphere. He refers to Böhme and elaborates upon the reference to the stage set when describing atmospheres. 'Atmospheres are an intermediate phenomenon and, while certain ingredients that shape atmosphere—of lighting, for instance—may pre-exist [before] people's entrance into the setting, their response to it is also likely to be shaped by their current mood and prior experience, and this in turn has the potential to feed back into the ongoing production of the atmosphere.'[34]

Based on the literature review above related to 'light', several concepts have been pointed out because of their reference to scenographic principles and the possibility of using these concepts to define the potentials of light in urban spaces. The concepts pointed out are nocturnal identity (Narboni), light scenes (Brandi), shadow (Mende), dynamic events (Gröndahl), the urban light code (Wasserfurth-Grzybowski), the atmosphere (Edensor), practical light (Keller), and symbolic light (Fischer-Lichte).

In each chapter—on actor, space, and light—key concepts were selected describing how scenographic principles may be used in urban design, architecture, and lighting design or how scenographic principles are used within different research disciplines to structure analyses of complex urban space contexts. In the following, these concepts will be combined to define architectural and social potentials of lighting in urban spaces.

RESULTS

The concepts from the literature analysis are collected in Figure 2 below and are later described in a series of recommendations for how light's architectural and social potential can be used in urban spaces.

Potentials

The concept described in Figure 2 is explained below in a series of recommendations for the architectural and social potential of light:

Architectural potentials of light in urban spaces:

- Lighting design in the urban nightscape may—at the city-planning level—be useful for establishing a nocturnal city structure.
- At eye level—when the lighting is designed in light scenes—the practical and symbolic qualities of light and shadow may be utilized to create spaces with different social and aesthetic atmospheres which relate to people's memories.
- The visually perceived space and the materials and surfaces in that space may be tuned with light to meet or support certain nocturnal purposes.

In the interconnections between the built environment and everyday practices, lighting can influence behaviour and emotional experience when designed to create a certain urban ambience.

Social potentials of light in urban spaces:

- Urban spaces are often designed primarily for daylight situations, and the lighting is added later and planned according to the daylight use. However, a city's lighting may be designed for the nocturnal identity of the space, with varying designs according to the area's use. It can be designed to meet the needs for commuting and communicating in a socially conducive and safe atmosphere.

- The social rhythms and the more or less self-conscious scripts for social interactions in public spaces may be analysed and lighting be designed according to these rhythms so as to create attractive spaces for everyday activities.
- Light may be designed to support face-to-face communication between people by using scenographic principles when designing the light, and also to facilitate mutual acknowledgement and trust as well as a sense of common purpose in public spaces.
- Light may be designed according to movement and rhythm analyses conducted in the city, and the light can therefore support wayfinding, point out the direction for walking, and also show people where to walk (choreography) by demarcating areas for specified functions.
- The dynamics of lighting (e.g. turning lights on/off, dimming or increasing light levels) made possible by technological development may be connected to the natural rhythms of day and night and of summer and winter, and to the city's social rhythms. The dynamics of lighting design may add another layer to the experience of the urban nightscape and thereby support increased use of the city.

Space	**Light**	**Actor**
Space *city structure* (Lynch) *part and whole* (Leatherbarrow) *imageability* (Lynch) *eye level* (Gehl)	Space and light *nocturnal identity* (Narboni) *light scenes* (Brandi)	Perception *visual perception* (Gibson)
Space and scenography *choreography of people* (Jacobs) *urban scenography* (Lavrinec) *urban interventions* (Brejzek) *urban ambiance* (Thibaud)	Light qualities *shadow* (Mende) *practical light* (Keller) *symbolic light* (Fischer-Lichte) *atmosphere and light* (Edensor)	Social interaction *face work* (Goffman) *scripts for social interaction* (Goffman) *front stage / back stage* (Goffman) *socially produced space* (Wilkie)
	Light and movement *dynamic event* (Gröndahl) *urban light code* (Wasserfurth-Grzybowski)	Human movement *mobilities* (Jensen) *rhythms* (Lefebvre) *movement analysis* (Sánchez)

Figure 2. Matrix of concepts from literature analysis.

- Light may visually connect elements in an urban space. Lighting up a small symbolic object in the city may have a great impact on the experience of that special location and thereby the entire space's perceived identity. The light code of a space includes all of the illuminated elements and their coherence.

CONCLUSION

At the theatre, all planning centres on the play's purpose or message—on what the story is about and how the scenography can support that story and that message. All efforts are focused on this goal.

In the urban space, 'the scene' is fragmented and diffuse, functions or 'plays' are often designed separately, and so is the lighting design. This complexity is defined through two potentials for the lighting: the architectural and the social potentials of light. These potentials form a theoretical framework with which it is possible to discuss the historical, physical city—specifically, the vertical surfaces and their potentials for creating architectural scenes with light. At the same time, the dynamics of light can be combined with the dynamics of the flow of traffic, people, and the natural rhythms of light and weather in the architectural scenes. The social potential of light can be enhanced by designing light to support meetings between people, whether a nod or a conversation in the everyday actions within the city. The aim of this article is to show that by using the mindset of the theatre stage in the city's nocturnal spaces, we can tell the 'story' of the specific space in specific settings and thereby create nocturnal urban spaces where lighting enhances either planned-from-above or pre-established-from-below place identities and social uses of the space.

PERSPECTIVATION

The theoretical framework developed in this article is the initial analysis for a three-year project investigating how urban lighting can meet more potentials. The reference to scenography, the scenographic principles, and the potentials defined in the article will be used as qualitative tools to analyse existing urban spaces and to develop design concepts for better use of lighting. This initial theoretical analysis was conducted to create a conceptual framework supporting the important work on emphasizing focus lighting in urban spaces. This framework is meant to support the awareness of how lighting affects our perceptions of urban space identity, and thereby how light affects how people move in the space and how one relates to other people in the space in certain light settings.

NOTES

[1] Hervé Descottes, *Architectural Lighting: Designing with Light and Space*, from the series *Architecture Briefs* (Princeton, NJ: Princeton Architectural Press, 2011).

[2] Chris Cuttle, 'A New Direction for General Lighting Practice', *Lighting Research & Technology* 45, no. 1 (2013), pp. 22–39.

[3] Gernot Böhme, 'The Art of the Stage Set as a Paradigm for an Aesthetics of Atmospheres', *Ambiances* (February 2013), pp. 2–8.

[4] Joslin McKinney and Scott Palmer, eds., *Scenography Expanded: An Introduction to Contemporary Performance Design* (London: Bloomsbury, 2017).

[5] Scott Palmer, *Light: Readings in Theatre Practice* (Hampshire: Palgrave Macmilian, 2013).

[6] Ibid.

[7] Erving Goffman, *The Presentation of Self in Everyday Life* (New York: Doubleday, 1959).

[8] Ibid.

[9] Erving Goffman, *Interaction Ritual: Essays in Face-to-Face Behaviour* (1967; repr., New York: Pantheon, 1982).

[10] James J. Gibson, *The Ecological Approach to Visual Perception* (New York: Taylor & Francis Ltd, 1979).

[11] Ole B. Jensen, *Staging Mobilities* (London: Routledge, 2013).

[12] Maria José Martinez Sánchez, 'Dynamic Space, Complex Contexts', *Urban* 8 (2014), pp. 77–91.

[13] Henri Lefebvre, *Rhythmanalysis: Space, Time and Everyday Life* (London: Bloomsbury, 1992).

[14] Fiona Wilkie, 'Performance and the Spatial Turn', *Theatre Journal* 67, no. 4 (2015), pp. 735–45.

[15] Kevin Lynch, *The Image of the City* (Cambridge, MA: The MIT Press, 1960).

[16] Jan Gehl, *Cities for People* (Washington, DC: Island Press, 2010).

[17] Jane Jacobs, *The Death and Life of Great American Cities* (New York: Modern Library, 1961).

[18] David Leatherbarrow, 'Architecture, the City, and Nature: Part and Whole?', *Oz* 24 (2002), pp. 14–19.

[19] Jekaterina Lavrinec, 'Urban Scenography: Emotional and Bodily Experience', *Limes: Borderland Studies* 6, no. 1 (2013), pp. 21–31.

[20] Thea Brejzek, 'From Social Network to Urban Intervention: On the Scenographies of Flash Mobs and Urban Swarms', *International Journal of Performance Arts and Digital Media* 6, no. 1 (2010), pp. 109–22.

[21] Jean-Paul Thibaud, 'The Backstage of Urban Ambiances: When Atmospheres Pervade Everyday Experience', *Emotion, Space and Society* 15 (2015), pp. 39–46.

[22] Roger Narboni, 'From Light Urbanism to Nocturnal Urbanism', *Light & Engineering* 24, no. 4 (2016), pp. 19–24.

[23] Ibid.

[24] Ulrike Brandi, *Light for Cities: Lighting Design for Urban Spaces* (Basel: Birkhäuser, 2006).

[25] Ibid.

[26] Kaoru Mende, *Designing with Shadow: Lighting Design for Urban Environments and Architecture* (Tokyo: Azur Corporation, 2013).

[27] Laura Gröndahl, 'From Candle Light to Contemporary Lighting Systems: How Lighting Technology Shapes Scenographic Practices', *Nordic Theatre Studies* 26, no. 2 (2014), pp. 20–32, esp. p. 20.

[28] Ibid., p. 23.

[29] Ibid., p. 20.

[30] Max Keller, *Light Fantastic: The Art and Design of Stage Lighting* (Munich: Prestel, 2010).

[31] Norbert Werner Wasserfurth-Grzybowski, *The Light Code* (Gütersloh: Via Verlag, 2018).

[32] Ibid.

[33] Erika Fischer-Lichte, *The Semiotics of Theater* (Bloomington, IN: Indiana University Press, 1992).

[34] Tim Edensor, 'Light Design and Atmosphere', *Visual Communication* 14, no. 3 (2015), pp. 331–50.

URBAN DESIGN: SCIENCE, ART, OR A SCIENTIFICALLY INFORMED CREATIVE PRACTICE?

Jarre Parkatti

ABSTRACT

In a debate initiated by Alexander Cuthbert, the scientificity of urban design is questioned, and means of strengthing it are suggested. On the other hand, some authors contest the usefulness of abstract theory, considering the practical-aesthetic nature of urban design. In any case, the relevance of scientific findings and their translation into design solutions is no trivial issue, as urban design is a pragmatic activity, which demands aesthetic and drawing skills rather than, or in addition to, academic skills. From a Scandinavian perspective, neither the meaning of *science* nor the status of the sphere of urban design as a professional field is as obvious as implied in this Anglo-Saxon debate. In the present article, Cuthbert's unclear standpoints concerning the theory of science and the role of science in relation to urban design are initially addressed. Regarding the entire debate, it is argued that science, instead of primarily legitimating urban design as a specialized professional activity, should effectively guide practitioners and help them to understand relevant social and political background conditions, including power. Power enters in at many levels, even at that of knowledge, affecting priorities. Nonetheless, easily marginalized 'social' knowledge should be intellectually/scientifically recognized and ideally define boundary conditions for possible design solutions.

KEYWORDS

Urban design, science, knowledge, power

INTRODUCTION

Recently, a debate has formed about the scientific respectability of urban design, the significance of theory for its down-to-earth practices, and its disciplinary autonomy.[1] Although the questions have been asked before,[2] in its present shape the origin of this Anglo-Saxon discussion might be traced to Alexander Cuthbert's questioning of the existence of scientific urban-design knowledge. Aiming at a reconstruction of the presumed discipline, he presents his doubts concerning its current state in an extensive article backed up by a trilogy of books.[3] However, his agenda of promoting urban design as a profession, partly underlying the debate, appears less topical from a Nordic viewpoint, as here architects still tend to assert themselves within the field. My purpose is therefore rather to reflect on the status of 'weak' knowledge of a social kind that furthers the quality of the built environment, whatever design/planning-related subfield it primarily is intended to guide.

Cuthbert reproaches the leading figures within urban design for treating the realm as self-sufficient and for not citing other authors. His aim is to put the discipline on a scientific footing by connecting it to social science, thereby providing it with an external check, enabling critical self-reflection. In its present state, he claims, urban design is 'largely fragmented in its practices, theories and methodologies'. He admits 'the considerable overlap between [the] somewhat arbitrary professional realms' of architecture, urban design, and town planning and claims that there is no coherent definition of urban design in the related literature. Nonetheless, he defends its status as a distinct professional sphere in relation to its neighbouring domains, placing it 'alongside architecture and urban planning, rather than being subsumed to their interests'.[4]

In the ensuing discussion, Stephen Marshall modifies Cuthbert's criticism, sparing the classics and rather faulting the professional community for its blind faith in canonical work, excluding testing and making it immune against criticism. As a response, however, Kim Dovey and Elek Pafka warn against a wrong kind of testing, which itself may be problematic from a scientific viewpoint. Urban designers need various kinds of knowledge, not all of which is scientifically testable. Likewise, Hooman Foroughmand Araabi points out that practitioners use diverse types of theory. Mike Biddulph underlines the specificity of urban design, making the social-scientific elucidation of its preconditions of limited value for the practitioner. As to whether urban design should indeed be taken to define a discipline or rather just

be regarded as a pragmatically delimited area of practice, Michael Gunder perceives its increasing autonomy as connected with neoliberal dominance. Matthew Carmona, concretely analysing the urban design processes shaping public spaces, thereby offers an alternative way of anchoring the discipline, reconnecting to Cuthbert's efforts of understanding its preconditions. He also includes the power issue in his discussion.[5]

Before engaging with the debate in its entirety, I shall subject Cuthbert's 'bold hypotheses', based on the theory of science and Castells, to criticism in accordance with his Popperian ideal rather than ignore them. These ideas privileging 'hard science', or 'science instead of ideology', have largely escaped critical evaluation. Indeed, a certain scientism, in the sense that the scientificity of knowledge not conforming to overly restricted criteria is rejected, seems to mark many contributions. This is facilitated by the English-language science/humanities distinction (ignoring the common notions of 'social science' and 'the human sciences').

In relation to Cuthbert, I shall thus specifically focus on:

- his combination of Castells's Marxism with Popper's falsificationism
- the role of the social-scientific base of urban design
- urban design as a practice and a discipline

More broadly, my treatment will engage with the following interrelated issues in the contributions:

- Concerning scientism (naturalistic empiricism):
    - Should natural science be regarded as an exemplar for urban design?
    - Is testability of hypotheses considered the key/sole criterion of scientificity?
- What is the role of science?
    - To support the urban design process by offering immediately applicable knowledge?
    - To critically evaluate urban design and explain its societal preconditions?
    - To legitimize urban design as an autonomous discipline?
- As to the (mostly implicit) power dimension of the debate,
    - How is power relevant for understanding the preconditions of urban design?
    - How is power related to the knowledge used?

Methodologically, the discussion centres on the analysis of arguments presented in the discussion, narrowly delimited to contributions that either directly refer to Cuthbert or cite later contributions referencing him. The standpoints are evaluated as to their internal coherence and from the viewpoint of social-scientific and philosophical literature. Concerning this theory, the treatment is guided by a realist-structurationist understanding, opposed here particularly to empiricist naturalistic scientism and post-structuralism or Foucauldian archaeology and genealogy. The former rejected position, favouring quantifiable and formalizable science, marginalizes social-scientific knowledge relative to technocratic know-how. The same actually applies to Foucault's stance, as his power/knowledge analysis advises us to be suspicious of the expertise of planners, particularly when founded on the human sciences. The more neutral theoretical starting point adopted here allows one to accept urban-design knowledge, especially of a social kind, as potentially both valid and relevant for reaching the goals of urban design.

My background assumption is that urban design should aim at creating an ecologically sustainable, socially well-working, aesthetically attractive, and economically competitive built environment,[6] and that to attain this both multidisciplinary knowledge and design skills must be used. This seemingly trivial starting point turns the attention from defending the discipline and its scientific reputation to the means needed for achieving the specified ends. The methods may indeed be of a scientific kind. Even so, a distinctive trait defining urban design is the competence it requires in translating factual knowledge into designs. To help practitioners understand the context of their actions, theoreticians are nonetheless expected to explicate various preconditions of urban design. This should include the mechanisms affecting what kind of knowledge is taken to form boundary conditions for the practitioner's creative effort in reconciling divergent interests.

Obviously architecture, urban design, and town planning are contingently institutionalized, interdependent, and imprecisely separated, thus partly posing similar questions concerning their appropriate knowledge. Even if the supposed problem with abstract planning versus aesthetically focused architecture, and thus the felt need of an autonomous urban design, transcends the Anglo-Saxon world, there are counter-examples such as the Finnish capital. There, partial master plans and detailed plans effectively further architectural town-planning goals. Nevertheless, not the least in Finland, the tacit nature of much architectural and urban-design knowledge is exacerbated by a prag-

matic tradition emphasizing technical and aesthetic skills in the education of architects. This not only tends to conceal the societal preconditions of the activity, but it also threatens to marginalize social knowledge of an immediately applicable kind.

CUTHBERT'S CASTELLSIAN CRITICISM OF THE THEORY OF URBAN DESIGN

In his articles and books, Cuthbert raises essential questions about urban design, discussing its feeble scientific foundations, its societal preconditions, and its ambiguous identity, although being interpretable as an age-old practice. The inclusion of his largely ignored ideas relating to Marxism and the theory of science in my treatment responds to his call for scientific criticism. Such an effort hopefully contributes to preventing misguided philosophical conceptions from obscuring the understanding of substantial aspects of the activity. In what follows, I shall take a closer look at Cuthbert's general, hierarchical view of science, his combination of theories, and his understanding of the role of social science and of urban design as a discipline.

Cuthbert shows that urban design literature intending to sum up the achievements within the professional area, creating a synthesis, treats urban design as self-contained. It disregards social-scientific findings and even ignores critical unorthodox currents within the field (post-modernism). On the other hand, literature aiming at the formulation of comprehensive original new programmes for urban design—that of Kevin Lynch, Rob Krier, Bill Hillier and Julienne Hanson, and Christopher Alexander—tends not to cite other authors with the same intent, or urban design literature generally. Thus, it does not live up to scientific standards enabling the cumulation of knowledge. Cuthbert therefore finds it necessary to transcend the limits of urban design by connecting it to social science.[7]

According to Cuthbert, 'the best view of science we can adopt is one that is a continuum from "pure science" and positivism on the one hand, through a whole spectrum of possibilities, to some of the more rarefied research methods in the social sciences on the other'. Ontologically, the extreme poles of possible scientific approaches according to him are those of realism and constructivism. Concerning the relation between natural and social science, he believes, on the one hand, that there is a certain consensus that they must differ; on the other, he sees no 'hard and fast line' between them—still, he regards the method of social science as proto-scientific.[8] He finds that

> the use of the term *science* has . . . been extrapolated into other areas of knowledge, adding credibility by way of association . . . where the *social* then adopts a mantel that may not actually reflect the complexity and appropriateness of the methods of the natural sciences.[9]

Despite his liberal starting point, Cuthbert thus regards natural science as the ideal, defining proper scientific method. Another way this unrestrained tolerance is limited is by the adoption of Karl Popper's falsificationism as a standard for scientificity. He even claims that a discipline should be defined by a refutable theory, complaining that 'one may search in vain for any author who begins an article "my hypothesis as to a satisfactory theory of urban design would be the following"'. Nonetheless, he makes a concession to other kinds of knowledge in allowing that scientific knowledge is partial.[10]

In his more precise positioning of himself, Cuthbert follows Manuel Castells, aiming at a (non-Faludian) theory *of* urban design rather than a theory *for* or *in* urban design.[11] His reliance on Castells also connects his reconstruction to Althusserian Marxism.[12] With the former, he holds that to secure scientific knowledge as opposed to ideology, a discipline must have either a real or a theoretical object.[13] A real object is an aspect of reality, 'ready-wrapped in preconceptions which are usually "ideological"'.[14] The scientific (or theoretical) object of a discipline 'is constituted by the set of concepts developed to account for the various real objects the science is claimed to analyze'.[15] Cuthbert singles out public space, frequently the target of urban design, as the real object of the field and civil society as its theoretical object. A common-sense explanation for so limiting its object might be that since urban design is not focused on designing separate buildings, which he holds are essentially 'closed boxes',[16] it instead shapes the spaces in between (cf. Gehl's *Life between Buildings*).[17] This space, it might be held, should preferably be public, housing interaction that civil society depends on.

Currently, however, urban design's strength, for Cuthbert, lies in its practice, while as theory it is inconsequential. 'Paradoxically', he claims, 'gaining credibility for urban design as a "field" is dependent on relinquishing the idea that it somehow has its own inherent integrity'.[18] One reason for Cuthbert's insistence on an autonomous urban design based on social science is what he regards as the self-referential, ideological, and atheoretical nature of architectural theory. According to him, architecture forces architectural aesthetics upon urban design as its knowledge base. Town planning again is of a regu-

latory nature and, although more closely related to social science, has weak theoretical foundations, it tends to be occupied with development and policy planning and to be 'reluctant to recognize "physical design"'.[19] Repudiating the architectural and planning 'mystifications' that 'the city is merely a larger building' and that 'all we need is another set of design guidelines', he deplores the state of urban design in the 'middle ground allocated to it by architecture and planning' and its actual dependence on both. Nevertheless, he observes that spatial political economy completely rejects 'any division of knowledge based upon professional and academic boundaries'. Although he mentions both power and, in relation to such disciplinary struggles, power/knowledge, he does not integrate these notions into his account.[20]

The problem with establishing Cuthbert's standpoint is its ambiguous relation to the various views in the literature he reports. Nonetheless, his advice of tying urban design theory to insights about society and his criticism of its theorists' lacking references to other authors both seem justified. Contrariwise, his positive views of science are problematic: the continuum between positivism and anti-empiricism or from realism to constructivism does not make up a trustworthy interpretation of the scope of contemporary scientific alternatives or a strong scientific position. Fundamental principles of the positivism of the twentieth century, logical positivism, were refuted already before World War II.[21] As to realism, its naïve outdated variety should be distinguished from its more plausible contemporary kinds. The constructivist extreme may less controversially be understood as (weak) social constructionism.

Cuthbert's position is associated with two types of problematic scientism. First, he worries about social-scientific theory not living up to natural scientific standards. However, he does not base his concern on any argument about the nature of the research objects justifying the comparison. Second, the emphasis on the idea of an epistemological break with previous theorizing tied to Louis Althusser—consonant with much French thinking influenced by Gaston Bachelard, Georges Canguilhem, and others[22]—may cause its advocates to rashly write off arguments incompatible with the privileged approach. Accordingly, Cuthbert's view eventually implies that all theory, except for that founded on (the later) Marx, is ideological, as distinct from scientific.[23]

In relation to the theory of science, Cuthbert's combination of a Marxist view with Popper's falsificationism also seems strange, as one central objective of

the latter was to find a way of delimiting doctrines, such as those of Karl Marx and Sigmund Freud, from science. And falsifiability hardly characterizes the abstract and general thinking of Castells, who regards the explanatory capacity of his theory as its decisive test.[24] Although Cuthbert probably is correct about the need to test theory in one way or the other, in view of a contemporary understanding of science (as explicated by, among others, Thomas Kuhn, whom Cuthbert himself cites), this is not as clear-cut of a matter as Popper supposed.

Again, Castells's perspective may be significant in bringing space into social science and for grasping conditions ruling planning on a general level. Yet, the question remains as to how it helps to guide an aesthetically creative activity. Linking urban design to social science through public space and civil society, themselves disputable as its unique research objects (private courtyards and gated communities are designed, too), does not solve the problem.[25] This difficulty is reflected in an ambiguity in Cuthbert's formulation of his purpose: if it concerns explaining 'the essential features of a creative process called urban design', then Castells's spatial political economy appears far-fetched. An abstract investigation of 'how the form of cities has come about' seems more in line with Castells, but it alienates the treatment from urban *design*. True, Cuthbert's method 'is not concerned with *what to do* about urban design projects, but about *how to think* about what to do'.[26] However, exactly this philosophical turn makes his reconstructed discipline irrelevant for the practically focused urban designer in need of substantial design rules for creating a good urban environment. He indeed acknowledges this.[27]

Such oddities notwithstanding, Cuthbert's views about the problems that urban design faces in a capitalist environment come close to what other authors have said about town planning. Thus, Nigel Taylor remarks that Marxist writers in the 1970s pointed out how the power of planners was 'heavily circumscribed and constrained by more fundamental and enduring socioeconomic forces and "structures"'; he continues by asserting that 'one had to "situate" planning activity within its "political economic" context, because the context significantly shaped and constrained—and therefore did much to explain—the nature and effectiveness of planning activity'.[28] Ray Pahl, cited by Taylor, catches one of Cuthbert's main points in stating:

> The fundamental error of urban sociology was to look to the city for an understanding of the city. Rather the city should be seen as an arena, an understanding of which helps in the understanding of the overall society which creates it. Thus our questions should not be framed in terms of specifically 'urban' problems or 'urban' processes, as if these could be understood separately and independently of the host society.[29]

This understanding supports or at least illuminates Cuthbert's position as to the significance of (Marxist) social science in relation to 'the urban question'. However, the problem remains as to what consequences, if any, these general points might have for urban design practice.

In the 1960s and 1970s, the case for the autonomy of urban design might have been defended, for planning theory at the time regarded town planning either as a completely procedural field concerned with rational decision-making, thus abstracting from any specific content (including, in principle, that of *town* planning!), or as being about the system that an urban area defines, again abstracting from design.[30] Even then, a sharp dividing line in the other direction, between the architect's design of a building (a building complex? a campus?) and the urban designer's design of the surrounding streetscape, urban block, or neighbourhood (a building complex? a campus?) would somehow have to be drawn up to defend urban design's integrity. Cuthbert's Marxist characterization of the specificity of the concrete object of urban design is not watertight and hardly helps in this respect: 'While Architecture represents the locus of exchange values locked into fixed capital assets, Urban Design qua the public realm appears as use values representing the space of civil society'.[31]

While Cuthbert's defence of a theoretical and autonomous discipline might be comprehensible considering the past and present contingent states of urban design in an Anglo-Saxon context,[32] the universal need of such a solution and its specific elements still seems doubtful. Within a multidisciplinary applied field, questions requiring very different responses may be posed. As Foroughmand Araabi makes clear, diverse types of theory may consequently be used.[33] From this viewpoint, what counts is a theoretically reasoned position for solving practical problems rather than a consolidation of the professional area as an autonomous discipline bolstered by inapplicable theory. Cuthbert actually acknowledges that a main reason for his project is that presently anybody in any way involved in city development might call him or herself an urban designer. Yet, he continues giving his project a professionally

less self-regarding justification: 'A new profession may be expendable, new knowledge is not.'[34]

From the latter perspective, an alternative might be to reintegrate the design and planning disciplines in a manner that enhances their social-scientific awareness. Gunder in fact identifies a 'progressive differentiation between urban planning and urban design' tied to neoliberalism.[35] This further shifts the burden of proof towards Cuthbert in view of his Marxist perspective. According to Gunder, urban design fills an essential task in ensuring a liveable environment when tied to planning (as it is, for example, in the Finnish capital), while as a freestanding endeavour it tends to favour private gain.

In any case, it remains unclear exactly how Cuthbert's Castellsian view of the theory *of* urban design will enable him to surpass the earlier theory *for* urban design that he castigates. As he points out himself,[36] there is a fundamental gap to bridge between the two endeavours. It is hardly enough to urge us to completely reassess 'urban design traditions as . . . potentially irrelevant to the globalization of capital' and to change our understanding of design from 'a modernist, Beaux Arts obsession with form, the eureka principle, and the cult of master/disciple to one where the organic production of urban forms and spaces are homologous with the production of society'.[37] If the researcher finds Castells's broader theory of the urban helpful in, for example, defining the urban system as 'the specific articulation of the instances of a social structure within a (spatial) unit of the reproduction of labour power',[38] then such general statements, meaningless without the support of a particular Marxist understanding of the workings of capitalist society, are to little avail for the practitioner. Although I generally find the criticism of Cuthbert surprisingly cautious, at least Mike Biddulph reacts by asking:

> Is that a theory that explains everything? If we know and understand spatial political economy and the relationship between this academic tradition and the design of the built environment will we be better urban designers? . . . Empowered by the political awareness of social equity and social justice, and its unclear built form ramifications, will urban designers become a progressive force shaping urban development and confronting the vagaries of, for example, neoliberalism and globalization?[39]

If, however, one acknowledges Cuthbert's interest in the overarching societal features, urban designers still need to understand how their efforts are

conditioned by strong interests and social mechanisms on several levels of the design process, as concretely described, for instance, by Carmona. The abstractly minded researcher might study how constraints imposed by 'the system', possibly tied to mechanisms such as Foucauldian dispositifs, affect the knowledge used. Especially interesting is how the restraining conditions are translated into planning practices and internalized by urban designers on the level of the (Giddensian) practical consciousness. Although such concretization seems compatible with Cuthbert's intentions, his Marxist belief in the structural determination of urban design makes him withdraw into the rarefied world of 'heterological-meta-methodological' reflection.[40] This apparently blocks his interest in exploring how substantial design knowledge and rules could secure a decent urban environment within the limits set by capitalism. He might even feed the cult of the master-designer, which in principle he opposes, by trusting in the power of 'thinking differently'. Expecting theoretical-political edification suddenly to produce a creative urge to design in new, better ways may thus protect urban design from concrete, academically founded criticism interfering with design solutions.

Connecting the discussion with the questions in the introduction, both the scientific and the practical aspects of Cuthbert's intervention are problematic. As to science generally, his theoretical eclecticism makes his position ambiguous, but seemingly contradictory and datedly scientistic. Regarding the capacity of social science to elucidate the conditions of urban design, it remains unclear how, according to him, this knowledge serves urban design's practical tasks and in what sense it could make up its theoretical base. Cuthbert's abstract and partisan Marxist standpoint does not lessen the problem.[41] As to the status of an autonomous urban design discipline, he defends it despite the implications of his Marxist stance.

THE SCIENTIFICITY OF URBAN DESIGN

In the debate, the ascientific nature of urban design as an art or technical practice is generally acknowledged, the issue rather being the status of its theory. The responses to Cuthbert reject the idea of basing urban design on external theory 'of' or 'about' the activity. Yet, Marshall follows him in connecting the problematic scientific status of urban design to the lack of a coherent theory underpinning it, comparing its knowledge with pseudo-science.[42] Contrariwise, Dovey and Pafka observe that such allegations may derive from overlooking existing theory and incorrectly interpreting its status.[43] Almost all contributions recognize a mix of different kinds of knowledge at the heart of

urban design theory. A key question, however, is to what extent this theory is 'scientific or normative' and what its possible scientificity means.

Moderating Cuthbert's criticism, Marshall problematizes urban designers' uncritical reception of intrinsically respectable work. Trust in authority leads them to cling to received wisdom despite new findings. Following Cuthbert in reviewing the literature, he therefore looks particularly at its reception. In addition to Lynch and Alexander, treated by Cuthbert, Marshall discusses Gordon Cullen and Jane Jacobs. According to Marshall, Lynch's principles remain hypothetical and their practical value open to question. Cullen, not even pretending to be purely scientific, has met with normative criticism based on the opponents' distaste of the picturesque, et cetera, even when his ideas might be understood as testable hypotheses. Again, Jacobs's central theses have not been controlled in a systematic way, and when they, in exceptional cases, have been tested, they have been disproved. The same goes for Alexander.[44]

Instead of importing knowledge, as Cuthbert suggests, from another field of doubtful direct bearing on urban design, Marshall prefers to modify and develop older contributions within the field into scientifically respectable knowledge.[45] Hence, he suggests measures for scientizing urban design, listing three ways of practising it. First, it may be considered a purely technical-creative endeavour. Second, one may see it as a technical-creative undertaking supported by scientific knowledge. Third, the technical-creative task might be supported by scientific urban-design knowledge proper. In the second case, practitioners must be able to apply scientific knowledge, while in the last case, according to Marshall, urban design must work in a fully scientific manner, placing demands on both theory and practice.[46]

As to Marshall's last case, Biddulph, supported by Carmona, observes that due to the wickedness of urban design problems, urban designers cannot work as applied scientists.[47] On a closer look, Marshall's unqualified emphasis on testing may also be problematic in view of a post-Kuhnian theory of science, as noted above. Dovey and Pafka even remark that a wrong kind of testing may itself be pseudo-scientific.[48] They point out that the theories discussed, to which they add Camillo Sitte's and Ildefons Cerdà's, are sophisticated and complex, containing ingredients ranging from the straightforwardly empirical to aesthetical meaning. According to them, diagrammatical social-spatial knowledge epitomizes urban design. They note that even important empirical results, such as Cerdà's, have been overlooked when published in

other languages than English. Dovey and Pafka suggest that this might have contributed to demands such as Marshall's for a renewed scientized urban design.[49] Nevertheless, somewhat surprisingly, they accept his conception that classics of urban design often make seemingly empirical claims, which in fact are not testable and 'therefore not science'.[50] Instead of stressing the manifold varieties of science, with varying levels of testability, they maintain that there are other types of knowledge valuable for urban design.[51] They cite Cullen, who claims that

> we have to rid ourselves of the thought that the excitement and drama that we seek can be born automatically out of the scientific research and solutions arrived at by the technical man . . . We naturally accept these solutions but are not entirely bound by them.[52]

The problem with Dovey and Pafka's impeccable remark that not all knowledge relevant for urban design needs to be scientific is that the possibly non-scientific status of 'social' (sociological/social scientific/humanist) knowledge risks leaving it as a source of inspiration only, no more objectively binding than artistic programmes. Technical and economic requirements, often possible to express in apparently neutral and precise terms, tend to be respected as boundary conditions for urban design. On the contrary, the social dimension, theoretically-politically relative and more diffuse, is easily marginalized. If such knowledge is not even in principle allowed to specify what socially significant traits should be secured, then the social dimension may dissolve in the more general category of architectural quality, determined by the educated aesthetic sensitivity of architects.

The apparent devaluation of the social sciences and humanities—and the dependence of the perception of them as non-scientific on English language—could hardly be more clearly expressed than by Dovey and Pafka writing that

> there are clear limits to any science of aesthetics. Suppose we could prove empirically that people generally prefer certain cityscapes, urban imagery or open space designs—this won't persuade those who accuse Sitte and Cullen of romanticism because such critique stems from the humanities and not the sciences.[53]

Why would it be more justified to respect such an assumed regularity if it could be derived from genetics? Neither the social sciences (which more

typically might be interested in the uniformities of popular perception) nor aesthetics, commonly judged even less scientific, consists of mere opinions. From this viewpoint, anything worthy of the status of knowledge, whatever its type, at least if *wissenschaftlich* / *vetenskaplig* / *videnskabelig*, et cetera (as aesthetics must be, as a *Geisteswissenschaft*), should be respected—or argued against. While in fact Dovey and Pafka consistently defend exactly this knowledge, it is noteworthy that the science status of knowledge has persuasive force, giving rise to the power/knowledge problem they mention in passing.[54] In any case, vindicating the scientific status of such knowledge would strengthen its claims to being followed. After all, the importance of science, considerations of self-regarding professional interests and respectability apart, is its function as an arbitrator between conflicting claims.

Discussing knowledge within urban design, Carmona distinguishes between two kinds. On the one hand, there is pragmatically used external knowledge tied to practices; on the other, he discerns an evolving field where such knowledge is added to and moulded into a coherent whole, while also producing new knowledge unique to urban design.[55] In his account, this field defines a 'mongrel discipline' with *internal* conflicts between normative design, tending to aesthetically biased 'urbanisms' coupled with political naivety, and scientific, socioeconomic, or political-economic approaches. The latter often effectively disregard the specific contribution of urban design.[56]

Nevertheless, one should note that the theory in each category, allegedly forming part of an urban design discipline, is not of a piece. As Dovey and Pafka point out, some pioneering urban-design related work is not at all naïve and might not be easy to test. And if one trusts the objectivity of science to check the supposedly arbitrary normative subjectivity of design, then it should be noted that normativity characterizes not only design and the knowledge closely related to it, but also more detached social science, varying in each case in kind and degree. Both types of theory may be strongly normative in formal terms. Nevertheless, it might be generally acceptable if based on political-professional consensus in principle, as is today the need of favouring pedestrians and public transport.

Instead, trusting quantifiable, formalizable 'hard science', or lofty partisan theory, may rather obscure the obviously political nature of both urban design and social science. Ultimately, science may then obtain something like a magic role, supporting technocratic-aesthetic urban design. True, a

genuinely scientific spirit may require sticking to the authority of science, ruling out eclecticism of a kind that Dovey and Pafka's stance might be feared to allow. Yet, to avoid scientific dogmatism and idiosyncrasy, one must grasp the spirit of science by taking a broader view of its basis, requiring it to be open to questioning and rational discussion on a conceptual level. This spirit becomes overshadowed by strategic thinking towards the end in Marshall's discussion, where—despite his overall stance as an austere critic—professional strategy and the mere impression of scientificity seem to become the decisive consideration.[57]

Without ignoring the fact that empiricism lingers on within the theory of science,[58] giving some contributions to the debate a certain plausibility, such views are problematic if unreflectively embraced. The 'robust, consistent scientific grounding'[59] that Cuthbert and Marshall call for ties the scientificity of urban design to the issue of its autonomy as a discipline. If urban design were instead regarded as a transdisciplinary project, then its scientificity should rather be secured by the ability of the urban designer to discern what kind of knowledge is relevant or binding for a problem at hand. This is a more demanding task than formulaically recognizing quantitative and formalized data as (hard/paradigmatic) science.

THE PRACTICAL-CREATIVE ASPECT OF URBAN DESIGN

Whatever one's view of science, it should be clear that urban design primarily is a practical professional sphere. There is a significant difference between explaining or understanding its societal background conditions, setting up or spelling out its goals, and guiding its execution. Cuthbert focuses on the first undertaking at the cost of neglecting the latter ones. While the political-economic conditions of urban design are important, academics should scarcely disregard the theoretically interesting and practically consequential issue of how social science and urban design theory, whether relatively neutral or openly normative, might non-arbitrarily guide creative, aesthetically oriented practice. As Biddulph points out, 'the absence of a firm theoretical base in a social scientific sense cannot limit the activity'.[60]

Even Cuthbert occasionally acknowledges the significance of the practical aspect of urban design: 'To those who would claim that I have at last removed urban design entirely from design issues and design knowledge, I would plead guilty to overstating my case'.[61] Yet, Biddulph makes a welcome contribution in defending the value of theory *for* urban design, specifically

helping designers to design. While his interests might primarily concern supporting the craft as such and understanding its specific nature, his viewpoint is fundamental for allowing research to promote the quality of the urban environment.[62] On the other hand, even if one focuses on this task, Cuthbert is right in stressing the importance of understanding the societal preconditions of urban design, which is one of the intentions in Carmona's study. The latter undertaking might include an analysis of which issues are particularly contested and which are more consensual *in principle* (special interests may induce actors to act contrary to declared commitments), thus also defining limits to the wickedness (largely political contestability) of design and planning problems emphasized by Biddulph.

On the contrary, social-scientific criticism of urban design is problematic if it does not touch on how specific design prescriptions or traits affect the social world. This often happens for instance in the treatment of New Urbanism. Thus Cuthbert advises the urban designer against following the New Urbanists' design prescriptions, which allegedly 'mask existing class struggles' with 'reactionary aesthetics' in what he allows is their 'genuine search for a secure and humane community'.[63] After critics have condemned the New Urbanists' retrospective style, the discussion tends quickly to move beyond the level of design, neglecting its tangible effects, into an examination of assumed presuppositions or implied allegiances *behind* the design approach.[64] Theory *about* or *of* urban design in contrast to theory *in* or *for* urban design might illuminate theoretically profound and politically 'relevant' issues. However, to be relevant for the practitioner and, in the end, the town dweller having to cope with the designed environment, 'theory of' must somehow connect with 'theory for'.[65]

The requirement of applicability means that theory must stand a chance of affecting the actual moulding of urban environments, prescribing or proscribing specific design solutions. From this practical viewpoint, the ideological bias and motives of the New Urbanists should not be decisive. Instead, the effects of, for example, their Transect principle on the liveability (or legibility, authenticity, etc.) of the produced urban environment needs to be analysed. Resulting criticism should preferably include architectural sketches and visualizations modifying the functions, proportions, and, if necessary, the aesthetics of proposed or realized projects to correct any deficiencies (fig. 1ab).[66] The problem might be due to a partly implicit, but strongly sanctioned, division of labour between academics and practitioners. The latter, whose success

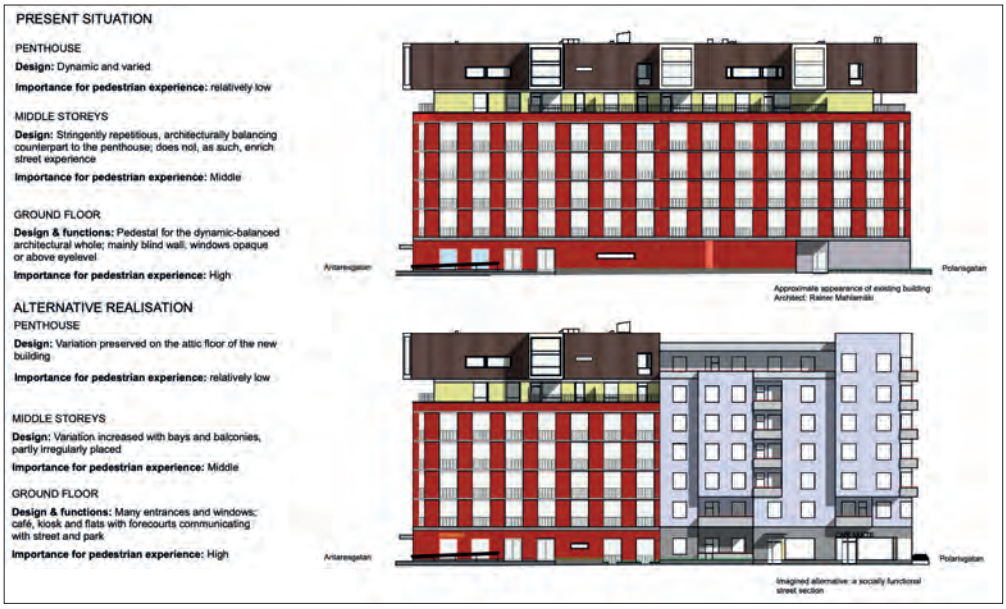


Figure 1a. Elevation of realized building as present situation and imagined alternative realization. Concretization of urban design criticism from a social perspective in terms of Penthouse, Middle Storeys and Ground Floor. Above elevation according to architect Rainer Mahlamäki. (Manipulation below: J.P.)

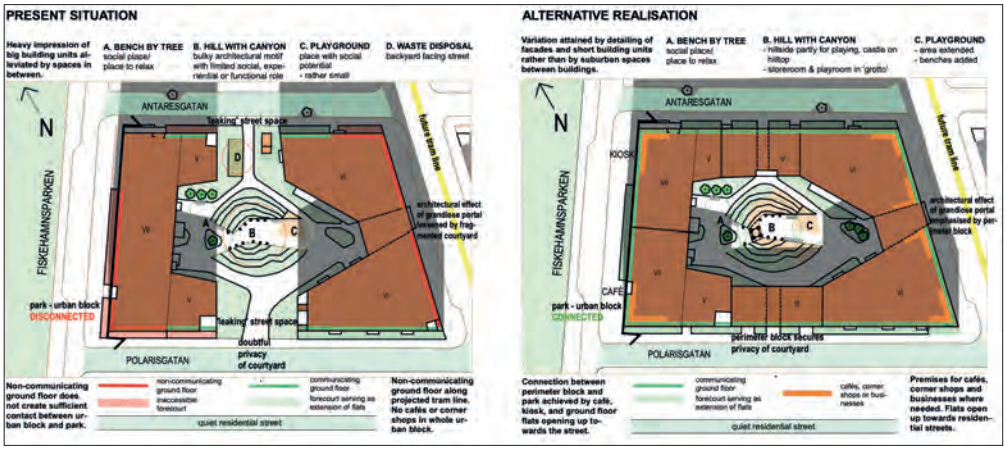


Figure 1b. Present urban block and counterfactual realization as perimeter block. Imperfect urbanity in view of Jacobsian and Gehlian principles in the inner-city district of Fiskehamnen in the Finnish capital. (Drawings: J.P.)

depends on artistic achievements rather than on the justifiability of designs by arguments, refuse to take instructions from scholars,[67] who again might lack the capital to compete on the conditions ruling the design sphere. From the viewpoint of such a Bourdieusian field analysis, a part-cause of the academic abstractions or change of subject might be that theoretically trained or focused scholars retreat to the meta-level to avoid being despised as amateur or second-rank designers. The reverse cause is then that the academic field may bring more distinction to those (including former practitioners) taking part in a theoretically advanced social-scientific/philosophical discourse than to those remaining on the urban design level.[68] A more general, and generally recognized, cause is found in the difficulties inherent to all transdisciplinary work, in this case involving a real understanding of both design and theory and effecting a synthesis rather than a mechanic combination of the two. Yet, unless a meeting point between them is found, the doings of architects and urban designers, with their largely artistic perspective, will be protected from not only critical public debate but also theoretically informed evaluation.[69] This adds weight to complaints like those presented by Kristof Van Assche et al., questioning planning dominated by architects and urban designers.[70]

As the urban-design knowledge intended here is largely of a social kind, an objection might be that such knowledge is perspective dependent, political, and vague. Although some 'technical' knowledge, such as that concerning the amount of parking spaces needed, is certainly political, too, it is usually not imprecise. Nevertheless, Biddulph notes that perspective dependence and vagueness do not imply total freedom of interpretation:

> This is not to suggest, however, that what is left is merely a form of relativism in which anything goes in urban design terms. There are many conclusions from discrete pieces of research or forms of consensus which guide the nature of the decisions that might be made. Alexander's patterns might be viewed in this way, or the conclusions of Lynch on the features that help people find their way around, or maybe more tenuously Cullen's concern for townscape. The principles of urban design are also a good example, as they set out a design agenda and point out the issues that need to be addressed without prescribing, machine-like, particular forms of solution.[71]

Above, I have made extensive use of Biddulph's insights. Nonetheless, much hinges on how one interprets the fact that there are limits to how far social

science and urban design theory can take the designer, who always depends on practical skills and creativity. Still, social boundary conditions should count equally with technical ones at the creative stage, too. Biddulph cites Allan Jacobs and Donald Appleyard, stating that

> . . . after a while one knows and accepts that the research into what makes good places to live will be endless, often without conclusion, and always value-laden. There comes a time when one says, 'Well, I must take a leap. All of the experience has taught me something. It may be unprovable, but I think I know what a good place is.'[72]

Further on, Biddulph emphasizes the width of the problems facing designers, connecting their predicament to wicked problems. Yet, he arguably then underestimates the (in principle if not de facto) binding force of social urban-design knowledge, provided agreement on general political objectives and design principles. Moreover, despite the gap or complementarity between art and science (one cannot produce art by following a scientific procedure or vice versa), the practitioner must respect numerous technical, legal, and economic boundary conditions. The same should probably apply to generally agreed upon social-scientific, urban-design findings.[73] Their validity may be questioned;[74] the problem is when guidelines are simply ignored. Why do 'technically' grounded requirements tend to be acknowledged, even when they contradict the best available knowledge (norms securing numerous inexpensive parking spaces), while 'social' requirements often are not, even when they correspond to a political and professional consensus (communicating ground floors promoting street life)?

KNOWLEDGE AND POWER

There is one socially basic aspect of urban design not yet explicitly treated, and for the most part also ignored in the debate. This is the power issue. It enters on two levels: first, as influencing the urban design process; second, less obviously, in discussing urban design itself as a professional sphere, its status, knowledge, and scientificity. As to the latter level of influence, being part of social reality, neither the academic world nor professional practices can wholly escape power mechanisms. Yet, the power issue is sometimes obscured by the abstractions of both traditional theory of science and, to refer to the abstract level of theorizing favoured by Cuthbert, philosophy of action. In the former, Kuhn's empirical work marks a shift to a more realistic understanding tied to the institutional conditions of science. Social scientists,

again, have broken with the tendency of analytical philosophers to abstract from power in studying action. From a social-scientific viewpoint, it can hardly be denied that power is a fundamental dimension of social life.

Giddens, from his structurationist perspective, regards power, along with norms and meaning, as an analytic component of his 'virtual' social structure.[75] Bourdieu's less all-embracingly abstract analysis of forms of capital, such as social and cultural, conceivable as broadly structurationist,[76] may be employed to understand the dynamics of academic fields. Even more specifically, profession studies help to grasp how claims to knowledge become a stake in this-worldly struggles for defending preserves. These approaches do much to explain the problematic professional-strategic starting point in some articles, seemingly overshadowing the authors' worries about the quality of the urban environment designed.

Also focused on professional knowledge is the work of Foucault. In taking a disinterested view of knowledge production precisely from the perspective of knowledge being of this world, his later writings have made the interweavedness of power and knowledge a troubling background theme to any discussion of the scientificity of the human sciences. His deconstructive research interest, however, seems a problematic approach for securing constructive urban-design criticism and applicable knowledge. Even if one therefore does not wholeheartedly embrace Foucault's power/knowledge analysis, at least the theme of the relation between power and knowledge should be confronted. To avoid making power a mystical catch-all notion or residual category, it may be conceived of as the factual aspect of reality, adding to it a viewpoint rather than a substance. As with Foucault, it is intertwined with and realized through the force of arguments, norms, and meanings but, as pure facticity, works through the strategic aspect thereof.

Carmona treats power in relation to the urban-design process, where it might be connected to the wickedness of its problems underlined by Biddulph, whereas Dovey and Pafka mention it in discussing urban-design knowledge. While neither contribution overtly accounts for its position with respect to standpoints within the theory of power, Carmona does emphasize the need to grasp power in relation to agency/structure and process, thus conforming to a structurationist understanding. Without developing his view in relation to social science, he illustrates how power relations at different stages and levels direct the urban design process. However, for urban design as a profes-

sional and academic sphere, the issue is how power enters the production/incorporation and use of knowledge, which Dovey and Pafka draw attention to, without developing the point.[77]

The problem of the scientificity of urban design can thus be restated in power terms, power actually figuring implicitly throughout the texts. In Cuthbert, it takes the shape of capitalism, explaining why the good will or knowledge of practitioners does not suffice to attain a good environment. Marshall's contribution, taking a seemingly less political turn in focusing on the characteristics of science, can be read as a strategical address to the profession of guarding its preserves in the face of widespread professionalization. In Dovey and Pafka's discussion, the power/knowledge dimension might contribute to understanding why the scientization of urban design is seen as important and why, on the other hand, knowledge without the prestige of science hardly counts.[78]

Knowledge forming de facto boundary conditions for action tends to be tied to effective sanctions of an economic, legal, or political kind, represented by some of the disciplines and spheres of expertise 'colonizing' urban design, mentioned by Cuthbert.[79] However, the contributions do not problematize the weak power/knowledge potency of 'social' urban-design knowledge. Consequently, the—in fact anti-Foucauldian—problem of 'power setting aside (the best urban design) knowledge' forming the backdrop of, for instance, Bent Flyvbjerg's significant Ålborg study, is often effectively turned into a problem of differing values and of the value-ladenness of social knowledge.

SUMMARY OF POSITIONS

As stated above, Cuthbert's account does not clarify his prima facie odd move of combining Popper's falsificationism with Castells's Marxism. He fails to explain how social-scientific 'theory of' urban design might underlie it as a practical activity. No more does he satisfactorily justify the ideal of urban design as autonomous and founded on a specific kind of abstract theory. As to the subsequent contributions (fig. 2), Marshall's view of science, like Cuthbert's, implies straightforwardly testable hypotheses. Like them, Dovey and Pafka unreservedly accept the distinction between the sciences and humanities. In defending a more complex view of urban-design knowledge, the latter thus admit the lesser credibility of such 'non-scientific' knowledge, even if classifiable as *wissenschaftlich*, as compared with 'true' scientific knowledge. In the debate, the position of social science in this categorization appears

	GENERAL VIEW OF SCIENCE: Scientistic tendency	**POWER: Implicit or explicit role**
Alexander Cuthbert (2007, 2011a)	+ Inherent in Althusserian Marxism and Popperian falsificationism; doubts social-scientific methodology	Mainly implicit Mentions, but does not integrate into, theoretical position Central to his spatial political economy
Stephen Marshall (2012)	+ Revealed in the importance attached to unproblematized testing	Implicit Power/knowledge explains need to boost scientific image of assumed discipline
Kim Dovey & Elek Pafka (2016)	+/- Question the scientificity of non-natural scientific knowledge; yet, this is implied by a strict use of the English science/ humanities distinction	Explicit Situate the discussion in a power context by mentioning the problem of power/ knowledge
Mike Biddulph (2012)	- Not revealed	Implicit Connected to the political aspect of urban design knowledge and to the wickedness of urban design problems
Matthew Carmona (2014)	- Not revealed	Explicit Integral to his account of the urban design process

ROLE OF SCIENCE	**Theory *for* (in) urban design**	**Theory *of* (about) urban design**	**Legitimizing disciplinary status**
Alexander Cuthbert (2007, 2011a)	- Criticized for being insubstantial	+ Recommended as a foundation for urban design	+ Basic aim (despite some remarks to the contrary)
Stephen Marshall (2012)	+ In focus	+ ? Probably, provided such testable knowledge exists	+ Important aim
Kim Dovey & Elek Pafka (2016)	+ In focus	+ Fits into the broad range of theory described	- No such priority
Mike Biddulph (2012)	+ In focus	+ Approves of it despite reserve against non-practicable knowledge	- No such priority
Matthew Carmona (2014)	+ Findings applicable as such theory, supporting the practice	+ Interest in the conditions and determinants of urban design	- No such priority

Figure 2. Scientificity and the practical nature of urban design. Summary of positions. Source: Jarre Parkatti.

vacillating, often standing for the objectivity of *theory of*, contrasted with normative, easily applicable knowledge *for* urban design. Yet, the latter is frequently social scientific, too. Biddulph, also noting the amorphous character of urban-design knowledge, emphasizes the largely ascientific character of urban design. Carmona's account, trying to situate the field within a complex mixture of theoretical traditions, appears to support the rejection of an empiricist understanding of academically respectable knowledge.

Concerning the role of science in urban design oriented to practice and aesthetics, Marshall, while following Cuthbert in tracing pseudo-science, does not focus on the preconditions of urban design and its political aspect. While Marshall certainly tries to identify knowledge useful for the practitioner, the stress is on legitimating the discipline. Opposing any simplistic scientizing of urban design, Dovey and Pafka hold that both empirical science and interpretative theory contribute important results to the endeavour. For Biddulph, stressing the importance of various kinds of theory, even directly applicable urban-design knowledge cannot definitely limit possible design solutions due to the political-practical nature of the activity. Carmona takes up Cuthbert's project in elucidating the preconditions of urban design. Yet, he does it in a tangible manner, accessible to professionals. Thus, even abstract aspects of his research *might* function as theory *for* urban design.

As regards power, it is implicit in Marshall's defence of the scientific status of the field. Science associated with the conventional natural scientific ideal, strengthened by the word's connotations in English, from the present viewpoint has a stronger power/knowledge position than the humanities. While Carmona discusses the power of involved agents and in relation to structural conditions, Dovey and Pafka mention power/knowledge conditioning knowledge production.

DISCUSSION

The contributions share an interest in developing urban design, if from varying perspectives. There is a concern for creating a better world in the face of capitalism and neoliberalism, for the scientific and professional quality of urban design, for an understanding of its distinctive character and an anxiety to defend the professional preserve. The debate does not settle the issue of the role and status of 'social' urban-design knowledge and how power affects its use. Requiring design practice more generally to be grounded in a scientifically informed rationality—Marshall's second alternative—would

allow one to ask whether all aspects of urban-design knowledge are satisfactorily considered. If the possibility of adequate knowledge within urban design is taken seriously, a power/knowledge analysis, although thematizing the hidden power dimension, seems a questionable point of departure. To secure a rationally-scientifically binding role for design-relevant knowledge, one must take a broad view of scientific rationality. This requires respect for the force of the better argument, whether or not popularly persuasive as scientific, preceding decisions on method. Such a well-founded view, based on arguments, social theory, and the theory of science, excludes an empiricist-naturalist ideal in describing and explaining the ontologically divergent social reality of urban design.

To be able to take real responsibility for city development, the town planning agency (although subordinated to formal political decision-making) *analytically* must have the strength and autonomy to use available urban-design knowledge. Thus, preparing political decisions, planning-cum-urban design must largely succeed in securing professionally acceptable planning ends and means, setting limits to professionally unacceptable action promoted by the larger municipal organization, politicians, or strong actors. Only then can it undertake the task, not touched upon above, of empowering weak actors, benevolently translating their fragile local knowledge and views into professionally comprehensible or respectable language.

CONCLUSION

Cuthbert's contribution is significant in thematizing the scientific rationality of the pragmatic practice of urban design and in emphasizing its socially conditioned nature. While his solution is flawed, the resultant debate has successively clarified issues. Rather than worrying about the scientific image of urban design as a self-sufficient discipline, the distinctiveness of architecture/urban design as an artistically creative practice founded on a diverse knowledge base should be comprehended. To effect a good urban environment, the social conditions of urban design should be grasped, including interfering mechanisms connected to the interweaving of power and knowledge. In any case, 'social' design knowledge, if found valid, should be regarded as binding and, as far as the power position of the urban designer and planning institution allows, translated into designs.

NOTES

[1] Hooman Foroughmand Araabi, in more general terms, observes 'discussion on urban design theory . . . flourishing during the last decade'. See Hooman Foroughmand Araabi, 'Multiple Expectations: Assessing the Assumed Roles of Theory in Relation to Urban Design', *Journal of Urban Design* 22, no. 5 (2017), pp. 658–69, esp. p. 658.

[2] For example, concerning the scientificity of urban design/town planning activity, see Jane Jacobs, *The Death and Life of Great American Cities* (New York: Random House, 1961). Likewise, the question underlay the transition in planning theory from urban design to planning procedure and the urban system at the turn of the 1970s; Nigel Taylor, *Urban Planning Theory since 1947* (London: Sage, 1998).

[3] Alexander Cuthbert, 'Introduction', in *Designing Cities: Critical Readings in Urban Design*, edited by Alexander Cuthbert (Oxford: Blackwell, 2003), pp. 1–20; Alexander Cuthbert, *The Form of Cities* (Oxford: Blackwell, 2006); Alexander Cuthbert, 'Urban Design: Requiem for an Era; Review and Critique of the Last 50 Years', *Urban Design International* 12 (2007), pp. 177–223; Alexander Cuthbert, *Understanding Cities: Method in Urban Design* (London: Routledge, 2011); also Alexander Cuthbert, 'Urban Design and Spatial Political Economy', in *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris (London and New York: Routledge, 2011). My response is primarily based on the comprehensive article (Cuthbert, 'Urban Design: Requiem for an Era'), the introductions to *Designing Cities: Critical Readings in Urban Design* and *Understanding Cities: Method in Urban Design*, and the latter's first, theory-focused chapter.

[4] Cuthbert, 'Urban Design: Requiem for an Era', p. 215; Cuthbert, *Understanding Cities: Method in Urban Design*, pp. xviii–xix.

[5] Stephen Marshall, 'Science, Pseudo-Science and Urban Design', *Urban Design International* 17 (2012), pp. 257–71; Kim Dovey and Elek Pafka, 'The Science of Urban Design?', *Urban Design International* 21 (2016), pp. 1–10; Araabi, 'Multiple Expectations: Assessing the Assumed Roles of Theory in Relation to Urban Design'; Mike Biddulph, 'The Problem with Thinking about or for Urban Design', *Journal of Urban Design* 17, no. 1 (2012), pp. 1–20; Michael Gunder, 'Commentary: Is Urban Design Still Urban Planning? An Exploration and Response', *Journal of Planning Education and Research* 31, no. 2 (2011), pp. 184–95; Matthew Carmona, 'The Place-Shaping Continuum: A Theory of Urban Design Process', *Journal of Urban Design* 19, no. 1 (2014), pp. 2–36.

[6] Matthew Carmona ('The Place-Shaping Continuum', p. 2) offers a similar 'not untypical' characterization citing the Planning Institute of Australia.

[7] Cuthbert, 'Urban Design: Requiem for an Era', pp. 191–207.

[8] Cuthbert, *Understanding Cities: Method in Urban Design*, pp. 12–13 and 15.

[9] Ibid., p. 8.

[10] Ibid., p. 20, Chapter 1. Cuthbert, 'Introduction', in *Designing Cities*, pp. 11–12; Cuthbert, in 'Urban Design: Requiem for an Era' (pp. 180, 182–83, and 185), writes as if also definitions, not only theories, should be refutable in principle for the discipline to be scientific. Yet, definitions, describing relations between terms, cannot be true or false, only more or less suited to their purpose. It thus makes more sense to find definitions inadequate 'in the absence of a theoretical framework that would make them "real"' (ibid., p. 184).

[11] Cuthbert, 'Urban Design: Requiem for an Era', pp. 178 and 188. Yet, in other passages Cuthbert ('Introduction', in *Designing Cities*, pp. 11 and 15) states that his interest is in theory *about* not *of* urban design.

[12] Cuthbert, *Understanding Cities: Method in Urban Design*, p. 16. This is the case although Castells expresses some reserve in relation to the latter after the first publication of *La questi-*

on urbaine (in 1972). Manuel Castells, *The Urban Question: A Marxist Approach*, trans. Alan Sheridan (London: Edward Arnold, 1977), p. ix.

[13] See Kieran McKeown, *Marxist Political Economy and Marxist Urban Sociology: A Review and Elaboration of Recent Developments* (Basingstoke: Macmillan, 1987), pp. 90–91.

[14] Chris Pickvance, 'Introduction: Historical Materialist Approaches to Urban Sociology', in *Urban Sociology: Critical Essays*, edited by C. G. Pickvance (London: Tavistock, 1976), p. 4.

[15] Manuel Castells, 'Theory and Ideology in Urban Sociology', in *Urban Sociology: Critical Essays*, edited by C. G. Pickvance (London: Tavistock, 1976), pp. 60–84, esp. p. 60; originally published in French as: Manuel Castells, 'Théorie et idéologie en sociologie urbaine', *Sociologie et sociétés* 1, no. 2 (1969), pp. 171–91.

[16] Cuthbert, 'Urban Design: Requiem for an Era', p. 190.

[17] Jan Gehl, *Livet mellem husene*, 2nd ed. (Copenhagen: Arkitektens forlag, 1980), published in English as: *Life Between Buildings: Using Public Space* (Washington, DC: Island Press, 2011).

[18] Cuthbert, 'Introduction', in *Designing Cities*, pp. 10–11.

[19] Ibid., p. 11; Cuthbert, *The Form of Cities*, p. 249; Cuthbert, 'Urban Design: Requiem for an Era', pp. 182, 208, and 215.

[20] Cuthbert, 'Introduction', in *Designing Cities*, p. 4; Cuthbert, 'Urban Design: Requiem for an Era', pp. 177 and 215; Cuthbert, *Understanding Cities: Method in Urban Design*, p. xviii.

[21] Peter Manicas, *A History and Philosophy of the Social Sciences* (Oxford: Blackwell, 1987), pp. 60–61, Chapter 12; Daniel Stoljar, 'Physicalism', *The Stanford Encyclopedia of Philosophy* (Winter 2017 edition), edited by Edward N. Zalta, section 1, https://plato.stanford.edu/archives/win2017/entries/physicalism/.

[22] Donald Broady, *Sociologi och epistemologi: Om Pierre Bourdieus författarskap och den historiska epistemologin* (Stockholm: HLS Förlag, 1990), pp. 365–70.

[23] See McKeown, *Marxist Political Economy and Marxist Urban Sociology*, pp. 91–92.

[24] Castells, *The Urban Question: A Marxist Approach*, p. 128.

[25] Connecting the field to public space is common (in the debate, e.g. Biddulph, 'The Problem with Thinking about or for Urban Design', p. 1). The stress on public space is also compatible with Jane Jacobs's writings, which emphasize the importance of the well-functioning street, upholding civil society, while depreciating the more private life in courtyards. Still, it is significant that traditional, decidedly urban town planning and urban design create perimeter blocks articulating both the public space of the street and the semi-private space of the courtyard.

[26] Cuthbert, *Understanding Cities: Method in Urban Design*, pp. xvii, 2, and 7.

[27] Ibid., p. 2. Such advice would be provided by programmatic work dismissed as pseudo-scientific in the debate. One certainly aiding the practitioner is Jane Jacobs, whom Cuthbert himself labels an 'enlightened critic' but does not discuss (in 'Urban Design: Requiem for an Era', p. 196)—and who, perhaps being embarrassingly liberal, is assigned only a couple of lines (in relation to the 'metropolitan symbolic' along urban motorways!) by Manuel Castells (*The Urban Question: A Marxist Approach*, p. 229).

[28] Taylor, *Urban Planning Theory since 1947*, pp. 101–02.

[29] Ray Pahl, *Who's City? And Further Essays on Urban Society*, 2nd ed. (Harmondsworth: Pen-

guin, 1975), pp. 234–35), cited in Taylor, *Urban Planning Theory since 1947*, p. 102.

[30] Taylor, *Urban Planning Theory since 1947*, Chapter 4.

[31] Cuthbert, 'Urban Design: Requiem for an Era', p. 190. He also states (loc. cit.): 'There are however significant philosophical, technical and functional differences among and between [architecture, urban design and planning], and neither architecture nor urban planning can make facile assumptions about their own ability to expedite urban design strategies as praxis.' Whatever this means (especially as abstracted from a description of a specific urban design and planning reality), the role, character, and effectiveness of the practices related to these activities vary depending on the planning system.

[32] One indication of the Anglo-Saxon bias is that—of the forty significant texts in urban design that he selects and enumerates (Cuthbert, 'Urban Design: Requiem for an Era', p. 189)—*three* are written by authors not clearly attached primarily to English-speaking countries (viz. Christian Norberg-Schulz, Jan Gehl, and Rob Krier). The same kind of confusion of the Anglo-Saxon world and the World can be observed in Gunder ('Commentary: Is Urban Design Still Urban Planning?', p. 185), citing only Anglo-Saxon literature, which tends to limit itself to the anglophone world.

[33] Hooman Foroughmand Araabi observes that the participants in the debate tend to reduce theory to a systematically testable kind. See Araabi, 'Multiple Expectations: Assessing the Assumed Roles of Theory in Relation to Urban Design', p. 660.

[34] Cuthbert, *Understanding Cities: Method in Urban Design*, p. xix. He also points out that for spatial political economy 'professional monopolies are part and parcel of the ideological relations of capitalism' (Cuthbert, 'Introduction', in *Designing Cities*, p. 9).

[35] Gunder, 'Commentary: Is Urban Design Still Urban Planning?', pp. 184–85. He specifies that this is true, at least for New Zealand.

[36] Cuthbert, 'Introduction', in *Designing Cities*, p. 12.

[37] Cuthbert, 'Urban Design: Requiem for an Era', p. 179.

[38] Castells, *The Urban Question: A Marxist Approach*, p. 237.

[39] Biddulph, 'The Problem with Thinking about or for Urban Design', p. 9. See also Stephen Marshall, 'Refocusing Urban Design as an Integrative Art of Place', *Urban Design and Planning* 168, Issue DP1 (2015), pp. 8–18, esp. p. 16.

[40] Cuthbert, *Understanding Cities: Method in Urban Design*, p. 2; Cuthbert, 'Urban Design and Spatial Political Economy', in *Companion to Urban Design*, p. 89.

[41] Is it impossible for non-Marxists to be competent (or 'educated') urban designers? This points to a general problem which social science must live with. The Weberian idea of value-free science, once the subject of study has been chosen, can no longer be trusted. Political fights are partly fought within science (cf. neoliberalism versus Keynesianism in economics). This being so, explicit value-ladenness is certainly better than feigned value freedom. Neither is there any a priori reason why a Marxist viewpoint would be false. However, given the radical and provocative nature of Cuthbert's suggestions, these problems should be dealt with explicitly.

[42] Marshall, 'Science, Pseudo-Science and Urban Design', pp. 257–59.

[43] Dovey and Pafka, 'The Science of Urban Design?', pp. 1–2 and 5.

[44] Marshall, 'Science, Pseudo-Science and Urban Design', pp. 259–62.

[45] Ibid., p. 265. His characterization of former knowledge as 'a repository for sometimes dated

or half-digested knowledge' could be read as an indirect criticism of Cuthbert.

[46] Ibid., pp. 265–67. Apparently, he observes no difference in principle between engineering knowledge, depending on physics, and urban-design knowledge, largely tied to the social sciences and the humanities.—In a later, conceptually elucidating 2015 article ('Refocusing Urban Design as an Integrative Art of Place'), Marshall interestingly makes a fresh start, instead seeking to anchor urban design in the arts.

[47] Biddulph, 'The Problem with Thinking about or for Urban Design', pp. 11–12; Carmona, 'The Place-Shaping Continuum', p. 4.

[48] Dovey and Pafka, 'The Science of Urban Design?', p. 1.

[49] Ibid. Among those demanding a new beginning, Dovey and Pafka nonetheless also mention a representative of German-speaking academia, namely the Italian-German architect Vittorio Magnago Lampugnani (ibid., p. 1). See also Vittorio Magnago Lampugnani, 'Gedächtnis und kritische Wissenschaft: Für eine Neugründung der Disziplin Städtebau', *Geographische Revue* 1 (2012), pp. 53–57.

[50] Ibid., p. 1.

[51] By paying tribute to the classics, whose scientific authority they question, many contributions in fact recognize other forms of knowledge than that based on their (natural) scientific ideal. In the present article, the concept of knowledge, not supposed to need a properly epistemological treatment in the context, is understood as practically significant, reasonable beliefs produced by variously reliable methods, whose relative strength and appropriateness are under debate. The classical definition of knowledge as justified true belief would leave little space for discussion. Such a definite notion is even stronger than that of 'scientific knowledge', which, as conventionally conceived, should be falsifiable. From a realist perspective, however, the classical meaning of knowledge should be borne in mind. It is obscured by Foucault's power/knowledge analysis and his sceptical attitude to ontological issues, for example in Michel Foucault, *Histoire de la sexualité, Vol. I*: *La volonté de savoir* (Paris: Gallimard, 1976), published in English in 1978 as *The History of Sexuality, Vol. 1: The Will to Knowledge*. A further aspect of the issue remaining implicit here is how tacit knowledge or knowing relates to factual knowledge ('knowing how' to 'knowing that').

[52] Dovey and Pafka, 'The Science of Urban Design?', p. 2; Gordon Cullen, *Townscape* (London: The Architectural Press, 1961), p. 10.

[53] Dovey and Pafka, 'The Science of Urban Design?', p. 3.

[54] Ibid., p. 8.

[55] Carmona, 'The Place-Shaping Continuum', pp. 3–4. 'Unique about urban design' should not necessarily be read as delimiting the field strictly from architecture and planning, since for instance Christopher Alexander's work, spanning everything from interior design to regional planning, is mentioned as foundational.

[56] Carmona, 'The Place-Shaping Continuum', pp. 2–5.

[57] As a reply to the question of why to bother about the scientificity of urban design, of whether other kinds of knowledge may be as useful, Stephen Marshall reasons as follows: 'Some may argue against the "scientisation" of design, or that cities cannot be "reduced" to scientific scrutiny. However, the lack of a proper scientific grounding erodes the case for urban design being considered a properly academic subject . . . And if urban design theorists do not pay attention to the science of cities, others surely will.' Marshall, 'Science, Pseudo-Science and Urban Design', p. 265. The mentioning of the physicist Geoffrey West's view of urban design and his threatening suggestions about a fresh start for it are hard to take seriously as a sincere argument (loc. cit.): '[G.W.] has reportedly dismissed urban theory as based on "old methods

of social science" and "unconstrained speculations of architects", comparing it with "physics before Kepler pioneered the laws of planetary motion in the 17th century" . . . West apparently aims to begin again "with a blank page, to study cities as if they had never been studied before" . . . This kind of claim, if successfully prosecuted, could put conventional urban design theorists out of business.'

[58] See Manicas, *A History and Philosophy of the Social Sciences*; and Peter Manicas, *A Realist Philosophy of Social Science: Explanation and Understanding* (Cambridge: Cambridge University Press, 2006). In the real world of common perception and government policy, this is even more pronounced. As Stephen Turner and Daryl Chubin write, discussing the changing institutional-economic conditions and expectations of science from the viewpoint of the United States: 'By the late 1990s, science had become STEM (science, technology, engineering, and mathematics).' See 'The Changing Temptations of Science', *Issues in Science and Technology* (Spring 2020), pp. 40–46, esp. p. 42.

[59] Marshall, 'Science, Pseudo-Science and Urban Design', p. 257.

[60] Biddulph, 'The Problem with Thinking about or for Urban Design', p. 10.

[61] Cuthbert, *Understanding Cities: Method in Urban Design*, p. xx. He justifies his need to anchor urban design in theory, despite regarding himself as being most of all at home in practical activity, by declaring that 'I need to feel that there is more than my own individual talent at stake, that there is much to share in the realm of ideas, and that urban design as a discipline must stand on the bedrock of social and urban theory that must inform and enlighten our design decisions' (ibid., p. xvii).

[62] For example, he reflects on drawing as a means for thinking (Biddulph, 'The Problem with Thinking about or for Urban Design', p. 10): 'It is one thing to construct an academic argument within the social sciences about urban design. It is something completely different to design, discuss and justify the product of urban design practice. So it is that urban designers must have the knowledge and skill to draw and interpret drawings, as well as write and rationally discuss ideas, in order to fully engage with their field.'

[63] Cuthbert, 'Introduction', in *Designing Cities*, p. 5. Whatever one thinks of New Urbanist aesthetics or even their more general town-planning principles, the movement seems to represent a countercurrent to mainstream modernism criticized for its myopia by Cuthbert. More importantly, the Transect principle, disregarding its details, makes it possible to introduce systematic architectural and urban-design thinking on the level of master and regional planning. It appears more interesting to discuss the potential in principle behind the fundamental objectives and methodological instruments introduced than their real-world realizations or the possible political connotations of the style preferred by the New Urbanists themselves.

[64] This characterizes, for example, the contribution by Michael Gunder ('Commentary: Is Urban Design Still Urban Planning?', pp. 188–89).

[65] Michael Gunder attempts a synthesis on the institutional level, which, however, is dependent on the way the different tasks within urban design and town planning are divided up and how they are taught. Thus, from the claim of Cuthbert ('Introduction', in *Designing Cities*, p. 15) that 'most of what passes for theory in urban design orthodoxy is disconnected from any larger social context', Gunder ('Commentary: Is Urban Design Still Urban Planning?', p. 189) draws the conclusion that 'perhaps to foster urban design research and innovation, urban planning does indeed need to consider putting urban design back in the box as a subset of wider planning education, practice, and theory'.

[66] A difficulty in visual criticism based on social knowledge is that attention is easily directed at the aesthetic qualities of the alternative. In principle, two or more stylistically different versions realizing the same principles might therefore ideally be presented for the intended style-independent features to stand out. In the present illustration, this is achieved by sketching in an imagined new building, taking up half of the length of the actual one, and manipulating the

existing building by adding communicating ground-floor functions. Certainly, such changes (or cutting the building in two) are not completely neutral in relation to style and might not be accepted by the architect. In the illustration, secondary improvements making the main part of the present facade more stimulating for pedestrians, might also have been added, trying to keep the style intact. Yet, this would even more likely have been disapproved of by the author.

[67] See Gunder, 'Commentary: Is Urban Design Still Urban Planning?', p. 189.

[68] See Biddulph, 'The Problem with Thinking about or for Urban Design', pp. 11 and 15. His scenario of how writing on the terms of social science alienates the research by academics (originally) close to the profession from its concerns might already have come true. In Finland, where attention has shifted from the neighbouring Nordic countries to the Anglo-Saxon world, their participation in an abstract discussion of a foreign urban design and planning reality is doubly alienating.

[69] See Niraj Verma, 'An Incompletely Theorized Project', in *Companion to Urban Design*, edited by Tridib Banerjee and Anastasia Loukaitou-Sideris (Abingdon: Routledge, 2011), p. 59.

[70] Kristof Van Assche, Raoul Beunen, Martijn Duineveld, and Harro de Jong, 'Co-Evolutions of Planning and Design: Risks and Benefits of Design Perspectives in Planning Systems', *Planning Theory* 12, no. 2 (2012), pp. 177–98. The authors draw attention to the contingent development of professional and disciplinary boundaries, largely determined by power- or knowledge-related struggles. Partly basing their criticism on the personal interpretation by Klaus Kunzmann ('Planning Education in a Globalized World', *European Planning Studies* 7, no. 5 [1999], pp. 549–55), they do not, however, any more than he does, explicate what precisely is wrong with a design perspective per se. On the face of it, at least, the design effort would seem necessary in order to concretize and complete planning-related social goals. And Kunzmann (ibid., p. 552), rather than regarding a rule of architects as 'disastrous' due to their aesthetic focus, which he is cited for (Van Assche et al., 'Co-Evolutions of Planning and Design', p. 186), more moderately states that '(re-)stressing the importance of design in planning education in continental Europe would signal a return to traditional urban planning education in architectural programmes. It would certainly be the wrong signal as it would in the end mean the demise of independent planning education in many European countries'. Instead of worrying about architects' disrespect for social urban-design knowledge, Van Assche et al. (ibid., pp. 188–89) mention their neglect of the views of residents and the political dimension. Their scepticism about design knowledge implies eroding its boundary to politics.

[71] Biddulph, 'The Problem with Thinking about or for Urban Design', p. 12.

[72] Ibid., p. 2; Allan Jacobs and Donald Appleyard, 'Toward an Urban Design Manifesto', *APA Journal* (Winter 1987), p. 112.

[73] Such a condition would be more reassuring than Stephen Marshall's statement that urban design being an art '*need not* mean superficial appearance, grandiose symbolism or futile abstraction' (Marshall, 'Refocusing Urban Design as an Integrative Art of Place', p. 11; my emphasis), based on an intrinsically persuasive account. See also Hooman Foroughmand Araabi, who points to limits of the seemingly boundless complexity associated with wicked problems; Araabi, 'Multiple Expectations: Assessing the Assumed Roles of Theory in Relation to Urban Design', pp. 661–62.

[74] See Hooman Foroughmand Araabi, 'Multiple Expectations', p. 666. Foucauldians and poststructuralists would point out that any such apparent consensus presupposes a hegemonic discourse. While the point should sensitize us to the Other's dissent, such 'structural violence' is an unavoidable fact of social life. It hardly justifies the claim that no agreement is possible.

[75] Anthony Giddens, *New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies* (London: Hutchinson, 1976); Anthony Giddens, *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis* (Basingstoke: Macmillan, 1979); Anthony Giddens, *A Contemporary Critique of Historical Materialism*, vol. 1: *Power, Property and the*

State (London: Macmillan, 1981); Anthony Giddens, *The Constitution of Society: Outline of the Theory of Structuration* (Cambridge: Polity Press, 1984).

[76] Despite obvious differences, such as Bourdieu's epistemological and Giddens's ontological focus, on a general level it is scarcely implausible to categorize both approaches as structurationist. For example, before Giddens introduced his version, a prominent presentation of a structuration mechanism was found in: Pierre Bourdieu, *Esquisse d'une théorie de la pratique: Précédé de "Trois études d'ethnologie kabyle"* (Geneva: Librairie Droz, 1972), rewritten in English as: *Outline of a Theory of Practice*, trans. Richard Nice (London: Cambridge University Press, 1977).

[77] Dovey and Pafka, 'The Science of Urban Design?', p. 8.

[78] In Finland, at least, due to the strong professional position of architects within town planning, one may claim that the professional hard core in urban design/planning is not social science or 'hard science' but artistry; cf. Marshall's alternative of basing the discipline of urban design on art (Marshall, 'Refocusing Urban Design as an Integrative Art of Place'). Still, of the auxiliary knowledge enabling and constraining the urban design process, engineering knowledge with a 'hard science' look has more power to set boundary conditions than 'weak' social knowledge.

[79] Cuthbert, *Understanding Cities: Method in Urban Design*, p. xviii.

SWEDISH PREFABRICATED HOUSES IN THE SAUDI ARABIAN OIL FIELDS

Abdulaziz Alshabib and Sam Ridgway

ABSTRACT

In 1948, a shipment of Swedish, flat-packed, prefabricated timber houses was discharged in the recently constructed port of Al-Khobar on the Arabian Gulf coast of Saudi Arabia. The houses were destined for the Dhahran oil compound where ten years earlier oil had been discovered in the deep-test well Dammam No. 7. The Arabian-American Oil Company (Aramco) had ordered the houses to accommodate its rapidly expanding workforce.

The oil camps attracted many local Bedouins looking for work. The Swedish, Scottish, and English architects and builders who accompanied the prefabricated houses supervised the construction and trained locals in carpentry as well as other building trades so they could be of assistance in the process. Within the context of Saudi Arabia's seismic shift from traditional to modern forms of architecture, the arrival of the Swedish houses, and also others from the West Coast of America, can be understood as a crucial event. The vast wealth that flowed from the discovery of oil combined with a workforce trained in construction helped to spread the associated architectural and cultural knowledge beyond the oil compounds to Saudi society more widely.

This article discusses the Swedish prefabricated houses and the architectural changes they helped to establish in Saudi Arabia. The article has been developed as part of PhD research that aims to theorize and historically contextualize the Saudi government's current initiative of building more than one million affordable houses by 2030 using industrialized construction methods.

KEYWORDS

Imported prefabricated timber housing, saudi arabia, sweden, oil camps

INTRODUCTION

Studying the Swedish prefabricated timber houses, which were imported into the Saudi Arabian oil fields in the early twentieth century, is part of a larger PhD research project at the University of Adelaide in South Australia. The PhD focuses on the current Saudi government scheme, announced in 2017, to build more than one million prefabricated and affordable houses by 2030. The discovery of oil and the import of prefabricated timber buildings, particularly houses, into the oil compounds is an important part of this article. The Arabian-American Oil Company (Aramco), imported thousands of houses, of various styles and technologies, into the vast Saudi Arabian desert to house its large, mainly expatriate, workforce. Initially ready-made bungalows and ranch houses were sourced from the west coast of the United States. Following the Second World War, with the growing reputation of the Swedish prefabrication industry and as part of a contra deal to repay an oil debt, the company began to import Swedish prefabricated timber houses.

Since the 1930s, Saudi residential architecture has undergone profound changes. Urban fabric has undergone transformation from traditionally designed courtyard houses and narrow, irregular streets to contemporary, modern villas built in urban areas that have been planned in a gridiron pattern. This fundamental change has been examined by a number of architectural scholars. Some have linked the discontinuity of traditionally and culturally formed urban fabric to the discovery of oil in the 1930s.[1] For example, Geoffrey King in his book *The Traditional Architecture of Saudi Arabia* writes that 'prior to the full flow of its oil economy Saudi Arabia's architecture and architecture styles had not changed for centuries'.[2] As the urban population grew rapidly due to increased migration from rural areas, the need for affordable housing grew.

Since the 1950s, the Saudi government, in response to the demand for housing, has introduced many initiatives and projects to tackle this issue. The first governmental effort was documented in the early 1950s with a number of in-situ built houses in Riyadh city. As the number of citizens and migrants continued to increase, the government turned its focus on prefabrication techniques. The first government affordable housing project to use these techniques was launched in the early 1970s.[3] Companies from Europe, South Korea, and Saudi Arabia were hired to complete a large national housing project. However once completed, many of the housing units stayed unoccupied for many years. For several decades following the completion of

this project, public housing projects continued with the use of conventional precast, reinforced concrete panels.

With the recent increased demand for affordable housing, the Saudi Housing Ministry reintroduced the use of technology and prefabrication as the main approach to satisfy this demand. In 2017, the ministry introduced its new housing vision and strategic plan. One of the vision's main objectives is to provide more than one million housing units for the Saudi citizens within the next few years. According to the ministry plan, a key strategic factor to the achievement of this goal is related to the use of new high-tech, industrialized construction methods as well as imported and local lightweight construction materials. Since 2017, the ministry has been keen to introduce new imported housing solutions and many international companies have been invited and hosted. Companies from the United States, China, Turkey, the Netherlands, and Bahrain have already built housing prototypes and experiments within the ministry's lands. Saudi Arabia is currently considered as a country where new utopian and experimental technological housing dreams and solutions can be implemented. For example, the 3D-printed house, built by a Dutch company, is one of the latest experimental housing prototypes built in Riyadh.[4]

SWEDISH WOODEN PREFABS ARRIVE IN SAUDI ARABIA

In the last week of May 1948, a small group of building specialists from Europe and the United Kingdom arrived at the Dhahran oil compound in Saudi Arabia to oversee the assembly of flat-packed, prefabricated timber houses from Sweden. [5] The group had just supervised the discharge and transportation of the houses from the recently constructed port of Al-Khobar 10 kilometres away on the Persian Gulf coast. Jack Ross from Kirkcaldy, Scotland, Tom Hulme from Shrewsbury, England, and Gunnar Backsell and Axel Strom from Stockholm, Sweden, had arrived from the cool climates of the north into one of the hottest and driest countries on earth. Travelling from Al-Khobar through the vast treeless desert to the isolated oil camp was a shock. On arrival, they passed through the chaotic and unplanned Saudi workers' camp and were then amazed to enter the American camp, a small, well-organized 'Californian' suburb in the desert. Eventually expanding to an enormous scale, later observers referred to it as an Arabian 'Levittown'.[6]
On arrival in Saudi Arabia, the group's mission was clear. They were responsible for the discharge and assembly of the Swedish prefabricated houses. In addition, during their relatively short stay, they were required to train the

Arabian-American Oil Company's Arab workers, including local Bedouin, in the construction and assembly skills necessary to complete this mission and for them to be available for the inevitable expansion of this camp and other camps. Despite the relative order and familiarity of buildings in the American camp, in the early years of the oil industry, conditions in the desert were clearly difficult. Gunnar Backsell, who had a PhD in architecture and who left Saudi Arabia on 7 July 1948, described his short stay as 'a little warm and a little rough after his own cool countryside'.[7]

The influx of expatriate workers into the Dhahran camp following the discovery of oil created a serious shortage of suitable housing. The predominantly American workers, crucial to the successful exploration and extraction of Saudi Arabia's oil wealth, were prepared to 'rough it' for a while, living in tents and sheds.[8] But Aramco was keen to provide more familiar accommodation for them in an effort to create a stable workforce. The import of prefabricated timber houses from the west coast of America and then from Sweden into the oil compound was a pragmatic, commercial decision to fulfil this need. There was a strong belief, still evident today, that containing foreign workers, the imported houses and western cultural as well as technological thinking that came with them in compounds would limit their influence on Saudi society. While gated compounds did limit conflict between the oil workers and the local population, it can be argued that the architecture and building technology imported into the compounds were the beginning of profound changes in Saudi architecture and to some extent cultural practices associated with domestic architecture.

PREFABRICATED WOODEN HOUSES IN SWEDEN

The most common building material used in Swedish domestic architecture is wood. As Colin Davies explains in his book *The Prefabricated Home*, unlike in the UK, in Sweden:

> there is no timber frame versus brickwork debate, no awkward compromises, no ideological agonizing. The balloon or platform frame has been the standard technology for low-rise housing ever since it took over from the log building vernacular in the early twentieth century . . . In the 1950s and '60s, sawmills began to diversify into the production of house components, such as roof trusses and wall panels, taking advantage of timber frame's natural aptitude for prefabrication. Soon the industry had settled into a tripartite structure: the factory itself; a marketing operation

> producing advertisements and brochures, including pattern books; and a network of builders to assemble the individual houses on site. Dozens of small companies now operate in this way. It has become the normal method of housing provision in a country where almost half of households live in privately owned detached houses.[9]

Wooden houses account for more than 90 per cent of the housing market share in Sweden, Finland, and Norway.[10] Since the 1940s, Sweden has been seen as a world leader when it comes to timber construction and prefabrication. Rasmus Waern suggests in his essay *Scandinavia: Prefabrication as A Model of Society* that the history of wooden house prefabrication in Sweden can be divided into three categories: the pioneer age, the mass-production age, and the customization and design age.[11] The pioneer age started at the end of the nineteenth century with many preliminary experiments without massive production. A key figure in the early development of timber prefabrication was Fredrik Blom, who was born in 1781. Blom was an architect and a colonel in the Corps of Naval Engineers and is considered to be the first Swede to recognize the potential of prefabrication within the timber industry.[12] He conceived and produced the basic wall as a series of panels that could be assembled and then dismantled as needed. By 1840, more than 140 of the houses he designed were being produced[13] and Sweden also began exporting these prefabricated houses during this period. In 1849 the firm of Siwers and Wennberg shipped the first movable house from Stockholm to California.[14]

The pioneer age was followed by the mass-production age, a time when production reached its limit. Early twentieth century housing shortages, resulting from the First World War, were a key motivator for the expansion of wooden house prefabrication. Within Sweden, the government recognized the increase in demand by publishing many standardized drawings to help maintain higher housing quality standards. The Borohus Company seized the opportunity to publish the first Swedish prefabricated houses catalogue in 1924.[15] A key marketing strategy for the company was that their houses could be delivered anywhere in Sweden. By the end of the 1930s, there were at least twenty different companies offering ready-made houses that could be selected from catalogues.[16] During this time, the number of prefabricated houses produced annually reached 5000.[17] In the middle of the twentieth century, the Swedish economy became more established and regulated and the government began providing many welfare services,

including housing. The National Swedish Housing Board (Bostadsstyrelsen) was created for this purpose. International conflicts and wars, such as the Winter War, helped the Swedish market to expand rapidly and the country to become a world-leading manufacturer of wooden houses. In 1947, Sweden produced more than 17,500 prefabricated houses.[18] Hugh Anthony in his book *Houses: Permanence and Prefabrication* argues that construction quality was one key factor for this success:

> Although the average floor area of small Swedish houses is less than in England, far more attention is paid to thermal insulation, to double windows and proper heating . . . House equipment, too, such as stoves, cookers, plumbing, built-in cupboards, etc., has been more highly and rationally developed and is better designed than in this country.[19]

The production of high-quality prefabricated wooden houses and furniture occurred mainly in the central and southern regions of Sweden.[20] Many sawmills and housing manufacturers with international reputation were located within these regions. As the global demand for Swedish prefabricated houses grew, the Swedish housing industry established a new entity, the Svensk TrähusExport (STEX), to manage and control orders from foreign countries. In the late 1940s, Swedish prefabricated houses appeared in many countries including the United States, Great Britain, Finland, Saudi Arabia, Kuwait, and Australia.[21] To counter the negative connotations associated with prefabricated houses in some of these countries, where they were seen as second-best and only for temporary use, STEX promoted their acceptance and success in Sweden. For example, in Great Britain in March 1944, *Picture Post* published an article in which the question 'why should English prefabricated houses look like wooden huts while the Swedish ones have the appearance of pleasant homes?'[22] was asked. As Bernard H. Cox writes in his book *Prefabricated Homes*, the story of prefabricated housing in Sweden is indeed 'a simple and happy one'.[23]

Swedish prefabricated houses are quite distinctive. Most twentieth century examples have external walls clad with solid vertical timber boards which are approximately 125 millimetres in width. Living rooms are prioritized in terms of size whereas bedrooms are usually smaller. Each bedroom comes with built-in fittings and closets. Ornamental features almost vanished with an increased emphasis on high-quality fittings and fixtures, which seems to be an influence of the modern movement. More attention was paid to provi-

ding heat insulation to deal with the extreme cold during winter. By 1945, the Swedish prefabrication industry was well recognized internationally for promoting architectural input into the prefabrication process.[24] A significant amount of the design of factory-produced housing within Sweden was carried out by architects.

Driving through the Swedish countryside and walking through the suburbs of Gothenburg, Stockholm, and the town of Åmål on our research trip in 2019, the centrality of timber construction to domestic architecture over many generations is unequivocal. It is no surprise, given the ubiquity of the vernacular language of Swedish timber houses, that when the transition to industrialized prefabrication occurred, this consistency was replicated. Prefabricated houses are no longer produced in Åmål but photos taken inside the ÅSA factory in the 1950s and those we took on our visit to the A-hus factory south of Gothenburg bear remarkable similarities (fig. 1). On the surface, the main difference appears to be the transition from the use of hand tools and manual labour to a hybrid system of manual work and machine production, such as automated nailing. There were, no doubt, many other changes between the 1950s and contemporary production. However, there is still a strong resonance with pre-modern vernacular buildings, particularly in the use of vertical boards as external cladding.

SWEDISH WOOD AND SAUDI OIL

Following the Second World War, there was high demand for Swedish prefabricated houses from both the domestic and international markets. Manufacturers focused heavily on export with the production of special catalogues

Figure 1. Swedish prefab manufacturing process in the past and present. The image on the left was taken in 1951 inside Åmåls Sågverks Aktiebolag, whereas the one on the right was taken in 2019 inside the A-hus Factory.

containing standardized designs to market their houses to international clients.[25] Interestingly, however, a careful examination of the Aramco house designs and the Swedish manufacturers' catalogues revealed that while the houses shipped to Dhahran and other oil camps were clearly based on designs from a catalogue, they were customized according to instructions from Aramco. Differences can be identified when examining the size of the houses, thermal specification, wall thickness, roofs, and the finishing.

By 1948, when the first Swedish houses arrived in Dhahran, Aramco had already imported a number of prefabricated houses and other buildings from America. The first, an air-conditioned two-bedroom prefabricated bunkhouse imported from California, was erected in 1937. It is not entirely clear why Aramco turned to Sweden as a source of housing in addition to their American suppliers. However, with the end of the Second World War in 1945, shipping houses from Europe became safer. Furthermore, it was closer and therefore faster. In addition to this, a contra deal was made with Sweden to deliver houses to clear an oil debt that had been accrued during the war. Bader Biltagi, a native Palestinian who worked for Aramco between 1950 and 1991, stated during an interview conducted by Aramco that the company at that time 'had lots of money . . . [which] they couldn't collect . . . [so] they took the portables in exchange and built us the intermediate camp'.[26]

Of the many manufacturers operating in Sweden in the late 1940s, the Arabian-American Oil Company ordered houses from two different manufacturing companies. These orders were made through the company of Svenska Trähus A.B,[27] which was an agent and marketing organization for ten different Swedish sawmills. Research has revealed that a company connection in the town of Gävle led to awarding some of the oil company's orders to Korsnäs Sågverks A.B located in Gävle city.[28] Korsnäs Sågverks A.B was the producer of more than seventy-five large prefabricated houses for Aramco in 1948. The second company to receive a special order from Saudi Arabia was Åmåls Sågverks Aktiebolag, located in the small town of Åmål.[29] Both companies shipped prefabricated houses to the oil camps between 1948 and 1952. The oil company requests were highly valued and were reported about in many local and international Swedish newspapers.

A review of archival material has revealed that the first documented orders from Sweden occurred in the middle of the 1940s.[30] Following this, in 1948, Aramco signed a 2.5 million Swedish Krona contract with STEX to deliver

approximately fifty portable wooden houses, fifty single-family prefabricated houses, and seven apartment buildings.[31] Each of the portable houses contained at least two to three bedrooms and the family houses or duplexes had two bedrooms, a living room, and a kitchen. The apartment building incorporated seven different dwelling units. It is likely that other types of Swedish prefabricated houses were shipped to Aramco's oil compounds, however to date research has not been able to locate documentation confirming their existence.

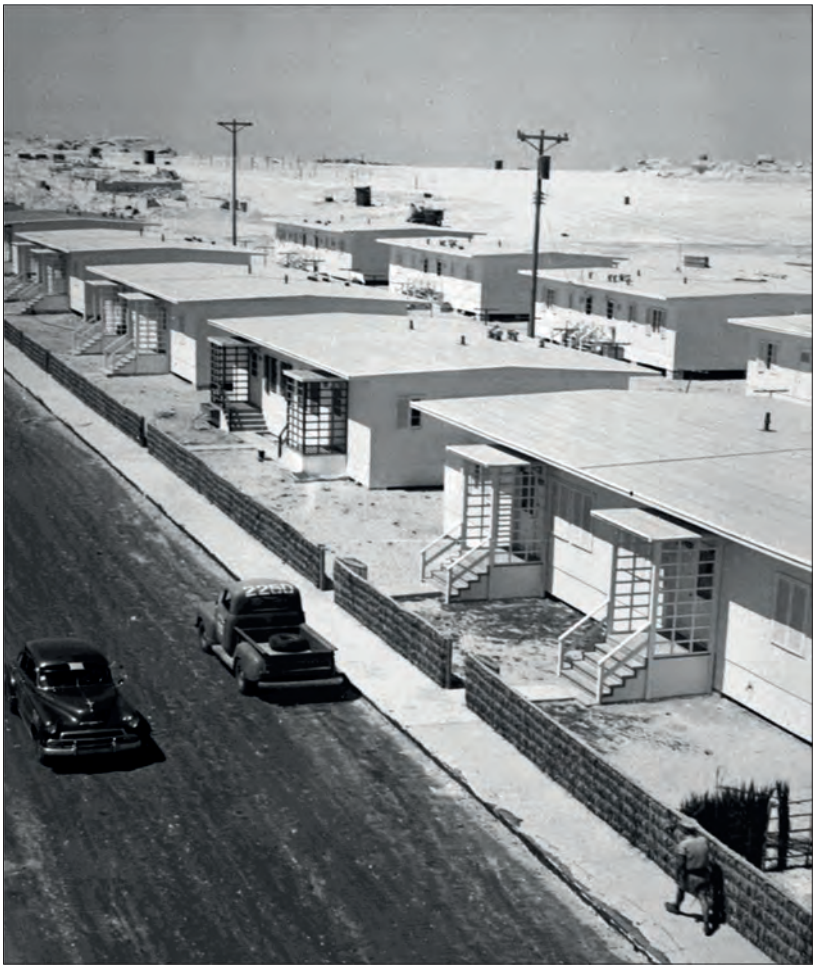


Figure 2. The Swedish duplexes as they appeared in Dhahran camp in the 1950s. Most of these houses were built by Saudi workers. Photographer unknown, Courtesy of Saudi Aramco.

The Swedish duplex located in the Dhahran camp (fig. 2) is an excellent example of the imported Swedish prefabricated timber houses. There were more than 120 duplexes within the oil company's camps. Each dwelling unit size was 9.6 by 9.6 metres, thus the total size of the duplex is 19.2 by 9.6 metres. The houses are well-recognized for their architectural style as being simple and compact in shape. This allowed for a relatively simple relocation and transportation process. Prior to being relocated, the duplexes would be first separated and then eventually moved from one camp or city to another as needed. Once relocated, the houses were rejoined, repaired, and repainted as the transportation process usually caused some minor damage to the houses. Figure 3 shows one of the duplexes being prepared for relocation.

While the houses were customized according to Aramco's instructions, they were still definitely Swedish, built with high-quality Swedish materials, detailing, and architectural features. In terms of form, the houses featured a low-pitched gable roof showing some consideration of the difference between Scandinavian and Arabian weather. However, gabled roofs are not common in Saudi Arabia as the majority of courtyard houses, the most dominated house style in the Middle East, feature flat roofs (fig. 4).

Figure 3. A Swedish duplex being prepared for relocating. Photographer unknown, Courtesy of King Abdulaziz Foundation for Research and Archives (Darah).

The doors and windows were selected from ready-made catalogues and the interior and exterior walls were made from prefabricated wooden panels, all of which were in accordance with Swedish building standards, dimensions, and proportions. In addition, some of the houses feature an entry porch with timber lattice detailing. To highlight how keen Aramco was to provide the

Figure 4. Riyadh city in the 1950s consisted of many flat-roof courtyard houses. Photographer Daniel van der Meulen. Source: Dutch Envoys in Arabia: Photographic Impressions 1880–1950.

Figure 5. Swedish duplex after some modifications. The original external walls were covered in shingles. Photographer unknown, Courtesy of King Abdulaziz Foundation for Research and Archives (Darah).

mainly American workforce with familiar surroundings, after some of the houses were erected and occupied, the exterior walls were reclad with timber shingles imported from the United States (fig. 5).[32]

From 1948 on, prefabricated houses orders from Aramco continued and the number of shipped houses dramatically increased. The houses came from all over Sweden and the number of wooden houses in the oil company camps reached one thousand.[33] Various types of houses were designed and manufactured with many destined for remote camps in the eastern regions of the country. They were shipped to Dhahran, Ras Tanura, Abqaiq, Qaisumah, Turaif, and other newly established Tapline towns.[34] When houses arrived at a camp, construction teams, by now very familiar with the process of erecting these buildings, soon had the footings in place and the prefabricated kit of parts assembled and ready to be occupied. The benefits that followed the construction of prefabricated houses in the camps were enormous. Before 1948, most oil workers, especially those in remote areas, lived in sheds and tents. Bader Biltagi recalls that the company replaced their tents with portable houses that contained 'air-conditioned rooms' and that recreational facilities such as 'a swimming pool, an open theatre, a recreation centre, a library and a decent cafeteria' using prefabricated timber buildings were also built.[35] This represented a big improvement in living conditions, especially for low-and middle-income earners.

While one of the modern movement's utopian dreams for prefabricated and factory-made housing was to reduce the reliance of on-site skilled labour, in reality, the assembly and erection of these buildings is a job that requires a high level of skill and training. Aramco did not engage a foreign, skilled workforce for this but instead, from the mid-1930s on, employed a relatively small number of foreign building professionals to train Saudi tradesmen. Training programs included instruction in carpentry, plumbing, and sheet metal work. The first Californian prefabricated houses were built during 1936 and 1937 in Dhahran camp. Photographs of the construction site from 1936 show that Saudis did participate in this project (fig. 6). By the time the Swedish houses and building team arrived in 1948, the Saudi workforce was already skilled in erecting the prefabricated, timber-framed houses that had come from the west coast of America. What was new to them in relation to the Swedish houses was the significantly higher level of prefabrication and the challenge to complete the construction within the world average time. After many attempts and more training, the Saudi team was able to assemble the

houses within the world average time overcoming many obstacles in terms of culture, knowledge, and boundaries. In March 1952, the Saudi team was able to assemble one of the Swedish prefabricated duplexes in less than 5,300 man-hours whereas the world average at that time was 5,000 man-hours.[36]

Aramco established many carpentry shops to deal with the increasing number of wooden houses within the oil company camps. In 1960, Dhahran camp's carpentry crew ranged from between 100 to 115 men in the shop and on-site.[37] The carpentry foreman at that time, Hillal bin Ali, was a Saudi as were all the rest of his crew. Their tasks included repairing and making windows, doors, cabinets, and book shelves for houses within the camp (figs. 7 and 8). They were also responsible for all residential maintenance and repair requests such as wall insulation, roofing, and floor surfacing. In 1960, the team was hired to add an extra bedroom to existent two-bedroom wooden houses in Dhahran camp. To qualify for a carpentry job within Aramco required a high level of knowledge and skills. This meant undertaking a long apprenticeship and work experience. One of the Saudi carpenters explains his journey by stating that 'first [he] worked as an office boy, then as a timekeeper; then [he] became a gang-pusher (labour foreman); in 1941 [he] started as a carpenter's helper; then served as head carpenter up to August 1948'.[38] Afterwards he moved to a contracting business where he was responsible for the completion of a

Figure 6. Saudi workers participating in a Californian timber frame construction in Dhahran camp in 1936. Photographer unknown, Courtesy of Special Research Collection, UC Santa Barbara Library, Saudi Arabia Oil Photograph collection, Bernath Mss 366.

number of construction projects. The carpentry skills of the Saudis were much appreciated at that time. However, Saudi wealth and new education opportunities meant that these skills were not passed on to the following generation. Nowadays, most of these types of projects are outsourced and carried out by foreign workers mostly from Pakistan, India, and other Arab regions.

A recent visit to Aramco's Dhahran camp revealed that some of the Swedish houses, erected almost seventy years ago, are still occupied and in relatively good condition. However, the use of some of the houses has been changed to other work-related uses in response to the availability of other alternative houses built in recent years. Surviving all these years could be related to the fact that maintenance requests are managed by highly trained Aramco personnel. Additionally, preventive repairs, regular check-ups, and inspections conducted by the housing team could be another important factor for this achievement. In comparison, other concrete housing projects around the country have not survived due to the lack of appropriate repairs and maintenance.

Figure 7. Saudi carpenters constructing a timber frame house model in an effort to fully understand its construction techniques and specifications. Photographer unknown, Courtesy of Saudi Aramco.

SWEDISH PREFABRICATED WOODEN HOUSES: THE AUSTRALIAN CONNECTION

While studying the Swedish prefabs in Saudi Arabia, it has become clear that there is a significant Australian element to the story. In the early 1950s, at the same time Aramco was importing Swedish houses into its oil camps, the Australian government began importing them into Australia in an effort to alleviate an acute post-war housing shortage.[39] In 1950, Åmåls Sågverks Aktiebolag (ÅSA) received two large international orders. The first was from Aramco, in order to provide housing for its expanding oil workforce, and the second was made by the Australian government. Åmåls Sågverks Aktiebolag was able to manufacture the houses and ship them to both Saudi Arabia and Australia in the early 1950s. In both cases, the houses were customized. The Saudi houses were modified by American experts working for the oil company and the Australian house designs were modified by architects employed by the Australian Federal government in Canberra.

Both the Australian and the Saudi Swedish prefab houses consist of two to three bedrooms. The living room is located to the right of the entrance in both cases. The Australian houses' size is between 13.7 metres in length, 6.9 metres in width, and 2.7 metres in height, whereas the Saudis' houses are between 12.2 metres in length, 9.6 metres in width, and approximately 3 metres in height. As the examination revealed, both house designs were

Figure 8. Saudi carpenters making tables, doors, and windows at Dhahran's carpentry shop. Photographer unknown, Courtesy of Saudi Aramco.

based on a module of 1.2 metres with the layout organized around a central corridor running along the length of the house. The construction and thermal insulation techniques are similar in both the Saudi and Australian examples. Exterior walls were made of vertical timber panels known in Sweden as *Småbloc* construction.

Australia ordered 2,000 prefabricated houses from Åmåls, Mo & Domsjö, and Svenska Trähus sawmills in March 1950 during a tour by the Commonwealth delegation to Great Britain and Scandinavia.[40] During this tour, the Australian members of the delegation examined a number of prefabricated houses in several European countries. After touring factories within Europe and England, the mission concluded that prefabricated houses from Scandinavian countries were the best within the examined region in terms of quality. This aligns with the British conclusion mentioned above and seems to be the basis of the decision by the Australian government to place the order.

The number of houses shipped to Saudi Arabia exceeded 200. All of these houses were erected within Aramco's camps in eastern Saudi Arabia. Like the Australian government, Aramco sent some of its experts to Sweden. Bjorn Bjornson, an Aramco employee who worked in Saudi Arabia, returned from Sweden in June 1948 after checking the first housing shipments.[41] The Australians were concerned about the required manpower to assemble the houses. Therefore their selections of manufacturers were related to the company's ability to both supply and assemble the houses in Australia. Interestingly, in 1951 a large group of Europeans with trade skills immigrated to Australia, the same year the houses were delivered. The group migration process was simplified as their help was needed in assembling the 3,050 imported prefabricated houses the government had ordered from various European countries.[42] Once they finished the project, a large number of the group remained and settled in Australia. In contrast, Swedish prefabricated houses in Saudi Arabia were built by many local people trained specifically for such projects.

These two different forms of cultural and technological exchange and understanding had a quite different impact on architecture and construction practices within both countries. The philosopher of technology, Don Ihde, states that 'the adaptation of a transferred technology—at least at first—depends on its being able to fit into an extant praxis. But even when it is adapted, the context of significations may differ quite radically relative to the sedimented

type of praxis in the recipient culture.'[43] In Australia, with its strong connections to Europe, the Swedish houses fitted quite neatly into its existing building practices and into Australian culture more generally. For many, these houses would have been both familiar but also an improvement in quality, representing a European approach to detailing and other design elements. In Australia at that time, many young architects were encouraged to tour Britain and Europe. The Australian architect Alan Graham Hamilton for example, returned from his trip in 1951 after visiting the US, Britain, and Sweden. He reported that within these countries 'any type of prefabricated house can be built, but it must be simple in shape. Americans favour the flat roof, but Britain and Sweden have got away from that'.[44] He extends his enthusiasm about using imported industrialization techniques within architecture by suggesting that '[Australians could] get workmen from England, Sweden, Germany, or elsewhere, to come and do the fabricating in Australia'.[45]

In contrast to the Australian experience and despite the fact that there is a traditional precedent for framed lightweight domestic buildings in Saudi Arabia called *barastis*, the walls of which are constructed using reedy wooden stick uprights through which palm leaves are woven, Swedish and American lightweight construction techniques and associated residential forms never migrated out of the gated compounds. Saudis viewed them with suspicion which may be partly because although *barastis* were common in the early twentieth century, they were associated with subsistence living and rejected as second-best once concrete and masonry buildings started to appear. On the other hand, imported masonry construction techniques and materials such as concrete blocks were accepted and used within a short time as the main alternative to traditional mudbrick. The shift to concrete block, in-situ concrete, and later precast concrete panels fitted very well into the Saudi 'sedimented . . . praxis' of constructing heavyweight buildings made from local mudbrick and stone.

In regard to the Swedish houses' current heritage value, Saudis and Australians approached this quite differently. As the houses did not stem from traditional Saudi residential architecture or its construction practices, they were never valued by Saudi people, even though they were occupied by Saudi oil workers at various times. For example, many of the houses were used to accommodate workers of the Trans-Arabian Pipeline, which was closed in 1967. Afterwards they were relocated to settlements along the pipeline and thus became accessible to native Saudis and Bedouins around

the country. Despite this visibility, Saudis never constructed their own houses using lightweight timber prefabrication techniques. Generally, the Swedish houses in Saudi Arabia have always been owned and maintained by the oil company and they are yet to be considered as national heritage buildings. In contrast, the Swedish prefabricated timber houses we discovered in Sydney that were imported into Australia in 1951 to house military personnel, despite falling into disrepair over many years and being earmarked for demolition, were eventually saved and restored. These houses were manufactured by Åmåls Sågverks Aktiebolag and were erected in the now prestigious Sydney suburb of Georges Heights. Following a heritage study conducted in 2003 that correctly identified their Swedish origins, they were saved from demolition and restored by the Australian government. They are now long-term rental properties.

CONSTRUCTION MATERIALS AND AFFORDABLE HOUSING IN SAUDI ARABIA

Historically, the use of imported lightweight construction materials within the Saudi context faced many challenges. Saudi oil workers resisted the use of imported timber as a construction material when building their own camps within the oil fields, preferring to adhere to their own traditional building practices. Solon T. Kimball in his journal article *American Culture in Saudi Arabia* describes the camp's houses as being 'constructed of every conceivable kind of scrap material with a scattering of more traditional palm-leaf native *barastis*, and an occasional substantial building of concrete block. These settlements represent the attempt by Arabs to establish a type of community life with which they are familiar.'[46] The appearance of such a camp was not appreciated by the Saudi government and Aramco and this was at least partly the reason why the Saudi Workers Home Ownership Program was launched in 1951.

This program allowed many Saudi Aramco workers to build their own houses with financial assistance from both the government and the oil company. The houses they built followed the American oil company guidelines and safety standards. With the limited availability of Saudi architectural and construction knowledge and expertise at that time, the houses were designed and built mainly by the oil company's architects and builders. Most of the houses were built in international and modern styles. For the first time outside of the oil compounds, Saudis witnessed the use of imported construction materials, such as Portland cement and concrete, to construct their houses. In fact,

all building and construction materials, except for sand, were imported.[47] Cement came from different areas such as Europe, England, and the United States; steel came from England and The United States; wooden rafters (*chundal*) were cut on the African coast (west of Madagascar); and bamboo withes or purlins, which are placed over the *chundal*, came from Iraq and India; flush toilets were brought from Lebanon, India, and Kuwait.

The Saudi government, Aramco, and the Saudi workers all appreciated the houses that were built through the Home Ownership Program and within a few years, this style of imported masonry residential architecture became the norm in the eastern region. However, while the first houses built for individual workers and their families were well-accepted and liked, when they were later mass-produced, through national housing programs, concerns about their suitability arose and as a result, a large number of the houses were not occupied for some time. The increase in migration to urban areas between the 1960s and 1980s created a severe housing shortage and, as mentioned earlier, large scale housing projects were introduced to alleviate this shortage. The first major governmental affordable housing project using prefabrication techniques was initiated in the 1970s by foreign companies in several cities across Saudi Arabia. The villas that were built introduced new architectural concepts as well as spatial arrangements and the houses were constructed using precast concrete panels. This was the first use of this construction technique in an affordable housing project. The houses with the novel construction technique and material were highly criticized by Saudis. The houses' limited social acceptance was related to the new construction characteristics and their monotonous appearance. The project also featured many new architecture and construction elements that Saudis were not familiar with, such as the use of precast panels and slabs.[48] As a result, some of the houses were empty for several years before being occupied by US military personnel and refugees during the First Gulf War, and when the war ended by Saudi citizens who were in desperate need of housing.

Within the Saudi government's most recent affordable housing initiative introduced in 2017, the use of alternative and innovative construction materials and techniques has been encouraged. However, it is noticeable that even with the success of the Swedish and American prefabricated wooden houses within Aramco's camps, timber has not been considered as an option for affordable housing projects. A review of recently proposed materials shows that the use of timber was minimized in preference to the use of materials

perceived to be more durable, such as steel and lightweight concrete which were found to be the most culturally accepted materials. There are still concerns about timber as a construction material and it is not considered suitable due to the scarcity of the material in Saudi Arabia and other concerns such as acoustic and thermal insulation. Jon Boon argues in his essay 'Legislative Grounds and Housing Policy as Determinants of Dwelling Form and Residential Pattern in Saudi Arabia', in which he explores the impact of legislation and policy on house forms and residential patterns in Saudi Arabia, that no matter how complex, cost effective, fast, and innovative the introduced housing project will be within the Saudi context, related social and cultural factors will play a crucial and sensitive role in the acceptance of the introduced housing solutions.[49] Thus materials used for the construction of affordable houses—wood, steel, or precast concrete—are significant when it comes to social acceptance of the completed houses. As in the past, this will likely be a determining factor in the success of the current housing initiative with its emphasis on the introduction of new industrialized construction techniques. These factors have led to some of the Saudi's public houses having been unoccupied for more than forty-five years.[50]

CONCLUSION

The story of Swedish prefabricated timber houses in Saudi Arabia is significant in terms of their role in the development of the oil industry. The Swedish prefabrication industry was very popular and productive in the middle of the twentieth century. Once the value of these houses was recognized by the Arabian-American Oil Company, they started to be imported and first appeared in Saudi Arabia in 1948. While being familiar with the construction of prefabricated houses from their previous experiences with houses from California, the Swedish prefabs presented a challenge for the Saudi carpenters due to their higher level of prefabrication and European quality materials, detailing, fittings, and fixtures. With training and practice, the Saudi carpentry team was able to construct Swedish prefab duplexes in near world average record. With the increased wealth and education in Saudi Arabia, following the discovery of oil, perceptions about manual work changed. This led to trade skills not being transferred to the next generation. Nowadays, most carpentry and steel work jobs are carried out by foreign workers from different countries.

While Swedish prefabricated houses were considered successful examples in alleviating housing shortages in many different countries such as Great Britain and Australia, their presence in the Saudi oil camps did not translate more

widely into the modern Saudi urban environment. This could be linked to resistance caused by the perception that timber is a temporary and second-class material and to the scarcity of timber in the region as well as the availability of other masonry alternatives. From the beginning, Saudi public housing projects were built using concrete and steel as the main construction materials. While the recently proposed housing scheme encourages the use of new technologies and imported lightweight materials, wood has not been considered.

This article has been developed as a part of ongoing PhD research that aims to theorize and historically contextualize the Saudi government's current initiative to build more than one million affordable houses by 2030 using industrialized construction methods and lightweight construction materials. Materials and construction technique seem to be the focus for the current housing plan with limited emphasis on the importance of architectural values and cross-cultural technological exchanges.

NOTES

[1] Mashary Al-Naim, 'Identity in Transitional Context: Open-Ended Local Architecture in Saudi Arabia', *International Journal of Architecture Research* 2 (2008), p. 125.

[2] Geoffrey King, *The Traditional Architecture of Saudi Arabia* (London: I.B. Tauris, 1998).

[3] The Rush Housing Campaign was the first major housing project in Saudi Arabia. The campaign includes more than 14,000 units located in major Saudi cities.

[4] The prototype house was built in 2018 in Riyadh city by the CyBe firm based on the Netherlands.

[5] St. John, 'Construction Report', *Sun & Flare*, 30 May 1948.

[6] Nathan Citino, Suburbia and Modernisation: Community Building and America's Post-World War II Encounter with the Arab Middle East', *Arab Studies Journal* 13, no. 2 and 14, no. 1 (2006), pp. 39–64.

[7] St. John, 'Construction Report', *Sun & Flare*, 7 July 1948, p. 3.

[8] Wallace Stegner, *Discovery!: The Search for Arabian Oil* (Beirut: Middle East Export Press, 1971).

[9] Colin Davies, *The Prefabricated Home* (London: Reaktion Books, 2005), p. 157.

[10] Sven Thelandersson et al., 'New Timber Construction in Nordic Countries', keynote speakers at the World Conference on Timber Engineering, 2004.

[11] Waern Rasmus, 'Scandinavia: Prefabrication as a Model of Society', in *Home Delivery: Fabricating the Modern Dwelling*, edited by Barry Bergdoll and Peter Christensen (Basel et al.: Birkhäuser, 2008).

[12] Peter Gössel et al., *100: One Hundred Houses for One Hundred European Architects of the Twentieth Century* (Cologne and London: Taschen, 2004), p. 262.

[13] Rasmus, 'Scandinavia: Prefabrication as a Model of Society', p. 27.

[14] Ibid.

[15] Annaliese Carolina Mirus et al., 'Prefabrication: New Zealand's Golden Ticket?', in *Engaging Architectural Science: Meeting the Challenges of Higher Density*, edited by Priyadarsini Rajagopalan and Mary Myla Andamon, Proceedings of the 52nd International Conference of the Architectural Science Association (Melbourne: The Architectural Science Association and RIMT University, 2018), pp. 417–23.

[16] Rasmus, 'Scandinavia: Prefabrication as a Model of Society', p. 27.

[17] Renee Mathieu, 'The Prefabricated Housing Industries in The United States, Sweden and Japan', *Construction Review* 33 (1987), p. 2+.

[18] Rasmus, 'Scandinavia: Prefabrication as a Model of Society', p. 28.

[19] Hugh Anthony, *Houses: Permanence and Prefabrication* (London: Pleiades, 1945).

[20] Ingrid Persson, 'Prefabricated Wooden Houses in The Swedish Welfare State', conference paper, Universität Siegen, 2015.

[21] Swedish prefabricated houses were shipped to the UK in 1944, Saudi Arabia in 1948, and Australia in 1950.

[22] *Picture Post*, 18 March 1944, p. 3.

[23] Bernard Cox, *Prefabricated Homes* (London: Paul Elek, 1945), p. 22.

[24] Ibid., p. 32.

[25] Most manufacturers had more than two housing catalogues. Some of these catalogues were specifically for exportation purposes.

[26] Scott McMurray, *Energy to the World: The Story of Saudi Aramco* (Houston: Aramco Services Company, 2011), p. 194.

[27] *Dagens Nyheter*, 14 May 1948, p. 6.

[28] *Dagens Nyheter*, 23 October 1948, p. 12.

[29] *Dagens Nyheter*, 6 April 1950, p. 14.

[30] 'Looking Back: Roses in the Desert', *Alaela Family* 3 (Spring–Summer 2011).

[31] *Dagens Nyheter*, 14 May 1948, p. 6.

[32] The cladding was placed after the erection of the houses. It appears to have been imported from America.

[33] 'The Carpenters of Dhahran', *Aramco World*, January 1960.

[34] Many of Aramco's expats have unforgettable memories about the houses transportation during the 1940s and 1950s.

[35] McMurray, *Energy to the World: The Story of Saudi Aramco*, p. 194.

[36] *Sun & Flare*, 19 March 1952, p. 5.

[37] 'The Carpenters of Dhahran', *Aramco World*, January 1960.

[38] Carleton S. Coon, 'Operation Bultiste: Promoting Industrial Development in Saudi Arabia', in *Hands Across Frontiers*, edited by Howard M. Teaf Jr. and Peter G. Franck (Ithaca: Cornell University Press, 1955), p. 332.

[39] *Dagens Nyheter*, 6 April 1950, p. 14.

[40] *Dagens Nyheter*, 21 March 1950, p. 16.

[41] St. John, 'Construction Report', *Sun & Flare*, 7 July 1948.

[42] *Queensland Times*, 26 April 1951, p. 5.

[43] Don Ihde, *Technology and the Lifeworld: From Garden to Earth* (Bloomington and Indianapolis: Indiana University Press, 1991), p. 127.

[44] H. J. Summers, 'Pre-fabrication Homes is Normal Practice Overseas –Why Not Here?', *The Courier-Mail*, 15 March 1951, p. 2.

[45] Ibid.

[46] Solon T. Kimball, 'American Culture in Saudi Arabia', *The New York Academy of Sciences* 18 (1956), p. 472.

[47] Coon, 'Operation Bultiste: Promoting Industrial Development in Saudi Arabia', p. 343.

[48] Raeyd Aldakheel, 'Residents' Satisfaction with Public Housing: The Case of Buraidah Public Housing Development in Saudi Arabia', PhD Thesis, University of Michigan, 1995, p. 83.

[49] Jon Boon, 'Legislative Grounds and Housing Policy as Determinants of Dwelling Form and Residential Pattern in Saudi Arabia', in *Housing: The Impact of Economy and Technology*, edited by Oktay Ural and Robert Krapfenbauer (New York: Pergamon Press, 1981).

[50] Hundreds of housing units within the Mecca Public Housing Project, which was built in the 1980s, are still vacant and uncompleted.

TYPICAL FALLACIES REGARDING POTENTIALLY VACATING PROTECTED BUILDINGS

Mari Oline Giske Stendebakken and Nils O. E. Olsson

ABSTRACT

A significant number of institutions in Norway are moving out of protected buildings—key architectural works—into new buildings, while the historical buildings thus become derelict. This can be seen in ten buildings in Oslo alone, including the Ministry of Foreign Affairs, the National Gallery, and the Munch Museum. Several factors lead to the vacating of such structures; one of them is a prejudice against older buildings in the documents that provide the basis for politicians' decisions. This article lists typical examples of such prejudice as found in Norwegian public documents that lay the groundwork for decisions regarding protected buildings. When an institution has needs that are not being met by its existing premises and wishes to change this situation, it must typically choose between rehabilitating the current premises for continued use or moving into a new build. For larger building projects in Norway, the decision is made by the government, and quality assurance (QA)1-documents provide a basis for the government's decision. This article is based on an examination of QA1-documentation. The QA1-documentation that was examined demonstrates a lack of appreciation for architectural and historical qualities, which are qualities that can be protected under the Norwegian Cultural Heritage Act. The findings reveal that consultants fail to include all the necessary information in QA1-documentation when they rely on fallacies regarding protected buildings in such documentation—documentation that serves as a basis for the government's choice of concepts. Regrettably, such fallacies occur frequently throughout society. The findings in this article should be useful for future QA1-documentation and decisions regarding protected buildings, and for everyone working in the cultural heritage field.

KEYWORDS

Architectural quality, cultural heritage, quality assurance (QA), economic analysis

INTRODUCTION

Norway has seen a series of protected buildings be vacated in the past decade. Several of the affected buildings are recognized national monuments, but there are nonetheless few plans for their future use. The significance of historic buildings is widely recognized[1] by national legislation[2] and the adoption of international charters such as the Venice Charter[3] and the Nara Document on Authenticity[4] by ICOMOS[5] in Norway, and Norwegian authorities are thus obligated to safeguard protected buildings. Since most protected buildings are best preserved by being used, not only a minimum of maintenance, but also adaptation to new uses should be expected for protected buildings that have been vacated. Transforming and activating of a series of protected public buildings simultaneously will come with significant costs, according to estimates. Norwegian authorities have put themselves in this challenging situation through persistently deciding that institutions should vacate their historical buildings in favour of new buildings. Reactivating these protected buildings is likely to come with a significant price tag. Before an alternative is chosen, cultural heritage sites are currently required to undergo economic quality assurance analysis by public authorities as stipulated in the

Figure 1. The Viking Ship Museum, one of the buildings discussed in the documentation examined. Courtesy the museum; photographer unknown.

Norwegian QA-scheme, with the aim of preventing unexpected costs. The costs incurred by institutions' vacating existing buildings have, however, generally not been emphasized in the economic analysis. The challenge is thus a question of both method and professional knowledge: to be useful, economic analysis as a tool must be capable of evaluating a cultural heritage site's inherent value, and the consultants performing the economic analysis must understand the qualities and usability of the cultural heritage site. Although there are methods to translate non-monetary value into monetary value, such as the Contingent Value Method (CVM),[6] which is based on surveys, these methods have problematic aspects, one of them being a lack of professional assessment, since the surveys are aimed towards the general public and their evaluation of a given site. Such methods are mainly designed to define experienced value, not potential value. The focus of this article is thus on understanding the qualities and usability of cultural heritage sites when vacating them or remaining in them is being evaluated. The findings identify fallacies found in the economic analyses of larger public building projects and the handling of protected buildings.

The empirical data for this research comes from the Norwegian Quality Assurance scheme, which covers most large, public, on-shore investments. The Norwegian Ministry of Finance has required mandatory quality assurance and uncertainty analysis for large public investment projects under this scheme since 2000. This requirement came as a response to cost overruns and unstructured decision processes for large investments. In this context, 'large' refers to investments with a budget over 90 million euros (1 billion NOK), which are typically connected with infrastructure, defence, and larger building projects for key public institutions. The QA-scheme provides a basis for politicians' investment decisions. It includes two key decision points, of which we have focused on the first, which addresses the choice of concept for a proposed investment. Two sets of documentation are produced as preparation for this decision point, KVU and QA1. A KVU ('Konseptvalgutredning' in Norwegian, or concept evaluation) is prepared by the ministry or agency responsible for proposing an investment. In the KVU, different alternative concepts are evaluated in comparison with each other, including a 'zero alternative'—doing as little as possible. For public buildings, alternative concepts include various levels of reuse and refurbishing, new buildings, or a combination of these options. A KVU-report is typically compiled or commissioned in-house by the agency or ministry responsible. The KVU-documentation is then subjected to quality assurance, QA1, performed by pre-qualified

external consultants. The consultants have framework agreements with the Ministry of Finance. They assess the technical quality of the KVU-documentation and produce a report, referred to as QA1. The KVU and the QA1 form the basis for a decision on the governmental level, where the project can be rejected, or a concept chosen and the agency or ministry thus asked to continue with preparations for the investment.[7] Since the concern of this article is fallacies in connection with protected buildings, we have limited the study to projects related to buildings that are protected under the Cultural Heritage Act in the existing situation.[8]

We wish to emphasize that although these fallacies are illustrated using examples from existing QA1-documentation, they are not limited to the QA-scheme.[9] On the contrary, the same or comparable fallacies surface in a number of debates regarding protected buildings. However, since QA1-documentation is highly formalized, these documents present an opportunity to discuss and improve the practice. Our intention is not necessarily to devalue the conclusions drawn. Fallacies in the initial KVU-report can be addressed in the QA1-report, and recommendations can be adjusted. The fallacies noted do, however, seem to be part of a larger structural problem that we wish to remedy, and the examples serve to illustrate this.

In this article, we will present concrete examples of such fallacies and explain why we deem them to be incorrect. There are several typical reasons for choosing a new building over renovating the old one: the belief that a new building will have a lower environmental impact than the existing building, or the possibility that the protected building (such as the National Gallery) can be sold to the highest bidder, thus bringing in revenue and doing away with any connections with the public. It has also been proposed that older buildings have dramatically inefficient indoor climates, which is characterized as a massive, unsolvable problem. Finally, there are claims that historical buildings of significant age have a short expected life span when compared with new buildings. Some of the documentation blames cultural heritage authorities for blocking the continued use of buildings, but documented dialogue with the aforementioned authorities is generally lacking.

As mentioned in the abstract, the Norwegian Cultural Heritage Act emphasizes architectural and historical qualities. Because these qualities are treated equally as causes for juridical protection under the Cultural Heritage Act, we will also consider both qualities in this article. The QA1-documentation and

Norwegian legislation that were studied were originally written in Norwegian, and all quotes have been translated into English by the authors for the purpose of this article.

ON ECONOMICS APPLIED TO ARCHITECTURE AND CULTURAL HERITAGE

The QA-scheme can be regarded as a part of a planning system. Such planning systems are related to, and inspired by, a number of scientific disciplines, including political science, public administration, and economics. Peters and Pierre[10] found two dominant approaches in public administration research: theoretical analyses of public institutions and empirical studies. This study is a contribution to the latter type of research, but viewed from the perspective of architectural and cultural heritage.

Christensen[11] analysed the Norwegian Quality Assurance Scheme based on organization and decision-making theory. According to Christensen, an economic-rational perspective can explain the technical planning ideal on which the system is based.

Figure 2. The Museum of Contemporary Art, one of the buildings discussed in the documentation examined. Courtesy the museum; photographer unknown.

Christensen also found that the QA-scheme incorporates features from both New Public Management (NPM) and post-NPM. The approach to planning and the use of external consultants is inspired by NPM thinking. However, the ambition of QA1, which is about increasing political control of the early phase of public investment, draws on post-NPM.

This study addresses how cultural heritage values and architectural quality are considered in decision-making documents that focus on economic analyses. This is a different approach compared with previous work on the QA-scheme, which has typically been done from a rational decision-making point of view, often based on project management or socio-economic perspectives (both of which share many similarities). When studying cultural heritage buildings, however, a more interdisciplinary approach is desirable.[12]

The documents studied can be regarded as examples of interdisciplinary analysis. Interdisciplinary projects are often dissimilar in both approach and complexity from projects in more homogenous fields. Öberg claims that interdisciplinary projects can be challenging due to cultural as well as epistemological dissimilarities. In contrast to interdisciplinary projects, the understanding of quality is less of a major issue in more homogenous projects involving just one professional field. As there are often dissimilarities between professional fields, the ability to make sound decisions regarding quality decreases as interdisciplinary complexity increases.[13] Stendebakken, Grytli, & Olsson show that the professional fields of economics and cultural heritage have cultural dissimilarities with respect to the language they use, the theories to which they refer, and the methods they apply, even though there are scholars who also show that the two traditions do not have to be in conflict with each other.[14] Stendebakken, Grytli, and Olsson nevertheless illustrate that the dissimilarities between economics and cultural heritage can be significantly related to the respective notions of value in different professional fields. Architecture and cultural heritage are also two professional fields that can have dissimilar notions of value, but Stendebakken[15] shows that these dissimilarities are typically of a lesser magnitude compared to the dissimilarities that are documented between architecture or cultural heritage and economic analysis.

Value is a concept that has different meanings in different contexts.[16] In connection with willingness to pay, for instance, economics make use of two approaches to value: either as a revealed preference based on actual

economic transactions, or as stated a preface based on what people say that they would have been willing to pay for something.[17] Both approaches are challenging to apply to the value of architectural quality or cultural heritage, because they are typically part of a larger whole and rarely an entity that is sold alone; it is thus difficult to place a market value on them. There are, however, approaches to calculating the monetary price of an aspect of an entity, for example, architectural quality or cultural heritage as an aspect of sold properties, using statistical analysis.[18]

The cost-benefit methodology used in economics is an established method for assessing public investments.[19] However, people not directly involved in such analyses can experience them as relatively inaccessible 'black boxes'. The results are consequently often questioned.[20] There are also non-valued costs and benefits related to an investment; this means that a complete economic analysis consists of both quantified and non-quantified issues.[21]

Non-quantified issues can be summarized with a qualitative judgement of the expected effects. The impact can be illustrated using a scale ranging from strongly negative to strongly positive. It is recommended that there should be a limited number of effects and that they should not overlap.[22]

Economic analyses commissioned by cultural heritage authorities have been applied to quantify the value of cultural heritage in Norway.[23] This adoption of economic analysis in the field of cultural heritage can be seen as a consequence of the demand for quantifiable measures. Nevertheless, this adoption of method simply adds to the reasons why it is interesting to examine how such analysis handles the value of architectural quality and cultural heritage.

METHOD

This research has been conducted by researchers with backgrounds in both architecture and investment theory, respectively with thorough knowledge of cultural heritage and economic analysis of public investments. The method used in this research is document analysis. We have collected and examined QA1-documentation for all QA1-projects dealing with protected buildings that was available at the time the data was collected. As shown in Table 1, this consists of nine investment projects, but each potential investment may include several protected buildings and their surroundings, one or a few major buildings, or a combination. There is already a research program dedicated to research on the Norwegian QA-scheme. The research program's

database stores the QA-documentation and associated documents compiled and has provided important information for this research.[24] The dataset consists of all KVU/QA1-reports on building projects in the database, with buildings protected as cultural heritage in the existing situation listed in the table below. The protected buildings are listed along with the year they were erected. It should be noted that the Norwegian constitution dates from 1814, and that the country gained independence in 1905.

The documentation collected has been examined for judgements regarding potentially vacated protected buildings qualities, values, and potential. The validity of these assessments has been discussed, and conclusions that might be disputed and categorized as fallacies are discussed in this article. According to the Norwegian Cultural Heritage Act, there is a strong connection between juridical protection and architectural quality, since the Cultural Heritage Act includes historical and architectural qualities as grounds for juridical protection.[25]

Findings

Searching through the QA1-documents brought to light a series of unfounded fallacies connected with economic analyses' evaluations of protected buildings and their potential for use. To shed light on this shortcoming and to avoid further misunderstandings, this article will address a selection of such fallacies, with pertinent examples. By referring to existing knowledge and research, we will show that these fallacies are either overtly simplified or outright wrong. The statements we address need not be indisputably wrong, since answers to difficult questions can consist of a broad array of nuances. Such nuances may be overlooked if a field is evaluated by non-specialists and if the various professional groups involved do not share a common professional language.[26] The complete list of fallacies is quite long and to cover all of them here would be impossible. Our intention is hence to question the validity of relying on such fallacies in making decisions.

In the following, we discuss the fallacies found in the documentation. They are listed in tables according to their respective subchapters, where the fallacies observed in connection with potentially vacating protected buildings are coded into main groups based on concurrent themes.

Lack of Regard for Cultural Heritage Values

We repeatedly see that the protection of cultural heritage is not emphasized

under normative needs, where QA1-documentation is supposed to consider laws relevant to the project at hand.[27] This is, for example, the case with the Campus for the Norwegian University of Science and Technology (NTNU) project[28], where the focus was on normative needs connected with the University's mandate. [29] The Cultural Heritage Act seems to be overlooked more easily than other laws, regulations, and political guidelines, such as

Table 1. Dataset: QA1-reports regarding building projects with buildings protected as cultural heritage in the existing situation (with year built).

Project	**Buildings in the existing situation with juridical protection as cultural heritage**
National Museum	National Gallery (1882) The Museum of Decorative Arts and Design (1904) The Museum of Contemporary Art (previously the Central Bank of Norway's second building) (1906) The National Museum—Architecture (previously the Central Bank of Norway's original building) (1828), with the Ulltveit-Moe Pavilion by the Pritzker Architecture Prize laureate Sverre Fehn (2007)
Norwegian School of Veterinary Science	Ten buildings at Campus Adamstuen (1929–). The college also owned the adjacent farm Lindern, with buildings from ca. 1820 to 1950.
Museum of Cultural History	The Viking Ship Museum (1926–54) The Historical Museum (1902)
New Government Quarters	Thirteen buildings and one outdoor area, including two buildings with Picasso murals. The Government Quarters (1906–) include older buildings originally built for other purposes, dating back to the eighteenth century.
Future location of the NTNU Campus	Nine buildings and two outdoor areas (1914–).
National Theatre	The National Theatre (1899) The Torshov Theatre (1928) The outdoor area known as 'Studenterlunden': this area was a historic garden turned park, surrounding and pre-dating the National Theatre. The area has been rebuilt several times.
The National Stage	The theatre building (1909) with surrounding park from the same year, situated on protected ground from the medieval period.
Tullinløkka Area	The National Gallery (1882) St. Olavsgate 32 (1879), formerly the Norwegian Mapping Authority and Oslo National Academy of the Arts, including an outdoor area with the obelisk that used to be Norway's standard datum plane. The University of Oslo has two buildings in the area: Frederiks gate 2 (1902) (the Historical Museum) and Frederiks gate 3 (1875).
New Courthouse in Bergen	The existing town courthouse (1933), situated on protected ground from the medieval period.

requirements for energy efficiencies in buildings. As the Cultural Heritage Act itself states, this should not be the case:

> § 1 (...)
> When, according to another law, decisions are made that affect the cultural heritage resources, emphasis shall be placed on the purpose of this act.[30]

The quote above means that if there are conflicting interests between the Cultural Heritage Act and other laws, the Cultural Heritage Act is to be prioritized: the Cultural Heritage Act can pull rank. Nonetheless, the legal protection of cultural heritage is repeatedly challenged or problematized, as can be seen in the KVU-report for the Tullinløkka area project:

> All options that are investigated involve extensive protection of historical buildings and outdoor areas. This protection has a very high alternative cost because the uses are limited. For example, a development of the entire site Akademihagen into hotels, residences, or commercial buildings with a larger building height could provide significant financial gains for the state and very attractive and environmentally friendly buildings with a large capacity near a public transport hub. The costs associated with protection are only made visible to a limited extent in this investigation.[31]

While QA1-documentation has addressed other value-based legal conditions, including accessibility and equality, sadly, cultural heritage is not always shown the same regard.

Part in the difficulty of discussing the value of cultural heritage is the paucity of and/or need for quantifiable measures. The cultural heritage field is based on qualitative understanding and argumentation, a multi-faceted understanding of value, and the selection of trusted experts to determine which cultural heritage is worthy of legal protection. There are various approaches to enhancing cross-disciplinary dialogue, including boundary tools—such as architectural models—which are objects that can support dialogue and understanding. However, there is currently no functioning converter to translate multi-faceted qualitative evaluations[32] from the cultural heritage field into a quantified value tailored to economic analyses.[33] The pressure to identify quantifiable measures of the value of cultural heritage not only leaves experts dumbfounded. It simultaneously demonstrates a lack of regard for the

prevailing legal protections, which is based on thorough professional evaluations. For example, the priced benefits for the Museum of Cultural History project that were ultimately quantified were merely the revenues from sales of tickets and the museum shop and/or cafe, totalling 50 and ≤14 NOK (5.5 and 1.5 euros) respectively, per visitor.[34] The value of the museum's main tasks and created value, namely preservation, research, and teaching, cannot be priced (within reasonable means). A lack of recognition of the value of cultural heritage might therefore be due to an inability to see and process such values. In the QA1-documentation, we have at times seen the protection of cultural heritage discussed without any parallel discussion of the true cultural heritage.[35] Legal protection is discussed, but without mention of the significant historic and architectural qualities of the protected buildings. The juridical protection of cultural heritage is thus disconnected from cultural heritage values and hence risks being reduced to a mere juridical obstacle. Consequently, complying with the Cultural Heritage Act might be reduced to drearily following the law instead of the important task of protecting cultural heritage values as an important public good.

This can be seen in the case of the Bergen District Courthouse, a distinctive stone building nicknamed 'Gotham city' due to its neo-Gothic details.[36] The KVU-report claims that new buildings are cheaper and better suited to the functions of the court—a clear adherence to the style functionalism and its motto 'form follows function'.[37] The documentation claims that the only factor (if any) that might justify higher costs and 'worse functional solutions' is the legal protection. This protection is referred to as an isolated phenomenon: as a juridical condition. The building it protects is not referred to, and the building's history, architectural qualities, and ties to the institution of the court and to Bergen itself are not even acknowledged. It is extremely challenging for the legal protection to justify both higher costs and a lower building quality resulting from them. Historical buildings can have qualities that are rarely found in new builds, such as craftsmanship, traditional materials, historical architectural styles, and layers of symbolism. The existing Bergen District Courthouse is an example of such rare qualities.[38] In Table 2, we note that in some of the QA1-documentation examined, cultural heritage authorities are treated as case workers and not specialists. In the QA1-documentation for the New National Museum, the Cultural Heritage Directorate's connection to the project is described as follows:

> Positive influence: prompt and constructive processing of zoning and building plans. Negative influence: can set requirements that complicate a good building solution (Norwegian phrase: god bygningsløsning).[39]

The role of the Cultural Heritage Directorate is that of an adviser, not of a hired consultant or designer: representatives of the Directorate are supposed to process applications for alterations to protected buildings and should thus—for unbiased judgement—not create the proposals. One of the country's strongest and most valuable sources of specialist skills with respect to cultural heritage is nevertheless clearly ignored, and the positive contribution to such important projects that is expected from the Directorate is reduced to moving paper swiftly from one pile to another. As shown in the quote above, there was a fear in the New National Museum project that the Cultural Heritage Directorate would set unworkable requirements for the protected buildings—and this was not an isolated case. The Cultural Heritage Directorate insists that use is the best basis for preservation for the majority of protected buildings in Norway today.[40] For the Bergen District Courthouse, the KVU-report stressed that legal protection hindered an 'optimal' solution.[41] At the same time, the consultants who compiled the QA1-report found no evidence of dialogue with cultural heritage authorities in the KVU-report.[42] Subsequently, through such dialogue, the legal protections' limits of tolerance for alterations were tested, and alterations enabling further use of the building as a courthouse were proposed.[43] Table 2 shows the main issues discussed above a summary.

A Lack of Understanding of Historical Buildings

We also found fallacies connected to a lack of understanding of the historical buildings themselves. A typical challenge for consultants with a background in economic analysis when working with historical buildings is that they have no specialist knowledge regarding such buildings and hence no expertise on the matter they are evaluating. In the KVU-documentation for the National Theatre, for instance, claims were made that a new build (larger addition) would be much more environmentally friendly than a smaller project resulting in continued use of the existing building.[44] This fallacy is a common error: as the consultants compiling the QA1-report expressed, building more area, even if the new build is environmentally friendly in its design, will still be less environmentally friendly than managing with the buildings we already have.[45]

It is also often claimed that older buildings are ineffective in terms of area. In the KVU-report for the Bergen District Courthouse, several thousand square metres (19,300 versus 16,600) were added to the program for the continued use of the existing courthouse in comparison with a new building, hence representing a major cost driver in the calculations.[46] This was apparently done without actually calculating the efficiency of the building plan, even though such calculations can be done relatively quickly based on floor plans.

For several of the projects examined, indoor climate in older buildings was framed as a large and intractable problem. This applies to both the National Museum[47] and the Bergen District Courthouse. [48] In 2010, the Bergen District Courthouse underwent a condition analysis by the firm of Dr.techn. Kristoffer Apeland AS. The esteemed firm found the building to be in quite good shape. In 2015, the firm OPAK conducted another analysis of the building and found it to be almost unusable.[49] Continued use for the next five years would require an investment of 6 million NOK (650,000 euros), but for use beyond five years, an investment of a staggering 975 million NOK (106 million euros) was deemed necessary.[50]

The monetary value of historical buildings is calculated in a number of ways. If the QA1-documentation recommends selling the historical building, [51] it can typically be assigned a significant monetary value. [52] To avoid distorting calculations and due to the maintenance backlog, the monetary value of historical buildings is, however, sometimes set at 0 NOK.[53] While the motivation to assign zero as the value is understandable from an econo-

Table 2. Observed fallacies regarding a lack of regard for cultural heritage values.

Main theme	**Fallacy**
Lack of regard for cultural heritage values	Cultural heritage protection is not included under normative needs.
	The core concept of the protection of cultural heritage is questioned.
	Cultural heritage values are put under pressure as particularly unquantifiable.
	Architectural and historical qualities, identity, and tradition are ignored.
	Cultural heritage authorities are treated as caseworkers, not specialists.
	The critical level of alterations that can be made to a protected building is not based on contact with cultural heritage authorities, but rather on the consultants' gut feelings.

mic viewpoint, it is nonetheless surprising to see well known, historically important, and centrally located real estate of high architectural quality and outstanding craftsmanship evaluated as worthless, as was the case with the Historical Museum, a key example of European Art Nouveau in Norway:

> Item 2, Sites: 'Fredriksgate (sic) 2 and 3 are freed. The areas are enclosed with requirements for protection and can be difficult to sell in the market. Substantial rehabilitation investments are also required before the building can be used for new purposes. The value of the Museum of Cultural History's premises at Tullinløkka is therefore set at NOK 0 million.[54]

Table 3 shows the main issues discussed above.

A Lack of Understanding of Buildability

The reports examined show a lack of understanding of how structures come to exist and function, and how they can be altered in an expedient manner. This particularly applies to the alluring concept of building large, invisible, underground areas connected with historical buildings, as seen in

Figure 3. The Museum of Cultural History, one of the buildings discussed in the documentation examined. Courtesy the museum; photographer unknown.

the KVU-report for the National Theatre.[55] One significant proposal was to build large underground areas directly connected to, and in the immediate vicinity of, buildings with historical masonry on Norway's parade street, Karl Johans gate. These areas would be built on clay, near the harbour, in an area with heavy traffic at almost all hours of the day. If truly seriously considered, this construction ought to be discussed in more detail, rather than simply being classified as 'dangerous' and with a 'risk of high costs'.[56] The Tullinløkka project also identified underground construction as the most feasible from a building technology point of view.[57] This surprising judgement cannot be characterized as evident and should thus have been backed by convincing argumentation for it to have any chance of being accepted. The main issues discussed above are shown in Table 4.

Assessments Intended for New Construction Do Not Work for Older Buildings

Historical buildings face additional challenges when it comes to expected life span. The assessments used for them are intended for new builds with an expected life span of a few decades. This short expected lifespan does not

Table 3. Observed fallacies: lack of understanding of historical buildings.

Main theme	Fallacy
A lack of understanding of historical buildings	New buildings are perceived as being more environmentally friendly than existing buildings.
	Older buildings are deemed dramatically ineffective in terms of area.
	Indoor climate in older buildings is characterized as a large and intractable problem.
	The monetary value of existing protected buildings is determined to be zero.

Table 4. Observed fallacies: lacking understanding of buildability.

Main theme	Fallacy
A lack of understanding of buildability	A lack in understanding of how structures come to exist and function, and how these can be altered in an expedient manner.
	Building large areas below ground level in connection with protected buildings is complex, but nevertheless repeatedly recommended.

pair well with buildings that are already much older and are supposed to be preserved for future generations. Conveniently, the expenses of a new build will be spread out over a few decades, which corresponds with the lifespan of the building and the expected time period before major investments in maintenance become necessary. Historical buildings, however, are often already much older than this expected life span, sometimes by several hundred years. Since they are intended to be preserved for future generations, the argument could be made that the cost could be spread out over a longer time period. But this is not the conventional approach, despite requirements that an economic analysis should contain all relevant elements in the life span of a given action and that the life span should reflect the time period in which that action will be in use or in public service. If this is not possible, the residual value should be calculated.[58]

Protected buildings have a residual value beyond that of the expected life span of a new build, but this value is typically not included in economic analyses today. It is often the opposite: new builds are assigned a higher residual value. For the Bergen District Court, the consultants found that historical buildings should have a lower residual value, since they are older.[59] For the Norwegian School of Veterinary Science, NVH, residual value was only considered and calculated for new buildings.[60] In the QA1-documentation examined, there is often a sliding transition between a building's life span and the life span of investments made in the building. This seems to arise from reasoning that it costs more or less the same to demolish and build anew as to rehabilitate after a few decades, because the cost of a renovation outweighs the residual value of the building. This makes little sense for protected buildings. Regardless, a building's life span and the life span of investments made in the building should be treated separately. Even if it is necessary to rehabilitate a historical building again after forty years, this is not the same as the historical building

Table 5. Observed fallacies: the methods tend to favour newer buildings.

Main theme	**Fallacy**
The assessments are intended for new builds with an expected life span of a few decades.	Protected buildings are not granted residual value when compared with the expected life span of a new build.
	The difference between a building's life span and the life span of investments made in the building is unclear or conflated.
	The possibility that the value of cultural heritage may increase over the coming decades is typically not considered.

then being worthless. It is actually the opposite, as the value of cultural heritage can increase over time and older buildings can often be more durable than new builds.[61] Unfortunately, this is not always recognized. Table 5 shows the main issues discussed above as a summary.

Unintended Results of Complex Political Processes

QA1-analyses are done in connection with political processes, and both the documentation itself and the related subjects can be affected by political decisions. This is seen when the historical buildings of public institutions become too small—not because the established institution is expanding, but because several institutions are being merged, typically to obtain scale economies. This was the case for the Bergen District Courthouse, which, before such a merger,[62] had large empty areas, according to OPAK.[63] When buildings are deemed too small because the institutions are growing larger in the pursuit of efficiency, the connections between established institutions and their traditional buildings are sometimes ignored. For the theatre in Bergen, Den Nationale Scene, this connection was recognized:

> Cultural heritage protection as a whole must include two inseparable parts, namely the building as well as the inherent theatre activity.[64]

Ignoring connections between institutions and their historical buildings can undermine the political feasibility of a measure, as seen in the case of the National Gallery[65] building and the new Government Quarters project. [66] Political feasibility was commented on in the Tullinløkka project—with respect to both costs and public ties to the historical buildings.[67]

For the New National Museum, political decisions were slighted, with unclear reasoning:

> In the beginning of 2006, Metier completed the alternative analysis for a development project for the National Museum of Art, Architecture and Design. At the time, there were political provisions for the National Museum's main base to be at Tullinløkka. In 2008, however, the municipality of Oslo sold so-called Field D on the Vestbanen site back to the state. This means that there is enough area for the state to consider gathering all of the National Museum's activities in a new building at Vestbanen. Such a location is therefore examined in this report in the same manner as the other options in Tullinløkka in the KS 1 material for the National Museum's development project from 1 February 2006.[68]

The reasoning above is not logical, and there must be more behind this change in scope than a new plot of land becoming available in the capital. Table 6 is a summary of the main issues that are discussed in relation to unintended results of complex political processes.

Different Understandings of the Importance of Certain Issues

There seems to be disagreement on the respective importance of various issues. The institutions involved in producing a KVU-report thus highlight issues that the consultants then downplay in the QA1-documentation. This was the case for the National Theatre project, where the external consultants compiling the QA1-report pointed out that the social significance of several effects had been overrated.[69] Unquantifiable effects are a part of economic analyses.[70] For an effect to be rated at the extremes of the scale, higher scores initially need to be given to both significance and scope.[71] Table 7 highlights the main issue here.

Problematic and Incongruent Demarcation of Projects Costs

If an institution vacates an existing, protected building and moves into a new building, society will have an additional building to take care of. This additional cost should be included in the economic analysis. This is seldom the case, as is seen in both QA1-documentation[72] and research.[73] The reason that costs for vacated buildings are not taken into consideration is that the scope is limited to the project's meeting the needs of the institution. This makes sense from a project management viewpoint, but not for the state, which might end up paying for two buildings instead of one. While the costs for vacated buildings are not considered, expected income from the sale of the same buildings are quite often included, as was the case with the Bergen District Courthouse. The QA1-report noted that plans for measures to be conducted before the courthouse was vacated were lacking, and also that the estimated sales price was unrealistic, with respect to both the estimated price and the social value that the building's cultural heritage represents.[74] It has been repeatedly claimed that protected buildings can be managed without restrictions, as in the case of the Museum of Cultural History project. Regarding the Art Nouveau building of the Historical Museum, the QA1-report states:

> The state is free to use the premises as they see fit if it is vacated, including sale.[75]

Juridical protection is, however, intended to safeguard cultural heritage values, before as well as after a sale. The buildings in this study are well known public buildings and selling them might be both ill-advised for a number of reasons as well as politically impossible. It might be ill-advised because the state would have less control of key cultural heritage, lose the possibility to utilize a building of outstanding quality, and take away public access to important cultural heritage. It might be politically impossible due to resistance from a range of stakeholders.

Possible sales of buildings can generate large sums in an economic analysis, and thus also affect the recommendations that are made based on the analysis. For the new Government Quarters, the proposed sale of real estate for 3 billion NOK (329 million euros) significantly affected the calculations of project costs and played a large part in the alternative analysis.[76] It is problematic to rate the sale of attractive real estate as a gain, since real estate is often considered a stable or lower risk investment. Having money in attractive real estate is comparable to having money in the bank, and selling real estate is more a matter of financing an investment than actually creating value. For the same reasons, a state-owned site that is required for a new build should not be considered as being available at no cost, as was initially claimed for the New National Museum project:

Table 6. Observed fallacies: unintended results

Main theme	**Fallacy**
Unintended results of complex political processes	The buildings are deemed too small because the institutions are growing larger in pursuit of efficiency.
	The connections between established institutions and their traditional buildings are ignored.
	Political decisions are disregarded based on informal political signals.
	Political feasibility is overestimated.

Table 7. Observed fallacies: misjudging impact.

Main theme	**Fallacy**
Different understandings of the importance of certain issues, meaning that smaller concerns can have major impact	Biased weighting of significance.

> Overview of the total investment costs (nominal values). . . The state already owns the sites on Tullinløkka and A2 on Vestbanen. The market price for these sites is therefore not included.[77]

Owners of protected buildings are obliged to maintain them. Sadly, this responsibility is often neglected, resulting in a maintenance backlog that accumulates over years. This maintenance backlog should be addressed separately from the project costs, since the maintenance should have been done regardless and should have been paid for using earlier budgets. Conflating these different costs makes it harder to realize the continued use of protected historical buildings. Table 8 shows the main issues that are discussed above as a summary.

Evaluations Can Appear Biased and Possibly Tailored to a Preferred Result

Differences in opinion arose in the case of both the Norwegian School of Veterinary Science[78] and the Future Location of Campus NTNU projects, although this was not evident in the QA1-documentation.[79] But especially when an institution is considering a decision as serious as vacating its historical buildings, it is necessary to ensure that all views are represented.

Historical buildings with a documented cultural heritage value are likely to have flaws, but when describing them, one must be sure to also describe the rather obvious advantages. The National Gallery building was described very differently in the New National Museum project and the Tullinløkka project, and, in retrospect, it is interesting that the former project chose a new build alternative, thus vacating the National Gallery building, while the latter project aims to find new use for the National Gallery building. This seems to have affected their evaluations of the National Gallery building. According to the QA-scheme's purpose of real political control of decisions, a genuine and unbiased analysis should be the objective. Table 9 summarizes the main issues related to biased evaluation.

Concluding Discussion

In the quality assurance of building projects connected with protected buildings, it is vital to understand the qualities and usability of the cultural heritage sites. This research has uncovered a blindspot in the performance of economic analyses within the QA-scheme, since adaptive reuse generally comes with a significant price tag, and the QA-scheme ostensibly aims to include all the relevant effects of a given alternative or measure. We have

listed what we perceive to be typical fallacies regarding the future of protected buildings. We have also argued that these assertions are disputable and that presenting them as factual is thus detrimental.

The objective of this article is to improve the discussion of the value of cultural heritage in economic analyses and in general; its aim is not to attack the QA-scheme. It is important that major government investments undergo quality assurance. It is also necessary to have a system that ensures political control over larger public investments. At the same time, the decisions that are made based on QA1-documentation affect protected buildings that are sites of significant cultural heritage with broad roots in society.

This article has shown fallacies in KVU-documentation and the QA1-report compiled by external consultants. As implied in the literature reviewed, interdisciplinary analyses are difficult. It is nonetheless our opinion that QA1-reports do improve the objectivity and quality of the information given to politicians, compared with KVU-reports. However, the totality of the issues in QA1-documentation with respect to protected buildings that are highlighted in this article indicate a poor assessment of cultural heritage buildings and their potential. Each of the fallacies above has the potential to affect the management of important historical buildings based on insufficient grounds. A clear communication of this lack may improve the future management of protected buildings, and not only in connection with the key projects that are included in the QA-scheme.

Table 8. Observed fallacies: problematic and incongruent demarcation of projects costs.

Main theme	**Fallacy**
Problematic and incongruent demarcation of projects costs	Costs related to protected buildings are typically not considered.
	Claims that protected buildings that have been vacated can be sold.
	Claims that protected buildings that have been vacated can be sold at market price.
	The sale of a cultural heritage building can reduce the costs of a new building.
	State-owned real estate is mislabelled as 'cost-free' for public building projects.
	A lag in maintenance is erroneously included in project costs calculations.

The QA-scheme is currently used solely for larger public investments, but the methodology also trickles down to the administrative system, and versions of the QA-scheme are now being used for other public investments. Our examination of QA-documentation has shown that institutions tend to overrate the significance of some effects and minimize the importance of others.

The fallacies described are not limited to larger public building projects and can also be found in the discussion of other protected and historical buildings. QA1-documentation serves as a verifiable source of information regarding these fallacies, but QA1-documentation is not the only place they can be found. Regrettably, such fallacies occur frequently throughout society. The findings in this article should be useful to everyone working in the cultural heritage field who desires a knowledge-based management of our most important historical buildings. Evaluating architectural quality and cultural heritage means assessing not only what value a given building has today, but also the potential future value of the building. This includes revealing and realizing qualities and values that are currently under-communicated or even unknown, and hence highlights the importance of involving all relevant professional fields.

This article has focused on typical fallacies connected with protected buildings that may potentially be vacated, and illustrated such fallacies with examples from the QA1-documentation examined. Consequently, all the QA1-documentation selected was treated alike, which might seem unfair to documentation in which a true awareness is shown for the real challenges that protected buildings that have been vacated face—such as in the Tullinløkka project. We have refrained from doling out gold stars and lumps of coal, as our objective is an improved practice in connection with future projects. At the same time, we would like to point out that there are some signs of an increased awareness of the potential and value of protected buildings in more recent reports.

Table 9. Observed fallacies: evaluations can appear biased.

Main theme	**Fallacy**
Evaluations can appear biased and possibly tailored to a preferred result.	Internal dissension amongst key stakeholders is ignored.
	Evaluations can appear biased.
	The weaknesses of older buildings are emphasized without the positive qualities being commented on, as should be done for a genuinely balanced evaluation.

Other measures have also been implemented, such as instructions that protected buildings should be kept in use. This was done both for the National Theatre and the National Stage in Bergen. However, assuming continued use does not do away with the need for a thorough understanding of protected buildings. Quite the contrary: genuinely understanding the usability, vulnerability, and value of protected buildings is instrumental for continued use in compliance with the buildings' inherent cultural heritage value.

This article demonstrates how easily the QA1-documentation can be used against an existing protected building and, based on unfounded assertions, make continued use almost impossible to defend. This vulnerability in the evaluation of QA-schemes must be addressed for the sake of treasured pieces of the country's architectural heritage, and so that hidden costs arising from ill-advised decisions can be prevented.

We acknowledge that problematic results can emerge from the best motives. The goal of this article is to strengthen the understanding of protected buildings, a hitherto overlooked and important subject in QA1-documentation, and thus strengthen the decisions that are made based on these documents. It is understandable that the government desires economic analysis of larger public investments, but it is rather surprising that it has not also demanded an architectural assessment of larger public investments that are de facto building projects. Safeguarding cultural heritage is part of the normative needs in QA1-documentation dealing with protected buildings: society's most valuable cultural heritage is protected by law, because architectural and historic heritage is an important basis for our culture and thus our society. Information that is provided about protected buildings should thus be correct and of high quality so that it gives decision makers a genuine basis for reaching decisions. This article is based on interdisciplinary research due to the complexity of public decision making. We hope that this type of interdisciplinary research can add new perspectives in architectural research. Interdisciplinary research has the potential to create broader understanding and bring in new perspectives in an increasingly complex society.

ACKNOWLEDGEMENTS

This work was supported by the Concept Research Programme at the Norwegian University of Science and Technology.

NOTES

[1] Lovdata, The Cultural Heritage Act: 'Lov Om Kulturminner [Kulturminneloven]—Lovdata', Lovdata.no (2018), https://lovdata.no/dokument/NL/lov/1978-06-09-50?q=kulturminnelov (all URLs accessed in April 2021).

[2] Lovdata, The Plan and Building Act: 'Lov Om Planlegging Og Byggesaksbehandling (Plan- Og Bygningsloven)—Lovdata', Lovdata.no (2018), https://lovdata.no/dokument/NL/lov/2008-06-27-71?q=plan%20og%20bygning.

[3] 'International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964), IInd International Congress of Architects and Technicians of Historic Monuments, Venice, 1964', ICOMOS (2019), https://www.icomos.org/charters/venice_e.pdf.

[4] 'The Nara Document on Authenticity (1994)', ICOMOS (2019), https://www.icomos.org/charters/nara-e.pdf.

[5] ICOMOS, 'Charters and Other Doctrinal Texts—International Council on Monuments and Sites', ICOMOS.Org (2019), https://www.icomos.org/en/charters-and-other-doctrinal-texts.

[6] Marta de la Torre, *Assessing The Values of Cultural Heritage* (Los Angeles: Getty Conservation Institute, 2002).

[7] Concept, 'QA Scheme—Concept—NTNU', Ntnu.edu (2019), https://www.ntnu.edu/concept/qa-scheme.

[8] Mari Stendebakken, *Den glemte kostnaden når staten bygger nytt—Concept Arbeidsrapport 2018-2* (Trondheim, 2018).

[9] Mari Stendebakken, 'Er eldre bygninger uten vern uten verdi?', in Gro Lauvland and Elisabeth Aasen, *Må Ruseløkka skole rives?* (Trondheim: 07 Media, 2017), pp. 50–57.

[10] B. Guy Peters and Jon Pierre, 'Two Roads to Nowhere: Appraising 30 Years of Public Administration Research', *Governance: An International Journal of Policy, Administration, and Institutions* 30, no. 1 (2017), pp. 11–16.

[11] Tom Christensen, 'The Norwegian Front-End Governance Regime of Major Public Projects: A Theoretically Based Analysis', *Concept Rapport* 23 (2009).

[12] Mari Stendebakken, Eir Grytli, and Nils Olsson, 'Proposed Aspects for Evaluation of the Value of Spaces in Historic Buildings', *Procedia Economics and Finance* 21 (2015), pp. 23–31, https://doi.org/10.1016/s2212-5671(15)00146-x.

[13] Gunilla Öberg, 'Facilitating Interdisciplinary Work: Using Quality Assessment to Create Common Ground', *Higher Education* 57, no. 4 (2008), pp. 405–15, https://doi.org/10.1007/s10734-008-9147-z.

[14] David Throsby, 'Cultural Capital and Sustainability Concepts in the Economics of Cultural Heritage', in de la Torre, *Assessing the Values of Cultural Heritage*, pp. 101–17.

[15] Mari Stendebakken, *Cultural Heritage and Analysis-Assessment of Built Cultural Heritage within Cultural Heritage Protection, Architecture and Public Investment Analysis* (Original title: *Kulturminner og analyse: Vurdering av vernede bygninger innenfor kulturminnevern, arkitektur og offentlig investeringsanalyse*), PhD thesis, Norwegian University of Science and Technology, 2019.

[16] Mathea Sagdahl, 'Verditeori', *Store Norske Leksikon* (2014), https://snl.no/verditeori.

[17] Mari Stendebakken, 'Kulturarvens samfunnsøkonomiske verdi', *Arkitektur N* 3 (2018), pp. 48–55.

[18] Finansdepartementet, *NOU Norges offentlige utredninger 2012:16 Samfunnsøkonomiske analyser* (Oslo: Departementenes servicesenter Informasjonsforvaltning, 2012), https://www.regjeringen.no/contentassets/5fce956d51364811b8547eebdbcde52c/no/pdfs/nou201220120016000dddpdfs.pdf.

[19] Nils O. E. Olsson, Andreas Økland, and Siri B. Halvorsen, 'Consequences of Differences in Cost-Benefit Methodology in Railway Infrastructure Appraisal: A Comparison between Selected Countries', *Transport Policy* 22 (2012), pp. 29–35.

[20] Vincent Kaufmann, Christophe Jemelin, Géraldine Pflieger, and Luca Pattaroni, 'Socio-Political Analysis of French Transport Policies: The State of the Practices', *Transport Policy* 15, no. 1 (2008), pp. 12–22.

[21] Lóri Tavasszy, Wouter Jonkhoff, Arnaud Burgess, Menno Rustenburg, and Alistair Hunt, *Key Issues in the Development of Harmonised Guidelines for Project Assessment and Transport Costing* (Delft: HEATCO Deliverable D3, 2005).

[22] Concept (2019), 'Konseptvalg og detaljeringsgrad Versjon 1.0', draft, dated May 24, 2010, https://www.ntnu.no/documents/1261860271/1263838555/Veileder%20nr%2011%20Konseptvalg%20og%20detaljering.pdf.

[23] Caroline Wang Gierløff, Kristin Magnussen, Lars Stemland Eide, Endre Kildal Iversen, Karin Ibenholt, Siri Voll Dombu, Ståle Navrud, and Jon Strand, 'Rapport Verdien Av Kulturarv En Samfunnsøkonomisk Anayse Med Utgangspunkt I Kulturminner Og Kulturmiljøer', *Menon-Publikasjon* 72 (2017), https://www.menon.no/wp-content/uploads/2017-72-Verdien-av-kulturarv-1.pdf.

[24] 'Concept's Role: NTNU', Ntnu.edu (2019), https://www.ntnu.edu/web/concept/concept-s-role.

[25] Lovdata, 'Lov Om Kulturminner [Kulturminneloven]—Lovdata'.

[26] Gunilla Öberg, 'Facilitating Interdisciplinary Work: Using Quality Assessment to Create Common Ground', *Higher Education* 57, no. 4 (2008), pp. 405–15.

[27] Finansdepartementet, 'Utarbeidelse Av KVU/KL Dokumenter' (2010), p. 4, https://www.ntnu.no/documents/1261860271/1263838555/Veileder%20nr%209%20Utarbeidelse%20av%20KVU%20dokumenter.pdf..

[28] Kunnskapsdepartementet utført av Rambøll, *KVU Framtidig Lokalisering Av Campus NTNU Konseptvalgutredning* (Trondheim, 2014), pp. 38–43.

[29] Kunnskapsdepartementet og Finansdepartementet, utført av Metier og Møreforsking Molde, *Kvalitetssikring Av Konseptvalg, Framtidig Lokalisering Av Campus NTNU* (Trondheim, 2015), pp. 12–14.

[30] Lovdata, 'Lov Om Kulturminner [Kulturminneloven]—Lovdata'.

[31] Oslo Economics, Snøhetta og Atkins, *Alternativanalyse for Konseptvalgutredning Tullinløkka Utarbeidet for Statsbygg* (2016), p. 64.

[32] Kari Hovin Kjølle and Siri Hunnes Blakstad, 'Architects and End Users: Boundary Objects in Participatory Briefing and Design', *Nordic Journal Of Architectural Research* 1 (2014), pp. 35–64.

[33] Mari Stendebakken, 'Kulturarvens samfunnsøkonomiske verdi', pp. 48–55.

[34] Metier AS og Møreforsking Molde AS, *Kvalitetssikring Fase 1 (KS1—Konseptvalg) Av Kulturhistorisk Museum Rapport Til Finansdepartementet Og Kunnskapsdepartementet* (2009), pp. 70 and 90.

[35] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, *Konseptvalgutredning For Fremtidig Rettsbygning I Bergen* (Oslo, 2016), pp. 7, 92, and 96.

[36] Statsbygg, 'Historikk—Statsbygg.No', Statsbygg.no (2019), https://www.statsbygg.no/Prosjekter-og-eiendommer/Byggeprosjekter/Bergen-tinghus/Historikk/.

[37] Arne Gunnarsjaa, 'Funksjonalisme', *Arkitekturleksikon* (1999), pp. 268–70.

[38] Riksantikvaren, *Forskrift Om Fredning Av Statens Kulturhistoriske Eiendommer Kapittel 10 Fredete Eiendommer I Landsverneplanen For Justissektoren Vedlegg 13 Bergen Tinghus* (2014).

[39] Kultur og kirkedepartementet i samarbeid med Nasjonalmuseet for kunst, arkitektur og design, Statsbygg og Entra Eiendom AS med utgangspunkt i en mal, laget av Metier AS, *Nasjonalmuseet For Kunst, Arkitektur Og Design Utbyggingsprosjekt Plan For Investering Og Drift Konseptvalgfasen Revidert Utgave 2* (2006), p. 47.

[40] Riksantikvaren, *Rapport. Kulturminner i bruk- verdi, vekst og vern*. 2011.

[41] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, *Konseptvalgutredning For Fremtidig Rettsbygning I Bergen*, p. 6.

[42] Holte Consulting, SNF, A-2 og Proba har på oppdrag fra Justis- og beredskapsdepartementet og Finansdepartementet, *Kvalitetssikringsrapport Ks1 Av Fremtidig Rettsbygning I Bergen Utarbeidet For Finansdepartementet Og Justis- Og Beredskapsdepartementet* (2017), p. 5.

[43] Riksantikvaren, 'Bergen Tinghus—Ny Revisjon Av Fredningsomfang—Bergen Kommune—Varsel Om Ytterligere Endring Av Forskrift Om Fredning—Høringsbrev', Bergen.Kommune.no (2019), https://www.bergen.kommune.no/politikere-utvalg/api/fil/1374753/Horing-Bergen-tinghus-Ny-revisjon-av-fredningsomfang-Endring-av-forskrift-om-fredning.

[44] *Konseptvalgutredning For Utvikling Av Nationaltheatret* (2014), p. 87.

[45] Metier og Møreforsking Molde, *Kvalitetssikring Fase 1 (KS1—Konseptvalg)*, p. 59.

[46] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, *Konseptvalgutredning For Fremtidig Rettsbygning I Bergen*, pp. 5–6, 67, 77–78, and 95–96.

[47] Kultur og kirkedepartementet i samarbeid med Nasjonalmuseet for kunst, arkitektur og design, Statsbygg og Entra Eiendom AS Med utgangspunkt i en mal laget av Metier AS, *Nasjonalmuseet For Kunst*, pp. 34–36.

[48] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, *Konseptvalgutredning For Fremtidig Rettsbygning I Bergen* (Oslo, 2016), p. 2.

[49] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, p. 23.

[50] Ibid., p. 81.

[51] Metier AS, OPAK AS og LPO arkitekter AS for Fornyings-, administrasjons- og kirkedepartementet, *Konseptvalgutredning For Fremtidig Regjeringskvartal* (2019), p. 116.

[52] Mari Stendebakken, 'Fraflyttingens pris', *Arkitektur N* 4 (2019), pp. 70–79.

[53] Metier AS og Møreforsking Molde AS, *Kvalitetssikring Fase 1 (KS1—Konseptvalg)*, p. 85.

[54] Ibid.

[55] *Konseptvalgutredning For Utvikling Av Nationaltheatret* (2014), p. 64.

[56] Ibid., p. 9.

[57] Oslo Economics, Snøhetta og Atkins, *Alternativanalyse For Konseptvalgutredning Tullinløkka Utarbeidet For Statsbygg*, p. 60.

[58] Finansdepartementet, *NOU Norges Offentlige Utredninger 2012:16 Samfunnsøkonomiske Analyser*, p. 13.

[59] Holte Consulting, SNF, A-2 og Proba har på oppdrag fra Justis- og beredskapsdepartementet og Finansdepartementet, *Kvalitetssikringsrapport Ks1 Av Fremtidig Rettsbygning I Bergen Utarbeidet for Finansdepartementet Og Justis- Og Beredskapsdepartementet*, p. 62.

[60] Dovre International AS Transportøkonomisk institutt for Kunnskapsdepartementet Finansdepartementet, *Norges Veterinærhøgskole Kvalitetssikring Av Konseptvalg (KS 1)* (2012), p. 1.

[61] Mari Stendebakken, 'Er eldre bygninger uten vern uten verdi?', pp. 50–57.

[62] Statsbygg, Metier AS, OPAK AS og Dark arkitekter 2, *Konseptvalgutredning For Fremtidig Rettsbygning I Bergen* (Oslo, 2016), p. 3.

[63] Opak for Statsbygg, *Tilstandsregistrering Bergen Tinghus* (2015), p. 3.

[64] Holte Consulting, SNF og A-2 på oppdrag fra Kulturdepartementet og Finansdepartementet, *Kvalitetssikringsrapport Ks1 Den Nationale Scene Utarbeidet for Kulturdepartementet Og Finansdepartementet*, p. 71.

[65] Andreas Slettholm, 'Oslo Blir De Fraflyttedes Praktbyggs By', *Aftenposten* (2017), https://www.aftenposten.no/meninger/kommentar/i/5XOqm/Oslo-blir-de-fraflyttede-praktbyggs-by--Andreas-Slettholm.

[66] Adresseavisen, 'Riksantikvaren Vil Kjempe For Høyblokka' (2013).

[67] Oslo Economics, Snøhetta og Atkins, *Alternativanalyse For Konseptvalgutredning Tullinløkka Utarbeidet For*, p. 60.

[68] Metier for Kulturdepartementet, *Utbyggingsprosjektet Til Nasjonalmuseet For Kunst, Arkitektur Og Design—Alternativanalyse Oppdatering 2008 Rapport Til Kulturdepartementet* (2008), p. 7.

[69] Metier og Møreforsking Molde, *Kvalitetssikring Fase 1 (KS1—Konseptvalg) Av Utvikling Av Nationaltheatret Rapport Til Kulturdepartementet Og Finansdepartementet* (2015), p. 59.

[70] Det kongelige forsvarsdepartement, 'Veileder Til Konseptfasen—Samfunnsøkonomisk Analyse For Investeringsprosjekter I Forsvarssektoren', Forsvaret.no (2015), p. 27, https://forsvaret.no/prinsix/ForsvaretDocuments/Veiledere/Veileder%20KL%20og%20S%C3%98A.pdf.

[71] Metier og Møreforsking Molde, *Kvalitetssikring Fase 1 (KS1—Konseptvalg)*, p. 59.

[72] Holte Consulting, SNF, A-2 og Proba på oppdrag fra Justis- og beredskapsdepartementet og Finansdepartementet, *Kvalitetssikringsrapport Ks1 Av Fremtidig Rettsbygning I Bergen Utarbeidet for Finansdepartementet Og Justis- Og Beredskapsdepartementet*, p. 42.

[73] Mari Stendebakken, *Den glemte kostnaden når staten bygger nytt*.

[74] Holte Consulting, SNF, A-2 og Proba på oppdrag fra Justis- og beredskapsdepartementet og Finansdepartementet, *Kvalitetssikringsrapport Ks1 Av Fremtidig Rettsbygning I Bergen Utarbeidet for Finansdepartementet Og Justis- Og Beredskapsdepartementet*, p. 44.

[75] UIO—Kulturhistorisk Museum—Grunnlag For Ks1, *Alternativanalyse for Kulturhistorisk*

Museum Grunnlag for Kvalitetssikring Av Konseptvalg 28.05.09 (2019), p. 17.

[76] Metier AS, 'Referansedokument 9 Elektronisk Vedlegg. Forutsetninger For Alternativ- Og Usikkerhetsanalyse Metier AS 1 Metier Better Projects—PDF', Docplayer.me (2013), p. 16, https://docplayer.me/24385989-Referansedokument-9-elektronisk-vedlegg-forutsetninger-for-alternativ-og-usikkerhetsanalyse-metier-as-1-metier-better-projects.html.

[77] Metier for Kulturdepartementet, *Utbyggingsprosjektet Til Nasjonalmuseet For Kunst, Arkitektur Og Design—Alternativanalyse Oppdatering 2008 Rapport Til Kulturdepartementet* (2008), p. 36.

[78] Dovre International AS Transportøkonomisk institutt for Kunnskapsdepartementet Finansdepartementet, *Norges Veterinærhøgskole Kvalitetssikring Av Konseptvalg (KS 1)* (2006), pp. 19–20.

[79] Kunnskapsdepartementet utført av Rambøll, *KVU Framtidig Lokalisering Av Campus NTNU Konseptvalgutredning* (Trondheim, 2014), p. 59.

HERITAGE BEYOND A SUBCATEGORY OF CULTURAL ECOSYSTEM SERVICES IN SWEDISH LANDSCAPE MANAGEMENT

Susanne Fredholm and Freja Frölander

ABSTRACT

The ecosystem services (ES) approach aims to identify and valorize the multiple benefits that ecosystems provide to human well-being. The approach is rapidly gaining ground on all levels of planning in Sweden, but cultural ecosystem services and especially its subcategory cultural heritage are elusive concepts and, as a result, assessed only marginally. This article explores how various discourses of heritage are covertly or explicitly embedded in the ES framework with the aim of examining the role of heritage management in ecosystem conservation. This aim was fulfilled through a review and analysis of Swedish national, regional, and local ES guidelines by focusing on their embedded accounts of heritage. We also draw on semi-structured interviews with ES practitioners and experts in Sweden, and we discuss how particular conceptualizations of heritage and its implementation in the ES framework derive from specific discourses (*preservation*, *conservation*, and *heritage planning*). Combining the heritage discourses and the commonly used cascade model for ES has helped us to illustrate how heritage is operationalized in the ES framework in three ways: 1) heritage supports ES through its biocultural dimension; 2) the object-centred approach to heritage in pre-existing inventories and expert-led assessments are utilized to identify cultural ES 'hotspots'; and 3) 'living heritage' can play a significant role in social-ecological analysis. While heritage preservation discourse was shown to be most dominant in current practice, a continuous critical dialogue on heritage may infuse new ideas and approaches which foster positive outcomes across multiple environmental and cultural fields of research and practice.

KEYWORDS

Cultural ecosystem services, cultural heritage, landscape planning

CULTURAL HERITAGE AS A CULTURAL ECOSYSTEM SERVICE

The ecosystem services (ES) framework promotes sustainable development and multifunctionality assessments of natural and cultural values in landscapes by means of identifying, interpreting, maintaining, and preserving supporting, cultural, provisioning, and regulating services. Cultural heritage is intricately linked to the relationships between ecosystems and human societies[1] and is therefore cogently included as a cultural dimension of ES alongside, for example, spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. The ultimate goal of an ES assessment is better governance of biological and cultural diversity, with a central focus on human well-being and guidance for decision-making.[2] Conventional heritage management supports similar benefits and likewise aims to contribute to sustainable development.[3] For example, the history of a place adds to a community's collective sense of value, or to a sense of belonging, both aiding cognitive development and spiritual enrichment.[4] Simultaneously, historical land cover can have a strong influence on current service provision.[5] The biodiversity conservation agenda is therefore linked to cultural heritage management in various ways, and a growing number of researchers within the field of heritage studies is showing interest in the ES framework, especially in relation to the management of cultural landscapes and biocultural heritage.[6]

The deployment of the ES concept amongst a broader set of actors in society has resulted in a need for well-structured classifications and uniform terminology. Cultural ES have proven particularly difficult to pin down and resultant 'shades of grey' impede their consideration by decision-makers, causing a lack of scientific rigour in research studies dealing with their identification.[7] To turn this trend around, Terry C. Daniel et al.[8] argue that cooperation between ecologists and economists within the ES community must be extended to broader domains of environmental and social sciences, particularly for cultural ES. At the same time, Herdis Hølleland et al.[9] maintain that cultural ES are not yet adequately integrated within the ES framework. Merging the two disciplinary domains of cultural heritage management and ES necessitates a clearer understanding of how it is possible to articulate the different aspects of heritage, value, and valuation in the ES framework. In support of such claims, this article explores how various discourses of heritage are covertly or explicitly embedded in the ES framework with the aim of exploring the role of heritage management in ecosystem conservation. This will be followed by a discussion on possible ways for heritage professionals to navigate their way forward.

COMPETING HERITAGE DISCOURSES IN LANDSCAPE MANAGEMENT AND PLANNING

Cultural heritage as a concept is constantly evolving. The current coexistence of a multitude of conceptualizations of heritage and its management results from heritage being a discursive phenomenon.[10] Discourse can be defined as a way of understanding and talking about the world (or an aspect of the world), and attention is directed to the ideas that become accepted as 'common sense'. Each discourse points to different possible and appropriate courses of action.[11]

In the field of heritage studies, many authors have reflected on how a variety of discourses, or different value frames and strategies, are structured and renegotiated over time and how they in turn are put at work in historic environments.[12] Patrick Patiwael et al.[13] review a number of binary and ternary classifications which have emerged so as to differentiate the discourses according to various characteristics, including old–new, expert–participatory, and protectionist–utilitarian. The binary classification of heritage made by Laurajane Smith[14] reveals the 'authorized heritage discourse' (AHD) as opposed to a 'heritage-as-process' discursive practice. The AHD originated in nineteenth- and twentieth-century European architectural and archaeological debates and advocates a 'conserve as found' conservation ethic that assumes that value is innate within heritage sites. Heritage-as-process regards heritage as intangible and as a dynamic sociocultural construct.

A ternary classification of how the management of the past in the present has changed during the twentieth century is presented by Gregory Ashworth.[15] He argues that the development has resulted in three different paradigms that since the 1980s coexist in what Ashworth calls an incomplete paradigm shift: the first is *the preservation paradigm* (spanning from the late nineteenth century); the second, *the conservation paradigm* (present from the 1960s); and the third, *the heritage paradigm* (present from the 1980s). The incomplete shift suggest that the three paradigms continue to coexist, which means that stakeholders within one paradigm must interact with stakeholders in the other paradigms in terms of different understandings of the nature of heritage values, approaches, and assessments. We agree with Patrick Patiwael et al.[16] that although Gregory Ashworth uses 'paradigm' in his ternary conceptualization of heritage management, 'discourse' might be more appropriate, since Ashworth's conceptualization strongly focuses on coexistence, which seems conceptually closer to 'discourse' rather than 'paradigm'. Therefore, we

will, in line with Patiwael et al., refer to Ashworth's classification as the three heritage *discourses* in the remainder of this article.

In short, *preservation* can be described as a traditional perspective of the past, where experts focus on intrinsic values of specific objects with the aim of protecting them from alterations, development, and other threats. A *conservation* perspective includes not just separate objects, but also collections of objects (environments). Furthermore, it takes into consideration the contemporary use in contemplations for the future and includes the politics (policymakers) in decision-making alongside experts. Essentially, the contemporary use of cultural heritage becomes an important part of local development and renewal of places. A *heritage approach* or a *heritage planning discourse* builds on the idea that values are created in contemporary society and are not about historical accuracy or the intrinsic authenticity of objects or places. As such, this approach is focused on the use of the past in the present and thus prioritizes users rather than experts and policymakers. It implies that not just so-called historic environments, but all places, have a past with potential cultural heritage that can be utilized in urban and development planning. Heritage sites are thus selected for various degrees of protection according to stakeholder demand and are managed to satisfy those stakeholders.[17]

The dynamic and contextual understanding of heritage within the heritage planning discourse often runs counter to heritage legislation and practices in line with the AHD.[18] Explained differently, adopting the concepts used by the archaeologist Rodney Harrison, the *inofficial* processes of heritage are often marginalized by the *official* heritage processes. Official processes of heritage describe those aspects of care which are sanctioned by the government, including documenting, listing, and managing places as heritage. The practices of unofficial heritage refer to the 'bottom-up' relationship between people, objects, places, and memories which link people to the past within their communities in order to build a sense of identity and to connect with the places in which they live.[19]

THE ECOSYSTEM SERVICES FRAMEWORK

Different ways of defining ecosystem services have been developed. The groundbreaking Millennium Ecosystem Assessment defines ES as 'the benefits people obtain from ecosystems'. By contrast, the more current Economics of Ecosystems and Biodiversity (TEEB) initiative defines ES as the direct and indirect contributions of ecosystems to human well-being.[20] Thus, according

to TEEB, services give rise to benefits; they are not the same thing. TEEB therefore suggests a hierarchical typology by separating ecological processes from the actual benefits dependent upon these processes.[21] In alignment with the TEEB definition, we use 'ecosystem service benefits' to mean the end products that are directly used by humans and hence also desired by humans, for example, crops, fish, and space for recreation/tourism and activities associated with heritage values.

The 'cascade model'[22] (fig. 1) is one of the simpler representations of the current ecosystem services paradigm. It includes some of the thinking generated by TEEB in terms of separating services, benefits, and values. The cascade model seems to suggest a rather linear relationship between ecological structures and processes on the one hand, and benefits and values on the other. In the 'real world', of course, things are more complex and cannot easily be captured in a simple model such as this. Nevertheless, the elements of the cascade provide a vocabulary necessary for our analysis.

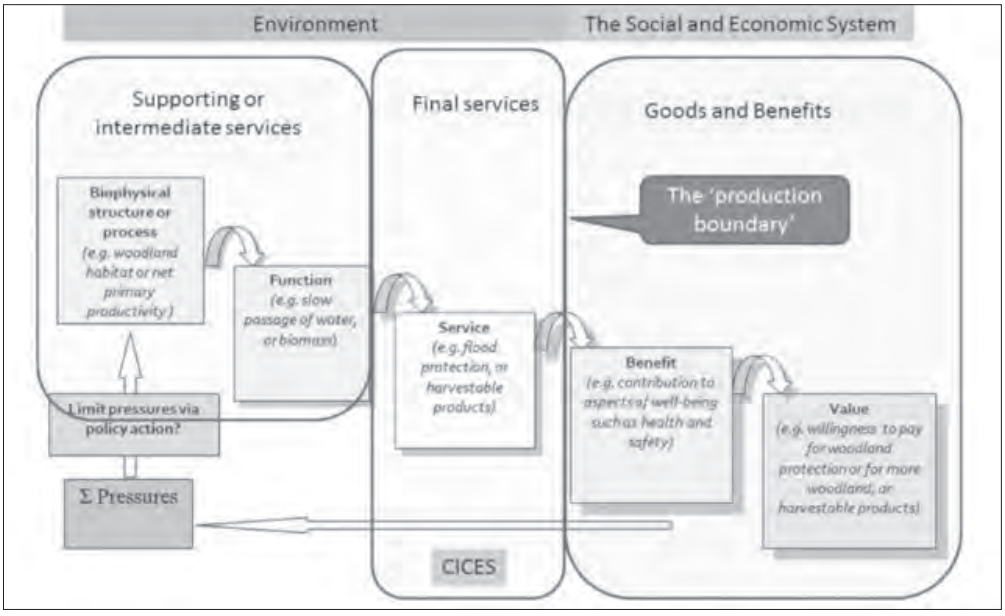


Figure 1. The cascade model adapted from Potschin and Haines-Young (2011).

On the left-hand side, the entire chain starts with biophysical structures that together with fundamental processes of nature create the capacity of potential for ecosystem functioning. Functioning ecosystems create the potential for actual ecosystem services, placed in the central section of the cascade model. They retain the link to underlying ecosystem functions, processes, and structures. To distinguish them from functions and to emphasize that they are the interface between the ecological and socioeconomic parts of the overall socioecological system, they can be called final ecosystem services.

Ecosystem benefits (or 'products'), as the direct and indirect output of ecosystems that have been turned into products or experiences, are the next section of the interrelated chain. They are no longer functionally connected to the systems from which they were derived. They are something that can change people's 'well-being', for instance people's traditional customs, and can be valued either in monetary or social terms. 'Value' is therefore the final box in the cascade model and is the criterion by which people assign/justify importance to/of things, be it individual or collective, qualitative or quantitative. Human well-being is that which arises from adequate access to the basic materials for a good life, which are needed to sustain freedom of choice and action, health, good social relations, and security. It is by reference to these values that people and societies choose to act (or not) in order to modify or manage the pressures on ecosystems and ultimately the benefits they deliver to society. This feedback is what is being highlighted in the arrow running from values back to the left-hand side of the cascade model.[23] There are various different ways in which natural and human-influenced landscape processes and values are conceptualized and assessed within the social sciences that somehow align and sometimes differ from the ES cascade model.

HERITAGE IN THE SWEDISH ES FRAMEWORK

In recent years, there has been increased activity related to ES at Swedish national, regional, and local planning levels. A governmental goal is that by the end of 2025, most municipalities will make use of and integrate urban greenery and ES when planning, building, and managing urban areas. The Swedish Environmental Protection Agency has been commissioned by the Swedish government to coordinate the endeavour and to implement the framework in planning practice. The agency defines cultural heritage in accordance with the Common International Classification of Ecosystem Services (CICES), which is associated with direct, in-situ, and outdoor interactions with living systems that depend on presence in the

environmental setting.[24] At the same time, the Swedish National Board of Housing, Building and Planning groups cultural heritage as a subcategory of cultural ES on the following grounds:

Parks are infused with history and can tell of a bygone era. We have had different perspectives on nature during different eras, which is reflected in our parks and green areas that have been established throughout the years.[25] The concept of ecosystem services has no legal definition and is currently not included in any legislation. However, both the Planning and Building Act and the Environmental Code contain concepts that could be ecosystem services, for example the term 'natural and cultural values' or 'natural conditions'.

Methodology

Eleven Swedish national, regional, and local guidelines for implementing the ES approach in planning practice were analysed. The selection of documents was based on recency (maximum of five years since publication) and on the requirement that they collectively cover Swedish national, regional, and municipal approaches; as well as being applicable to land-use planning (documents are listed in the Appendix). The documents were coded using the keywords 'cultural ecosystem services', 'historical', and assembled terms such as 'cultural+value / heritage / environment'. When keywords were encountered, they were compiled in a matrix and recoded, using the characteristics of Ashworth's conceptualization of heritage management to identify explicit and implicit conceptualizations of heritage and its implementation of each guideline (see Table 1). We focused on reference to the implementation

Table 1. Characteristics of the heritage management discourses (based on Ashworth 2011).

	Discourses		
	Preservation	**Conservation**	**Heritage Planning**
Focus	Object	Ensemble	Narrative(s)
Goal	Protection	Adaptive reuse	Use
Justification	Value	Value/Reuse	Utility
Criteria/values	Intrinsic	Preserve purposefully	Extrinsic
Authenticity of . . .	Object	Compromise	Experience
Change	Immutable	Adaptable	Flexible
Temporal nature of value	Static	Metastable	Dynamic
Actors (who has authority)	Experts	Policymakers/Planners	Users

strategies involving 'experts', 'policymakers/planners' or 'users', the conceptualization of heritage as an 'object', 'ensemble', or 'narrative', and the reference to authenticity in terms of 'object', 'compromise', or 'experience'.

The document analysis was complemented by ten semi-structured interviews. Participant selection criteria included involvement in conducting ES assessments in planning practice on a local or regional level or experience as key experts and practitioners in national or regional heritage agencies with knowledge of the ES framework. The interview questions were based on the review of the national, regional, and local guidelines (Table 2).

We particularly examined three interrelated issues: (1) conceptualizations of heritage; (2) multifunctional assessment strategies; and (3) the involvement of stakeholders in the process. As the basis for focusing our analysis, we used the three heritage management discourses defined by Ashworth[26] (Table 1) in combination with a version of the cascade model, adopted from Johannes Langemeyer et al.[27] and Marion Potschin-Young et al.[28] (fig. 2). This adopted

Table 2. The interview theme and questions.

Theme	**Interview questions**
ES analysis approach	Do you define the spatial unit for an ES analysis as a 'cultural landscape' (Swedish: *kulturmiljö*) or more in terms of a natural landscape/area?
	Based on the previous question, is the definition of the spatial unit for an ES analysis of importance for choosing relevant methodology and expertise?
	What separates an ES analysis from an EIA?
Heritage in the ES framework	How would you define cultural heritage in the ES approach?
	What measures are taken to identify and valorize CES (and cultural heritage, if applicable)?
	To assess CES, and particularly cultural heritage, is there a minimum spatial unit size required?
	What is your view of compensation of CES, and particularly cultural heritage?
Conventional heritage practices in the ES framework	Is conventional heritage management—that is, practices performed by heritage professionals, architects, or the equivalent—relevant in ES analyses, and if so, how?

model accounts for ecosystem structure and processes (supply) alongside benefits and values (demand). Services exist only with respect to a demand of a beneficiary, and so there is a need to distinguish both the supply and demand sides of the service provision.[29] The demand (benefits and values) feed back into policymaking and vice versa, which in turn also affect the actual structure and functions of ecosystem services, that is, the supply.

Figure 2. A version of the cascade model, adopted from Langemeyer et al. (2016) and Potschin-Young et al. (2018), in which the basic proposition linking ecological structures through structure, functions, services, benefits, and values is largely retained. It is, however, visualized as a circle, also including the stage of policy- and decision-making that in turn affect both the supply and the demand of ecosystem services.

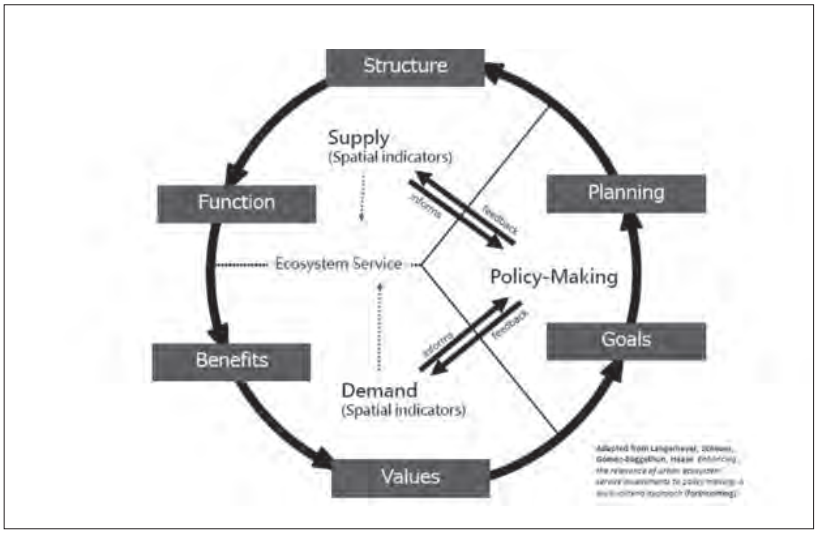


Figure 2. A version of the cascade model, adopted from Langemeyer et al. (2016) and Potschin-Young et al. (2018), in which the basic proposition linking ecological structures through structure, functions, services, benefits, and values is largely retained. It is, however, visualized as a circle, also including the stage of policy- and decision-making that in turn affect both the supply and the demand of ecosystem services.

RESULTS

The Nature of Heritage and the Role of Heritage Management in the Ecosystem Services Framework

The review of guidelines revealed four fundamental results which informed the interviews and the analysis: 1) expertise from the social sciences and humanities among authors, reference groups, and dialogue seminar participants in developing the guidelines is lacking, and expertise in heritage management is rarely requested, which implies that such knowledge is not prioritized in national, regional, and local ES guidelines; 2) a historical landscape is considered a potential ecosystem service, but it is recommended that man-made structures be excluded from an ES analysis; 3) most Swedish national, regional, and local guidelines do not explicitly categorize cultural heritage as a cultural ES.[30] The scope of heritage is at times addressed and discussed but rarely conceptually defined. Instead, heritage is mostly implicitly interrelated with the cultural ES 'spiritual experience and sense of place':[31] and 4) there are tendencies of wanting to heed a mix of expert analysis and public participation activities. However, the themes for these activities are most often based on pre-existing inventories of historic monuments and sites with a focus on protected areas for conservation which serve as a basis for public discussions on the values of the past.

The interviews with practitioners and ES analysis experts complemented and challenged our guideline analysis. In the following, using the characteristics of the three heritage discourses (as outlined in Table 1) in combination with the adopted cascade model (fig. 2), we will show the various ways in which a range of heritage discourses is activated in the application of the ecosystem services framework in Swedish planning.

Heritage Supply: Biocultural Heritage as Ecosystem Services

The most commonly stated notion of heritage in relation to ES is biological cultural heritage, which has been defined as:

> . . . ecosystems, habitats and species which have originated, developed or been favoured by human utilization of the landscape and whose long-term persistence and development is dependent on, or favoured by, management.[32]

The National Board of Housing, Building and Planning[33] emphasizes the importance of urban green heritage demonstrated by historically important

trees, parks, and gardens, as well as historical city elements such as boulevard trees, which are important assets for a city's identity. Adopting the vocabulary of the cascade model, biological cultural heritage is various forms of domesticated structures and processes (supply) which shape biological units encompassing everything from a tree to landscapes (ecosystem services) with an ability to tell stories about human presence (benefit).

We affirm that the principles for the management of biocultural heritage are largely ingrained in the heritage *preservation* discourse. The Swedish National Heritage Board[34] asserts that the art of understanding what species and biological structures tell us is based on combining expert biological knowledge with knowledge of the human use of ecosystems. Experts are the main authority that frame and identify the objects for the sake of protection. However, the importance of stakeholder engagement is prevalent in guidelines and amongst practitioners. Such acknowledgement reflects the awareness that the meaning and value that people assign to biocultural landscape features relate to the extent people actually live on and work with the landscape.[35] Interviews indicate that, particularly in rural areas, stakeholder participation is more or less the norm, whereas in urban areas value assessments made by experts are more often presumed to represent the values of society at large. Various constraints of engaging additional stakeholders relate to tight time schedules and a lack of resources, both financial and human.

Heritage Supply II: Built Heritage as a Spatial Indicator of Ecosystem Services 'Hotspots'

The main focus of conventional heritage management has traditionally been significant cultural sites and physical heritage assets. Spatial data and state registers of such sites and assets may be used as spatial indicators to map and assess ecosystems and their services of a particular area. Tools also include regional and local management programs for historic landscapes and protected zones, areas declared to be of national interest for the conservation of the built environment, municipal programs and inventories, as well as aerial image interpretation.

Archaeological sites and built heritage thereby point towards (presumed) cultural landscape qualities and cultural 'hotspots',[36] in turn directly or indirectly linked to biological processes and various ecosystem services. They serve as useful 'heritage indicators' utilized in ES assessments. It thus becomes possible to identify old oaks or historic garden structures, whereby

specific biological processes can be assessed (sometimes framed as biological cultural heritage as elaborated above). The Swedish Agency for Marine and Water Management[37] suggests that it is possible to acknowledge the links between marine heritage and marine ecosystem services based on indicators such as active harbours or the quantity of fishing vessels, and by means of using statistics of cultural heritage objects and sites such as mills.

Previous research has positioned similar uses of *official* heritage[38] in the authorized heritage discourse (AHD).[39] These are objects and sites that have been pointed out by public actors and are often more or less protected through legislation. This means that the activity would be positioned in Ashworth's *preservation* discourse.[40] Heritage professionals are engaged in the ES processes as providers of 'spatial indicators' of ecosystem services based on previously valued landscape characteristics, features, and practices, a supply of assets which are presumed to be valued by society at large.

Heritage Demand: Heritage as Infrastructure for Socioecological Systems
When a decline in biological processes serves as the starting point for inquiry in an ES process, living heritage as well as culturally significant places and/or practices can be exposed and subsequently play a significant role in socioecological analysis. According to this approach, the understanding of the direct and indirect drivers of change in an ecological process which delivers the ecosystem service requires an understanding of how that change also affects the benefits, that is, who is being affected, and how. The assessment of a specific biological process and its associated ecosystem services thus gives rise to an identification of users and an acknowledgment of particular sociocultural behaviour linked to that ecosystem service (traditions, skills, relations, language, ceremonies, collective and personal identities).

The cultural values that a society attaches to a habitat depend on interactions between the environment and the people.[41] A telling example is given by Magnus Tuvendal and Thomas Elmqvist,[42] where the identification of plausible drivers of water brownification impacts downstream stakeholders, exposing the vulnerability of fishing in the culturally significant 'Eel Coast' of Southeast Sweden. Water brownification (a biological process), eels, and seasonally flooded meadows (ecosystem services) are closely linked to eel fishing along the coast as well as to farming, that is, grazing and haymaking (benefits). The knowledge system of how to build fishing gear, the community identity associated with eels and the cultural heritage

known as the Eel Coast may thus be referred to as 'living heritage'.[43] The vulnerability of this living heritage is closely associated with the deterioration of certain ecosystem services. The resilience of such socioecological systems, including the living heritage, can be estimated by observing and analysing how local stakeholders respond to disturbances and by analysing their response strategies. This may include understanding the drivers of transformations of the built heritage, such as the selling of eel huts for rebuilding into recreational cabins on the shore, in light of a decline of eels as an ecosystem service.[44]

In a report from the Swedish Environmental Protection Agency,[45] ecosystem services are per definition utilitarian (anthropocentric), whereby it is argued that if there is no demand, explicit or implicit, from individuals or the community, then there are no ecosystem services. The agency consequentially does not predefine categories for cultural ES but lets relevant stakeholders define whether or not they value a certain landscape benefit associated with a particular ES (such as biological heritage). This corresponds with the recurrent argument that we may better understand cultural ES by studying the actions and perceptions of local people.[46]

A people-centred approach to landscape management is positioned in Ashworth's *heritage planning* discourse[47] and builds on the idea that values are not about historical accuracy or the intrinsic authenticity of objects or places but are created in contemporary society and are highly contextual.[48] It gives grounds to define heritage as the ongoing contemporary cultural and social process of experiencing and of ascribing meaning to landscapes. Heritage can be defined as an infrastructure and public good, comparable to other infrastructures that constitute a frame for people's daily private and professional activities. The interaction between different parts of the system defines landscapes and heritage rather than specific monuments and areas that have been identified in line with AHD.[49] Indeed, all interviewees in this study claim to understand ES assessments as a way to register and understand multifunctionalities and diverse usages of landscapes. When conceptualizing cultural heritage specifically, however, only a few of the interviewed ES practitioners and experts adopt a systems perspective.

Heritage as Neither Supply Nor Demand—Unless Fundamentally Dependent on Living Processes

Rather than defining a service as cultural heritage, values related to 'pastness' are often linked to 'symbolic and spiritual services' or 'other cultural services' in policy and by ES practitioners. Public parks and urban gardens, heaths, commons, and greens are said to generate benefits in the form of living heritage such as traditions and a collective sense of place, which are to be accounted for in decision-making:

> And it doesn't have to be historically way back, it can be a tradition since a few years only, as long as it is valued by people today. A place where students annually gather for graduation ceremonies, for example.[50]

In such instances, several landscape architects claim that they find it difficult to distinguish an ES assessment from conventional methods for landscape value assessments. One respondent even considered the ES framework to be rather obsolete, given the fact that established approaches to landscape assessments instinctively move beyond the nature/culture divide. A systematic approach to integrating greenery, recreation, aesthetic experiences, and heritage values in line with existing environmental goals and heritage jurisdiction is widely applied. Such conventional urban landscape assessments are mainly based on *a conservation approach* to heritage, whereby the goal of heritage management has shifted from preservation of form towards function and 'preserving purposefully'. The approach is dependent on contemporary urban objectives, whereby urban planners are brought into the decision-making processes of historic sites.[51] It does, however, adopt a rather strict expert perspective and rarely promotes public consultation on contemporary values related to the landscape.

Conventional landscape assessments differ from an ES analysis in that they do not strictly separate human-made and non-human-made structures for analysis. The landscape as a whole is taken into consideration. Yet, in an ES analysis, cultural ecosystem services, like all other forms, ideally must demonstrate a significant relationship between ecosystem structures and functions.[52] Theoretically, cultural ES are 'the physical settings, locations or situations that give rise to changes in the physical or mental states of people, and whose character are fundamentally dependent on living processes'.[53] Only the biophysical landscape—excluding human-made structures—is taken into consideration. This might seem like an argument over semantics, but it causes some pragmatic problems and confusion in practice.

On the one hand, all of the interviewed practitioners and experts reject the nature/culture divide and agree that defining a park or landscape in such dichotomic terms at the outset of an ES assessment is futile. The landscape characterization should be informed by the mapping of ecosystem services, whereby the predominant services and benefits will guide the continuing decision-making process. On the other hand, there are different opinions as to what to include in such mapping. Some interviewees oppose the inclusion of historical man-made structures in an analysis, no matter how significant they are for the well-being of people. Instead, they argue for the need to complement ES analysis with more conventional heritage assessments so as to guide holistic decision-making. Others do not make such a distinction:

> A definite line is seldom drawn between biological and non-biological features; the assessments most often take the whole landscape into account.[54]

Indeed, heritage is defined by some ES practitioners as ancient monuments and historical buildings (human-built *official* heritage), as well as non-listed historic remains with a cultural value for people on site, such as benches, statues, and hideouts (human-built *unofficial* heritage). Similarly, the Swedish Forest Agency[55] notes that damage to ancient monuments is a significant problem within forestry and claims that it poses a negative impact on the ecosystem service 'knowledge and information'. This might suggest that human-made *official* heritage is to be considered as data for analysis. The Swedish Forest Agency provides an illustrative example of the ambiguity of separating interrelated forms of material and immaterial linkages to the past:

> Just over a century ago, more than one million Swedes emigrated to the United States. Today, their descendants are returning 'back home' to perhaps experience and understand the ancestors' way of life and reasons for leaving. The old, abandoned crofts or homesteads are today usually situated in the forest. Those who lived in the houses (the physical heritage) planted the apple tree (the biological cultural heritage) and today the story and memory still exist (the intangible cultural heritage). If strictly applying the ES delimitation, the fruit trees are valued as ecosystem services, and perhaps even the memory, while the ruins of the house are not, despite the close interdependencies of each heritage characteristic.[56]

Previous studies have called for a clarification of the role of human-made structures and objects as providers of cultural ES.[57] By means of the competing discourses laid out in this article, we have shown that *unofficial* and *official* man-built heritage may be used as spatial indicators of (presumed) cultural qualities in ES assessments. If and how these human-made structures are subsequently assessed *as* cultural ES *per se* is still unclear and subject to further research.

DISCUSSION: HERITAGE BEYOND A SUBCATEGORY IN THE ES FRAMEWORK: IMPLICATIONS FOR PRACTICE

Heritage is generally an elusive concept and not less so when integrated into the ES framework. This study shows how parallel discourses of managing the past in the present—*preservation/conservation* and *heritage planning*—are simultaneously present in Swedish ES policy and practice. Cultural heritage is not only represented in the ES framework as a subcategory of cultural ES in the form of long-standing trees or a historic park in need of protection. Cultural heritage is also represented as an incentive for critical debates and democratic processes related to understanding the present, and for the multifunctionality management of landscapes. In the following, we will engage with contemporary research to explore implications and ways forward for heritage management when navigating these different conceptualizations and approaches. Expectedly, biocultural heritage is the most common heritage association in the ES framework, assessed mainly by experts because they represent landscape memories assumed to be valued by society at large. Moreover, inventories of officially recognized built heritage are being used as spatial indicators of cultural landscape qualities to be assessed in an ES analysis. Such understandings of people's relationships with the past and how to manage historic landscapes and sites mainly conforms to what Ashworth[58] refers to as a *preservation* discourse.

A continuous application and development of such an approach in Swedish landscape planning may come to include solidifying the need for historical surveys and advance the historical dimension of an ES analysis. Cultural ecosystem services have typically been analysed using focused surveys over short time periods.[59] Cultural values, however, are not static but also depend on changes over time.[60] Recent research emphasizes the risk of ignoring historic land-cover analysis, given the risk of drawing incorrect conclusions regarding how the distribution and quality of some ecosystem services may be altered in response to land-use/cover change. The ES approach may, more-

over, assist archaeological aims in various ways, such as the ability to predict the preservation of cultural artefacts and buried materials in soil.[61] In addition, analysing the socioecological values of urban green spaces may require an in-depth understanding of the surrounding built environment and ways to assess how current urban preservation agendas support and interrelate with these green urban spaces, and vice versa. The contribution by heritage professionals is likely to increase as ES assessments become more systematically applied in municipal planning, because of their ability to interpret the range of important layers of history relevant to ES.[62] Heritage professionals may find that they can link the preservation of cultural heritage to the biodiversity conservation agenda, and that, as Martin Dallimer et al. put it, 'certain courses of action provide win-win outcomes across multiple environmental and cultural goods'.[63]

As shown in our results, heritage may also be understood as the very infrastructure for socioecological systems of a landscape, which conforms to what Ashworth refers to as a *heritage planning* discourse. Such an approach moves beyond expert knowledge on monuments and sites and focuses on interpreting and communicating the actual process of managing the past in the present, viewed as a predominantly people-centred and functional activity.[64] It emphasizes aspects such as local knowledge and history, stories and myths, crafts, minority identity, local identity, and collective memory in land-use planning. In accordance with this reasoning, it is the people's use of the built, social, and natural capital and its relevance in space and time that defines what is an infrastructure and public good, and thus heritage.

Theoretical approaches in line with the *heritage planning* discourse show many similarities with the utilitarian (anthropocentric) perspective of the ES framework. Both perspectives highlight the requirement to not omit what people value, as it can lead to decisions that are not linked to what matters for most people.[65] ES policy and research highlight the important aspect of involving the public due to the fact that the actual process of mapping and assessing ES should ideally contribute to democracy in parallel with the actual results and outcomes.[66] It is therefore important that the process is credible, salient, and legitimate if stakeholders and beneficiaries are to continue to be involved in implementation and decision-making.[67] The vision is shared by contemporary cultural heritage policies in Sweden, which claim that cultural heritage is crucial for the development of social cohesion and an inclusive society.[68]

Heritage professionals might therefore have a legitimate role to play in advancing methodologies to better integrate biodiversity and cultural landscape management and to establish participatory governance of natural and cultural heritage. Based on our policy review, the ES framework seems, however, to present limited opportunities for conventional heritage management professionals to shape and influence the ES process. In Sweden, the ES framework is highly influenced by historically endorsed professional roles and responsibilities in land-use planning, with a strong political division between nature and culture management, which challenges a progressive role of heritage professionals. This position is mirrored in our analysis in three ways,

First, ES project managers and policymakers are mainly environmental specialists by training and by profession.[69] Those performing applied environmental analysis and consultancy with a specific focus on cultural ES are mostly landscape designers/architects or geographers. In their work they might focus on heritage, or they might not. Ways of understanding and using heritage in the ES framework is not steered by heritage professionals. Instead, the development of the heritage-biodiversity nexus very much depends on the competence and ambition of individual project managers or experts, most often from other fields of study and practice.

Second, interviewees define the term *cultural environment* (Swedish: *kulturmiljö*) in jurisdictional terms and thereby mostly see heritage as a concept related to tangible assets with historical-cultural values in line with definitions in the legal framework (Swedish: *kulturmiljölagen*). Since man-built structures are generally excluded from an ES analysis, and heritage professionals such as archaeologists or urban heritage planners are expected to focus on the management of the *cultural environment* generally associated with built heritage, they are consequentially marginalized from the ES framework. The exception is those who engage in biological heritage.

Third, policy calls for the need of a mix of expert analysis and public participation to assess and value ES, indicating an inclusive ambition. But most often inventories and dominant expert views on heritage as a set of cultural objects impedes unconditional value assessments. This illustrates continuous authoritative heritage-making[70] which frames and effects discussion at workshops and dialogue meetings.

Previous studies have shown that public officials on municipal and regional levels in Sweden express a wish for a stronger focus on intangible aspects of heritage and unofficial heritage practices, but the legal framework makes little room for their inclusion in decision-making.[71] The challenge for heritage professionals might therefore not be primarily related to narrowly defined concepts of heritage and whether or not to include man-made structures in mapping and assessments of ES. The challenge is rather to prevent the planning and management of the past in the present from staying in (or returning to) the traditional and isolated 'trenches' of planning. There is a need for relationship-building processes, which include new professional constellations across sectorial boundaries. The ES framework provokes new emergent questions such as: What direct and indirect drivers of change in natural capital are associated with any form of heritage practice? What drivers effect heritage practices associated with a particular ecosystem service? How is the 'cultural system' capable of adapting or enduring ecosystem services degradation? A continuous critical perspective and dialogues on heritage may be able to answer such questions and infuse new ideas and approaches which foster positive outcomes across multiple environmental and cultural fields of research and practice, beyond the perspective of *preservation*.

NOTES

[1] For example, Janet Stephenson, 'The Cultural Values Model: An Integrated Approach to Values in Landscapes', *Landscape and Urban Planning* 84, no. 2 (2008), pp. 127–39

[2] MAE, *Millenium Ecosystem Assessment – Ecosystems and Human Wellbeing: Synthesis* (Washington, DC: Island Press, 2005).

[3] Francesco Bandarin, Jyoti Hosagrahar, and Frances Sailer Albernaz, 'Why Development Needs Culture', *Journal of Cultural Heritage Management and Sustainable Development* 1, no. 1 (2011), pp. 15–25.

[4] Ingegärd Eliasson, Igor Knez, and Susanne Fredholm, 'Heritage Planning in Practice and the Role of Cultural Ecosystem Services', *Heritage & Society* 11, no. 1 (2019), pp. 44–69; Terry C. Daniel et al., 'Contributions of Cultural Services to the Ecosystem Services Agenda', *Proceedings of the National Academy of Sciences of the United States of America* 23, no. 109 (2012), pp. 8812–19.

[5] Martin Dallimer et al., 'Historical Influences on the Current Provision of Multiple Ecosystem Services', *Global Environmental Change* 31 (2015), pp. 307–17.

[6] For example, Anna Tengberg, Susanne Fredholm, Ingegard Eliasson, Igor Knez, Katarina Saltzman, and Ola Wetterberg, 'Cultural Ecosystem Services Provided by Landscapes: Assessment of Heritage Values and Identity', *Ecosystem Services* 2 (2012), pp. 14–26; Tema Nord, *Kulturarv og økosystemtjenester: Sammenhenger, muligheter og begrensninger* (Copenhagen: Nordic Council of Ministers, 2015); Peter Bridgewater, 'The Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES): A Role for Heritage?', *International Journal of Heritage Studies* 23, no. 1 (2017), pp. 65–73; Eliasson et al., 'Heritage Planning in Practice and the Role of Cultural Ecosystem Services'.

[7] Malgorzata Blicharska et al., 'Shades of Grey Challenge Practical Application of the Cultural Ecosystem Services Concept', *Ecosystem Services* 23 (2017), pp. 55–70.

[8] Daniel et al., 'Contributions of Cultural Services to the Ecosystem Services Agenda'.

[9] Herdis Hølleland, Joar Skrede, and Sanne Bech Holmgaard, 'Cultural Heritage and Ecosystem Services: A Literature Review', *Conservation and Management of Archaeological Sites* 19, no. 3 (2017), pp. 210–37, esp. p. 223.

[10] For example, Laurajane Smith, *Uses of Heritage* (London: Routledge, 2006); Zongjie Wu and Song Hou, 'Heritage and Discourse', in *The Palgrave Handbook of Contemporary Heritage Research*, edited by Emma Waterton and Steve Watson (Basingstoke: Palgrave Macmillan, 2015), pp. 37–51.

[11] Marianne Jørgensen and Louise Phillips, *Discourse Analysis as Theory and Method* (London: Sage Publications Ltd., 2002).

[12] For example, Gregory Ashworth, 'Preservation, Conservation and Heritage: Approaches to the Past in the Present through the Built Environment', *Asian Anthropology* 10, no. 1 (2011), pp. 1–18; John Pendlebury, 'Conservation Values, the Authorised Heritage Discourse and the Conservation-Planning Assemblage', *International Journal of Heritage Studies* 19, no. 7 (2013), pp. 709–27; Smith, *Uses of Heritage*; Wu and Hou, 'Heritage and Discourse'.

[13] Patrick Patiwael, Peter Groote, and Frank Vanclay, 'Improving Heritage Impact Assessment: An Analytical Critique of the ICOMOS Guidelines', *International Journal of Heritage Studies* 25, no. 4 (2019), pp. 333–47.

[14] Smith, *Uses of Heritage*, p. 11.

[15] Ashworth, 'Preservation, Conservation and Heritage'.

[16] Patiwael et al., 'Improving Heritage Impact Assessment'.

[17] Ashworth, 'Preservation, Conservation and Heritage'.

[18] Lucas Lixinski, 'Between Orthodoxy and Heterodoxy: The Troubled Relationship between Heritage Studies and Heritage Law', *International Journal of Heritage Studies* 21, no. 3 (2015), pp. 203–14.

[19] Rodney Harrison, *Heritage: Critical Approaches* (Milton Park, Abingdon: Routledge, 2013), p. 8.

[20] Rudolf de Groot, Rob Alkemade, Leon Braat, Lars Hein, and Louise Willemen, 'Challenges in Integrating the Concept of Ecosystem Services and Values in Landscape Planning, Management and Decision Making', *Ecological Complexity* 7, no. 3 (2010), pp. 260–72.

[21] Andrew Balmford et al., *The Economics of Biodiversity and Ecosystems: Scoping the Science* (Cambridge: European Commission, 2008).

[22] Marion Potschin and Roy Haines-Young, 'Ecosystem Services: Exploring a Geographical Perspective', *Progress in Physical Geography* 35 (2011), pp. 575–94.

[23] Ibid.

[24] Naturvårdsverket, 'Ekosystemtjänstförteckning med inventering av dataunderlag för kartläggning av ekosystemtjänster och grön infrastruktur', *Naturvårdsverket Rapport* 6797 (2017), p. 33.

[25] Boverket, *Ekosystemtjänster i den byggda miljön – vägledning & metod* (Stockholm: PBL Kunskapsbanken, 2018), https://www.boverket.se/sv/PBL-kunskapsbanken/Allmant-om-PBL/teman/ekosystemtjanster.

[26] Ashworth, 'Preservation, Conservation and Heritage'.

[27] Johannes Langemeyer, Erik Gómez-Baggethun, Dagmar Haase, Sebastian Scheuer, and Thomas Elmqvist, 'Bridging the Gap between Ecosystem Service Assessments and Land-Use Planning through Multi-Criteria Decision Analysis (MCDA)', *Environmental Science Policy* 62 (2016), pp. 45–56; and Marion Potschin-Young, Roy Haines-Young, Christoph Görg, Ulrich Heink, Kurt Jax, and Christian Schleyer, 'Understanding the Role of Conceptual Frameworks: Reading the Ecosystem Service Cascade', *Ecosystem Services* 7, part C (2018), pp. 428–40.

[28] Potschin-Young et al., 'Understanding the Role of Conceptual Frameworks'.

[29] Ralf-Uwe Syrbe and Karsten Grunewald, 'Ecosystem Service Supply and Demand: The Challenge to Balance Spatial Mismatches', *International Journal of Biodiversity Science, Ecosystem Services & Management* 13, no. 2 (2017), pp. 148–61.

[30] Cultural heritage was explicitly categorized as a cultural Ecosystem Service in MAE, *Millenium Ecosystem Assessment*.

[31] This conceptualization is more in line with TEEB, *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations* (Cambridge: Earthscan, 2010).

[32] Swedish National Heritage Board (RAÄ), *Biologiskt kulturarv – växande historia* (Stockholm: Riksantikvarieämbetet, 2014).

[33] Boverket, *Ekosystemtjänster i den byggda miljön – vägledning & metod*.

[34] Swedish National Heritage Board (RAÄ), *Biologiskt kulturarv – växande historia*.

[35] See, for example, Ove Eriksson, 'What Is Biological Cultural Heritage and Why Should We Care about It? An Example from Swedish Rural Landscapes and Forests', *Nature Conservation* 28 (2018), pp. 1–32.

[36] See, for example, Tobias Plieninger, Sebastian Dijks, Elisa Oteros-Rozas, and Claudia Beiling, 'Assessing, Mapping, and Quantifying Cultural Ecosystem Services at Community Level', *Land Use Policy* 33 (2013), pp. 118–29.

[37] Sara Bergek, Leonard Sandin, Fanny Tomband, Elinor Holén, and Andreas Bryhn, 'Ekosystemtjänster från svenska sjöar och vattendrag: Identifiering och bedömning av tillstånd', *Havs- och vattenmyndighetens rapport* 7 (2017), p. 25.

[38] Harrison, *Heritage: Critical Approaches*.

[39] Smith, *Uses of Heritage*.

[40] Ashworth, 'Preservation, Conservation and Heritage', p. 4.

[41] Mónica Hernández-Morcillo, Tobias Plieninger, and Claudia Bieling, 'An Empirical Review of Cultural Ecosystem Service Indicators', *Ecological Indicators* 29 (2013), pp. 434–44.

[42] Magnus Tuvendal and Thomas Elmqvist, 'Ecosystem Services Linking Social and Ecological Systems: River Brownification and the Response of Downstream Stakeholders', *Ecology and Society* 16, no. 4 (2011), p. 21.

[43] See, for example, UNESCO's List of 'Intangible Cultural Heritage' from 2012.

[44] Tuvendal and Elmqvist, 'Ecosystem Services Linking Social and Ecological Systems'.

[45] Eja Pedersen, Maria Johansson, and Stefan Weisner, 'Värdering av kulturella ekosystemtjänster baserat på bidrag till livskvalitet', *Naturvårdsverket Rapport* 6756 (2017), p. 15.

[46] For example, Brett A. Bryan, Christopher M. Raymond, Neville D. Crossman, and Darla Hatton Macdonald, 'Targeting the Management of Ecosystem Services Based on Social Values: Where, What and How?', *Landscape and Urban Planning* 97 (2010), pp. 111–22; Plieninger et al., 'Assessing, Mapping, and Quantifying Cultural Ecosystem Services at Community Level'.

[47] Ashworth, 'Preservation, Conservation and Heritage'.

[48] Brian Graham, Greg Ashworth, and John Tunbridge, *A Geography of Heritage: Power, Culture and Economy* (London: Routledge, 2000).

[49] Krister Olsson, 'Citizen Input in Urban Heritage Management and Planning: A Quantitative Approach to Citizen Participation', *Town Planning Review* 79, no. 4 (2008), pp. 371–94.

[50] Interview, 14 March 2019.

[51] Ashworth, 'Preservation, Conservation and Heritage'.

[52] Daniel et al., 'Contributions of Cultural Services to the Ecosystem Services Agenda'.

[53] Roy Haines-Young and Marion Potschin, 'Common International Classification of Ecosystem Services (CICES) V5.1 and Guidance on the Application of the Revised Structure' *CICES* (2018) p. 10. Available from www.cices.eu.

[54] Interview, 13 March 2019.

[55] Skogsstyrelsen, 'Skogens ekosystemtjänster – status och påverkan', *Skogsstyrelsen Rapport* 13 (2017).

[56] Ibid., p. 93.

[57] Hølleland et al., 'Cultural Heritage and Ecosystem Services: A Literature Review'; Eliasson et al., 'Heritage Planning in Practice and the Role of Cultural Ecosystem Services'.

[58] Ashworth, 'Preservation, Conservation and Heritage'.

[59] Bryan et al., 'Targeting the Management of Ecosystem Services Based on Social Values: Where, What and How?'; Plieninger et al., 'Assessing, Mapping, and Quantifying Cultural Ecosystem Services at Community Level'.

[60] Jharyathri Thiagarajah, Shermaine K. M. Wong, Daniel R. Richards, and Daniel A. Friess, 'Historical and Contemporary Cultural Ecosystem Service Values in the Rapidly Urbanizing City State of Singapore', *Ambio* 44, no. 7 (2015), pp. 666–77.

[61] Mark Kibblewhite, Gergely Tóth, and Tamás Hermann, 'Predicting the Preservation of Cultural Artefacts and Buried Materials in Soil', *Science of the Total Environment* 529 (2015), pp. 249–63.

[62] Tengberg et al., 'Cultural Ecosystem Services Provided by Landscapes'; Dallimer et al., 'Historical Influences on the Current Provision of Multiple Ecosystem Services'.

[63] Dallimer et al., 'Historical Influences on the Current Provision of Multiple Ecosystem Services'.

[64] Kate Clark and Paul Drury, 'From Monuments to People: The Functions of Cultural Heritage in a Changing Europe', in *Forward Planning: The Functions of Cultural Heritage in a Changing Europe* (Strasbourg: Council of Europe, 2000), pp. 113–17.

[65] Randall Mason, 'Assessing Values in Conservation Planning', in *The Heritage Reader*, edited by Graham Fairclough et al. (London: Routledge, 2008); Blicharska et al., 'Shades of Grey Challenge Practical Application of the Cultural Ecosystem Services Concept'.

[66] For example, Plieninger et al., 'Assessing, Mapping, and Quantifying Cultural Ecosystem Services at Community Level'.

[67] MAE, *Millenium Ecosystem Assessment*.

[68] Swedish National Heritage Board (RAÄ) (2016) *2030 Vision for cultural heritage management in Sweden*.

[69] See, for example, Tuija Hilding-Rydevik and Malgorzata Blicharska, 'Ekosystemtjänster i praktiken: Erfarenheter av att praktiskt använda begreppet ekosystemtjänster i planering och beslutsfattande i Sverige och en exempelsamling', *Naturvårdsverket Rapport* 6724 (2016), p. 6.

[70] Smith, *Uses of Heritage*.

[71] Eliasson et al., 'Heritage Planning in Practice and the Role of Cultural Ecosystem Services'.

APPENDIX

Guidelines and Local Strategies Used in Analysis, Listed by Author or Agency

Guidelines and Local Strategies	Author or Agency
Sara Bergek, Leonard Sandin, Fanny Tomband, Elinor Holén, Andreas Bryhn, 'Ekosystemtjänster från svenska sjöar och vattendrag. Identifiering och bedömning av tillstånd', *Havs- och vattenmyndighetens rapport* 7 (2017).	The Swedish Agency for Marine and Water Management is a government agency that works for flourishing seas, lakes, and streams. It is responsible for managing the use and preventing the overuse of Sweden's marine and freshwater environments.
Boverket, *Ekosystemtjänster i den byggda miljön – vägledning & metod* (Stockholm: PBL Kunskapsbanken, 2018).	The Swedish National Board of Housing, Building and Planning is a central government authority under the Ministry of Finance. They review developments within the fields of housing, building, and planning. The *BEST rapporten* was a collaboration with several municipalities in southern Sweden.
H. Hansson et al., *BEST rapporten – Får ekosystemtjänsterna tillräckligt stöd i PBL?* (Malmö: Boverket, 2016).	
C/O City, *Ekosystemtjänster i stadsplanering. En vägledning* (Stockholm: C/O City, 2014).	C/O City is a non-profit organization with an agenda based on the needs expressed by its members and on the challenges that climate change and other transformations pose to our urban environment.
Jordbruksverket och Enetjärn Natur AB, *Kartläggning av ekosystemtjänster i Jönköpings kommuns nordvästra jordbrukslandskap*, Dnr 4.3.11-4805/15 (2015).	The Swedish Board of Agriculture is the authority responsible for Sweden's official statistics as regards the agricultural sector and aquaculture.
Tuija Hilding-Rydevik and Malgorzata Blicharska, 'Ekosystemtjänster i praktiken: Erfarenheter av att praktiskt använda begreppet ekosystemtjänster i planering och beslutsfattande i Sverige och en exempelsamling', *Naturvårdsverket Rapport* 6724 (2016).	The Swedish Environmental Protection Agency is a public agency in Sweden that is responsible for environmental issues. The agency carries out assignments on behalf of the Swedish government related to the environment in Sweden, the EU, and internationally.
Eja Pedersen, Maria Johansson, and Stefan Weisner, 'Värdering av kulturella ekosystemtjänster baserat på bidrag till livskvalitet', *Naturvårdsverket Rapport* 6756 (2017).	
Ulf G. Sandström, 'Vägledning om Ekosystemtjänster i ärendehandläggning och annan verksamhet', *Länsstyrelserna, Rapport från RUS* (2016).	RUS is a collaborative body that supports, guides, and coordinates the work of the county administrative boards and the regional work in the environmental goals system.
Skogsstyrelsen, 'Skogens ekosystemtjänster – status och påverkan', *Skogsstyrelsen Rapport* 13 (2017).	The Swedish Forest Agency is the national authority in charge of forest-related issues. Its main function is to promote the kind of management of Sweden's forests that enables the objectives of forest policy to be attained.
Nacka kommun och Sweco, *Visualisera och värdera ekosystemtjänster i kommunal samhällsplanering – Ekotjänster i Nacka* (Nacka, 2015).	Municipality
Upplands Väsby kommun, *Strategier och metoder för kartering av ekosystemtjänster: Förstudie Ekologisk utvecklingsplan för Upplands Väsby* (Upplands Väsby: Ekologigruppen AB, 2016).	Municipality

CONTRIBUTORS

EDITORS

Morgan Andersson is an architect and PhD and has worked part-time since 2014 as a visiting researcher and since 2019 as an adjunct professor in the field of architecture for housing and care. His assignment at the City of Gothenburg local administration targets the functions of buildings in relation to user needs in the context of assisted living for elderly and for people with functional variations, along with preschools and schools. The research and teaching, in close cooperation with stakeholders, deals with living and care environments for the elderly and care environments for psychiatric and somatic care. It aims to develop knowledge in these areas, which is expected to contribute to the future planning and design of environments for housing and care.

Magnus Rönn, associate professor, is affiliated to building design in the Department of Architecture and Civil Engineering at Chalmers University of Technology. He is editor-in-chief of *The Nordic Journal of Architectural Research*. From 2004 to 2016, Magnus held the position of research leader in the School of Architecture, teaching at an advanced level. Together with colleagues, he has been the theme editor for publishing four special issues on competitions in two scientific journals (2009, 2012, 2013, 2014). He has also published five books on architectural competitions: three anthologies in English (2008, 2013, 2016) and two monographs in Swedish (2005, 2013). In cooperation with two colleagues, Magnus has edited three anthologies (2014, 2015, 2020) dealing with compensation measures in comprehensive planning and detailed planning in areas with cultural heritage.

Anne Elisabeth Toft, architect and PhD, specializes in architectural history and theory with a focus on architectural photography. She is an associate professor at the Aarhus School of Architecture. She has participated in group and solo exhibitions on architecture and architectural photography

in Denmark and abroad. Anne Elisabeth has curated exhibitions on architecture and photography, and she has written extensively about architecture, architectural education, architectural photography, and the visual arts. She is the co-editor of the book *Questions of Representations in Architecture* (Arkitektskolens Forlag, 2015, with Christina Capetillo). In 2014, she co-founded Photobook Week Aarhus, the first photo festival in Denmark devoted to the photobook and its discourse. She is a member of the European Society for the History of Photography, a member of the international research committee for the iphi awards, and served on the jury of the Danish Society of Artists (2014–20). Since 2015 she has been the president of the Nordic Association of Architectural Research (NAF/NAAR).

SECTION I

Isabelle Doucet is a professor of theory and history of architecture at Chalmers University of Technology. Through a focus on resistant practices and conceptual-methodological inquiries, her research centres on the relationship between architecture, (urban) politics, and social/environmental responsibility. Her recent books include *The Practice Turn in Architecture: Brussels after 1968* (2015) and the volume jointly edited with Janina Gosseye, *Activism at Home: Architects Dwelling between Politics, Aesthetics, and Resistance* (2021).

Karl Kropf is a senior lecturer in urban design and historic conservation at Oxford Brookes University and the director of Built Form Resource, an urban design, landscape, and heritage consultancy. He has combined academic research in urban morphology and practice in urban design for many years. Recent research has focused on the core concepts of urban morphology as a basis for integrating different methodologies and putting them into practice: 'Bridging configurational and urban tissue analysis' (2017) and 'Is there a normative science of the built environment?' (2021). Karl is the associate editor of the journal *Urban Morphology*, and his *Handbook of Urban Morphology* was published in 2017 by John Wiley.

SECTION II

Abdulaziz Alshabib is a Saudi architect and PhD candidate at the School of Architecture and Built Environment, University of Adelaide. He received his master's degree in 2015 from Pratt Institute, New York. His research explores the history and theory of Saudi residential architecture with a focus on

mass-produced housing projects and the use of prefabricated construction techniques. Before commencing his PhD studies, Abdulaziz worked as a lecturer in the College of Architecture and Planning at King Saud University, Saudi Arabia.

Susanne Fredholm is a senior lecturer in the Conservation of Built Environments programme at the University of Gothenburg. The areas of her scientific research, publishing, and teaching span the integrated conservation of built environments, with an emphasis on landscape studies, urban planning, and critical perspectives on heritage. In her current research project 'Ecosystem Services: An Integrative Instrument for Sustainable Living Environments in Practice?', she explores how the ecosystem services agenda influences the implementation of immaterial heritage in planning practice and conservation professionals' work on social inclusion. She furthermore explores collaborative governance in urban and infrastructure planning, with a focus on factors for the success and failure of negotiations. Fredholm is also a senior advisor and provides heritage assessment and consultancy services to the infrastructure and urban planning sectors.

Freja Frölander is a master's degree student in the Department of Conservation, University of Gothenburg. The primary focus of her master's thesis is biological cultural heritage management and traces of historical land usage in old-growth forests. She is currently working as a film creator in two ongoing projects at the Department of Conservation. Both projects focus on traditional knowledge systems and crafts connected to historical landscape management. The main objective is to find suitable ways of documenting disappearing knowledge and to facilitate a transfer of knowledge where the generational knowledge chain has been broken. Her research interests are traditional crafts, historical landscape management, and their contemporary relevance for biodiversity and the sustainable development of rural areas.

Kiran Maini Gerhardsson, PhD in environmental psychology, is an architect, illustrator, and a postdoc researcher at Lund University in the Department of Health Sciences. She is also a teacher and researcher in the Department of Architecture and Built Environment. Her general research interest is the interaction between people and their environment, for example, people's experiences and reasons for their actions. The main research topic is light and health, and she is currently involved in experimental research targeting older adults living in ordinary housing. Her thesis project aimed to increase

understanding of how residents use their lighting from natural and fabricated light sources, what they want from it, and when they do not want it. Another aim was to evaluate a personalized home lighting system in terms of comfort and intention to use the system.

Ellen Kathrine Hansen holds a Master in Architecture from the Royal Academy of Fine Arts in Copenhagen and a PhD in design experiments from the Department of Architecture, Design, and Media Technology at Aalborg University, Copenhagen, where she is now an associate professor, co-founder and coordinator of the MSc Programme and research group in lighting design. Ellen is a leading person in the field of transdisciplinary design research and teaching within light and sustainable architecture. She has more than twenty years of experience driving projects within the field of developing new sustainable and architectural potentials through the integration of daylight and lighting technology.

Mette Hvass holds a MSc in Architecture from the Royal Academy of Fine Arts in Copenhagen and has studied lighting design at the KTH Royal Institute of Technology in Stockholm. She joined the lighting design programme at Aalborg University, Copenhagen, as an external lecturer in 2017. In 2019, she started a co-financed PhD project about the architectural and social potential of lighting in urban space at the Department of Architecture, Design, and Media Technology. In her research, the focus is on the role of lighting in urban space, how lighting forms the visual space in the dark hours and sets the scene for the co-presence of people around everyday activities—combining knowledge from fifteen years in practice as an architect and lighting designer with the research practice at Aalborg University, Copenhagen.

Thomas Kampmann, Architect m.a.a., MSE: cand. Polyt., associate professor at the Royal Danish Academy, Copenhagen, at TRANSFORMATION, Master's Programme in Cultural Heritage, Transformation and Restoration. Thomas is responsible for teaching building surveying, building archeology, and sustainability. The teaching in building surveying is done using total stations, laser scanners, and traditional surveying methods. The thorough measurements form the basis for the building-archeological investigations. The teaching of sustainability is based on these studies in order to calculate life-cycle analyses on a credible basis. Previously, Thomas has worked with windows at the Centre for the Restoration of the Built Heritage, Raadvad, Copenhagen, through practical renovations, and as a consultant for The

Agency for Culture and Palaces. He has published articles on heat loss, sound insulation, total economy, and life cycle assessment (LCA).

Ann Legeby, PhD, is a professor of applied urban design in the School of Architecture at the KTH Royal Institute of Technology, Stockholm. Her research concerns society-space relations. Central to her research is the aim to increase understanding of the role of architecture in relation to social segregation and unequal living conditions, including the conditions for everyday life. Several of the research projects are conducted in close collaboration with municipalities and other public actors. Urban analysis is central and methodologies are developed on how to analyse, model, and visualize spatial form, defined by architecture and urban design, and how it relates to urban processes. Ann is engaged in both teaching and practice and works with urban design and planning in several cities in Sweden.

Nils O. E. Olsson, Department of Mechanical and Industrial Engineering, Norwegian University of Science and Technology (NTNU). With a PhD from NTNU in Norway and an MSc from Chalmers University of Technology in Sweden, Nils is a full professor in project management at NTNU in Trondheim. He has served as coordinator of large research projects and has held professorships at faculties of engineering and architecture. He has extensive experience as a consultant, research scientist, and manager. His consulting experience includes Ernst & Young and DNV (Det Norske Veritas). Current research is focused on emerging aspects of project management, including governance, digitalization, and the use of artificial intelligence.

Jarre Parkatti is a social scientist (having majored in practical philosophy, University of Helsinki, minored in social science, University of Copenhagen) and a PhD student at the School of Arts, Design and Architecture at Aalto University, where he also has worked as a researcher on the research project 'Power/Knowledge in Urban Development'. His present research focus is on the societal preconditions, practices, and results of urban design/town planning in the new inner-city districts of Helsinki, especially as concerns the urbanity, ecological sustainability, and social functionality of the built environment.

Sam Ridgway is an architect and adjunct associate professor in the School of Architecture and Built Environment at the University of Adelaide. He has a Master of Architecture from the University of Adelaide and a PhD from

the University of Sydney. His research and publications have focused on a theorization of factory-made buildings, construction theory, architectural representation, and the texts and buildings of the remarkable architect and academic Marco Frascari. His recent work explores the theatre, architecture, and imagination.

Mari Oline Giske Stendebakken, PhD, Architect MNAL, Department of Architecture and Planning, Faculty of Architecture and Design, Norwegian University of Science and Technology (NTNU). Stendebakken is an architect from NTNU and L'Ecole nationale supérieure d'architecture de Paris-La Villette (ENSAPLV). She has a PhD from NTNU in cultural heritage, architecture, and analysis. Stendebakken works as city antiquarian and lectures in architectural heritage at the Oslo School of Architecture and Design. She has extensive teaching experience from NTNU and has worked as an architect and consultant in Norway and abroad.

Tony Svensson is a trained planning architect and has a doctoral degree in planning and decision analysis from the KTH Royal Institute of Technology in Stockholm. He holds positions as a researcher at KTH in the School of Architecture and the Built Environment, Department of Urban and Regional Studies, and as senior lecturer at Dalarna University, Department of Energy and Built Environment. Tony has been leading the research project 'Co-creative Spatial Planning for Energy-efficient and Sustainable Station Communities' (2017–20), financed by the Swedish Energy Agency and the Region of Västra Götaland.

PEER REVIEWERS

PEER REVIEWERS

Anne Beim, Professor
Royal Danish Academy
Email: Anne.Beim@kglakademi.dk

Michael Benedikt, Professor
The University of Texas at Austin
Email: mbenedikt@utexas.edu

Irene Cieraad, Senior Researcher
Delft University of Technology
Email: I.G.Cieraad@tudelft.nl

Aaron Davis, Research Fellow
University of South Australia
Email: Aaron.Davis@unisa.edu.au

Jonathan Foote, Associate Professor,
Aarhus School of Architecture
Email: jofo@aarch.dk

Marius Fiskevold, Associate Professor
Norwegian University of Life Sciences
Email: marius.fiskevold@nmbu.no

Annika Gram, PhD
KTH Royal Institute of Technology
Email: annika.gram@byv.kth.se

Juano Galan, Associate Professor
Aalto University
Email: juagavi@gmail.com

Sten Gromark, Professor
Chalmers University of Technology
Email: sten.gromark@chalmers.se

Sidse Martens Gudmand-Høyer, Postdoctoral Researcher
Aarhus School of Architecture
Email. smgh@aarch.dk.

Lisbet Harboe, Associate Professor
The Oslo School of Architecture and Design
Email: Lisbet.Harboe@aho.no

Quan Jin, Senior Researcher
Chalmers University of Technology
Email: quan.jin@chalmers.se

Karin Krokfors, Professor
Aalto University
Email: karin.krokfors@aalto.fi

Johanna Lilius, Postdoctoral Researcher
Aalto University
Email: johanna.lilius@aalto.fi.

Helena Lonkila, Senior Lecturer
University of Jyväskylä
Email: helena.lonkila@jyu.fi

Katrine Lotz, Associate Professor
Royal Danish Academy
Email: lotz@kglakademi.dk

Pekka Passinmäki, Associate Professor
Tampere University
Email: pekka.passinmaki@tuni.fi

Barbara Penner, Professor
Bartlett School of Architecture
Email: b.penner@ucl.ac.uk

Reijo Kupiainen, Senior Lecturer
Tampere University
Email: reijo.kupiainen@tuni.fi

Thorbjörn Laike, Professor
Lund University
Email: thorbjorn.laike@arkitektur.lth.se

Johan Mårtelius, Professor
KTH Royal Institute of Technology
Email: johanmar@kth.se

Raine Mäntysalo, Professor
Aalto University
Email: raine.mantysalo@aalto.fi

Sepideh Olausson, Senior Lecturer
University of Gothenburg
Email: sepideh.olausson@gu.se

Scott Palmer, Associate Professor
University of Leeds
Email: S.D.Palmer@leeds.ac.uk

Philip D. Plowright, Professor
Lawrence Technological University.
Email: pplowright@ltu.edu

Jan Silverberger, Professor
ETH Zürich
Email: silberberger@arch.ethz.ch

Barbara Szybinska Matusiak, Professor
Norwegian University of Science and Technology
Email: barbara.matusiak@ntnu.no

Anu Soikkeli, Associate Professor
University of Oulu
Email: Anu.Soikkeli@oulu.fi

Helena Teräväinen, Senior Researcher
Aalto University
Email: helena.teravainen@aalto.fi

David Vanderburgh, Professor
Université Catholique de Louvain
Email: david.vanderburgh@uclouvain.be

Anna-Maija Ylimaula, Professor
Oulu University
Email: ylimaula@oulu.fi

Nordic Academic Press of Architectural Research - 2021
ISBN 978-91-983797-5-4

NAF/
NAAR