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CONTENTS

EDITORS' NOTES OFFERING A VISIONARY REALITY – ARCHITECTURE AS FICTION.....	5
STEN GROMARK, MARIUS FISKEVOLD AND MAGNUS RÖNN	
EXPERIMENTAL ARTISTIC APPROACHES TO CITIZEN INVOLVEMENT IN PLANNING: ACTORS IN NETWORKS AND POWER-RELATIONS	15
GISLE LØKKEN	
ART AND POLITICS IN ARCHITECTURAL COMPETITIONS	43
ALEKSANDER BERN	
PLANNING FOR HUMAN DIVERSITY: DESIGN PATTERNS OF UNIVERSAL DESIGN	75
LILIAN MÜLLER, DANIEL WOJAHN, IDA SANDSTRÖM AND PER-OLOF HEDVALL	
TORBORG ZIMMER. KVINNELIG PIONER OG BANEKRYTER I NORSK LANDSKAPSARKITEKTUR	105
BERIT RØNSEN	
VEGETATIONSPLANERING I UPPSALA UNDER 200 ÅR – IDEAL, FUNKTION OCH HISTORISKA AVTRYCK	135
ROGER ELG	
FORUM	
BOOK REVIEW: MAKING THE ARCTIC CITY.....	173
REVIEWER: TIINA MERIKOSKI	
BOOK REVIEW: CREATING BUILT ENVIRONMENTS. BRIDGING KNOWLEDGE AND PRACTICE DIVIDES	179
REVIEWER: MATTIAS KÄRRHOLM	
BOOK REVIEW: TROJAS MURAR. LABYRINTER UNDER 3000 ÅR	183
REVIEWER: ROLF JOHANSSON	

PLANNING FOR HUMAN DIVERSITY: DESIGN PATTERNS OF UNIVERSAL DESIGN

LILIAN MÜLLER, DANIEL WOJAHN, IDA SANDSTRÖM
AND PER-OLOF HEDVALL

Abstract

Ensuring the conditions for an inclusive society in the face of human diversity places various demands on the built environment. Planning is essential for accommodating a wide range of individual preferences and abilities.

This article examines the presence and absence of Universal Design (UD) in contemporary urban planning and construction in eight new or remodelled Swedish building and public space projects. The projects were studied *in-situ* and via documentation from the planning and building process.

The findings show two ways in which UD is present. The first is a pattern where people are not separated from each other, whilst the second is a pattern of facilitating equal use by placing low demands on users' abilities. It was revealed that UD was implemented more in remodelling projects than in new constructions, which instead created new inequalities through categorisations of users and high demands on users' abilities. They were also linked to an imbalance between green and social sustainability.

We argue that a change of mindset is pivotal for implementing UD. Human diversity must be a consideration throughout planning and building processes, and creating a sustainable society requires UD. This article contributes new knowledge regarding patterns characterising such a mindshift.

Keywords:

Universal Design, Architecture,
Urban planning, Built Environ-
ment, Social inclusion, Human
diversity, Sustainability

Introduction

This study explores the presence and absence of Universal Design (UD) in the built environment. Examining eight completed projects in Sweden, we have investigated the extent to which values and goals linked to UD are expressed in completed buildings and spaces and what characterises the presence of UD.

Our society is facing significant challenges. Despite global commitments such as Agenda 2030 and other strong global and local policies, there are signs of new inequalities being created. The Swedish government highlighted urban planning and design as central in making cities more coherent, suggesting in the *Policy for Designed Living Environments* (Bill 2017/18:110) that methods developed in the context of design processes may help increase inclusion and democratic participation. Expectations of design as an active producer of inclusive communities is echoed in the recent declaration of the New European Bauhaus, as well as in the UN Sustainable Development Goals Agenda 2030, which specifically highlights the role of cities and municipalities in sub-goal number 11.

The built environment is not only a major contributor to the social and environmental crises but also a primary site where solutions to its problems may be investigated, discovered and applied. Built environmental design has an important and vital impact on people's well-being. Its capacity to allow everyone, regardless of age or abilities, to access, understand and use the environment on equal terms has a decisive impact on the realisation of an inclusive society, social participation and on how to secure human rights (Steinfeld & Maisel, 2012).

UD in the built environment

Human diversity is the basis and starting point of UD. Recognising all humans as equal, UD has inherent democratic potential. UD should be linked to the understanding that includes disability as human condition (Lid, 2013). The UD concept was determined a main principle in the *Convention on the Rights of Persons with Disabilities*, CRPD (United Nations, 2006) and constitutes an "important contribution to future work towards inclusion and equal rights" (Lid, 2014, p. 1344). CRPD points out that UD is the primary strategy for creating a sustainable and inclusive society (Hedvall, 2019). UD strives towards design environments and products that all people can use without adaptation or specialised design (NC State University, 1997; Steinfeld & Maisel 2012), with the aim to move away from the "normate template", i.e., the "average body" (Hamraie, 2017). In contrast to strategies based on special designs for some users, UD is "based on the principle that there is only one population, comprised of individuals representing diverse characteristics and abilities" (Iwarsson & Ståhl, 2003, p. 61).

With its deep historical roots in the Disability Rights Movement, the concept aims to ensure equal opportunities and eliminate discrimination based on disability (Steinfeld & Maisel, 2012, p. 15). UD considers the broadest range of users and goes beyond the prescriptive approach of accessibility legislation (Mosca & Capolongo, 2018). Accessibility is an essential part of implementing UD to reach end results such as social inclusion and equal citizenship (Lid, 2016). UD embraces general and overall social inclusion goals and equality and may be seen as “a holistic expansion of accessibility”, with social inclusion as the essential outcome (Kajita, 2016, p. 87).

The Centre for Universal Design at North Carolina State University formulated seven principles of UD (NC State University, 1997). Adapted to the built environment, these comprise equity, flexibility, simplicity and intuitive use, perception, tolerance for error, low physical effort, and size and space for approach and use (Danford & Tauke, 2001). Steinfeld and Maisel later developed eight goals based on what is called primary purposes of UD: to improve human performance, health and participation. The eight goals are strongly linked to the seven principles and point out values such as social integration and cultural appropriateness (Steinfeld & Maisel, 2012). The eight goals have broadened the understanding of the concept, shifting the focus from accessibility for persons with disabilities to design for human diversity (Watchorn et al., 2019). The goals can provide essential guidance for performance evaluation and how to reach overall goals such as wellness and social inclusion (Mosca & Capolongo, 2018). In a Swedish context, UD policy has been increasingly adopted in recent years (Swedish Parliament, 2017/18:SoU5; Swedish Government 2017/18).

Including UD in urban planning and building processes will become increasingly important in the near future, not least because of the current and expected demographic change. In many developed countries, the older population will increase by more than 50 %, and estimates put the number of persons with disabilities in the world at 1 billion people, or 15 % of the global population (WHO, 2015; Maisel et al., 2018; Kajita, 2016). Aspects such as age and disabilities draw attention to the need to create a built environment suitable for different stages and situations in life.

UD in the built environment has been a subject of previous studies. It has been highlighted that practitioners’ perceptions of inclusive design are dominated by legislative accessibility framework (Van der Linden et al., 2016). Challenges to UD’s efficacy in a built environment include difficulties validating results and in determining what constitutes a built environment influenced by UD, or how UD principles should be applied or measured (Watchorn et al., 2019). Two main aspects addressed in previous studies on measuring and evaluating UD in the built environment were user needs and the architectural elements of the built environ-

ment (Mosca & Capolongo, 2018). Accessibility is frequently measured objectively, using checklists as primary tools; these may be elaborated from existing laws, regulations, standards and potential users' needs. However, these are insufficient for a holistic, qualitative evaluation of UD's presence in a building or environment (O'Shea et al., 2016). All proposed evaluation methods have limitations, and they all require further development, particularly with regard to UD values and goals such as social inclusion and wellness (Watchorn et al., 2019). The need for tools to include accessibility and universal design in urban planning has been highlighted in previous research (Borowczyk, 2018; Müller et al., 2022), and there is still a need for a deeper understanding of how values related to UD can be identified in the process and in the completed building projects.

UD and social sustainability

The concept of sustainability is growing increasingly important in urban planning. UD has a special connection to social sustainability. As human relations are shaped in and by built physical spaces, developing the relationship between UD and social sustainability is a significant aspect to develop, to make both notions more relevant to processes that result in actual buildings and urban spaces. Equitable access and social equity are commonly described as critical criteria for social sustainability (Dempsey et al., 2011). As such, sustainability can be seen as related to UD (Vavik & Keitsch, 2010; Ericsson et al., 2020), although persons with disabilities and their views are largely lacking in academic literature on social sustainability (Wolbring & Rybchinski, 2013). A study on planning sustainable cities highlighted accessibility as one of five topics called the "guidance criteria of social sustainability", in this context embracing all users' needs (Drilling, 2013). Imbalance between green and social sustainability, where social aspects are lagging, tends to create new barriers in the built environment (Müller et al., 2022).

Changed planning conditions

In a Swedish context, municipalities' planning conditions have changed in many respects in recent decades. Today, initiatives for changes in spatial planning come more and more from private actors in the building industry. Investments in the built environment increasingly take the form of agreements between the municipality and private actors in a negotiated planning of sorts (Johansson & Khakee, 2008, p. 54). Planning practice is more vision-oriented, and increased attractiveness or competitiveness have become overarching goals (Mukhtar-Landgren, 2012; Berglund, 2013; Hidman, 2018). Detailed development planning has changed in character from planning for future development to being the first step in testing a building permit for a concrete project, the initiatives for which often come from builders (Kalbro et al., 2012). Strong demands from policymakers to increase the growth of housing constructions, combined with the increased influence of private developers and financiers, has

led to changes where agreements and arrangements are decided earlier in the planning and building process. This may have a negative effect on balancing different interests and qualities during the project (Cars & Hedström, 2006).

The needs of certain users and groups may risk being overlooked in the increasingly complex planning and construction process, where many different actors, often with conflicting interests, collaborate on time-consuming projects. It is thus relevant to examine the extent to which contemporary urban planning and development are based on planning and building with human diversity in mind, and what happens to such values during the planning and construction process.

Purpose of the study

In this study, we searched for UD in the built environment in order to contribute to a more developed and nuanced discussion on inclusive design possibilities. We sought to identify patterns that support the implementation of UD in the built environment. An additional purpose was to identify critical phases and courses of events in the planning and building process when the implementation of UD is at risk of getting lost. The study contributes to a developed knowledge of how UD is expressed and can be identified in contemporary planning and building. It captures patterns that characterise the presence and absence of UD in the built environment and highlights critical phases and conditions that might strengthen or weaken UD's presence.

The research questions with which we approach the collected material aim to reveal the ways in which such patterns are found in the selected cases. This is also examined in the completed results and through the planning and construction process. The research questions are:

RQ1: What characterises the presence of UD in the selected cases?

RQ2: In which ways is UD integrated through the planning and building processes?

Method

The present study is a qualitative, multiple case-study based on a strategic selection of cases. The material consists of documents from the planning phase, photos and notes from field observations of eight completed building projects. The analysis was a qualitative content analysis, answering the research questions with cross-case conclusions.

The study was realised as a multidisciplinary study involving rehabilitation engineering, design studies and linguistics, relating to the architectural and urban conditions of the built environment.

Selection of cases

The study included eight planning and construction projects in Gothenburg, Sweden, all of which were completed during the 2010s. The projects included buildings and public spaces. Buildings included new constructions as well as renovated and remodelled buildings under cultural heritage protection. The cases selected comprise different projects in the built environment, including housing, workplaces, public buildings, outdoor public space and urban development projects. The aim was to include cases that were recently completed that represented both new and remodelled constructions and cases of great importance for many people – projects that affect different parts of people’s everyday lives. Selecting a wide range of cases was a consciously chosen strategy to represent critical facilities in daily urban life that affect people in various ways.

The cases were also chosen because they have all been, or still are, objects of public and media discussions. Several of the projects won prestigious architecture awards and were highlighted as good examples of innovation, usability and sustainability, making them particularly interesting to study. Five of the cases are new constructions and three represent the remodelling of older buildings and spaces. The cases are presented in Table 1.

Table 1
Overview of the eight cases included in the study.

Project	New construction	Remodelling project	Year of completion	Type of building/space
Angereds Arena	x		2013	Arena with indoor pools and ice rinks
Brf Viva	x		2018	Housing in challenging, hilly terrain, 132 apartments and common areas.
Brunnsparken		x	2020	Centrally located park and an essential hub for public transport
Högvakten		x	2019	Building complex from the 1700–1800s, protected as cultural heritage. City administration offices, public areas for meetings and events and the council chamber, also open for visitors.
Landamäreskolan	x		2016	School in a suburban area with low socio-economic status.
Röhsska museet		x	2019	Design and craft museum, building from the 1910s, protected as cultural heritage.
Stenpiren	x		2016	Building and hub for public transport.
Östra Kvillebäcken	x	x	2013–2018	Urban development site previously characterised by its small businesses, now transformed into a residential area.

The strategic selection of cases was made in cooperation with Gothenburg City's Real Estate Office. The office also made it possible for us to collect relevant documents from the projects' planning phases and to visit the completed projects, but had no influence on the study's design, performance or analysis. The study was thus independent of the interests of The Real Estate Office.

Material

The material for this study comprised official documents from the planning phases and our documentation from observations of the completed projects, i.e., photos, observations, notes from discussions with project managers, builders and representatives from the city planning department and the building permission unit during observations. The written material from the planning phase comprised a total of 265 documents selected from different stages of the planning phases and included, e.g., detailed development plans, a comprehensive plan, design programmes and documentation included in building permit applications. 436 photos, numerous notes from the visits and interviews with builders and the city representatives were collected from the observations of the completed projects.

Analysis

A multiple case-study was chosen on the basis of the assumption that the complexity of the research questions might lead to a deeper understanding, with the possibility to analyse across the cases. It was thus possible to compare similarities and differences between the cases and trace possible patterns (Yin, 2018). The cross-case analysis aimed at reaching conclusions on the overall level and not on individual cases.

The analysis was conducted with a two-way focus as regards the relation between data and theory: a bottom-up approach to study how users are described and categorised in the planning documents and a top-down approach in the search for UD values and goals in the built environment.

Research question 1 is answered by conducting cross-cases analyses (Yin, 2018) of observations in the completed projects, matching the presence (and absence) of UD-related values and goals in the cases. Collected data was organised by correlating UD principles and goals based on qualities and features linked to UD's seven principles (NC State University, 1997; Danford & Tauke, 2001) and the eight goals (Steinfeld & Maisel, 2012) such as equity, flexibility, awareness and understanding, social integration, health and wellness.

Observed elements of the buildings and spaces were connected to circulation systems, entering and exiting, wayfinding, use of services, products, common spaces, facilities and public amenities (where applicable). In terms of the degree of compliance with UD, human diversity in the

broadest sense was considered and included a wide range of users and a broad spectrum of physical, sensory and cognitive abilities.

The primary conditions for examples considered as UD-inspired in the study include a design that does not exclude or separate users, create inequalities or put unnecessarily high requirements on users' abilities. Previous research determined critical aspects in the buildings and spaces that can meet users' diverse needs without creating special solutions, segregation or stigmatisation of some users (NC State University, 1997; Joines & Valenziano, 1998; Steinfeld & Maisel, 2012; Maisel et al., 2018).

Examples of the contrary, such as excluding features, unequal solutions that separate users and examples of high demands on the user, were regarded as contradictory to UD values and goals. Examples breaking with UD values and goals revealed the absence of UD.

Figure 1 offers a concrete example of the method, showing the entrance to the building of the remodelling project *Högvakten*. The door on the left is the new entrance, adapted to be accessed without steps from

Figure 1
The new entrance (to the left) created in the reconstruction of the building is one example of how the UD principle *equitable use* has been implemented. *Högvakten*. PHOTO: LILIAN MÜLLER



street level. This new solution does not separate visitors, create inequalities or put high demands on users' abilities, and is thus determined to be an example of how the UD principle *equitable use* has been implemented.

The second example (Figure 2) shows how the environment placed high requirements on the users' abilities and will separate tenants from each other. The common outdoor area can be used only by those able to use stairs; this is analysed as an example of how the UD principle *equitable use* is absent.



Research question 2 is answered by using a bottom-up approach in the analysis of collected texts in documents (Schreier, 2014; Boréus & Kohl, 2018). The qualitative content analysis enables us to systematically examine the presence of UD in the language of the planning documents, as well as the categorisations of people expressed. In the documents, expressions linked to UD (such as equity, flexibility or social inclusion) and the groups of people explicitly mentioned in the texts were analysed. Timelines were created for each case to organise and analyse the data collected from the early project stages (visions, policies) to completion.

Figure 2
The common outdoor environment in the residential area *Viva* is an example of a built environment breaking with UD values and goals.

PHOTO: LILIAN MÜLLER

Identified changes in the design considerations and choices related to UD made during the process were noted.

Findings

This section contains examples of what characterises the presence of UD in the studied cases. Examples show how UD is expressed in the completed projects and how it has been implemented through the planning and building process.

The findings are grouped in:

- Patterns that characterise the presence of UD
- Patterns that do not characterise UD

Patterns characterising the presence of UD

In the cross-case analysis, patterns emerged for what characterised the presence or absence of UD values and goals. This section addresses patterns supporting the presence of UD.

The patterns that came to the fore were:

- Design solutions that do not separate people
- Design solutions that facilitate equal usage, putting low demands on the users' abilities.

Design solutions that do not separate people

According to UD principles and goals, all users should have equal opportunities to use the built environment. Design solutions should enable equal use and avoid categorising or separating users. Features and solutions to support equal use were found in the remodelling projects in particular. Equal use was indicated as a priority, and the costs for necessary measures were integrated in the budget. Creating useful designs that blend in, rather than stand out as appendages or exceptions, was a given condition in the remodelling projects as these buildings were protected as cultural heritage. Equal usage measures were frequently located around entrances and involved compensation for differences in level, but they were also linked to mobility and orientation.

Improving the level of accessibility was chosen as a theme of investigation in the pilot study for the reconstruction of *Högvakten*. Three alternatives with varying levels of reconstruction and accessibility were proposed. Cost calculations were included for each of the three alternatives. The City Council selected the alternative with the highest calculated costs and maximum accessibility. Among the measures was a new entrance adjacent to the old entrance, achieved by transforming an existing window (Figure 3). The new entrance is open for all visitors.



Figure 3
A new entrance for all visitors was created beside the previous main entrance. The solution is equal to all users and does not separate people from each other. Högvakten.

PHOTO: LILIAN MÜLLER

Improved accessibility and usability for all was prioritised in the reconstruction of the museum *Röhsska*. A new entrance with no level difference was created beside the previous entrance with stairs as an option for visitors (Figures 4 and 5).

Stairs with integrated lifts were installed in both projects to cope with level differences inside the building (Figures 6 and 7). The solution

Figures 4 and 5
The old entrance and the new entrance at Röhsska Design Museum. It is the visitors' choice which entrance to use. The new entrance is available for all users, on equal terms. Röhsska Museum.

PHOTO: LILIAN MÜLLER





enables visitors to choose the same route, regardless of their capacity to use the stairs, and the solution is a minimal intervention in the original building.

Design solutions that place low demands on users' abilities

To create conditions for equal use, design solutions must be based on human diversity and peoples' varying abilities. Facilitating use encompasses different aspects, i.e., accessibility of the physical environment, orientation, perceptibility and awareness.

The ramp in *Högvakten* is an example of how the design can help draw attention to an incline and where it starts and ends (Figure 8). Its visibility, accentuated by the contrasting colours employed, can make it easier for visitors to perceive the differences in level, even from some distance. The solution also creates a single, equal and accessible route for all users.

Accessibility and usability for all visitors were considered throughout planning of the reconstruction of the old and centrally located park, *Brunnsparken*. A broad dialogue with citizens was arranged to determine the strengths and weaknesses of the old park and the improvements desired.

Following the reconstruction, the ground surface of *Brunnsparken* was made compact, even and slip-resistant, with tactile paths. Mixed seating furniture allows visitors to choose from different benches; this flexibility accommodated a broader range of body sizes and abilities (Figures 9 and 10).

Landscape design can facilitate understanding of how a site is organised, and markers can support the construction of mental maps for the

Figures 6 and 7
Stairs with integrated lift in *Högvakten* and *Röhsska Museum*. Visitors may use the same route, regardless of their ability to walk on stairs. The solution does not separate people.

PHOTO: LILIAN MÜLLER



Figure 8 (top)

The difference in colours facilitates awareness of the gradient and understanding of where the slope starts and ends. The slope connects two buildings to each other. The slope offers an equal and accessible solution for all users. Högvakten.

PHOTO: LILIAN MÜLLER

Figures 9 (left) and 10 (right)

The walkways of Brunnsparke were made firm, even and non-slippery. Different bench designs allow visitors to choose what fits their own bodies and comfort. The design solutions facilitate usage for everyone and place low demands on the users' abilities. PHOTO: LILIAN MÜLLER

wayfinding process (Maisel et al., 2018). *Stenpiren* offers an example of how the design of a building can make it easier for users to find their way around a building/entrance. Completed in 2016, this centrally located transportation hub was designed to accommodate a large flow of people, offering qualities like transparency, clarity and security, even in the dark hours. The building is entirely different from any other building in the area and recognisable from a distance. Its shape and material are also distinctive in the environment, and there is a large sign stating the building's name and function positioned on the roof (Figure 11).

Efforts to facilitate usage for more people and to reduce demands on users' abilities were present in the remodelling projects in particular – more so than in the new constructions. The examples show that the building's age or construction time is inconsequential when it comes to implementation of UD. The patterns discovered – solutions that do not separate users and solutions that facilitate usage by placing low demands on user abilities – were more prominent in the remodelling of the old buildings than in the new constructions.

Figure 11
The design facilitates usage, orientation and wayfinding by shape, signage and visibility. *Stenpiren*.

PHOTO: LILIAN MÜLLER



Patterns that do not characterise UD

This section presents findings related to patterns that do not support the presence of UD.

Different kinds of inequalities were found in the material. The results presented here are primarily linked to

- Inequalities shaped by categorisations of users
- Inequalities caused by increased demands on users' abilities.

Inequalities shaped by categorisations of users

Some of the created inequalities in the studied cases were shaped by categorisation of users. Pointing out specific groups of users during the planning process may lead to special solutions for some users, which also can cause separation and inequalities among users.

The completed projects contain several examples of how the categorisations of users and creation of inequalities are evident in the design of the building. Some of these examples are from *Angered's Arena*. Changing rooms are subdivided; there are separate changing rooms for men, women, persons with disabilities and persons of no/all gender(s) (Figure 12). The turnstiles next to the reception area are another example from the project. Visitors who can pass through the narrow passage enter quickly, using their tickets to gain access. Visitors who require a wider passage must return to the reception for support and explain why they need the wider passage (Figure 13).

Figure 12 (left)
The special changing room intended for the categories “persons with disabilities” and “they” (Swedish *hen*): all genders and no gender. Other dressing rooms are for “men” and “women”. Angered's Arena. PHOTO: LILIAN MÜLLER

Figure 13 (right)
Visitors who cannot use the turnstile (i.e., those in wheelchairs or using walkers, overweight visitors or visitors who do not understand how to perform the operation to unlock the narrow passage) have to request help from reception for access via a wider passage. Angered's Arena. PHOTO: LILIAN MÜLLER



Other examples of how categorisation of users in the planning stage impact the completed environment are from the housing block *Viva*. Already in the detailed development plan, accessibility was only projected for reaching the flats, not the common facilities: “The accessibi-

lity to the buildings is ensured, as all flats are reachable by elevators and entrances (attic corridors)” (Göteborgs Stad, 2013, p. 19). The risk of excluding tenants is evident, as walking on stairs is a prerequisite for the use of shared facilities such as common outdoor areas, the greenhouse or the outdoor gym.

Special solutions for some users were found at *Östra Kvillebäcken*. There were some differences in level between the entrances to the newly constructed buildings and the pavement, meaning that a ramp was necessary for some users, although the site was on flat terrain. The resulting ramp separated those who use steps from those who do not (Figure 14).



Figure 14
A ramp was required, although the flat terrain would allow construction of entrances without differences in level. *Östra Kvillebäcken*. PHOTO: LILIAN MÜLLER

Inequalities caused by raised demands on the users' abilities

Several examples of inequalities based on high demands on the users' abilities were found in the analyses, especially in the newly constructed environments. These demands included, e.g., abilities such as mobility (walking, also for longer distances, and using stairs), vision or a high

capacity to concentrate and no need for other means of transport other than bicycle or standard public transport.

Inequalities caused by raised demands on the user were also often connected to a high profile of environmental sustainability. Care for the climate and concerns about emissions are often linked to ambitions to reduce car usage and to encourage people to walk or cycle. For persons with certain disabilities or illnesses, these planning ideas may result in significant challenges when cycling or walking is not an alternative.

Tenants in the newly built residential area *Viva* are expected to use bicycles or small electric devices for transport (Figure 15). Exceptions from the parking norm were made in the detailed development plan. In response to demands from the city, a minimum of six parking spaces for visitors and three for individuals with reduced mobility should be arranged. Regulations prevent parking for persons with reduced mobility from being omitted completely. However, the parking spaces can only be used by persons with a special parking permit issued by municipal authorities. The rules and procedures to obtain such permits are restrictive. According to building regulations, drop-off points should be located no more than 25 metres from entrances, which is not the case in this example.

The housing project *Viva* was presented as highly innovative from a green, sustainability perspective. The planning documents also expressed high ambitions in terms of social sustainability. The detailed



Figure 15
Tenants are expected to be able to use a bicycle or walk. Brf Viva.

PHOTO: LILIAN MÜLLER



development plan highlighted the need for larger flats for families, as well as flats for persons with disabilities and older individuals. The project has in terms of social sustainability gained attention for cheaper studio apartments for young people and a shared greenhouse. The project on the whole is, despite this, characterised by an absence of UD and a human diversity perspective. Moving around in the block and the courtyards requires the ability to use stairs and almost all outdoor stairs are made up of steel grids (Figure 16). To use common facilities such as the greenhouse, it is necessary to be able to walk on stairs without handrails or brightness contrasts (Figure 17). There is almost no space for common outdoor activities or children's play that does not place high demands on users' abilities. While the green profile is pronounced, Viva's approach to social sustainability is weak. The project aims at community but consistently, by its design, excludes people from its shared and common spaces.

Another project in which green and social sustainability were imbalanced and led to raised demands on the users' abilities was the urban renewal project *Östra Kvillebäcken*. Considerations to separate the public zones from the private zones and organise all car-parking underground were described in the planning phase and resulted in buildings positioned higher up than the courtyards. The detailed development plan describes how the stairs between the courtyard and the street should be combined with ramps, but the completed project either omits the ramps

Figures 16 and 17
Outdoor courtyard environment and the greenhouse. Brf Viva.

PHOTO: LILIAN MÜLLER



or includes ramps not designed in accordance with building construction regulations on accessibility and that are not useful for individuals using wheelchairs or walkers, nor for parents with children in prams (Figures 18 and 19).

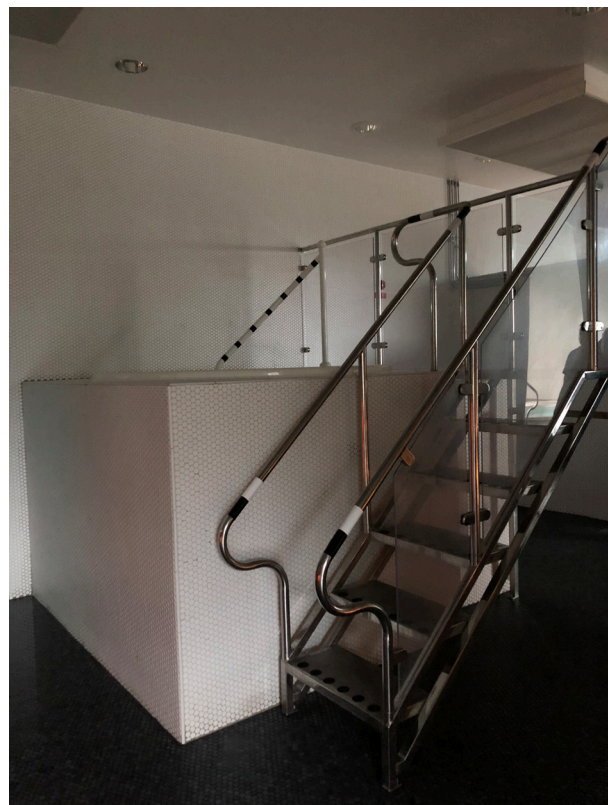
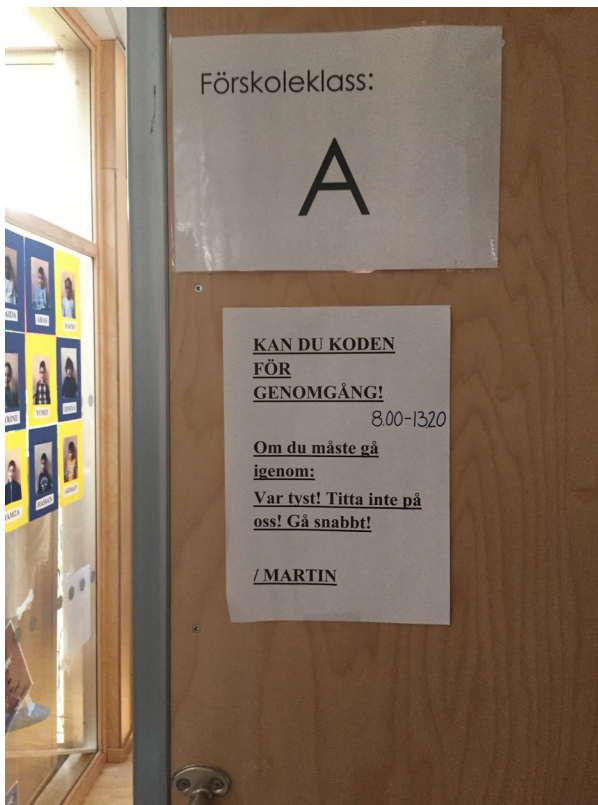
Raised demands on the users' abilities were evident and not only limited to mobility. In the newly constructed school, *Landamäreskolan*, the ability of pupils and staff to orient themselves and concentrate is put to the test. A vision of a school with built-in flexibility was expressed during the planning process, leading to a concept with an open environment with movable walls. It was later found that the open environment placed higher demands on small children, especially those with concentration difficulties or other special needs. The Swedish National Board of Housing, Building and Planning (Boverket) previously highlighted that open areas can result in concentration difficulties for pupils and staff (Boverket, 2020). The chosen design also added costs for the acoustic solutions. Special signs were put up as a temporary fix for the situation (Figure 20): "Do you know the passing code? If you need to walk through, do it quietly! Don't look at us and walk fast!". Other unexpected effects of the design were revealed by staff during our field observations. The demanding environment also resulted in an increased need to move pupils to the special school for pupils with special needs, a closed, separate unit integrated into the building.

Higher expectations of the users' abilities were also found in *Angereds Arena*; in the spa section, the ability to use stairs was necessary to reach the pools (Figure 21). However, in the planning documents, *older individuals* and *persons with disabilities* were named as important users.

Figures 18 and 19

The courtyards are located above street level in response to design considerations seeking to separate the public from the private and to keep private cars away from the street. The stairs are not combined with ramps or elevators, and new inequalities are created as only those who can use stairs can access the common space directly from the street. Östra Kvillebäcken.

PHOTO: LILIAN MÜLLER



Summary of results

Several clear patterns are discernible in the main results of the study.

Patterns characterising the presence of UD were design solutions that did not categorise users or separate them from each other and environments that facilitated usage by placing low demands on the users' abilities. The presence of UD appears more clearly in the remodelling of old buildings and environments than in the new constructions. Intentions to create equal and accessible environments for all can be traced from early documents and throughout the entire process.

Patterns characterising the absence of UD are solutions in which inequalities are created by placing high demands on users' abilities and by categorisations of users. High demands on the user are also often linked to an imbalance between environmental and social sustainability, particularly in the new constructions. The objective of creating inclusive environments is challenged by ideas of what constitutes a sustainable lifestyle.

Figure 20 (left)

A sign on the door to a pre-school class in Landamäreskolan brings the issues of open environments to the surface: "Do you know the passing code? If you need to walk through, do it quietly! Don't look at us and walk fast!". The open areas in the school can be challenging for pupils and staff with concentration difficulties or reduced hearing. PHOTO: LILIAN MÜLLER

Figure 21 (right)

Visitors are expected to be able to climb the stairs to use the pool. Angereds Arena. PHOTO: LILIAN MÜLLER

Concluding Discussion

Implementing UD in the built environment requires more than legislation. Each participating actor must contribute in order for UD to be more consistently present throughout the building process. Human diversity must be present as an anticipated, essential condition in the visions and in all phases of the process (Lid, 2013).

Encouraging examples were found in the remodelling projects, where UD values and goals were evident, despite the complexity of tasks related to technical aspects and cultural preservation regulations. Equal use was highlighted as a priority in the processes behind the remodelling projects and the related costs were factored into the project budgets.

None of the cases in the study welcomed all users in all aspects. The new construction projects were particularly discouraging, not least in light of the clear statements on accessibility and usability in current building legislation (Boverket, 2018; Swedish Parliament, 2017; Swedish Government, Department of Culture, 2018) and the open initial conditions in new projects. The results indicate a variety of causes and conditions that might determine the presence of UD values and goals in the built environment.

As shown in these remodelling projects, a city is able to provide good examples of how UD can be implemented and contribute to social integration. It is however vital that sufficient time and occasions are available to observe and contribute to the whole, that knowledge can be gathered regarding the results to which specific efforts lead and how urban planning based on human diversity may be supported.

UD – easy to implement in existing buildings but harder in new constructions

Surprisingly, we found more evidence of UD in the remodelling projects than in the newly constructed buildings. The remodelling projects were supported by clear political decisions and budgets. Besides technical conditions, the buildings were constructed in times when equal access was not on the agenda or perhaps even imagined. In light of the challenges that cultural heritage protection might entail, the results in these cases were encouraging. Access and use for all were a prerequisite in all remodelling projects – from pre-studies to building permit applications to tender documents. High ambitions combined with challenging conditions might have been a driver for UD-inspired innovative solutions. The cases demonstrate how UD can be a valuable tool to widen the perspectives to create an inclusive society based on human diversity (Steinfeld & Maisel, 2012).

In the new constructions, the level of accessibility seems to have been limited to fulfilment of the minimum requirements of the building legislation. The new projects were all built after the CRPD came into effect in Sweden and following the enactment of the most recent Plan and Building Law (Boverket, 2018). It is evident that private and economic interests have had an excessive impact on the design solutions of the new constructions. These projects show, on the contrary, that strictly economic considerations have resulted in environments that do not support equal and inclusive use. Changed planning conditions have given building contractors significant influence over detailed development plans and even earlier stages, which might cause an imbalance between public and economic interests (Cars & Hedström, 2006; Kalbro et al., 2012; Mukhtar-Landgren, 2012; Berglund, 2013; Hidman, 2018).

To an extent, planning documents are already based on conditions of users' abilities; examples include plans for housing in very hilly terrain, requirements to manage without cars, elevated courtyards that exclude tenants who are unable to use stairs, and distances between public transport, parking spaces and building entrances. The new constructions also contained several examples of how categorisations of anticipated users can lead to inequalities and special solutions. Categorising users already in the planning phase seem to disadvantage certain persons and groups of persons, such as older persons and persons with disabilities.

Competing sustainability agendas weaken the impact of UD

It was noted that the new construction projects in the study with a strong green sustainability profile had a weaker social dimension. It should be noted that the examples with strong green profiles also tended to place higher demands on users' abilities. If "green values" are not balanced with social sustainability and UD, the desire to create a city with a green profile may ultimately lead to new inequalities.

The lack of integration between ecological and social sustainability has been identified as a primary challenge for Swedish municipalities when planning for new housing and living environments (Khan et al., 2020). Accessibility and environmental concerns are treated as in opposition rather than as strongly linked to each other (Vavik & Keitsch, 2010; Dempsey et al., 2011; Drilling, 2013; Wolbring & Rybchinski, 2013; Ericsson et al., 2020).

Discussions on social sustainability frequently view space as a relatively stable entity, a vessel to be filled with human life. Spatial phenomena such as segregation and fragmentation are often referred to as a predominantly socio-economic problem. In parallel, design is increasingly expected to contribute to democratic values, such as belonging and a sense of community (Sandström, 2020). The study shows that there is a gap between ideas of inclusive spaces and the actual design of these

spaces. The greenhouse at *Viva* illustrates the discrepancy between vision and implementation. It is a space made for collective and community-building activities, but the design includes a steep staircase that will allow some, but not others, to participate in any such activities; it is an inclusive space in terms of its intended use (collective and open to all), but its design solutions are exclusionary. Whilst there are other, comparable examples in the study, the greenhouse stands out as a particularly clear exemplification of the pressing challenges caused by the lack of integration between the notion of social sustainability and the values and goals of UD.

UD – a process concern where mindset matters

For urban planning and design to increase inclusion and participation in the society in line with national policy (2017/18:110), there is a need for more than laws and policies. This study reveals that in new constructions, existing building regulations to ensure accessibility for all fall short when it comes to inclusion and participation. A change of mindset is required for human diversity to be expressed at an early stage and remain a consideration for the duration of the project.

The study findings indicate that such a shift would need to be characterised by design moving beyond the separation of individuals and the reliance on special solutions, and that individuals' differences and abilities be considered throughout the process.

Several aspects of the findings will require future research, including the driving forces and counterforces that influence the presence of UD, as well as the factors in planning and building processes that are behind the differences in the presence of UD in the remodelling projects and the new constructions that were revealed in the study.

To conclude, we argue that UD can bring vital knowledge to fulfil overarching goals such as inclusion and social integration in the built environment (Lid, 2014; Hamraie, 2017; Hedvall, 2019). This study shows, by its numerous examples, that the values and goals of UD need to become fully integrated and implemented in the understanding of social sustainability. This integration of values is what will enable urban planning and design to contribute to a more sustainable society. Equality in the built environment needs the presence of UD.

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