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Urban Sustainability and the SDGs: A Nordic Perspective and Opportunity for Integration

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Abstract: Urban sustainability has been used to cover multiple aspects of urban development. Terms related to sustainability have been generously used to advance ubiquitous and hard-to-measure targets not least in response to global and national sustainable development (SD) targets. However, ad-hoc and governed urbanization processes differ. In addition to different development pathways, local differences in interpretation of sustainability exist. This renders a global urban sustainability discourse disconnected from local practice. In this paper we focus on the Nordic cities, combining what is known about the similarities of the cities and societies, their recent development and highlights. Comparing with the global sustainability discourse spearheaded by the UN development goals (SDGs) we analyze the potential links in Nordic urban development to the global aims, as well as the local action taken via ex-ante review and assessment. With increasing demands for transformative change in urban planning and other institutions due to environmental, social and economic challenges, we demonstrate where strengthening the urban sustainability agenda is particularly needed. Findings show surprisingly little focus on socially just and cross-thematic development pre-SDGs, while it is expected that the dominant technocratic focus will give way to these other aspects necessary to address sustainability under the current SDG framework.

Keywords: Nordic; Sustainable Development Goals (SDG); smart city; sustainable; urban; planning

1. Introduction

The notion of sustainability in the urban realm stems from the awareness that the predominant paradigm of urban development, including the social and economic, is endangering the environment and implies social decay, ecological and economic deprivation. Since the necessary paradigm shift does not limit itself to technological advances, we can speak about a broader sociotechnical transformation, as elaborated by Geels and Kemp [1]: "Transitions and transformations can only occur when developments at multiple levels amplify each other." A transformation within the urban realm is therefore necessary for cities to meet the requirements of a sustainable framework of development and progress.

For this paper, we adopt the viewpoint of Bibri and Krogstie [2] on sustainability, whereby "Sustainability epitomizes a holistic, long-term perspective based on the premise of consciously and incessantly going with the grain of nature and providing the conditions for deploying the frameworks necessary for its operationalization and its translation into practices in a more intelligent way in order to reach a sustainable society". We argue that the concept of sustainable development (SD) coined in the late 1980s by the Brudtland (1987) commission through Agenda 21 to the current UN 2030 Agenda for Sustainable Development including the Sustainable Development Goals (SDGs), is particularly

prevalent in, and suited for the context of the development of (Nordic) cities. The SDGs introduced in 2015 are now starting to be operationalized in different urban contexts [3].

Cities with different political and governing frameworks, sizes, population densities, levels of development and cultures (of urban planning) are difficult to compare. With respect to practices of (urban) planning in the Nordic countries, we argue, most of these aspects are similar, if not identical, making it possible to support an argument for similar opportunities, challenges, strengths and weaknesses rather than a comparison of stark differences [4,5].

Denmark, Finland, Iceland, Norway and Sweden constitute the Nordic countries, or Nordics (as defined by The Nordic Council and the Nordic Council of Ministers, www.norden.org). These countries have commonalities besides their geographical proximity and intertwined histories. They are globally speaking wealthy, open, liberal societies, often seen as spearheading gender equality and even frontrunners in different sectors of economic activity [6]. Especially in Denmark, Finland, Norway and Sweden an important common denominator is the so-called Nordic welfare model [7], which strives to secure a good quality of life for all citizens through redistribution of wealth in the form of social benefits, housing schemes and various other services (e.g., [8,9]). This model is by nature egalitarian, emphasizing individuals' rights to sustenance whereby the state has a strong role as provider of adequate means and services.

With the growth of cities and their concentration of people, wealth and opportunity, urban sustainability in the Nordics, much like elsewhere, can be seen as the 'mini-state' of sustainable development, and in many cases reflect the nation state's position with respect to the global SD targets. Even though the SDG indicators measure local, regional, national and global level development, the implementation and monitoring is expected to take place primarily at the national level [10]. However, front runner cities are starting to report their SDG indicators directly, bypassing the state level [11,12]. Many more cities are setting their ambitions significantly higher than required by the state level. In the Nordic city context this can be seen in, for example, the sustainability requirements for procurement [13,14]. Thus, cities themselves are increasingly recognizing their pivotal role in achieving the SDGs (e.g., [3]).

Still, urban sustainability often reflects a desired rather than an actual state in which an urban society balances between environmental, social and economic protection and integration, equity and opportunity, development and renewal: "Years ago, the concept of city said little about the need to be smart and was much less linked to the concept of sustainability" [15]. At the sub-national level, the responsibility for implementing sustainability agendas in practice rests on the city and municipal level [16]. This can be a challenge, as indicated by the Swedish case where, despite high levels of national commitment, the implementation at local level waned [16]. Initiatives to foster local level commitment may result in actions that remain incremental and stress consensual cooperation rather than challenge the state of play and aim for the necessary transformative action [17]. Nevertheless, the Nordics are often considered frontrunners in sustainable urban development, manifested through, for example, implementation of environmentally sound urban development using holistic and integrated approaches [18,19].

The rationale for an increasing role for urban planners and city authorities in the transformation to sustainability stems from the concern for developing specifically urban responses that can transform existing trends and accelerate change towards both local and global sustainability [20]. This implies a need to improve understanding of the complex interactions between social, ecological and economic processes, across spatial and temporal scales largely affected by cities [20]. Much like in other Nordic states, according to Khakee [5], Swedish planning was once used to implement policies of 'welfare communities'. With more urgent demands on planning, the focus has recently [21,22] lessened on the welfare society, and planning has turned its attention to environmental concerns, and even to creating conditions for business. These developments indicate an increased concern for the state and future of urban areas and that urban policies should be more flexible and more frequently updated.

The aim of this article was to systematically identify through a review and exploration of the findings, the possible gaps in research within the field of sustainable cities as pertains to the applauded Nordic culture of cities and planning. The article seeks to scrutinize the point of departure of Nordic cities as they are seriously starting to implement and operationalize the SDGs in the urban realm. It also critiques the understanding of sustainability of Nordic cities, based on a review of recent, pre-SDG literature—a method thus far not applied in this context. To tackle various aspects of sustainability we move beyond the research evidence and assess explicit (and sometimes implicit) links to the 17 Sustainable Development Goals. As a result, an integrated approach is presented to align the emergent pre-SDG urban concepts, governance and solutions in the Nordics-focused literature with the global SD targets. On the one hand we present the most evident cross-connections, and, on the other, we highlight where cross-connections are lacking with respect to the SDG framework. We call this approach, together with the subsequent interpretation, a literature-based ex-ante analysis of Nordic urban sustainability with respect to the SDG framework. This was hypothesized to support or, in fact, disarm the argument of the Nordic city model as being one of the most sustainable.

In the following we first present the data collection for the literature review, and the methods for analyzing the literature. After this follows the results section where the analysis is divided into 13 emergent themes under three broader categories: Concepts, Governance and Solutions. Under each theme we also investigated which SDGs the literature in that theme cross-connects with. The results section is followed by a discussion on the perceived gaps and indications in the Nordic context. We conclude the study by highlighting the possibilities for urban sustainability and transformation when implementing the SDGs in the urban domain also outside the Nordics.

2. Methodological Approach

In this section, we identify the emergent themes around three equally emergent top categories, namely Concepts, Governance and Solutions that arise from the Nordic urban sustainability discourse in scientific and other pre-SDG literature. The themes are then analyzed with respect to their explicit (and in some cases implicit) links to the current SDG framework.

First, we collected a set of relevant literature using methods of systematic review, useful in terms of arriving at a more comprehensive and trustworthy picture, as opposed to what would be possible from individual pieces of research [23,24]. We analyzed the resulting selection of articles primarily via text coding.

Following systematic review standards (e.g., [25]) the literature review involved a systematic search for English language academic and policy texts published between 2010 and 2017, with the relevant keywords inputted into a combination of search strings. The time interval was selected to reflect the most recent discussions before the implementation and significant urban literature published on the SDGs that were launched in the beginning of 2016. This enabled a so-called ex-ante analysis of urban sustainability in the Nordics, before the cities started to systematically implement the SDGs in their processes. The keywords were narrowed down based on internal and external (mostly) academic expert workshops in Finland and initial test search outcomes. The search strings were entered in various combinations into six online databases including Scopus, Google Scholar, JSTOR, Web of Science and Project Muse. The bulk of the search was conducted throughout June and July of 2017 and complemented by the most recent literature (published later in 2017) in June 2018.

The search string began with ("Nordic" OR "Scandinavia" OR "Northern Europe"); and the specific location of the Nordic countries: ("Finland" OR "Sweden" OR "Denmark" OR "Norway" OR "Iceland"); exclusion criteria were entered to filter various non-Nordic regions that initially often appeared in the search results: (NOT "Africa" NOT "Asia" NOT "South America" NOT "Australia"). To capture the city scale in response to the lack of reference to a relevant country, the capitals were added as ("Oslo" OR "Helsinki" OR "Copenhagen" OR "Stockholm"). The next element to add were the substance keywords for sustainable cities/urban planning, for which we used the forms: (urban* OR city OR sustainab* OR development OR "sustainab* indicators" OR "sustainable urban form" OR

urban planning OR "sustainable city" OR "smart city" OR "built environment"). This completed the initial search for the review. The search was complemented by backward snowballing [26], which included a search through reference lists of retrieved articles.

The search returned tens to hundreds of peer-reviewed academic articles and policy reports from each platform. Common guidelines for including an academic article in the final selection were made within the author team. These followed principles of the intended search, namely geographical area of the Nordics (or at least inclusion of an urban case in the geographical area), agreed timeline and specificity to the case of sustainability in urban development and (planning) practice. During the search for relevance, we also found that compared to the limited sources on the specific case of Nordic urban sustainability, there existed a vast amount of research on the global overview of what constitutes sustainable cities. These articles were omitted from the review but kept as background material for complementing the discussion sections.

Peer-reviewed articles in the selected time frame were somewhat limited. Therefore, fourteen relevant policy reports (grey literature) were included from the systematic review results in addition to the peer-reviewed academic sources, as these complemented the region-specific result. The reports were valuable for the purpose of the review, as they were created and/or published by key urban stakeholders and actors, such as municipalities, research think tanks or intergovernmental organizations such as the Nordic Council of Ministers which is the official inter-governmental body for cooperation in the Nordics. In total, 50 publications (36 journal articles and 14 policy reports) were included in the final set for analysis. The retrieved publications are listed and collated by thematic area in Supplementary materials.

After the references were collected, each author assessed what themes the articles represented via conventional content analysis by coding the data with themes reflecting the different aspects of urban sustainability emerging from the data [27]. In this phase 13 titles for best descriptive power were formed. After this the 13 themes were categorized under three broader categories: Concepts, Governance and Solutions (see Table 1 and Section 3.1).

Finally, the team assessed the individual articles with respect to which SDGs their represented themes explicitly or implicitly connected with. For this cross-referencing, each article was assigned a key theme out of the 13 (or in few cases, primary and secondary) they represented. Whilst the theme assessment was based in particular on the abstracts and conclusions, in the cross-referencing with SDGs other relevant sections such as results were also included. The introduction or background sections did not influence the cross-referencing, as they presented a broader spectrum of associated (but not fully represented) themes or development areas.

Table 1. Themes and links with sustainable development goals (SDGs): the darker the pattern the more links (counts) between the theme and the SDG were found. Blank cells (count 0) are lacking traceable links.

SDGs	Concepts					Governance		Solutions					
	Sustainable City	Socially Integrated City	Smart City	Compact City	Carbon Neutral and Green City	Indicators	Participation	Tools and Approaches	Transport	Consumption	Living Labs and Innovation Platforms	Building, Land Use and Urban Form	Ecosystem Services
1. No poverty	0	1	0	0	0	1	0	0	0	0	0	1	0
2. Zero hunger	0	0	0	0	0	0	0	0	0	1	0	0	0
3. Health	0	0	0	0	0	1	0	0	0	0	0	1	1
4. Education	0	0	1	0	1	1	0	1	0	0	0	0	0
5. Gender equality	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Water and sanitation	1	0	1	0	1	2	1	0	0	1	0	2	0
7. Energy	0	0	2	0	2	1	0	0	0	2	0	3	1
8. Work and growth	3	0	2	0	1	2	0	1	3	0	1	1	0
9. Industry, innovation, infrastructure	3	0	4	1	1	3	1	4	3	1	2	6	0
10. Inequality	1	2	1	0	0	0	1	0	1	1	1	3	1
11. Sustainable cities	3	0	2	1	1	7	1	6	4	1	3	7	3
12. Consumption and production	3	0	2	1	1	1	0	1	1	4	0	1	0
13. Climate	2	2	0	0	1	3	1	2	1	1	0	3	1
14. Life below water	0	0	0	0	1	2	0	1	0	0	0	1	1
15. Life on land	0	0	1	0	1	2	0	1	1	0	0	1	6
16. Peace, justice & institutions	3	1	1	0	1	3	1	4	1	1	1	3	1
17. Partnerships	3	0	2	0	1	2	1	2	1	0	2	1	1

3. Results

The main finding from the literature was that the sustainability and development themes particularly prevalent in the Nordic urban discourse are often connected to techno-material aspects under the categories Concepts, Governance and/or Solutions. Good examples of the themes within the categories are: Smart city (under Concepts), with content on digitalization and technologies; Indicators (Governance), with a focus on measurable emissions and flows; and Buildings, land use and urban form (Solutions), with a focus on physical urban structures. Table 1 presents how the 13 themes under three main headings link to the 17 SDGs; the table illustrates the number of links or 'counts' between the SDGs and themes the articles represent via a darkening color pattern. Only one SDG (#5 Gender equality) was not at all represented in the outcome of the analysis.

The 13 themes connect across the SDGs in similar patterns. Examples include Building, land use and urban form connecting most strongly to the SDGs #9 (Industry, innovation and infrastructure) and #11 (Sustainable cities), and Ecosystem services connecting most strongly to SDG #15 (Life on land). The emphasis on SDG #16 (Peace, justice and institutions) is also prevalent.

During the cross-linking analysis it became apparent that the Nordic urban literature pays less attention to the first five SDGs that concentrate on the social aspects of sustainability. In the following we elaborate on the emergent themes and their SDG linkages (or the lack thereof). The themes were divided under three overarching headings: Concepts, Governance and Solutions.

3.1. Category 1: Concepts

3.1.1. Sustainable City

In the reviewed literature the theme of sustainable city aims to integrate the three broad pillars of sustainability—environmental, social and economic—whereas the other themes in the concepts category have more focus. Although the sustainable city is a theme that more or less all of the literature touched upon, few of the retrieved articles addressed it with a primary focus. De Jong et al. [28] reviewed a multitude of concepts promoting sustainable urbanization, and concluded that there is need for rigor and nuance in the use of the terms. In their analysis 'sustainable city' was the most frequently occurring category.

In this theme, the city is seen as the crucial, key level player for operationalizing sustainability, positioned between the practical realm of citizens on the one hand, and national and supranational sustainability objectives on the other. Cities can thus also play key roles in bypassing the national level objectives (where considered too modest) and linking with each other across regions. Saldert [29] for example illustrates how the local discourses in two Swedish municipalities have shifted from a focus on ecological adaptation to focusing on sustainable growth. This shift can be interpreted as a result of turning attention from a local to global context, in response to a perceived need to compete on the global scale.

The necessity for cities to attract citizens and business can also be seen from the SDGs the theme is connected with. Work and growth (SDG #8); Industry, innovation and infrastructure (SDG #9); and Consumption and production (SDG #12) all suggest robust linkages between the sustainability discourse and economic sustainability. This however does not mean growth at any cost but is tied to the global challenges such as Climate action (SDG #13) that affect the possibilities of cities to thrive and can also provide opportunities for finding solutions (work and growth).

3.1.2. Socially Integrated City

Of the conceptual themes included in this study, the socially integrated city stresses most of the social aspects of sustainability. Even though the literature explicitly focusing on these aspects was thin, the ones discussing this theme took a clear stand. Even though the consensus is that social cohesion, gender and other aspects of equality are in relatively good shape in the Nordics, certain

challenges remain. One of these grand challenges is the increasing urban socio-economic polarization and fragmentation [30].

The Nordic cities, like many global counterparts, have faced and will further face the megatrend of increasing urban population. Despite being regarded as global leaders in tackling (SD) issues such as poverty and climate, the challenge is to also be prepared in future. Certain lessons could be learned from the Nordic example. One of these is related to the governance mechanisms that guarantee some reflexivity and tend to aim for consensus in decision-making, although admittedly, this is easier when the economic assets for governance are guaranteed and relatively predictable [31]. Despite the small number of sources touching upon this theme, the SDGs cross-referenced support these notions, with emphasis on reduced inequalities (SDG #10), addressing and considering the interrelations between poverty and climate action (SDG #1 and #13, respectively).

3.1.3. Smart City

Whereas the sustainable city per se was a primary focus in rather few of the articles, the related concept of the smart (sustainable) city was the focal point of several articles. The concept underpins the use of technologies and digitalization as a means to achieve the sustainability objectives. Or as Anttiroiko [32] puts it, the concept of a smart city "revolves around the technologically enhanced ability to transform the urban fabric and social practices in order to produce public value". Bibri and Krogstie [2] argue in a substantial review of smart sustainable cities that intelligent planning, or ICT (information and communication technology) in its various forms, is of fundamental importance for strategic development and to achieve the long-term goals of sustainability.

The literature on the concept often concentrates on the various smart city initiatives by Nordic cities. The smart city is often explicated as one of the building blocks of economic strategies and policy objectives. However, the absence of citizen perspectives and bottom-up reflections has been raising questions on the lack of co-creative dimensions of the applications [32]. However, also positive examples were discovered, such as the city of Oulu, Finland, which has integrated citizens into the development of local smart city initiatives [33].

From the search results, it appears that the Nordic trend of sustainable city development is to transform former industrial areas into smart city districts. Besides the smart city, the closely related concept of the intelligent city aims to generate a more holistic understanding of what it means when an extremely complex system such as a city aims to improve the quality of life with the help of intelligent solutions and the multiplicity of data streams and indicators. Kourtit [34] states that "an i-city operates on the basis of intelligent initiatives and solutions through the broad acceptance of digital technology in all constituents of the urban system."

In light of these observations, the use of the concept of smart (or intelligent) cities is understandably closely linked with SDG #9, Industry, innovation and infrastructure and Sustainable cities and communities (SDG #11). Consumption and production (SDG #12) and also the partnerships for sustainability (SDG #17) echo the issues raised in the discussions concerning the role of citizens in these initiatives.

3.1.4. Compact City

The compact city concept has been held as a signpost within the sustainable urban planning discourse [35]. In the Nordic region, compact city development is a wide-spread urban policy, even though finding the optimal way to locate and mix different urban functions and maintain a good quality of life in densifying urban areas is a challenge [30]. As populations continue to grow, cities can minimize land use through concentrating people and their activities [36].

The concept of the compact city is strongly associated with high urban density (often even just high population density). The main aim behind the concept is minimization of the need for transportation, land use and heating. Despite only one journal article retrieved [35], the compact city concept was addressed as a secondary theme in many grey literature references via densification and urban sprawl.

In general, Nordic countries share similar policy pathways, but there are also differences. For example, in Norway, there are more low density housing areas and urban sprawl than in Finland, Sweden and Denmark [37,38], possibly as a result of recent market-liberal coalition politics. Oslo, Norway, however, is an example of a compact city due to its surrounding forests that create a boundary [36] which produces densification within the city limits, thus preventing urban sprawl. In addition, the cities emphasize the fight against urban sprawl, e.g., City of Helsinki urban plans from several years (2013, 2015, 2017) highlight the densification and compact city aspects. On the other hand, in Stockholm, the dominant planning ideal is densification, coexisting with a strong vision of retaining green parks and natural areas that stretch from outside the city all the way to the center [39].

Also critical observations were found in the retrieved literature. Säynäjoki et al. [40] point out that prioritization of urban density, may happen at the cost of alternative means of supporting environmental sustainability, such as the encouragement of sustainable peri-urban or country lifestyles. Furthermore, Jensen et al. [35] conclude that there is no strong empirical evidence in support of compact cities as an efficient sustainable urban strategy. In relation to the SDGs it is clear from Table 1 that the compact city is a rather narrow concept of urban planning that, to date, lacks significant links to wider socio-economic and environmental (sustainable) development issues. The same was noted previously in the review by de Jong et al. [28].

3.1.5. Carbon Neutral and Green City

From the conceptual themes, the carbon neutral and green city represents the most narrowly focused one. The reviewed articles on carbon neutral cities concentrate on issues of municipal energy production and consumption as well as transportation, which are large sources of emissions. Especially around the energy consumption and heating issues the focus was mostly on the production side, leaving the citizen as a consumer of these utilities in a passive role.

As per the concept of the green city, Copenhagen promotes itself as being the leader based on indicators around urban form, innovation, skills and employment, low carbon and environmental quality [41]. Copenhagen also boasts covering over 97% of its residents within district heating systems [42]. District heating is common also in the other Nordic communities, which the cities have traditionally had control over, but the rise of distributed means of energy production might challenge the status quo [43].

Nguyen and Davidson [44] suggest that while plans from several metropolitan cities focus on promoting green technology through ecological modernization, they lack consideration of the practical tools needed for achieving it equitably, i.e., concomitantly enhancing social equity. Therefore, unsurprisingly, we found the theme has primary cross-links to Affordable and green energy (SDG #7), but also to a broad range of other SDGs, such as Responsible consumption and production (SDG #12) and Climate action (SDG #13). Besides these, on the way to social equity is the less evident link to Quality education (SDG #4).

3.2. Category 2: Governance

3.2.1. Indicators

From the three themes in the governance category, indicators was the one that appeared in the Nordic literature the most, in fact it collected the most links with the SDGs of all the considered themes. According to the literature, the main purpose of sustainability indicators is to assess the performance of a city by comparing its sustainability with other urban areas, utilizing up-to-date, relevant data to do so. Indicators were seen as an essential tool for efficient and legitimate governance.

Indicators are also used to compare countries, and the Nordics in general tend to do well in these comparisons [45]. For example, the European Green City Index evaluates cities based on CO_2 emissions, energy, buildings, transport, water, waste and land use, air quality and environmental governance. The index has ranked four Nordic cities as the wealthiest (based on GDP per person) and

with the highest 'green city' index score [42]. However, despite that the scales for the indicators should be globally applicable, as the physical constraints in the Nordic context sometimes restricts meeting the evaluation criteria [40]. Also, the governance-related indicators have sometimes been problematic, such as reaching the participatory aspects of governance [46].

Indicators are not neutral or free from controversies. One such issue is the weak link between indicators and policy and governance practices. While being valuable tools for administration, they do not necessarily have an effect on the policy processes or other discussions in the community. Pupphachai and Zuidema [47] raise the issue of sustainability indicators becoming comprehensive but isolated databases. Instead the indicators should connect to each other, which would also make them open to a broad range of urban actors.

The SDG linked to the indicators theme in the Nordic literature the most was Sustainable cities (SDG #11). Besides this, the theme links to the SDGs that are often also the topics the indicators themselves measure. Such as Clean water and sanitation (SDG #6); Industry, innovation and infrastructure (SDG #9); Climate action (SDG #13); and Peace, justice and strong institutions (SDG# 16).

3.2.2. Participation

Despite being the main focus in only one article [48], participation and inclusive planning was touched upon in several of the articles. This does not come as a surprise, as the role of citizens in the planning practices in the Nordics has been relatively strong and is growing. Participation has also been one measure to gain legitimacy and tackle discriminative barriers [31].

In an ideal situation, public involvement in the different phases of decision making and also policy implementation brings about benefits, despite making the processes sometimes more laborious [49]. Some cities, such as Lahti, Finland but also Helsinki have appointed special officials who aim to engage citizens in the policy and planning processes [31]. Besides policy processes, participation is also important in other kinds of initiatives for experimenting, testing and co-designing sustainable products and services. Living labs are a prime example of these kinds of mutual learning platforms, but also need to elaborate understanding of the dynamics of this kind of interaction [32].

As the role of participation spreads out to various issues, depending on the policy processes participation relates to, the SDGs this theme links to vary from Clean water and sanitation (SDG #6) and Reduced inequalities (SDG #10) to Peace, justice and strong institutions (SDG #16), which can be seen as supporting the participatory mechanisms.

3.2.3. Tools and Approaches

Besides participation, the Nordic governance model also has other tools and approaches contributing to the legitimacy, predictability, capacity building and accountability of policy making and administration. Governance has been recognized as part of the Nordic model of urban sustainability, where cities have an active and crucial role [50]. However, reflecting the notion of cities as actors competing for taxpayers and businesses, short-term economic interests in the municipal decision-making have sometimes challenged this tradition [40,51].

Despite the positive features mentioned above, criticism was also voiced. The planning monopoly that municipalities have held a long time in Finland, calls for more flexible and inclusive forms in future. This is seen as the case in point around the collaboration between municipalities, but also within the municipal administrative sectors [43]. The incrementality of Nordic governance is another issue that prevents more fundamental, or indeed transformative changes to take place despite the urgency of certain aspects of sustainability [52]. Also the technocratic features, e.g., the power of engineers and architects in planning, sometimes prevents the knowledge on local contexts, user and social perspectives to enter the processes, especially in large scale spearhead projects [48].

In relation to the SDGs, the Nordic governance tools and approaches seems to link to the aforementioned areas such as Industry, innovation and infrastructure (SDG #9), Sustainable cities (SDG #11) and Peace, justice and strong institutions (SDG #16). Besides these, the Nordic model relates

to a lesser extent to Climate action (SDG #13) and Partnerships for the goals (SDG #17) to achieve the sustainability objectives.

3.3. Category 3: Solutions

3.3.1. Transport

Transportation has also gained prominence in the last decade in Nordic literature (e.g., [53–55]). In the reviewed literature the discussions concentrated on one hand on the active modes (e.g., walking, cycling) and on sustainable transport planning and its effects on climate targets on the other. In relation to the active modes, the theme was often approached via the context of safety (e.g., [53]). Nordic cities such as Copenhagen also use cycling as a tool for building a positive city image, connecting the urban form via cycling routes while also stressing the health benefits of cycling [36]. Cycling is also closely connected to the other recurring topics of this theme, namely transport planning and sustainable urban mobility plans (SUMPs). These initiatives have been supported by national governments from the 1990s onwards, especially in Denmark, Norway and Sweden [53].

Transport planning and promoting active modes are also central when addressing greenhouse gas emissions from road transport which currently constitutes a major source of emissions (e.g., [56]). Along SUMPs, the development of urban form, and the role of spatial and regional planning in supporting it, can be seen as tools to improve the city's sustainability (SDG #11) and simultaneously address climate action (SDG #13). Urban form was also connected to the challenges in organizing public transport in lower density areas [57]. Despite strategies to promote active modes and mobility-as-a-service thinking, practical policy instruments seem to be lacking [54].

Prioritizing active modes addresses several SDGs. What is interesting is the connection between transport and SDG #8, Work and growth: besides environmental concerns, functional urban mobility is also seen to affect logistics and employment. Industry, innovation and infrastructure (SDG #9), not least in the form of urban planning and urban form, need to support the smooth connections between working and living such as the daily commute.

3.3.2. Consumption

In the relatively high-income context of the Nordic countries, private consumption is one focal point where sustainability targets such as resource use and emissions play a central role. It is also closely related to businesses offering services to customers. This is also an area where societal steering could help in creating markets that would enhance sustainability [58].

High living standards also often mean high (animal) product consumption [59] and food waste [60]. Alongside environmental impacts, there are also ethical implications that should be taken into consideration. Just like food consumption, water use is also connected to the daily practices of citizens, but unlike food waste, excess use of water is rarely a problem in the Nordics [36]. The Nordics in general do not suffer from water shortages and the quality of water management is often of high priority [59]. Water management is indeed one area where the public and private realms of sustainability interact substantially. Waste management is another such area that was also discussed in the literature [36], in particular in relation to urban form and governance structures [43].

Consumption was also addressed in the context of urban form through comparisons of emissions of different urban areas. This is, however, not as much an issue of the spatial characteristics or buildings' energy use, but more dependent on citizens' income and related consumption patterns. Density can, however, be justified by other aspects, such as ecological and social aspects and resource savings [61]. Besides the obvious linkage to the SDG #12, Responsible consumption and production, the theme of consumption was connected to SDG #7, Affordable and clean energy from both the consumer, but also utility provider side. Along these, connections to the aspects of Zero hunger (SDG #2) and Clean water and sanitation (SDG #6) were raised due to the explicit focuses on food and water issues.

3.3.3. Living Labs and Innovation Platforms

Urban living labs are often about collective experimentation and governance in a spatially bounded urban area. Living labs may overlap with other urban innovation platforms. Along the aims of generating growth through a less restricted operational environment and harnessing the dynamics of urbanization, urban living labs address also sustainability challenges. They are often used as tools for promoting the city's public image and attractiveness as frontrunners in sustainable urban development. The approach has been widely utilized in the Nordic cities [62].

Anttiroiko [32] provides a useful explanation of the purpose of living lab experiments. "Living labs serve as magnets in the innovation ecosystem: city governments use them to promote economic development by generating social, service, and governance innovations; higher education institutions use them to bring their teaching and research closer to developers and users; and innovative companies use them for ideation, testing, and product development. Through such a diversity of engaged actors and the principles of openness and co-creation, living labs actually do a great deal to shape the entire idea of smart city in the metropolitan region."

Thus, living labs highlight several elements of a sustainable city including participatory governance and smart city innovations by utilizing citizens in decision-making and development plans. The living lab concept can therefore easily be seen to align well with the Nordic welfare model. From the SDG perspective they connect to the general idea of a sustainable city (SDG #11), Industry, innovation and infrastructure (SDG #9) and Partnerships for the goals (SDG #17), but also resonate with Reduced inequalities (SDG #10) and generating employment and growth (SDG #8).

3.3.4. Building, Land Use and Urban Form

Land use and especially urban form were recurrent themes in the literature. For example, spatial planning has profound effects on several aspects of sustainability, such as mobility options, business opportunities, emissions from energy and the building sector, consumption patterns and safety.

Häkkinen and Belloni [63] studied the barriers and drivers of sustainable building in the Finnish context. They reported various risks related to the lack of experience and comprehensive information about new sustainable solutions within the construction sector. They emphasized the need to increase the awareness and demands of sustainable building. Cross-referencing with the SDGs, it was concluded that sustainable building and the subsequent changes needed in the construction sector fall under SDG #9, Industry, innovation and infrastructure, as well as implicitly under SDG #11, Sustainable cities and communities.

What then constitutes sustainable urban form? Our empirical material points in several directions. Analyses of energy use for housing and everyday travel support the idea of dense urban form [19]. There are, however, a number of challenges with this interpretation. The most important one is related to consumption, particularly in relation to mobility. Housing density, which strongly correlates with proximity to the city center, seems to have unintended effects on energy use for everyday travel and leisure-time travel, as revealed through an empirical study [19].

In the cross-reference table, the SDGs covering aspects of infrastructure (SDG #9) and general sustainability of city (structure) (SDG #11) are unsurprisingly well represented. Substantial links were also found in the technically oriented Affordable and clean energy (SDG #7), Climate action (SDG #13) and Clean water and sanitation (SDG #6) as well as institutions crucial for planning (SDG #16). However, this broad theme also touches upon the SDG that is less emphasized elsewhere, namely Reduced inequality (SDG #10) which is also something urban planning and form can contribute to, especially through housing.

3.3.5. Ecosystem Services

Ecosystem services and nature-based solutions (NBS) were a recurrent topic which clearly reflected the understanding of the Nordic way of life including a strong connection and proximity to nature,

also in urban contexts. This connection was turned into an asset, when the nature-based solutions were seen as something the Nordic are leading in the world and that could be also exported as practical solutions, technologies and governance models [64].

In practice NBS had several functions: (1) they were connected to harnessing or tackling natural phenomena causing problems in urban areas such as storm water, heavy rain or excess heat; or (2) offering health or leisure benefits for the citizens; or (3) improving biodiversity [65]. Acknowledging the experiences of citizens was seen as an important issue [66]. Careful planning was also considered crucial when aiming to combine urban and natural contexts, such as in the case of increasing recreation and hobbies [67]. Besides recreational value, urban nature and ecosystem services were seen also as tools to integrate people of diverse backgrounds into the Nordic societies where appreciation of nature and outdoor activities is intrinsically culturally highly valued [64].

As shown in Table 1, the theme of ecosystem services links most prominently to SDG #15 Life on land and Sustainable cities (SDG #11), but logically, also Climate action (SDG #13) and Good health and well-being (SDG #3) feature.

4. Discussion

The pre-SDG sustainability discourse in Nordic urban literature, as evidenced in the timeframe of the review, touches upon various issues of sustainability even prior to the on-set of the current SDG framework in 2016. Whilst the concept of sustainable development has been around since the late 1980s, it has arguably changed shape and form various times. The current 2030 Agenda for Sustainable Development including the Sustainable Development Goals (SDGs) have received, perhaps surprisingly, considerable traction. In the Nordic context, such as in Finland, the local level and cities in particular have recently been active in self-committing to the SDGs [17]. This trend of activity with respect to the SDGs will most likely continue in the coming years as we have witnessed several cities ambitiously integrating the SDGs in their planning and operations [3]. This further stresses the importance of fostering the balance and interconnectedness of the different aspects of sustainability of which this study shows still has room for improvement.

We systematically reviewed and analyzed a substantial body of literature (both academic and policy reports) on Nordic urban sustainability, comprising a selection of 50 articles. We collated the articles across 13 emergent themes under the three categories Concepts, Governance and Solutions, and cross-referenced them against the seventeen global SDGs. Through this exercise we aimed to unravel in an ex-ante analysis the multiple yet unobvious links between the pre-SDG urban development themes and the current sustainable development goals, and witnessed the uneven nature of the distribution. Hence, we argue, there was a need for the SDG framework to be taken seriously and also to be implemented at the city level in the Nordics.

From the cross-reference results depicted in Table 1 and discussed in the thematic subchapters, it is evident that the Nordic welfare model is still alive in the urban planning and development that is currently being practiced. Nevertheless, the lack of strong links with the lower numeral SDGs (poverty, hunger, health, education, gender equality), shows perhaps the technocratic culture in Nordic urban planning and an emphasis on the 'well-to-do' Nordic urban societies, despite the existing, even persistent issues around poverty, rising inequality and cost of living, much akin to urban counterparts globally.

Rarely do the 'catchy' concepts, under which the urban aspirations can be categorized (e.g., sustainable, socially integrated, smart, compact, carbon neutral and green), tangibly relate to the social aspects of sustainability (first five SDGs). With the exception of SDG #10 (Reduced inequalities), inequalities are more often addressed in the discourses of urban governance and, perhaps most surprisingly, solutions. What is visible throughout the themes, and perhaps less captured in the SDGs is citizen participation and civic action. This can be viewed as a particular Nordic strength, especially as it manifests across the otherwise rather technocratic themes. Other particular Nordic strengths arising from the review include: awareness among public actors in Denmark and Finland;

rigorous policies on urban development in Finland and Norway; significant advances in the area of smart cities and ICT solutions in Finland and Sweden; infill development in contaminated areas in Finland; ecosystem services in Sweden with tools for ecosystem services developed to a great extent in Norway; solutions for waste disposal, energy and heating in Iceland, Norway and Sweden whilst Finland also benefits from district heating infrastructure [4].

Underpinning the successes of community and municipal level solutions in the Nordic context, e.g., energy-efficient, near to net-zero fossil carbon developments that are less evident from the SDG connections are experimentation, continuous learning and extensive stakeholder engagement [18]. Such initiatives have also been developed elsewhere in Western Europe, based upon the progressive urban policies in the Nordics that were, by design, intended to foster sustainable urban development (ibid).

What is yet another particular Nordic strength is the prevalence of consideration for the natural environment. In fact, of all the three pillars of sustainability, the pillar of environmental sustainability, it could be argued, is by far the strongest, perhaps even stronger than the economic one, albeit likely at the expense of attention towards social sustainability. Still, with increased attention on social integration, participatory platforms and experimentation [18,31,32], the Nordic cities might well be underway to addressing the sustainability challenge ever more comprehensively.

Our paper reveals pre-SDG gaps in knowledge and research-based enquiry about the sustainability of Nordic cities and city planning, often applauded as forerunners in sustainability. This holds especially true for the social aspects of sustainability that have largely come to the fore with the onset of the global SDGs fostering a simultaneous, systematic approach to the multiple sustainability challenges related to rapid urbanization. It seems that the social aspects in particular—something the Nordic countries are known for through their policies of inclusive welfare—remains lacking in the discourse around sustainability. This lack of focus is likely not mere rhetoric, but could in fact have detrimental consequences to how urban sustainability might be interpreted and implemented in the long run. For effective measures that cities are now actively pursuing related to, for example, mitigating climate change, they need to simultaneously take into account aspects of equal distribution of impacts and acceptability of the measures taken [68,69]. Failing to couple the different aspects of sustainability jeopardizes the success of individual measures.

An urban development approach flush with participation and experimentation, requires securing sufficient resources and continuity in developing these initiatives. It also calls for finding new ways to harness the interaction of public and private actors [14]. This interaction requires integration of citizens into these processes, not only for the social acceptability and legitimization through the established participatory mechanisms but for the need to take citizens seriously as key agents for change [64]. This is the case in particular for advancing the social aspects of the SDGs that seem to have been taken for granted in the Nordic context in pre-SDG times.

5. Conclusions

In this paper, sixteen out of seventeen SDGs were successfully cross-referenced for a pre-SDG Nordic city literature base of 50 articles covering 13 themes under Concepts, Governance and Solutions. Nordic capital cities such as Copenhagen, Helsinki, Oslo and Stockholm form a good 'testbed' for assessing factors of sustainable urban development, due to high urbanization, municipal self-government, tax financing and a successful welfare system. These Nordic cities, among others, demonstrate that being a smaller city is not a barrier to the commitment of positive action for sustainability. Highlights of Nordic planning and development principles include advancing the status quo of sustainable performance, merging urban living with the qualities and benefits of nature, construction of functional, smart and aesthetically appealing urban structures, and the utilization of local resources adapted to local conditions.

This paper shows that critical issues of sustainability, mainly in the social realm, remain unaddressed or only cursorily mentioned in pre-SDG Nordic urban development and city literature, according to this ex-ante study. These less explored, largely unaccounted for, and theoretically

underdeveloped aspects of socially sustainable urbanization will need further attention on the way to truly transformative urban sustainability in line with the current SDG framework. This is especially important as the interconnectedness of social, environmental and additional sustainability aspects also means that the success of the practical measures depend on one another.

In addition to the attention already paid to environmental and economic sustainability, the Nordic urban and sustainability discourse will benefit from the already existing excellence around environmental justice in the future. This manifests in the Nordics, among others, as equal access to urban green space alongside the ecosystem services it provides. On the path towards evermore comprehensively sustainable cities, we must increasingly take on board the social aspects of sustainability, for without it, the other sustainability pillars will also be challenged.

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