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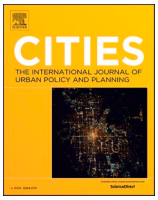

Descriptions of the relationship between human health and green infrastructure in six Nordic comprehensive plans

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ABSTRACT

The link between green infrastructure (GI) and human health and well-being (HH&W) is well-established. While land use planning is fundamental for delivering increased and equitable HH&W outcomes, whether and to what extent this is implemented in planning practice is largely unknown.

This study performed a content analysis of six Nordic comprehensive plans regarding terms, connections, and goals used to describe the GI-HH&W relationship in order to identify the conditions set for developing health-promoting GI in strategic planning interventions.

The results revealed common, varied, and nuanced terminology describing GI in all six plans, while health outcomes were non-specifically described and less consistently referred to. Similarly, connections between and goals related to GI and HH&W outcomes were rarely mentioned and expressed only in general terms. This lack of nuance may lead to uncertainty concerning (i) land claims required and (ii) how to configure allocated land in order to promote HH&W via GI. Overall, current descriptions fail to acknowledge that health outcomes vary with properties of GI, and may thus fail to provide sufficient arguments to withstand other land use interests. From a strategic planning perspective, the general description of the GI-HH&W relationship may create additional uncertainties for prioritization in subsequent planning phases.

1. Introduction

The relationship between natural environments and human health and well-being (HH&W) is well-documented (Bratman et al., 2019; Hartig et al., 2014; Markevych et al., 2017; van den Bosch & Ode Sang, 2017; WHO Regional Office for Europe, 2016). The World Health Organization recently presented a strategy calling for a transformation in how the environment is managed with respect to HH&W (WHO, 2020), highlighting a need for making HH&W a strategic objective in cross-sector action, stating land use planning as a key sector. Effective land use planning can be considered fundamental for delivering increased and equitable HH&W outcomes (Besser & Lovasi, 2023; Sallis et al., 2016), as benefits from green space need to be actively planned for (Amano et al., 2018; Kabisch et al., 2023).

Studies on the effects of natural environments on health outcomes are rapidly emerging, detailing e.g., specific HH&W outcomes derived from concepts such as "nature". However, less focus has been placed on providing evidence from a planning perspective, e.g., addressing specific needs of different age groups (Douglas et al., 2017), or through specific types of nature, e.g., 'green infrastructure' (GI) (Nieuwenhuijsen, 2021). GI is defined as a "*strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services*" (EC, 2013, p. 3). A well-documented relationship between ecosystem services (ESS) and human well-being presents a strong argument for combining these in planning approaches (van den Bosch & Ode Sang, 2017). Strategic planning and management of GI includes integrated, connective, and cohesive networks of green spaces viewed in a combined socio-ecological perspective (EC, 2013; Jansson et al., 2020; Mell, 2009), thus offering opportunities to integrate HH&W (Tzoulas et al., 2007). Therefore GI planning is critical for prioritizing health aspects, e.g., related to differentiated uses (Lee et al., 2015) or equity (Gradinaru et al., 2023). As part of the now renowned prolific Green Surge project on sustainable GI development, Davies and Lafortezza (2017) studied whether health was mentioned in collected European GI plans, revealing a high prevalence of the concept. However, they did not further analyze the extent to

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which health was presented or the aspects of health discussed.

In a European context, national and local governments are perceived to have the main responsibility for *developing* GI policies (Slätmo et al., 2019), while *implementation* of strategies for public accessible spaces in urban areas most often lies at the local government level (Carmona et al., 2004; Randrup & Persson, 2009). Within European planning practice, different cultures can be identified, e.g., the "The Nordic planning family" is characterized by a "comprehensive integrated" approach (Davies & Lafortezza, 2017, p 95). In the Nordic context, the comprehensive plan, sometimes referred to as the masterplan or municipal plan, is the overarching spatial planning instrument on local level, specifying and prioritizing land use, including GI preservation and development, to reflect political long-term ambitions (Borges et al., 2017). The plan consists of a map specifying land use and a written plan description, also referred to as a community section, containing visions, goals, and information to steer the municipality's strategic development. This comprehensive plan acts as the main guide and basis for land use, guiding the legally binding 'detail plans' that regulate individual areas, as well as pointing out focus themes and prioritizations in further steps in strategic planning (e.g., green plans or other strategic documents with a thematic focus) (Randrup & Jansson, 2020). Comprehensive plans are mandatory in all the Nordic countries, but there are differences in whether they are legally binding or only guiding. While guidance on primary focus areas for comprehensive plans is provided by national planning legislation in all Nordic countries, municipal autonomy is strong (Borges et al., 2017), so is up to each municipality to interpret and implement aspects such as HH&W within its plans. The Nordic countries show general similarities in GI planning discourses (Nordh & Olafsson, 2021) and public health promotion responsibilities on local government level (Helgesen, 2014). However, knowledge is lacking on whether and how the pathways between GI and HH&W are described in local government spatial planning practice and how the GI-HH&W relationship is integrated into municipal comprehensive plans, leaving the question of planning conditions for practical implementation of the coveted health-promoting GI unanswered.

1.1. Aim and research questions

The aim of this study was to identify the conditions in Nordic land use planning for further strategic interventions to create health-promoting green infrastructure. This was done by assessing how the relationship between human health and wellbeing and green infrastructure is addressed in comprehensive plans drawn up by Nordic municipalities.

This research question (RQ) was broken down into three sub-questions (a–c):

RQ: How is the GI-HH&W relationship described in Nordic comprehensive plans?

a) How is relevant terminology used to describe GI and HH&W?

b) How are the concepts of GI and HH&W connected?

c) Which goals are mentioned as regards the GI-HH&W relationship?

2. Analytical framework

2.1. A model describing the GI-HH&W relationship

In 2017, the WHO Regional Office for Europe presented a "*Causal model of the impacts of urban green spaces on health and well-being*" aimed at practitioners in planning, design, and management, decision makers, and civil organizations on local level (WHO Regional Office for Europe, 2017). The model, based on Roué-Le Gall (2015, cit. Milvoy & Roué-Le Gall, 2015), places the "green space-health" relationship in a framework that comprehensively describes GI-HH&W interconnections, largely building on work by e.g., Hartig et al. (2014). In this study, that model was adapted for a content analysis of planning documents.

2.2. Analytical framework for GI-HH&W pathways

The original WHO framework provides examples in the categories described, while the adapted model was reworked to provide defining descriptions (see Appendix to this paper) of the categories to guide content analysis, as well as a revision of the headings for each category and dimension. In a further development, the adapted WHO framework included a structural layering of the dimensions presented. The resulting analytical framework for GI-HH&W pathways is based on a three-layered structure (see Fig. 1 and Appendix). The basis is the socio-ecological framework described by e.g., Andersson et al. (2021) and Lachowycz and Jones (2013), where the ecological domain represents properties and functions performed by GI and the human domain represents HH&W effects and outcomes delivered by the ecological domain.

2.2.1. Ecological domain

The ecological domain is divided into two main dimensions; *GI Properties* and *GI Functions*.

GI Properties describe the physical features or characteristics of a green space and the relationship between individual spaces or overall GI within a municipality. There have been several attempts to categorize relevant features of green space (e.g., Bedimo-Rung et al., 2005; Lee et al., 2015; Lachowycz & Jones, 2013). Some features are included in several models, such as features/facilities, condition/maintenance, access/accessibility, esthetic/attractiveness/design, and safety (Bedimo-Rung et al., 2005; Lee et al., 2015; Lachowycz & Jones, 2013). In our model, *GI Properties* are divided into four categories: **Type, Attribute, Character,** and **Management**. From a HH&W point of view, *GI Functions* describe what *GI Properties* can perform or provide an opportunity for, in terms of individual experiences or environmental processes, resulting in two categories: **Experiential** and **Environmental**.

2.2.2. Human domain

The human domain comprises two dimensions: *Effects on Humans* and *HH&W Outcomes*. *Effects on Humans* can be described as the specific service provided, i.e., the impact of a *GI Function* on humans. These effects can be divided into four categories: **Individual services, Community Services, Environmental services,** and **Equality and equity.** The distribution of *GI Functions* affects **Equality and equity** for inhabitants, and therefore interactional and distributional justice. Although environmental justice can be considered to be engrained in all categories (Rigolon et al., 2019), the purpose of assigning a separate category in our model is to clarify whether these aspects are specifically mentioned in planning documents. The *HH&W outcomes* are categorized based on WHO's definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." (WHO, n.d), so three main categories are taken into consideration: **Physical health, Mental health,** and **Social well-being.** Table A1 in the Appendix lists the sources used to support the different categories.

2.2.3. Applicability of the framework

The original WHO framework aims to convey the overarching causality of the impacts of green spaces on health and well-being to be considered by policymakers and practitioners. Our adapted analytical framework assesses whether and how the relationship between GI and HH&W is presented in comprehensive plans. However, in both its forms the analytical framework represents a complex reality where the categories described within each dimension all interrelate and affect each other (Fig. 1). This is particularly evident for *GI Functions* and *Effects on Humans*, where it is not always obvious whether a specific concept is a function or an effect of a function. This issue is raised by Groot et al. (2010), who note that even though the overall structure of the WHO framework is generally accepted, there is still debate on the distinction between "function", "service", and "benefit". The distinction made in the present study was that *GI Functions* describe the performative aspects

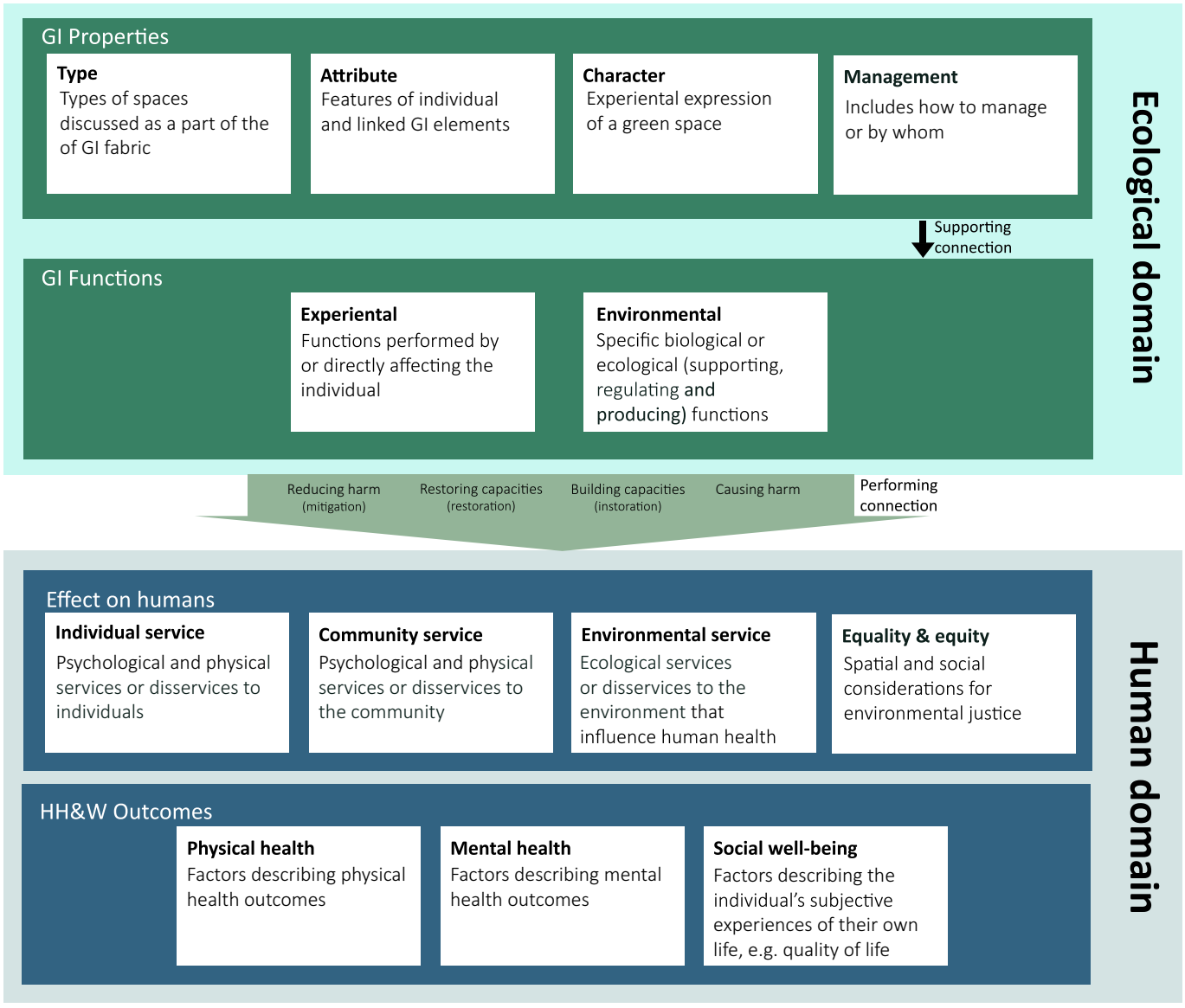

Fig. 1. Analytical framework for green infrastructure-human health & well-being pathways (adapted from WHO Regional Office for Europe, 2017). See Table A1 in Appendix for references on each category in the diagram. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

of a space, while *Effects on Humans* describe issues affecting humans (e.g., Shanahan et al., 2015), although recognizing that this oversimplifies the interconnections of ESS.

Table 1
Number of inhabitants (Inh.), urbanization, geographical location, and area of the six selected municipalities.

	Täby, Sweden	Espoo, Finland	Stavanger Norway	Aarhus, Denmark	Ii, Finland	Vilhelmina, Sweden
Inh (2021)	73 307[a]	293576[b]	142985[c]	352 31[e]	9848[b]	6667[a]
Urbanization	Town	City	City[f]	City	Rural	Rural
Geographical setting	Capital area	Capital area	Second-tier city	Second-tier city	Rural	Rural
Area tot. km^2	71[a]	528[c]	262[d]	468[e]	2873[c]	8740[a]
Area land km^2	60[a]	312[c]	256[d]	–	1614[c]	8047[a]

[a] SCB (2021).
[b] Statistics Finland (2021).
[c] Lantmäteriverket (2021).
[d] SSB (2021).
[e] DST (2021)
[f] Before merger with two rural municipalities.

3. Method

3.1. Selections of municipalities and comprehensive plans

Denmark, Norway, Finland, and Sweden are the four largest countries in the Nordic region, with a total population of just over 27 million (2022) distributed across 1053 municipalities (98 in Denmark, 356 in Norway, 305 in Finland, 290 in Sweden). Comprehensive plans from six municipalities in the four countries were selected and analyzed (Tables 1 and 2), as a collective case study representing a convenience sample (Stake, 2008). The selected cases reflected a spectrum from remote rural settlements ($N = 2$) to second-tier city municipalities (Cardoso & Meijers, 2016) (N = 2), and municipalities in capital regions (N = 2), geographically spread across the Nordic region (Fig. 2). The samples all belong to the same family in European planning practice (Davies & Lafortezza, 2017). They also represent a range of settings and variations in urbanization, comprising three cities (>50 % of the population living in high-density clusters), one town and its suburbs (<50 % living in high-density clusters and <50 % living in rural areas), and two rural municipalities (>50 % of the population living in rural areas) (Grunfelder et al., 2018). While differing in size and scope of urbanization, the selected municipalities are all partners in the NORDGREEN research project in which this study was conducted. Therefore, the municipalities are all highly motivated to increase practical implementation of research-based knowledge on how to integrate health aspects into GI planning. As such, the municipalities represent potential examples of best practice and can yield preliminary insights into the very context-dependent situations they represent (Flyvbjerg, 2006), providing an understanding of how the complex issue of the GI-HH&W relationship is addressed in Nordic planning practice.

For each municipality, the current comprehensive plan was identified (Table 2). In Finnish municipalities, legislation permits geographically defined plans for parts of the city. In those cases, the most recent plan covering a significant part of the city was chosen. All comprehensive plans were linked to a map outlining the vision for land use in the municipality, but these maps were not included in the analysis since the main focus was on GI-HH&W relationships. Thematic maps visualizing the plan content (showing e.g., GI, recreational connections, etc.) were assessed.

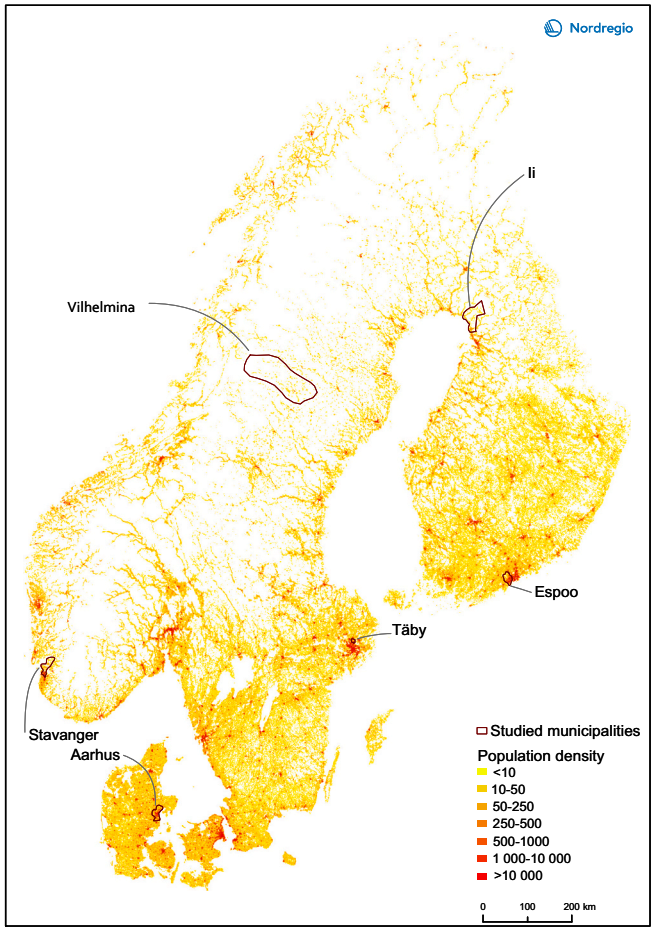

Fig. 2. Spatial distribution and overall population density (or urbanity) of the six selected Nordic municipalities. Image: Oskar Penje, Nordregio.

3.2. Data collection

Document content analysis was used as the main method to investigate whether and how HH&W aspects are connected to GI in Nordic

Table 2
Comprehensive plans analyzed for the six selected Nordic cities (abbreviations in brackets).

	Täby (TÄB)	Espoo (ESP)	Stavanger (STA)	Aarhus (AAR)	Ii (II)	Vilhelmina (VIL)
Title of plan	Det nya Täby Översiktsplan 2010–2030	Espoon eteläosien yleiskaava 2030	1. Kommuneplanens samfunnsdel 2020–2034 2. Planbeskrivelse 2019–2034 3. Bestemmelser og retningslinjer araealdel 2019–2034[a]	Aarhus Kommune-plan	Iin keskustaajaman osayleiskaava	Vilhelmina kommun Vualtjeren Tjïelte med sikte på 2030[b]
Plan approval year	2010	2008	2019–2020	2017	2016	2018
No. of pages (excl. appendices)	88	101	25, 115, 42	172	71	92
Legal status	Visionary and advisory, not legally biding	The map and complementary descriptions are legally binding	Visionary and advisory. A specific part (no 3.) is legally binding	Visionary and advisory, not legally biding	The map and complementary descriptions are legally binding	Visionary and advisory, not legally binding
Geographical coverage	The entire municipality	The south part, approx. half of the city	The entire municipality	The entire municipality	The central part of the city, excl. rural areas and small settlements	The entire municipality
Reference	(Täby Municipality, 2010)	(Espoo Municipality, 2008)	1. (Stavanger Municipality, 2020), 2. (Stavanger Municipality, 2019a), 3. (Stavanger Municipality, 2019b)	(Aarhus Municipality, 2017)	(Ii Municipality, 2016)	(Vilhelmina Municipality, 2018)

[a] The plan comprises three parts with different purposes. Due to an ongoing municipal merger, the plan was under revision during data collection, with one part from the new municipality (2020) and the other two from the old (2019a, 2019b).
[b] "Green comprehensive plan" was produced as a part of a research project (Bjärstig et al., 2018).

comprehensive planning. As the purpose of a comprehensive plan is to guide and steer land use and long-term development, the topics covered by the plans can be expected to reflect political intentions and therefore guide decision-making in subsequent planning steps (Norton, 2008).

Data collection comprised two main components, inspired by Cortinovis and Geneletti (2018), drawing on Baker et al. (2012). These were (i) the information base, i.e., background or general information used to support planning decisions, and (ii) the visions and goals stating the "long-term vision of the plan and the targets (either qualitative or quantitative)" (Cortinovis & Geneletti, 2018, p. 299), meaning statements describing the ambitions of the general and specific objectives of the plan. To complement the goals, strongly worded polices (i.e., containing words such as "must" or "shall") were included. Polices serve as "a general guide to decisions about development and assure that plan goals are achieved" (Berke et al., 2012, p. 140). As comprehensive plans are the overarching planning document on municipal level, few direct actions or implementation steps were expected to be found. Therefore these concepts were omitted from the collection procedure, despite being used in other studies (see e.g., Cortinovis & Geneletti, 2018; Heidrich et al., 2013). The focus was on content relating to the GI-HH&W relationship, rather than assessing the quality of the plan. A protocol inspired by Woodruff and BenDor (2016) was created to guide data collection to answer RQ. See Appendix B for the protocol.

First, the main author and one co-author independently read and coded two of the plans (STA, TÄB), followed by a systematic comparison of selected codes, similarly to Baker et al. (2012). The comparison confirmed that the selection criteria were sufficiently clear, with only minor adjustments needed in interpretation of selected codes. The remaining four plans were read and coded by the main author to ensure consistency (see also e.g., Baker et al., 2012). All six comprehensive plans were re-read twice or more by the main author, and key sections, sentences, or terms that corresponded to any of the data collection criteria were marked and copied to a spreadsheet.

The Scandinavian languages (Swedish, Danish, and Norwegian) are sufficiently similar to be read and understood in written form by all the authors. The Finnish language, a member of the Uralic family, was not directly comprehensible. Therefore, all plans were read in their original language except the Finnish plans (ESP, II), which were translated to English using an automatic online translation service that maintained the layout of the original document, enabling side-by-side comparisons. When the English text was checked, nonsensical translations were compared with the original document. The two translated plans were also read by a native Finnish speaker, in order to confirm the quality of the translations, re-translate specific sections, and ensure no relevant meaning was missed from the Finnish original text.

3.3. Coding and analysis

Our adapted framework provides a means to categorize the content of plans, here in order to answer the overarching RQ. Similarly to Nordh and Olafsson (2021), the presence of specific notions or contexts was addressed on terminology level, meaning that the presence of a specific term indicated that information or goals on that topic were addressed in the plan. For the three sub-RQs (a–c), the texts were coded and categorized related to terminology used, first into the overall domains Ecological and Human, and then into the four dimensions Properties, Functions, Effects, and Outcomes (RQa). From the categories, links were made to show how the different categories on GI and HH&W were interlinked (RQb). Finally, sentences or text sections describing specific goals relating to the GI-HH&W relationship were identified (RQc).

3.3.1. Terminology used in the GI and HH&W nexus

The terminology used within the plans was categorized in two steps:

(i) After re-reading the collected sections, sentences, and terms, the individual terms were coded in a directed qualitative content analysis approach inspired by Hsieh and Shannon (2005), using the categories of the analytical framework in a deductive approach. Terminology deemed relevant within one of the categories in the four dimensions was grouped accordingly. Here, mentions of health that did not relate to any aspect of GI, or its functions and effects (as described by the theoretical framework), were not included (e.g., land allocated to building a hospital was not included).

Terms that did not fit any specific category but were still considered relevant for the overall dimension were included in a "general" category. This was specifically the case in relation to HH&W outcome-related terms such as "health" and "well-being", where it was commonly not specified whether the term referred to physical, mental, or social health. (ii) When all terms were grouped, some categories had far more unique terms than others. In order to reflect this disparity and create meaning in description of terms, these categories were further divided into sub-categories. For example, in the sentence "*Proximity to parks and green areas is of paramount importance so that they can be easily used for the benefit of health and quality of life*", relevant terms (bold) were categorized according to the brackets:

"**Proximity** [GI Property – Attribute – Distance] to **parks** [GI Property – Type – GI] and **green areas** [GI Property – Type – GI] is of paramount importance so that they can be **easily used** [GI Function – Experiential - General] for **the benefit of health** [H&W Outcome – General] and **quality of life** [H&W Outcome – Social well-being]".

3.3.1.1. Classifying the terms. The category **General health** instead consisted of relatively general terms, such as "health", "public health", "physical health", and "quality of life". Therefore, this was added as a new category, instead of referring to the domain as a whole.

In some instances "green" was not stated specifically, but rather described as "outdoor". In those instances the context was reviewed, e.g., in comparison to the term "outdoor recreation", a Nordic term specifically meaning being in nature or green space (Nordh et al., 2017).

Physical aspects of safety discussed in the plans were classified as a form of accessibility, but perceived safety was classified as an effect on the individual.

The term sustainability was used and differentiated into social, economic, and ecological in all plans, but only VIL detailed specifically what was meant by these terms, where social sustainability was equated with public health. Therefore, the term sustainability was not categorized except in the VIL plan.

3.3.2. Links between GI & HH&W

With all terms categorized in categories and sub-categories, the collected data was read through again and links between categories that were rhetorically connected were identified. All links found between the four dimensions were noted, even when they only connected within the same domain. Terms within the same dimension were not linked. This approach allowed a link to be created if a plan mentioned e.g., the connection between a *GI Property* and a *GI Function* in one section, and a connection between the same *GI Function* and *HH&W Outcome* in another, whereas a link between e.g., a Type and Character was not included. Links formulated as goals (see next heading) were classified as both links and goals. For example, for the sentence exampled above, lines were drawn in accordance to Fig. 3.

All links were transferred to a visual diagram representing each plan, with the links between the different categories numbered and assigned a line thickness reflecting the number of connections (Table 3).

3.3.3. GI & HH&W-related goals

Sentences or sections formulated as visions, goals, or strongly worded policies (i.e., containing words such as "must" or "shall") were marked in each plan. As found by Nordh and Olafsson (2021), the visions and goals were not always described in a specific section, but were integrated in running text in the document. Depending on their national regulations, the studied plans mentioned national and regional goals to

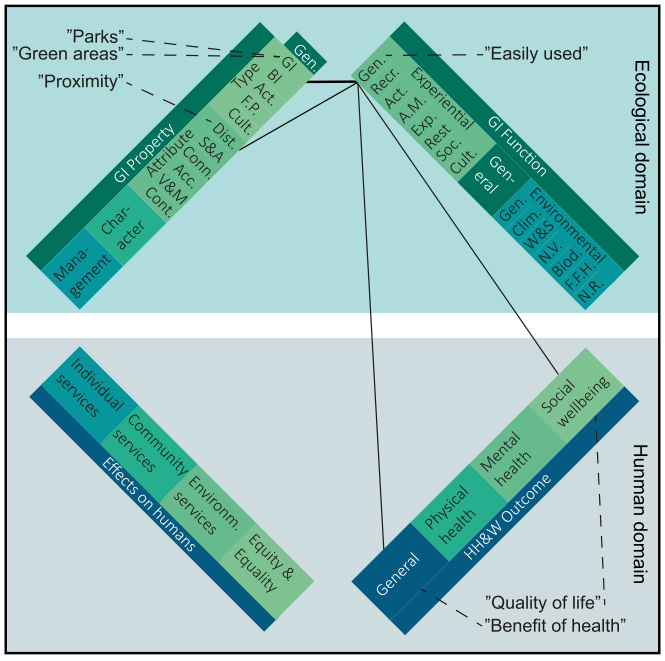

Fig. 3. Created links between identified categories in the sentence "Proximity to parks and green areas is of paramount importance so that they can be easily used for the benefit of health and quality of life". A bolder line indicates more links between unique terms. Abbreviations explained in Table 4. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 3
Number of unique terms per dimension (bold) and sum of terms per category (italics) in each plan (for city abbreviations, see Table 2).

Dimension/city	TÄB	ESP	STA	AAR	II	VIL
GI properties	**118**	**148**	**108**	**148**	**103**	**156**
General[a]	2	3	8	2	4	2
Type	*54*	*83*	*37*	*65*	*55*	*84*
Attribute	*46*	*40*	*48*	*61*	*22*	*46*
Character	*11*	*17*	*8*	*9*	*17*	*7*
Management	*5*	*5*	*7*	*11*	*5*	*17*
GI functions	**55**	**57**	**43**	**71**	**33**	**111**
General[b]	*0*	*2*	*0*	*0*	*0*	*3*
Experiential	*34*	*25*	*14*	*40*	*16*	*58*
Environmental	*21*	*30*	*29*	*31*	*17*	*50*
Effects on humans	**25**	**30**	**14**	**34**	**12**	**72**
Individual service	*9*	*10*	*4*	*8*	*8*	*15*
Community service	*3*	*0*	*1*	*16*	*2*	*14*
Environmental service	*12*	*17*	*5*	*8*	*2*	*35*
Equality & equity	*1*	*3*	*4*	*2*	*0*	*6*
HH&W outcomes	**4**	**7**	**5**	**5**	**4**	**7**
General "health"	*2*	*5*	*4*	*2*	*2*	*4*
Physical health	*0*	*0*	*0*	*0*	*0*	*1*
Mental health	*0*	*1*	*0*	*0*	*0*	*1*
Social well-being	*2*	*1*	*1*	*3*	*2*	*1*
Total	**202**	**242**	**170**	**258**	**152**	**346**

[a] General types including where GI is a part (e.g., "surroundings", "outdoor environments").
[b] General function terms (e.g., "Ecosystem services", "Societal functions").

varying degrees. Goals from other planning levels that were explicitly mentioned in the plans were coded. This was based on the reasoning that explicit mention of these goals implied that they were also considered as goals in the respective plan. The terms within the visons, goals, and policies were then grouped into the predefined categories in the framework, similarly to the process of categorizing the terms.

4. Results and discussion

4.1. Terminology used in the GI-HH&W nexus

Despite structural differences between the six comprehensive plans analyzed, a generally clear pattern emerged of the distribution of unique terms presented. Table 3 shows the number of terms within each dimension and category in the six plans. The production date of the plans spanned a period of >10 years (2008–2020), but no clear pattern was discerned between year of production and terms used.

In the relative relations between the dimensions within each city, there were obvious similarities. The ecological domain (specifically *GI Properties*) was described with far greater variation in number of terms than the human domain (specifically *HH&W Outcomes*). The categories used in each plan are summarized in Table 3.

Due to the large number of unique words in the *GI Properties* categories **Type** and **Attribute** and in the *GI Functions* categories **Experiential** and **Environmental**, these were further grouped into sub-categories. Table 3 details the sub-categories and their presence in each of the plans.

In the **Type** category, all six plans mentioned terms describing: *green space*, *blue space*, *formally protected* GI, and *Cultural areas*. There were also some similarities in the terms describing **Attributes** of a space. All mentioned *distance*; *connectivity*-related terms, *accessibility*, and *variation and multifunctionality*, *size and amount*-related terms. Due to the large number of unique words in the *GI Functions* categories **Experiential** and **Environmental**, they were further grouped into themes. In the **Experiential** category, eight themes emerged in the analysis: *general* (umbrella terms); *recreation*; *activity* (physical or outdoors); *active mobility*; *experience* (nature or outdoors); *rest*; *social*; and *cultural*.

In the **Environmental** category, six themes emerged: *General* (theoretical terms); *climate; water & stormwater; nature values; biodiversity; flora, fauna, habitats;* and *nature as a resource*. These sub-categories were mentioned in all plans with the exception of *nature as a resource*, which was mentioned only in two plans (II, VIL) referring to provisioning ESS such as production of timber, fish, and berries.

In general, there were few differences between the municipalities in terms of aspects addressed within the ecological domain, even on sub-category level. This only served to strengthen the contrast with health-related terminology, where only two of the six plans were found to differentiate between physical and mental health. While effects were mentioned in some way in all plans, there were large differences in the extent and in the categories considered.

4.2. Links between GI & HH&W

All six plans recognized the connection between the ecological domain with the human domain in some form, but primarily on a very general level. Fig. 4 shows a city-specific overview of the connections between the four dimensions through their categories. While there were large differences between the total number of links in the plans (Fig. 4), the number of links connecting the ecological and human domain did not differ as widely.

While most sub-categories were covered in the plans, as indicated in Table 4, many concepts were mentioned without any connection to the other dimensions handled within our adapted framework (Fig. 4). The connections between the categories differed among the plans, but shared some general traits. There was a strong focus on the connection between the categories **Type** and **Experiential functions**, where variations in GI and BI typologies were stated to provide general functions such as *recreation* or *use*. However, this was rarely connected to any further effects or health outcomes, while e.g., sub-categories such as *activity* or *active mobility* were more often described as connected to health outcomes (Fig. 4). In this context, *rest*, *social values*, and *cultural values* were less mentioned in general and almost never connected to either effect or health outcomes, such as in this example from Espoo:

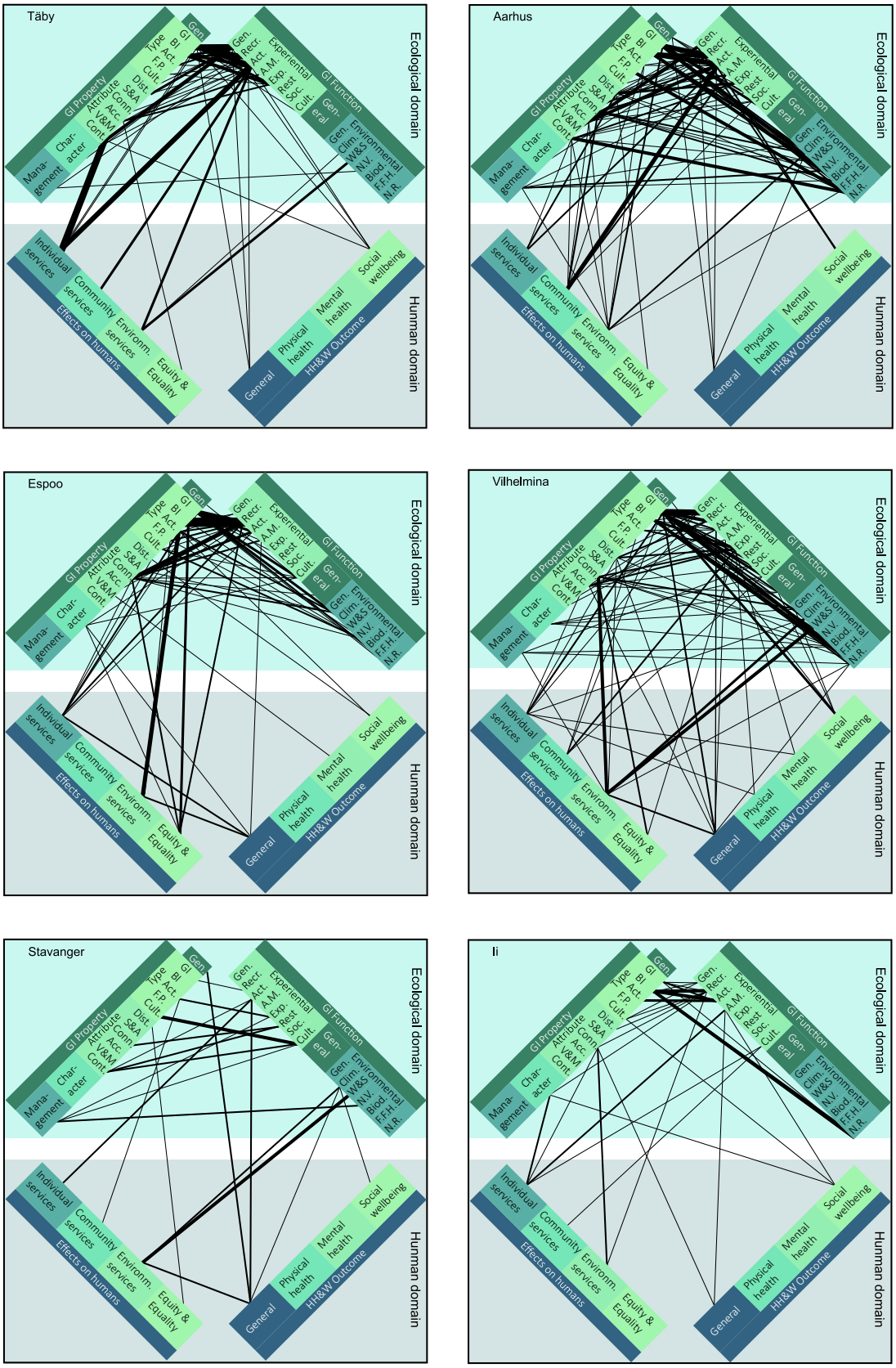

Fig. 4. Overview of connections in city plans between dimensions and categories in the analytical framework for GI-HH&W pathways. Bolder lines indicate more links between unique terms. Abbreviations of subcategories explained in Table 4.

Table 4
Overview of categories mentioned as information and included in goals in the six plans (see section 'GI and HH&W-related goals'; for city abbreviations, see Table 2). Any "X" indicates mention of the terminology, a bold "X" indicates it is mentioned in a vision or a goal, and "–" indicates no mention in the plan. Category abbreviations in brackets.

	Terminology/city	TÄB	ESP	STA	AAR	II	VIL
GI properties	Type						
	GI	**X**	**X**	**X**	**X**	X	**X**
	BI	X	**X**	X	X	**X**	**X**
	Activity (Act.)	X	X	X	X	**X**	X
	Formal protection (F.P.)	X	X	X	X	X	X
	Culture (Cult.)	X	X	X	X	X	X
	Attribute						
	Distance (Dis.)	**X**	X	**X**	**X**	X	**X**
	Size & amount (S&A)	**X**	X	**X**	**X**	**X**	–
	Connectivity (Conn.)	X	**X**	**X**	**X**	**X**	X
	Accessibility (Acc.)	X	**X**	**X**	**X**	**X**	**X**
	Variation&multifunction (V&M)	X	X	X	**X**	X	X
	Content (Cont.)	**X**	**X**	**X**	X	X	X
	Character	X	X	X	**X**	X	X
	Management	X	X	X	X	**X**	X
GI functions	Experiential						
	General(overall) (Gen.)	X	X	X	**X**	X	**X**
	Recreation (Recr.)	**X**	**X**	**X**	X	**X**	**X**
	Activity (Act.)	X	X	**X**	**X**	X	**X**
	Active mobility (A.M.)	X	X	–[a]	X	X	X
	Experience (Exp.)	X	X	X	X	–	**X**
	Rest	–	X	**X**	X	–	X
	Social (Soc.)	X	–	–	X	–	X
	Cultural (Cult.)	X	X	X	–	X	X
	Environmental						
	General(theoretical) (Gen.)	X	X	–	X	X	**X**
	Climate (Clim.)	X	–	X	X	–	X
	Water & stormwater (W&S)	X	X	**X**	X	X	**X**
	Nature values (N.V.)	X	X	X	**X**	X	**X**
	Biodiversity (Biod.)	X	X	X	X	X	**X**
	Flora, fauna, habitats (F.F·H)	X	X	X	X	X	**X**
	Nature as resource (N.R.)	–	–	–	–	X	**X**
Effects on humans	Individual service	X	X	X	X	X	X
	Community service	X	X	X	**X**	X	X
	Environment service	X	**X**	X	**X**	X	X
	Equality & equity	–	**X**	**X**	**X**	–	**X**
Health outcomes	General health	**X**	X	**X**	**X**	X	**X**
	Physical health	X	–	–	–	–	X
	Mental health	–	X	–	–	–	X
	Social well-being	**X**	**X**	X	**X**	X	X

[a] The main vision of the STA plan is "Short-travel everyday life", but not explicitly relating to GI.

Pedestrian and bicycle paths as well as outdoor routes also serve as important sports venues and recreational destinations which increase residents' exercise, and thus also contribute to improving public health (Espoo municipality, 2008, p. 82).

Most plans connected **Type** and **Environmental services**, describing the effects of *GI properties* on the environment. However, this was rarely combined with how it affected *HH&W outcomes*. Consequently, while the explicit focus was not on health outcomes, many arguments presented in the plans were inherently connected to health aspects.

In a few cases, the plan explicitly connected **Types** of spaces with **Health outcomes** through an activity, shown here in the Vilhelmina plan:

Investments in green infrastructure and increased accessibility have a positive impact on both physical and mental health by encouraging physical activities and nature experiences (Vilhelmina municipality, 2018, p. 87).

There was little focus on relating the size and amount of green space to their potential use, while aspects such as distance, connectivity, and accessibility were frequently mentioned regarding their importance for health, specifically in relation to walking and cycling, as exemplified by II:

Promoting bicycling and pedestrian traffic and the network and routes of recreational areas have positive health effects. They increase the attractiveness of everyday exercise and recreational opportunities (Ii Municipality, 2016, p. 67).

Only two of the plans, Täby and Espoo, mentioned the quality of a green space in relation to health outcomes. As with isolated mentions of quality in the other plans, this was not followed by a deeper explanation of what the concept of quality means in this context. In the Täby case, the mention of quality was as a basis for the use of a green space:

Proximity to parks and green areas is of paramount importance in order for them to be easily used for the benefit of health and quality of life. The content and quality of green areas determine how they can be used (Täby municipality, 2010 p. 17).

In the Espoo plan, quality (of the living environment) was described as being partly determined by the health outcomes it produces:

The quality factors of the living environment are health and comfort (Espoo municipality, 2008, p. 86).

In conclusion, the GI-HH&W relationship was described in all plans with a strong focus on the connection between types of spaces and their potential use for experiential GI functions, but with relatively few connections to health outcomes, with VIL being the exception.

4.3. GI and HH&W-related goals

As mentioned in the Methods section, the visions and goals identified were scattered throughout the plans. They were not always clearly stated and often integrated in the running text. Strongly worded policies were more common and used interchangeably with goals, and were therefore included in the results.

All six plans mentioned goals or policies related to the GI-HH&W relationship, but not all were equally clear. The number of statements defined as goals in the individual plans ranged between three and nine (see Table 4 for goal contents by category for each plan). The goals differed in their focus and were in general poorly linked to any specific type of environment.

The goals generally used generic terms such as "the city", "urban structure", or "surroundings", which should be provided to "promote health", "increase quality of life", or "prevent disease". Only TÄB clearly connected HH&W to a specific GI in its goals, by describing "the green half' of the municipality.

All plans mentioned a **Type** of GI or BI, but often in very general terms:

Our future Täby is a green city close to nature that is vibrant around the clock. Half of Täby is green (Täby municipality, 2010, p. 1).

All plans considered easy access to, within, and between areas to be important. Goals or policies indicating the character or content of GI were almost non-existent in the plans, with the exception of AAR (and STA's detailed regulations):

Based on wise use and layout of our land resource, we must try to create added value - more life, more nature, better transport, greater health, and so on (Aarhus municipality, 2017, p. 15).

For **Experiential** functions, similarly general terms such as "use", and "recreation" were mentioned in all plans to frame their vision, goals, and policies to detail how the generally described spaces should be used. AAR and II went one step further by detailing specific activities, while VIL also described experiences and cultural values:

Outdoor recreation, sports, and exercise shall contribute to the health and quality of life of Aarhusians. The leisure offers must be located scattered in Aarhus Municipality to ensure Aarhusians and visitors the greatest possible accessibility (Aarhus municipality, 2017, p. 47).

Only STA explicitly mentioned rest.

The mentions of **Equality and equity** mainly consisted of notions of equality, where the plans stated this in relatively general terms, e.g., "all citizens" (AAR) or:

Land use shall pay particular attention to the safety and comfort of the resulting physical environment and to the conditions for socially balanced demographic development (Espoo municipality, 2008, p. 102).

VIL clearly stated this in relation to health outcomes:

Good health for all on equal terms is an obvious endeavor in the municipality's work (Vilhelmina municipality, 2018, p. 21).

Only STA explicitly mentioned policies addressing health differentials:

Stavanger wants active residents who thrive in the best possible way throughout life. Therefore, we must: reduce social inequality and differences in living conditions through measures aimed at low-income families […] and facilitate environments and activities that promote health and prevent disease (Stavanger municipality, 2020 p. 15).

Very few specific, measurable quantitative regulations or guidelines were mentioned. STA specified 500 m to green space access and specified size and distance to different types of playgrounds, while AAR stated that forest area should increase to 8000 ha by 2030. STA was the only plan with a part devoted to mandatory specifications for e.g., size, content, and noise level in playgrounds.

Five of the six plans (not including II) mentioned **Health outcomes** in the goals or policies. Similarly to the described terms, the health outcomes were general, both when detailing the spatial aspects: "*The urban structure must safeguard the quality of life, safety, environmental comfort and competitiveness of current and future residents.*" (Espoo municipality, 2008, p. 101), or in terms of general health or in quality of life: "*Develop the green half of the city to promote citizens' quality of life, health, and recreation – in dialogue with the citizens.*" (Täby municipality, 2010, p. 17).

How is the GI - HH&W relationship described in Nordic comprehensive plans?

Based on the three sub-RQs, a pattern emerged in the general way in which the GI-HH&W relationship was described in the six plans. The prevailing use of GI terms was similar in all plans, revealing a common GI discourse, as also found by Nordh and Olafsson (2021). While the descriptions of terms relating to properties of GI were nuanced, visions describing outcomes were relatively scarce. Most *Effects on Humans* were described as risks or avoidance of risks connected to the environment or the individual. This reflects the fact that planning legislation requires the plan to avoid harm, rather than promoting health, whereas public health should be part of urban planning, describing intended health benefits (Lee et al., 2015).

When describing *Health Outcomes*, the plans were similar in terminology and nuance, but only in terms of the very general focus, to a point where the intended subcategorization of physical health and mental health proved too specific. This confirms findings by Reyes-Riveros et al. (2021) that planning strategies rarely address health benefits. However, most of the plans mentioned many aspects that are potentially relevant for the GI-HH&W relationship, but rarely explicitly stated as such, meaning that this might be a question of framing rather than actual content.

The study by Nordh and Olafsson (2021) grouped the concepts of health and recreation together and found widespread occurrence. In the present study, however, our analytical framework differentiated the two as a function provided by GI and the health outcome experienced by an individual. Recreation is a term that warrants specific attention, since it was frequently used as an overarching term in all six plans, as also found by Cortinovis and Geneletti (2018). While the term conveniently covers a range of different concepts, these cannot always be provided by the same space, e.g., a combination of organized physical activity and rest, or social gatherings and solitary relaxation. Thus, the term does not indicate the types of GI that are required. From an economic point of view, a shift from focusing on recreation to actual health outcomes could promote re-evaluation of land uses, where brownfield sites or undeveloped areas could be viewed as potential resources for health promotion and ESS, instead of the economic benefits gained from housing developments (Scott et al., 2016).

In other studies, green space policy frameworks have been found to focus on broad targets, e.g., distance from residence to green space and minimum sizes of parks, as opposed to design and content, or intended health benefits of the space (Moseley et al., 2013; Davies & Lafortezza, 2017). Our findings confirmed this on a very general level. Most of the six plans studied instead mentioned visions, but with attributes such as distance and accessibility far more commonly described than expected HH&W outcomes. However, while mentioning distance can be viewed as a baseline in the plans, some studies have shown that proximity to GI alone may not improve well-being, indicating a more complex relationship involving other factors (Brindley et al., 2019; Mears et al., 2019). Thus, connectivity and accessibility-related goals were more commonly described in the plans, focusing on a network of green spaces and easy access to these. Perceived access has been described by some as more important than geographical proximity (Lachowycz & Jones, 2013), but there was no indication in the plans of how this access should be manifested.

While general descriptions of access, connectivity, and distance were frequent, the character of spaces was in general less commonly specified. All plans mentioned "quality", but the term was not clearly defined or expanded upon in any plan. As examplified by the Täby and Espoo quotes addressing quality, the use of the term varied significantly and provided little guidance for planning. Quality is a concept that is inherently complex and can be understood in different ways (Fors et al., 2018), but each definition will inevitably include some values and exclude others (Lindholst et al., 2015). As quality of spaces have been stated to have larger impact on health outcomes than quantity (de Vries et al., 2013), a more clear indication of what is desirable in terms of quality would be relevant to truly support decisionmaking and prioritization in subsequent planning phases.

Only one plan (STA) provided a detailed recommendation regarding

content of GI, stating that places for rest must be installed along hiking trails according to the principle of universal design. Providing details of how spaces should be differentiated in order to support different HH&W outcomes was emphasized by Douglas et al. (2017), while Lee et al. (2015, p. 134) pointed out that "*a blunderbuss approach to development of urban green spaces may not translate into the desired health outcomes*". The overarching character of the comprehensive plans cannot be expected to provide extensive detailed guidelines on content, but most goals found were general to the point of providing little potential guidance for future decision-making.

The only plan explicitly mentioning both ESS and GI was VIL. This municipality is very large in area and has a relatively low level of urbanization, which explains a lack of focus on urban GI elements. The plan was produced as part of the project *Green planning: Vilhelmina as a testbed for innovative land use planning in the mountain region*, with the target of creating a green comprehensive plan focusing on participatory processes. This could explain the variety and number of terms describing both GI functions and effects on humans.

Protection and preservation of sensitive green spaces (here categorized as relating to Management), were mentioned by all plans, in line with recent findings for GI plans in Denmark, Norway, and Sweden (Nordh & Olafsson, 2021). Another common focus was disturbance of wildlife or sensitive nature areas and potential conflicts with recreational pressures in some form, which all plans mentioned and stated that recreational needs must come second.

Regarding equality and equity, only one plan (STA) specifically mentioned concepts relating to equity in describing health distribution within the population, while other mentions were of a more general character, e.g., "social balance" or "equal access for all citizens". As such, the plans generally had a focus on equality and did not address the potential impact of planning on e.g., vulnerable groups, reflecting findings by e.g., Gradinaru et al. (2023) on the superficial way in which equity is related to GI in strategic urban plans in Romania.

4.4. Implications for practice

This study analyzed six comprehensive plans from four Nordic countries to identify potential theory-practice gaps (e.g., Cooke et al., 2021). The results revealed connections between elements of GI and HH&W in the comprehensive plans, but the pathways were not strong in any of the plans. While it is important to communicate the overall message that green spaces or GI are important features for HH&W promotion, the lack of nuance in the use of terms and the lack of explicit goals create uncertainty about land claims and how allocated land should be configured to promote HH&W. Some aspects may be considered in subsequent strategic plans but, as mentioned, in the Nordic context these often have a thematic focus such as "mobility", "environment", or "green space", whereas it is the task of the comprehensive plans to prioritize between different types of land use, and thus themes or interests. As the "highest-level" planning document in the municipalities, the comprehensive plan sets the direction for the municipality's future development, meaning that a public health focus might be warranted. An intentional vision in this regard was only presented in the VIL plan, which had a common theme concerning ESS and GI from a landscape perspective, an approach that permeated the entire plan.

From a strategic planning perspective, the general nature of the plans could result in additional uncertainties in subsequent planning phases. Visions and goals that connect GI and HH&W in a clear way would be more productive in achieving clearer targets and entailing strategies that are more feasible for monitoring and evaluation. The method used in this study took the plans at "face value", i.e., investigated what was clearly stated rather than what might be implied. This might pose a risk of excluding implied arguments that were not clearly stated, e.g., the intended positive health aspects might have been unstated or taken for granted when mentioning e.g., recreation. However, since the plans are "communicative policy acts" (Norton, 2008), failure to include explicit arguments could pose a risk of issues being overlooked or ignored by decision-makers.

An undifferentiated approach to describing GI-HH&W pathways fails to acknowledge that health outcomes will vary with the properties and functions provided by GI and for different users (Bedimo-Rung et al., 2005; Hartig et al., 2014), and might not be sufficient to withstand other strong land use interests. The studied plans mentioned a range of concepts relating to the GI-health nexus, but did not frame them as such. This indicates that with a more targeted approach linking a broader set of terms, there is ample opportunity to connect *GI properties* more clearly to *HH&W outcomes*.

In relation to wicked challenges such as densification and climate change adaptation, increasing levels of multifunctionality are required from specifically urban GI. Multifunctionality is an important principle in urban GI planning (Pauleit et al., 2011), but an undifferentiated approach to the concept poses a risk that a given space, or a structure of small, fragmented spaces, will be expected to fulfil any and all needs expressed by residents, failing to account for the fact that not all types of functions can co-exist. This is particularly relevant in relation to aspects such as stress, where the qualities 'serene' and 'natural" are rated as most sought after (Grahn & Stigsdotter, 2010; Sang et al., 2016), and e.g., rest and social activities are difficult to combine in the same space (Stoltz & Grahn, 2021).

If the need for differentiated spaces, and particularly large green areas, is not stated clearly at land-use level, this risks being manifested on place-based level as more programmed spaces in order to accommodate multifunctionality that serves more citizens and copes with increased wear and tear (Randrup et al., 2021). Randrup et al. (2021) also found that central spaces are becoming less green and more programmed, while peripheral areas are becoming more nature-like as a result of decreasing maintenance intervals to divert a restricted maintenance budget to central areas. In effect, this creates a potentially uneven distribution of possible health outcomes where rest and tranquility might be difficult to find in central urbanized areas, while peripheral areas might be considered less attractive and accessible owing to perceived lower safety because of lower maintenance levels, as described by Nam and Dempsey (2019). There is then a risk of an undifferentiated approach to describing GI-HH&W pathways leading to distributional injustice. The question of health distribution is increasingly becoming an issue of health equity. A "smart data" approach now allows for more detailed comparison of residents' health in different areas of a city, paving the way for a more tailored approach to targeted health benefits for different spaces and promoting environmental justice.

Most health benefits likely come from the use of green space rather than its presence (Lee et al., 2015), but it is equally important to recognize that some health outcomes are affected by the mere presence of green spaces (described in this study as environmental services). A holistic view of GI is needed in order to emphasize synergies and interrelations between environmental effects such as increased biodiversity, which in turn might affect humans. The indirect effects of important aspects such as air quality and noise reduction also need to be understood in terms of functions performed by green spaces, rather than just the notion of their presence, in order to nuance the situation of presence/no presence and acknowledge that the distribution and configuration of these spaces affect the functions provided.

With the introduction of environmental demands on municipal level, comprehensive plans have become increasingly precise as regards environmental values (Nilsson, 2017). All plans analyzed here had established processes for environmental assessments on outcomes of the plan. Current legislation and national policy focus on avoiding harm, rather than promoting health, but Davies and Lafortezza (2017) suggest that health outcomes should be included in a strategic environmental assessment process. Similarly, introducing public health strategies on municipal level could mean that health promotion issues are addressed in a more strategic manner.

Limitations and suggested further research A limitation of the study was the small number of municipal plans reviewed. However, the six selected municipalities included represent different contexts in terms of urbanization and geography and the detailed analysis can be seen as a strength in understanding the subject matter (Flyvbjerg, 2006). The study was intended to give an indication of the current state of health and GI in Nordic planning practice, but the sample size was not large enough to enable definite recommendations for Nordic planning in general. However, the results, specifically on use of similar terms and the general vagueness of related goals, are sufficiently clear enough to provide a strong indication of how Nordic municipal comprehensive plans describe the relationship between GI and HH&W. Inclusion of different Nordic nations increased the complexity of policy contexts, and therefore the use of potential recommendations, but plans from municipalities with same country did not show great similarities, indicating that municipal autonomy may partly overrule national differences.

Further studies involving greater numbers of plans are needed to verify these conclusions. Using the adapted framework developed in this study, a diverse set of municipal comprehensive plans could be analyzed to confirm the findings on an instrumental level. This could be complemented with studies on plan quality, although on a professional planning and management level studies are perhaps needed on how the GI-HH&W pathways described in the plans are used in practice. This could be done through interviews with central actors, planners, managers, and health officers in participating municipalities. The results would reveal the relationships between planning incentives and practice and indicate how planning documents could be better formulated and presented for a stronger impact in creating GI for the benefit of HH&W.

5. Conclusions

Analysis of terminology used, connections made, and stated goals relating to GI-HH&W pathways in comprehensive plans for six Nordic cities showed that: (i) terminology relating to the ecological domain (*GI Properties*, *GI Functions*) was nuanced and largely consistent; (ii) terms relating to the human domain (*Effects on Humans*, *HH&W Outcome*) were rarely mentioned and broadly described; and (iii) an array of aspects relating to GI properties and the functions they provide were described, but connections to GI-HH&W pathways were sparse and described only in general terms.

This incomplete handling of GI-HH&W pathways in contemporary comprehensive plans risks creating an inability to withstand other land use interests, especially where economic benefits are apparent.

While the plans contained an abundance of information relating to aspects that are relevant for HH&W outcomes, these were not clearly stated as such. This suggests that in future comprehensive plans, the focus on HH&W outcomes could be strengthened by reframing to connect to a HH&W perspective, rather than primarily focusing on activities providing health benefits, such as recreation. A stronger HH&W focus would also require more nuanced descriptions of expected health outcomes beyond e.g., "mental health" or "quality of life", in order to create a more differentiated vision of pathways to public health and of specific properties needed to sustain health-promoting activities and expected health outcomes.

CRediT authorship contribution statement

Anna Sunding: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing. **Thomas B. Randrup:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Helena Nordh:** Formal analysis, Funding acquisition, Methodology, Validation, Writing – review & editing. **Åsa Ode Sang:** Formal analysis, Methodology, Supervision, Validation, Writing – review & editing. **Kjell Nilsson:** Funding acquisition, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A

Table A1
Description of categories, and examples of reviews and articles relating each of the categories to the GI-HH&W relationship shown in Fig. 1.

	Category description	Reference
GI properties		
Type	Types of spaces discussed as a part of the of GI fabric, including GI, BI, activity-related spaces, formal protected space, cultural spaces	Chen et al., 2021; Nguyen et al., 2021; Hunter et al., 2019; Nieuwenhuijsen et al., 2017
Attribute	Features of individual and linked GI elements, including size, access, accessibility, connectivity, content	Nguyen et al., 2021; Felappi et al., 2020; Hunter et al., 2019 Nieuwenhuijsen et al., 2017; McCormack et al., 2010
Character	The experiential expressions of spaces, focusing on expressed or intended character rather that perceived character. Includes aesthetics, style, conditions or levels of maintenance, quality	Nguyen et al., 2021; Nieuwenhuijsen et al., 2017; McCormack et al., 2010
Management	How to manage a space, or who has the responsibility for managing it	Felappi et al., 2020; Nam & Dempsey, 2019
GI functions		
Experiential	Functions with opportunity to directly affect the individual experiencing a green space, including psychological and physical experiences, learning and inspiration	Chen et al., 2021; Nguyen et al., 2021; Hunter et al., 2019; Coutts & Hahn, 2015; Hartig et al., 2014

(*continued on next page*)

Table A1 (*continued*)

	Category description	Reference
Environmental	Specific biological or ecological (supporting, regulating and producing) functions, including climate, water and storm water regulation, temperature regulation, general values, utilizing nature's resources	Nieuwenhuijsen et al., 2017; Coutts & Hahn, 2015: Hartig et al., 2014
Effects on humans		
Individual service	Psychological and physical services or disservices to individuals provided by GI, e.g., an active lifestyle, perceived safety, prevention of adverse health effects, feeling comfortable, de-stressing	Nguyen, Astell-Burt, Rahimi-Ardabili and Feng, 2021; Hunter et al., 2019 Nieuwenhuijsen et al., 2017; van den Bosch & Ode Sang, 2017; Hartig et al., 2014; McCormack et al., 2010
Community service	Psychological and physical services or disservices to the community provided by GI, e.g., social contact, commitment to home municipality, breaking down social barriers, conflict between residents or user groups	Chen et al., 2021; Nguyen et al., 2021; Nieuwenhuijsen et al., 2017; Coutts & Hahn, 2015
Environmental service	Includes services or disservices to green spaces that has an effect on human health, e.g., better air quality, water quality, reduced noise, pollutants, mitigated flood risks and damage	Chen et al., 2021; Nguyen et al., 2021; Nieuwenhuijsen et al., 2017; van den Bosch & Ode Sang, 2017; Hartig et al., 2014
Equality & equity	Spatial and social considerations for environmental justice, including mentions of health distribution and social balance, different groups of inhabitants	Hunter et al., 2019 (claiming insufficient studies); Rigolon et al., 2021
HH&W outcomes		
Physical health	Descriptions of physical health outcomes, including e.g., allergies, cardiovascular effects, obesity, injuries	Nguyen et al., 2021; Rigolon et al., 2021; Hunter et al., 2019; Nieuwenhuijsen et al., 2017; van den Bosch & Ode Sang, 2017; Coutts & Hahn, 2015
Mental health	Descriptions of mental health outcomes, including e.g., depression, cognitive functions	Nguyen et al., 2021; Chen et al., 2021; Hunter et al., 2019; Felappi et al., 2020; Nieuwenhuijsen et al., 2017; Coutts & Hahn, 2015; Hartig et al., 2014
Social well-being	The individual's subjective experiences of their own life, e.g., quality of life, life satisfaction	Nguyen et al., 2021; Hunter et al., 2019

Appendix B. Instructions for data collection (Protocol)

Data collection focuses on two main types of data: 1) The information provided in relation to green space and health matters and 2) the goals provided in relation to green space and health matters.

The data collection process involves searching for answers to the posed questions using the *Analytical framework for GI-HH&W pathways(shown in a separate file)*, as well as potential "new" terms or typologies not originally mentioned in the framework.

The masterplans are read through in their entirety. Key sections or sentences are marked and transferred to an analysis matrix containing each city and all questions & sub-questions.

The analytical framework for GI-HH&W pathways

The analytical framework for GI-HH&W pathways consists of four main Dimensions;

Categories represent subgroups of the dimensions and are the main focus in the data collection.

GI Properties (Type, Attribute, Character, and Management).

GI function (Experiential and Environmental).

Effect on humans (Individual service, Community service, Environmental service, Equality and Equity).

HH&W Outcome (Physical health, mental health, social well-being).

The categories are not conclusive/final in the data collection phase. Thus, they should be considered as "concrete examples" of the different dimensions in order to facilitate data collection. This means that terms or typologies that do not fit any category but are still considered as relevant for the overall step should be included. Similarly, general terms such as "health" and "well-being" should be included even though they fit more than one category.

Direct and indirect pathways between dimensions

A GI Property mentioned as supporting a GI Function is not a direct link to Human-related factors. However, if the mentioned GI Function is in turn stated to have an Effect or Health outcome, the GI Property can be considered to indirectly support these factors. It should therefore be included in data collection.

Information on maps

Map-based information could become relevant in relation to e.g., RQc, relating to spatial components. If e.g., walking paths are stated to be beneficial for health, a map that points out developments of a walking path network should be noted, with a reference to any reasoning supporting the specific spatial placement.

Questions guiding data collection

How is relevant terminology used to describe GI and HH&W?

Look for information containing terms which can be located into categories (see the framework).

Are there specific goals in related to Green Space?

Look for specific goals or strongly worded policies on decision making, or strategic planning, design or management relating to the GI-HH&W nexus.

References

Aarhus Municipality. (2017). Aarhus Kommuneplan [Aarhus Municipal plan]. Retrieved [2022-05-11] from: http://reader.livedition.dk/aarhuskommune/835/.

Amano, T., Butt, I., & Peh, K. S.-H. (2018). The importance of green spaces to public health: A multi-continental analysis. *Ecological Applications, 28*(6), 1473–1480. https://doi.org/10.1002/eap.1748

Andersson, E., Haase, D., Anderson, P., Cortinovis, C., Goodness, J., Kendal, D., … Wellmann, T. (2021). What are the traits of a social-ecological system: Towards a

framework in support of urban sustainability. *npj Urban Sustainability, 1*(1), 14. https://doi.org/10.1038/s42949-020-00008-4

Baker, I., Peterson, A., Brown, G., & McAlpine, C. (2012). Local government response to the impacts of climate change: An evaluation of local climate adaptation plans. *Landscape and Urban Planning, 107*(2), 127–136. https://doi.org/10.1016/j.landurbplan.2012.05.009

Bedimo-Rung, A. L., Mowen, A. J., & Cohen, D. A. (2005). The significance of parks to physical activity and public health: A conceptual model. *American Journal of Preventive Medicine, 28*(2, Supplement 2), 159–168. https://doi.org/10.1016/j.amepre.2004.10.024

Berke, P., Smith, G., & Lyles, W. (2012). Planning for resiliency: An evaluation of state hazard mitigation plans under the disaster mitigation act. *Natural Hazards Review, 13*(2), 139–150. https://doi.org/10.1061/(ASCE)NH.1527-6996.0000063

Besser, L. M., & Lovasi, G. S. (2023). Human physical health outcomes influenced by contact with nature. In T. McPhearson, N. Kabisch, N. Frantzeskaki, & N. Kabisch (Eds.), *Nature-based solutions for cities* (pp. 168–192). Edward Elgar Publishing.

Bjärstig, T., Zachrisson, A., Svensson, J., & Thellbro, C. (2018). Grön översiktsplanering i fjäll- och fjällnära landskap: Deltagande planering för en innovativ och hållbar översiktsplan för Vilhelmina kommun[Green comprehensive planning in the mountain regions: Participatory planning for an innovative and sustainable comprehensive plan for Vilhelmina municipality] (978-91-620-6811-0 (ISBN) 02827298 (ISSN)). Retrieved [2021-12-30] from: http://urn.kb.se/resolve?urn=urn:nbn:se:naturvardsverket:diva-9088.

Borges, L. A., Nilsson, K., Tunström, M., Tepecik Diş, A., Perjo, L., Berlina, A., Oliveira e Costa, S., Fredricsson, C., Johnsen, I. H., & Grunfelder, J. (2017). White paper on Nordic sustainable cities. White Paper on Nordic sustainable cities. Retrieved [2021-12-30] from: http://urn.kb.se/resolve?urn=urn:nbn:se:kau:diva-80624.

Bratman, G. N., Anderson, C. B., Berman, M. G., Cochran, B., Vries, S. D., Flanders, J., … Daily, G. C. (2019). Nature and mental health: An ecosystem service perspective. *Science Advances, 5*(7), Article eaax0903. https://doi.org/10.1126/sciadv.aax0903

Brindley, P., Cameron, R. W., Ersoy, E., Jorgensen, A., & Maheswaran, R. (2019). Is more always better? Exploring field survey and social media indicators of quality of urban greenspace, in relation to health. *Urban Forestry & Urban Greening, 39*, 45–54. https://doi.org/10.1016/j.ufug.2019.01.015

Cardoso, R. V., & Meijers, E. J. (2016). Contrasts between first-tier and second-tier cities in Europe: A functional perspective. *European Planning Studies, 24*(5), 996–1015. https://doi.org/10.1080/09654313.2015.1120708

Carmona, M., Magalhães, C., & d.. (2004). *Is the grass greener…? Learning from international innovations in urban green space management*. London: Cabe.

Chen, K., Zhang, T., Liu, F., Zhang, Y., & Song, Y. (2021). How does urban green space impact residents' mental health: A literature review of mediators. *International Journal of Environmental Research and Public Health, 18*(22). https://doi.org/10.3390/ijerph182211746

Cooke, S., Jeanson, A., Bishop, I., Bryan, B., Chen, C., Cvitanovic, C., … Young, N. (2021). On the theory-practice gap in the environmental realm: Perspectives from and for diverse environmental professionals. *Socio-Ecological Practice Research, 3*. https://doi.org/10.1007/s42532-021-00089-0

Cortinovis, C., & Geneletti, D. (2018). Ecosystem services in urban plans: What is there, and what is still needed for better decisions. *Land Use Policy, 70*, 298–312. https://doi.org/10.1016/j.landusepol.2017.10.017

Coutts, C., & Hahn, M. (2015). Green infrastructure, ecosystem services, and human health. *International Journal of Environmental Research and Public Health., 12*(8), 9768–9798. https://doi.org/10.3390/ijerph120809768

Davies, C., & Lafortezza, R. (2017). Urban green infrastructure in Europe: Is greenspace planning and policy compliant? *Land Use Policy, 69*, 93–101. https://doi.org/10.1016/j.landusepol.2017.08.018

de Vries, S., van Dillen, S. M. E., Groenewegen, P. P., & Spreeuwenberg, P. (2013). Streetscape greenery and health: Stress, social cohesion and physical activity as mediators. *Social Science & Medicine, 94*, 26–33. https://doi.org/10.1016/j.socscimed.2013.06.030

Douglas, O., Lennon, M., & Scott, M. (2017). Green space benefits for health and well-being: A life-course approach for urban planning, design and management. *Cities, 66*, 53–62. https://doi.org/10.1016/j.cities.2017.03.011

DST. (2021). Kommunedetaljer [Municipal details]. Retrieved 2021-12-30] from: https://www.dst.dk/da/Statistik/kommunekort/kommunefakta/kommune?kom=751.

EC. (2013). *Green Infrastructure (GI) — Enhancing Europe's Natural Capital. Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions. Brussels, 6.5.2013. COM(2013)*.

Espoo Municipality. (2008). Espoon eteläosien yleiskaava 2030 [General plan of the southern parts of Espoo]. Retrieved [2022-05-11] from: https://kartat.espoo.fi/Documents/Ksk_Yk_dokumentit/Selostus%20Espoon%20etel%C3%A4osien%20yleiskaava.pdf.

Felappi, J. F., Sommer, J. H., Falkenberg, T., Terlau, W., & Kötter, T. (2020). Green infrastructure through the lens of "one health": A systematic review and integrative framework uncovering synergies and trade-offs between mental health and wildlife support in cities. *Science of the Total Environment, 748*, Article 141589. https://doi.org/10.1016/j.scitotenv.2020.141589

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219–245. https://doi.org/10.1177/1077800405284363

Fors, H., Jansson, M., & Nielsen, A. B. (2018). The impact of resident participation on urban woodland quality—a case study of Sletten, Denmark. *Forests, 9*(11), 670. https://doi.org/10.3390/f9110670

Gradinaru, S. R., Onose, D. A., Oliveira, E., Slave, A. R., Popa, A. M., & Gravrilidis, A. A. (2023). Equity in urban greening: Evidence from strategic planning in Romania. *Landscape and Urban Planning, 230*, Article 104614. https://doi.org/10.1016/j.landurbplan.2022.104614

Grahn, P., & Stigsdotter, U. K. (2010). The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning, 94*(3–4), 264–275. https://doi.org/10.1016/j.landurbplan.2009.10.012

Groot, R., Alkemade, R., Braat, L., Hein, L., & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning. *Management and Decision Making. Ecological Complexity*, 260–272. https://doi.org/10.1016/j.ecocom.2009.10.006

Grunfelder, J., Rispling, L., & Norlén, G. (2018). *State of the Nordic Region 2018. Nord 2018:001*. Copenhagen: Nordic Council of Ministers. https://doi.org/10.6027/NORD2018-001

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and health. *Annual Review of Public Health, 35*, 207–228. https://doi.org/10.1146/annurev-publhealth-032013-182443

Heidrich, O., Dawson, R. J., Reckien, D., & Walsh, C. L. (2013). Assessment of the climate preparedness of 30 urban areas in the UK. *Climatic Change, 120*(4), 771–784. https://doi.org/10.1007/s10584-013-0846-9

Helgesen, M. K. (2014). Governance of public health: Norway in a Nordic context. *Scandinavian Journal of Public Health, 42*(15 Suppl), 25–30. https://doi.org/10.1177/1403494814546925

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Hunter, R. F., Cleland, C., Cleary, A., Droomers, M., Wheeler, B. W., Sinnett, D., … Braubach, M. (2019). Environmental, health, wellbeing, social and equity effects of urban green space interventions: A meta-narrative evidence synthesis. *Environment International, 130*. https://doi.org/10.1016/j.envint.2019.104923

Ii Municipality. (2016). Iin keskustaajaman osayleiskaava [Ii Partial master plan of the city center]. Retrieved [2022-05-11] from https://www.ii.fi/sites/ii.fi/files/TIEDOSTOT/ASUMINEN_YMPARISTO/Kaavoitus/IikeskustaOYKselostusEHDOTUS08022016.pdf.

Jansson, M., Vogel, N., Fors, H., Dempsey, N., Buijs, A., & Randrup, T. B. (2020). Defining urban open space governance and management. In M. Jansson, & T. B. Randrup (Eds.), *Urban open space governance and management* (pp. 11–30). London; New York, NY: Routledge.

Kabisch, N., Basu, S., van den Bosch, M., Bratman, G. N., & Masztalerz, O. (2023). Nature-based solutions and mental health. In T. McPhearson, N. Kabisch, & N. Frantzeskaki (Eds.), *Nature-based solutions for cities* (pp. 193–212). Edward Elgar Publishing.

Lachowycz, K., & Jones, A. P. (2013). Towards a better understanding of the relationship between greenspace and health: Development of a theoretical framework. *Landscape and Urban Planning, 118*, 62–69. https://doi.org/10.1016/j.landurbplan.2012.10.012

Lantmäteriverket. (2021). Arealer kommunvis [Area by municipality]. Retrieved [2021-12-30] from: https://www.maanmittauslaitos.fi/sv/information-om-lantmateriverket/organisation/statistik#Pinta-alat-kunnittain.

Lee, A. C., Jordan, H. C., & Horsley, J. (2015). Value of urban green spaces in promoting healthy living and wellbeing: Prospects for planning. *Risk Management and Healthcare Policy, 8*, 131–137. https://doi.org/10.2147/RMHP.S61654

Lindholst, A. C., Sullivan, S. G., van den Bosch, C. C. K., & Fors, H. (2015). The inherent politics of managing the quality of urban green spaces. *Planning Practice & Research, 30*(4), 376–392. https://doi.org/10.1080/02697459.2015.1057943

Markevych, I., Schoierer, J., Hartig, T., Chudnovsky, A., Hystad, P., Dzhambov, A. M., … Fuertes, E. (2017). Exploring pathways linking greenspace to health: Theoretical and methodological guidance. *Environmental Research, 158*, 301–317. https://doi.org/10.1016/j.envres.2017.06.028

McCormack, G. R., Rock, M., Toohey, A. M., & Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health and Place, 16*(4), 712–726. https://doi.org/10.1016/j.healthplace.2010.03.003

Mears, M., Brindley, P., Maheswaran, R., & Jorgensen, A. (2019). Understanding the socioeconomic equity of publicly accessible greenspace distribution: The example of Sheffield, UK. *Geoforum, 103*, 126–137. https://doi.org/10.1016/j.geoforum.2019.04.016

Mell, I. C. (2009). Can green infrastructure promote urban sustainability? *Proceedings of the Institution of Civil Engineers - Engineering Sustainability, 162*(1), 23–34. https://doi.org/10.1680/ensu.2009.162.1.23

Milvoy, A., & Roué-Le Gall, A. (2015). Aménager des espaces de jeux favorables à la santé. *La Santé en Action., 434*, 38–39. Retrieved from [2021-12-30]: https://www.santepubliquefrance.fr/docs/amenager-des-espaces-de-jeux-favorables-a-la-sante.

Moseley, D., Marzano, M., Chetcuti, J., & Watts, K. (2013). Green networks for people: Application of a functional approach to support the planning and management of greenspace. *Landscape and Urban Planning, 116*, 1–12. https://doi.org/10.1016/j.landurbplan.2013.04.004

Nam, J., & Dempsey, N. (2019). Place-keeping for health? Charting the challenges for urban park management in practice. *Sustainability, 11*(16). https://doi.org/10.3390/su11164383

Nguyen, P. Y., Astell-Burt, T., Rahimi-Ardabili, H., & Feng, X. (2021). Green space quality and health: A systematic review. *International Journal of Environmental Research and Public Health, 18*(21). https://doi.org/10.3390/ijerph182111028

Nieuwenhuijsen, M. J. (2021). Green infrastructure and health. *Annual Review of Public Health, 42*, 317–328. https://doi.org/10.1146/annurev-publhealth-090419-102511

Nieuwenhuijsen, M. J., Khreis, H., Triguero-Mas, M., Gascon, M., & Dadvand, P. (2017). Fifty shades of green. *Epidemiology, 28*(1), 63–71. https://doi.org/10.1097/EDE.0000000000000549

Nilsson, K. L. (2017). The history of Swedish planning. In S. Kristjánsdóttir (Ed.), *Nordic experiences of sustainable planning: Policy and practice* (1st ed., pp. 127–137). Routledge. https://doi.org/10.4324/9781315598529.

Nordh, H., Evensen, K. H., & Skår, M. (2017). A peaceful place in the city—A qualitative study of restorative components of the cemetery. *Landscape and Urban Planning, 167*, 108–117. https://doi.org/10.1016/j.landurbplan.2017.06.004

Nordh, H., & Olafsson, A. S. (2021). Plans for urban green infrastructure in Scandinavia. *Journal of Environmental Planning and Management, 22*. https://doi.org/10.1080/09640568.2020.1787960

Norton, R. K. (2008). Using content analysis to evaluate local master plans and zoning codes. *Land Use Policy, 25*(3), 432–454. https://doi.org/10.1016/j.landusepol.2007.10.006

Pauleit, S., Liu, L., Ahern, J., & Kazmierczak, A. (2011). Multifunctional green infrastructure planning to promote ecological services in the city. In J. Niemelä, J. H. Breuste, T. Elmqvist, G. Guntenspergen, P. James, & N. E. McIntyre (Eds.), *Urban ecology: Patterns, processes, and applications* (pp. 272–286). Oxford University Press.

Randrup, T. B., & Jansson, M. (2020). Introduction: Urban open space governance and management—The long-term perspective. In M. Jansson, & T. B. Randrup (Eds.), *Urban open space governance and management*. Routledge (ISBN 9780367173036).

Randrup, T. B., & Persson, B. (2009). Public green spaces in the Nordic countries: Development of a new strategic management regime. *Urban Forestry and Urban Greening, 8*(1), 31–40. https://doi.org/10.1016/j.ufug.2008.08.004

Randrup, T. B., Svännel, J., Sunding, A., Jansson, M., & Sang, Å. O. (2021). Urban open space management in the Nordic countries. Identification of current challenges based on managers' perceptions. *Cities, 115*, Article 103225. https://doi.org/10.1016/j.cities.2021.103225

Reyes-Riveros, R., Altamirano, A., De La Barrera, F., Rozas-Vásquez, D., Vieli, L., & Meli, P. (2021). Linking public urban green spaces and human well-being: A systematic review. *Urban Forestry & Urban Greening, 61*, Article 127105. https://doi.org/10.1016/j.ufug.2021.127105

Rigolon, A., Browning, M. H. E. M., McAnirlin, O., & Yoon, H.(. V.). (2021). Green space and health equity: A systematic review on the potential of green space to reduce health disparities. *International Journal of Environmental Research and Public Health, 18*(5), 2563. https://doi.org/10.3390/ijerph18052563

Rigolon, A., Fernandez, M., Harris, B., & Stewart, W. (2019). An ecological model of environmental justice for recreation. *Leisure Sciences*, 1–22. https://doi.org/10.1080/01490400.2019.1655686

Sallis, J. F., Bull, F., Burdett, R., Frank, L. D., Griffiths, P., Giles-Corti, B., & Stevenson, M. (2016). Use of science to guide city planning policy and practice: How to achieve healthy and sustainable future cities. *Lancet, 388*(10062), 2936–2947. https://doi.org/10.1016/s0140-6736(16)30068-x

Sang, Å. O., Knez, I., Gunnarsson, B., & Hedblom, M. (2016). The effects of naturalness, gender, and age on how urban green space is perceived and used. *Urban Forestry & Urban Greening, 18*, 268–276. https://doi.org/10.1016/j.ufug.2016.06.008

SCB. (2021). Land- och vattenareal per den 1 januari efter region och arealtyp. År 2012–2021 [Land and water area as of 1 January by region and area type. Year 2012–2021]. Retrieved [2021-12-30] from: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0802/Areal2012N/.

Scott, M., Lennon, M., Haase, D., Kazmierczak, A., Clabby, G., & Beatley, T. (2016). Nature-based solutions for the contemporary city/re-naturing the city/reflections on urban landscapes, ecosystems services and nature-based solutions in cities/multifunctional green infrastructure and climate change adaptation: Brownfield greening as an adaptation strategy for vulnerable communities?/delivering green infrastructure through planning: Insights from practice in Fingal, Ireland/planning for biophilic cities: From theory to practice. *Planning Theory & Practice, 17*(2), 267–300. https://doi.org/10.1080/14649357.2016.1158907

Shanahan, D. F., Lin, B. B., Bush, R., Gaston, K. J., Dean, J. H., Barber, E., & Fuller, R. A. (2015). Toward improved public health outcomes from urban nature. *American Journal of Public Health, 105*(3), 470–477. https://doi.org/10.2105/AJPH.2014.302324

Slätmo, E., Nilsson, K., & Turunen, E. (2019). Implementing green infrastructure in spatial planning in Europe. *Land, 8*. https://doi.org/10.3390/land8040062

SSB. (2021). 09280: Areal av land og ferskvatn (km^2) (K) 2007–2021 [09280: Area of land and fresh water (km^2) (K) 2007–2021] (Retrieved [2021-12-30] from) https://www.ssb.no/statbank/table/09280.

Stake, R. E. (2008). Qualitative case studies. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 119–149). Sage Publications, Inc.

Statistics Finland. (2021). Population by municipality-based units. Retrieved [2021-12-30] from https://www.stat.fi/org/avoindata/paikkatietoaineistot/vaesto_tilastointialueittain_en.html.

Stavanger Municipality. (2019a). Planbeskrivelse 2019–2034[Plan description 2019–2034] (Retrieved [2022-05-11] from) https://www.stavanger.kommune.no/siteassets/samfunnsutvikling/planer/kommuneplan/arealdel-stavanger-2020/vedlegg-01-planbeskrivelse-kpa-versjon-for-vedtak.pd.

Stavanger Municipality. (2019b). Bestemmelser og retningslinjer arealdel 2019–2034 [Regulations and guidelines areal part 2019–2034] (Retrieved [2022-05-11] from) https://www.stavanger.kommune.no/siteassets/samfunnsutvikling/planer/kommuneplan/arealdel-stavanger-2020/vedlegg-02-bestemmelser-og-retningslinjer-ny.pdf.

Stavanger Municipality. (2020). Kommuneplanens samfunnsdel 2020–2034 [Societal part of the municipal plan 2020–2034]. Retrieved [2022-05-11] from https://www.stavanger.kommune.no/siteassets/samfunnsutvikling/planer/kommuneplan/samfunnsdelen-2019/kommuneplanens-samfunnsdel-2020-2034.pdf.

Stoltz, J., & Grahn, P. (2021). Perceived sensory dimensions: An evidence-based approach to greenspace aesthetics. *Urban Forestry & Urban Greening, 59*, Article 126989. https://doi.org/10.1016/j.ufug.2021.126989

Täby municipality. (2010). Det nya Täby - Översiktsplan 2010–2030 [The new Tävy – Comprehensive plan 2010–2030]. Retrieved [2022-05-11] from: https://www.taby.se/stadsplanering-och-trafik/stadsplanering-och-utbyggnad/oversiktlig-planering/oversiktsplan-2010/.

Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemelä, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using green infrastructure: A literature review. *Landscape and Urban Planning, 81*, 167–178. https://doi.org/10.1016/j.landurbplan.2007.02.001

van den Bosch, M., & Ode Sang, A. (2017). Urban natural environments as nature-based solutions for improved public health - A systematic review of reviews. *Environmental Research, 158*, 373–384. https://doi.org/10.1016/j.envres.2017.05.040

Vilhelmina Municipality. (2018). Vilhelmina kommun Vualtjeren Tjïelte med sikte på 2030 Vilhelmina municipality Vualtjeren Tjïelte with a view to 2030. Retrieved [2022-05-11] from https://www.vilhelmina.se/media/2275/groen-oeversiktsplanvmina_lagakraft_190114.pdf.

WHO. (2020). *WHO global strategy on health, environment and climate change: The transformation needed to improve lives and wellbeing sustainably through healthy environments*. Geneva: World Health Organization. Retrieved [2021-12-30] from: https://www.who.int/publications/i/item/9789240000377.

WHO Regional Office for Europe. (2016). Urban green spaces and health - a review of evidence. Retrieved [2021-12-21] from https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2016/urban-green-spaces-and-health-a-review-of-evidence-2016.

WHO Regional Office for Europe. (2017). *Urban green spaces: A brief for action*. Copenhagen: WHO Regional Office for Europe. Retrieved [2021-11-29] from https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2017/urban-green-spaces-a-brief-for-action-2017.

Woodruff, S. C., & BenDor, T. K. (2016). Ecosystem services in urban planning: Comparative paradigms and guidelines for high quality plans. *Landscape and Urban Planning, 152*, 90–100. https://doi.org/10.1016/j.landurbplan.2016.04.003

World Health Organization. (n.d.). Constitution. Retrieved [2021-11-07] from https://www.who.int/about/governance/constitution.