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RESEARCH

Planning and managing urban green infrastructure for human health: perspectives on collaboration and implementation from four Nordic cities

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Abstract
While there is substantial research connecting urban green infrastructure (UGI) with human health and well-being (HH&W), less is known about how responsible actors address this relationship in practice. Based on interviews in four Nordic cities, this study examines UGI planning, UGI management, and public health practitioners' perceptions of their work, as well as perceived barriers and support for working with the UGI-HH&W nexus. The study revealed that HH&W was not addressed in-depth by either UGI planners or managers, but was instead seen as one of many general arguments for safeguarding UGI from urban development. Public health strategists conversely had a broader view of health and presented examples of a strategic approach to cross-sectorial collaboration. Planners and managers face similar challenges, but there is a more positive view among planners and health strategists on strategic development within the organisation. In contrast, managers are primarily and more deeply concerned about general challenges to UGI development. The results further present a range of coordination efforts, including both formal cross-sectorial groups and experimental approaches. However, there is a policy implementation mismatch in strategic UGI development, accompanied by a lack of long-term perspectives. These two challenges can be understood together, where a more strategic understanding of long-term UGI management would provide an opportunity to increase sustainability in current planning and investment practices. A more aligned approach offers a path for future development in planning and management of UGI for human health and well-being.

Keywords Urban green infrastructure · Urban planning · Urban green infrastructure management · Public health · Nordic municipalities

1 The relationship between urban green infrastructure and human health & well-being in research and practice

The benefits of urban green infrastructure (UGI) for human health and well-being (HH&W) have been well established (e.g. Barboza et al. 2021; Bratman et al. 2019; Hartig et al. 2014; Markevych et al. 2017; Nilsson and Grahn 2024; van den Berg et al. 2015, van den Bosch and Ode Sang 2017; WHO Regional Office for Europe 2016). In defining human health, WHO (n.d.) declare this to be "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". In addressing the relationship between human health and green environments, the term human health & well-being (HH&W) has been frequently been used (see e.g. FAO 2020; Nilsson et al. 2011; Tyrväinen et al. 2019), emphasising this multi-dimensional and holistic understanding of health.

UGI has been 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). In practice, UGI often comprises publicly accessible areas which are predominantly owned by local governments (Carmona and Magalhães 2006, p. 76). These organisations have the main responsibility for both developing and implementing UGI policies through planning, design, and management (Randrup and Jansson 2020, p. 6; Slätmo et al. 2019, p. 7 of 21).

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However, daily practice—where this evidence is supposed to be applied—is not well understood (Dobson and Dempsey 2021, p. 392).

Cross-sectorial collaboration has been widely acknowledged as a key strategy in addressing a range of challenges, including declining public health (Barton and Grant 2013, p. 120; Berglund-Snodgrass et al. 2022, p. 114; Bryson et al. 2006, p. 44). Here, UGI planning constitutes a central process in securing sufficient space at multiple scales to ensure physical and functional connectivity between individual green spaces and other urban infrastructures (Davies et al. 2015, p. 39). Likewise, UGI management constitutes the processes to develop and secure the functions and uses of individual green spaces (Jansson et al. 2020, p. 14), determining green spaces' ability to support HH&W after initial establishment (Dobson et al. 2021, p.3). Therefore, an integrated, cross-sectorial, and long-term perspective on planning and management is needed to support the relationship between UGI and HH&W in practice.

In Europe, public administrations including local governments are typically organised in a sectorial and hierarchal structure (Kettl 2015, p. 44; Torfing et al. 2020, p.12). Such organisational arrangements focus on separate departments, supporting policymakers in decision-making on sector-specific issues (Peters 2015, p. 5). Although cross-sectorial ambitions may be high, both joint policymaking and cross-sectoral coordination face administrative barriers which are intensified by the multi-organisational character of local governments (ibid, p. 2). These barriers contribute to organisational silos as different norms and cultures affect what are seen as important issues (de Waal et al. 2019). This is shown in previous studies, detailing how close collaboration between planners and health practitioners is scarce (Berglund-Snodgrass et al. 2022, p. 114; Crawford et al. 2010, p. 91), and a lack of practical application of research in planning and management of UGI (Hagemann et al. 2020, p. 284; Qiao et al. 2019, p. 2) and HH&W (Dobson et al. 2021, p. 1).

1.1 The NORDGREEN project—Nordic perspectives on healthy green cities

This study was conducted as part of the Nordic research project NORDGREEN—Smart Planning for Healthy and Green Nordic Cities.[1] The Nordic countries are considered frontrunners in matters related to sustainable development (Sachs et al. 2024, p. 20–21) and quality of life (Helliwell et al. 2022, p. 24), also scoring highly on health-related sociodemographic measures (Knudsen et al. 2019, p. e665). An international comparison shows that Nordic cities rate high on air and water quality and have high ambitions of balancing the compact and the green city (Aguiar Borges et al. 2017, pp. 30–31, 38). However, differences in mortality rates, rates of illness, perceived well-being (Rehn-Mendoza and Weber 2018, p. 176), and life expectancy gaps based on socioeconomic status in Nordic countries are still larger than expected compared to other European countries with less generous welfare policies (Mackenbach 2017, p. 14).

The study revolves around the four largest Nordic countries: Denmark, Finland, Norway, and Sweden. As welfare states, these countries have general similarities in health-promoting responsibilities at the local governmental level (Helgesen 2014, pp. 26–28), albeit with formal differences, as national legislation demands cross-sectorial collaboration on public health issues in only Norway and Finland. These countries also share a comprehensive integrated approach in their planning systems with a focus of integrating policies both horizontally and vertically (Nadin and Stead 2008, p.39). However, studies show a lack of support for UGI-HH&W relationships in Nordic planning policies (Sunding et al. 2024, p. 10). Further, the Nordic countries are also characterised by high local governmental autonomy (Ladner et al. 2016, p. 337), resulting in wide variations in how polices and responsibilities are interpreted and implemented. As such, there is limited knowledge about how the implementation of health-promoting measures takes place in Nordic UGI planning and management.

To encourage learning across the countries, the selection of city partners comprised a range of urban contexts, with similar governance structures and comparable yet varying planning cultures (Aguiar Borges et al. 2024, p. 13). Four of the participating cites are urban municipalities: Aarhus (DK), Täby (SE), Stavanger (NO), and Espoo (FI). These municipalities were used in this study as potential forerunners or best practice cases in the Nordic region, (see Sect. 3.1). Separate work packages were set up to address statistical analysis of UGI and HH&W characteristics (Nordh et al. 2024b), public participation GIS surveys as a planning tool for healthy cities (Kyttä et al. 2024), and evidence-based, health-promoting design of UGI (Bengtsson et al. 2024). Finally, this study addresses the governance context of the local governments responsible for implementing these methodologies to support moving from knowledge to implementation.[2]

[1] https://nordregioprojects.org/nordgreen/

[2] An outcome of the project was the handbook created to address the relationship between UGI and HH&W through statistical, technical, and design approaches, as well as approaches to integrate governance, which presented the theoretical model used to guide this study in a manner that is practically applicable for practitioners (see Aguiar Borges et al. 2024). The handbook was launched in January 2024 with a webinar: www.youtube.com/watch?v=yDcJsnP_6Zw.

1.2 Aim and research questions

Local governments are key actors in UGI planning and management, but high municipal autonomy entails a scarcity in general knowledge on how HH&W is addressed in these processes. Understanding the context of daily work and collaboration between relevant sectors is crucial to understand challenges for scaling up and integrating new methods and tools into daily practice. Therefore, this study focused on how local government planners, managers, and public health strategists address the relation between UGI and HH&W in everyday practice, and what factors affect the work. This led to the following research questions:

1. How do involved practitioners address the relation between UGI and HH&W in their daily work?
2. Which factors support or hinder the promotion of HH&W in UGI planning and management?

2 Theoretical background

2.1 Roles in UGI planning and management

In a public organisation, the following levels can be identified: (1) the *policy level* of vision development and goal setting (also referred to as the strategic level); (2) the *tactical level* of institutional interactions; and (3) the *operational level* of activities and implementation (e.g. Loorbach 2010, p. 168–170).

Practitioners responsible for UGI planning and management address different but interlinked issues. Planners produce plans on different organisational levels, addressing a range of spatial and temporal scales. In the Nordic context, this can be conducted through spatial plans for new developments such as comprehensive plans addressing land use visions, or detailed plans addressing site-level building regulations. Plans can also address existing spaces and facilities as a part of a strategic planning approach (Mäntysalo et al. 2014, p. 350–351). These strategies include thematic documents guiding development and (re)investment on a municipal scale, or addressing larger developments or regeneration projects (e.g. Brorström and Willems 2023, p. 346).

UGI managers are often oriented towards the interface between tactical and operational levels, as management addresses both development of existing UGI and operational maintenance (Dempsey and Burton 2012, p. 13; Jansson et al. 2018, p. 954). As such, managers are responsible for implementation, whereas the plans guiding and informing this implementation can be produced by managers or planners depending on their position within the organisation. Thus, the interface between planning and management can be jagged and even overlapping. Municipalities vary in how this interface is organised and how the interaction between different roles takes place.

2.2 The programmatic alignment model

As the complexity of societal challenges increases, so does the demand for aligning these issues across sectors through cross-departmental collaboration. This can be described as a need for *horizontal alignment*. While the formal political visions are decided at the policy level, they are affected by a range of decisions at operational and tactical levels. Therefore, an aligned approach across organisational levels, *vertical alignment*, is required to ensure that intended visions spanning multiple sectors are connected to operational activities. The programmatic alignment model offers a lens through which the relation between cross-sectorial visions and implementation can be understood, emphasising that horizontal and vertical alignment must take programmatic (overall) alignment into account (Singh et al. 2021, p. 4). The authors (ibid. p. 3) originally described this on a national–subnational scale, whereas we have reinterpreted the model for a local government setting (see Fig. 1). The two versions of programmatic alignment act in tandem; one nested within the other. The programmatic alignment approach provides an understanding of different aspects that can affect the link between an overarching policy and its implementation.

The notion of implementation is central for this paper and requires further clarification. In colloquial terms, "implementation" implies putting something into use, or carrying out intended actions. In the published research, a range of different perspectives have been taken to characterise implementation, and to identify implementation gaps. For example, implementation has been addressed as (1) taking findings from research to practice (Bishop 2024, p. 1), (2) use of planning support systems in planning processes (Geertman 2017), (3) use of the ESS (Ecosystem Services) concept in land use planning (Levrel et al. 2017), or (4) pertaining to "integrative cycles within the planning and policy process" (Wickenberg et al. 2021, p. 45). Following Singh et al. (2021) and Loorbach (2010), this paper understands implementation as actions taken at the operational level, also denoted "shop floor" (Merkus et al. 2019, p. 147) or "street level" (originally Lipsky 1980, also e.g. Hupe and Hill 2016, p. 114) on and in the physical UGI. In practice, implementation entails either maintenance of existing UGI, or actions aimed at changing it, such as planting trees or building a new park. This means that implementation implies more than simply operationalising a policy. According to this understanding, creating a strategy or action plan that sets out main goals and prioritisations is an important step towards implementation, but not implementation in itself.

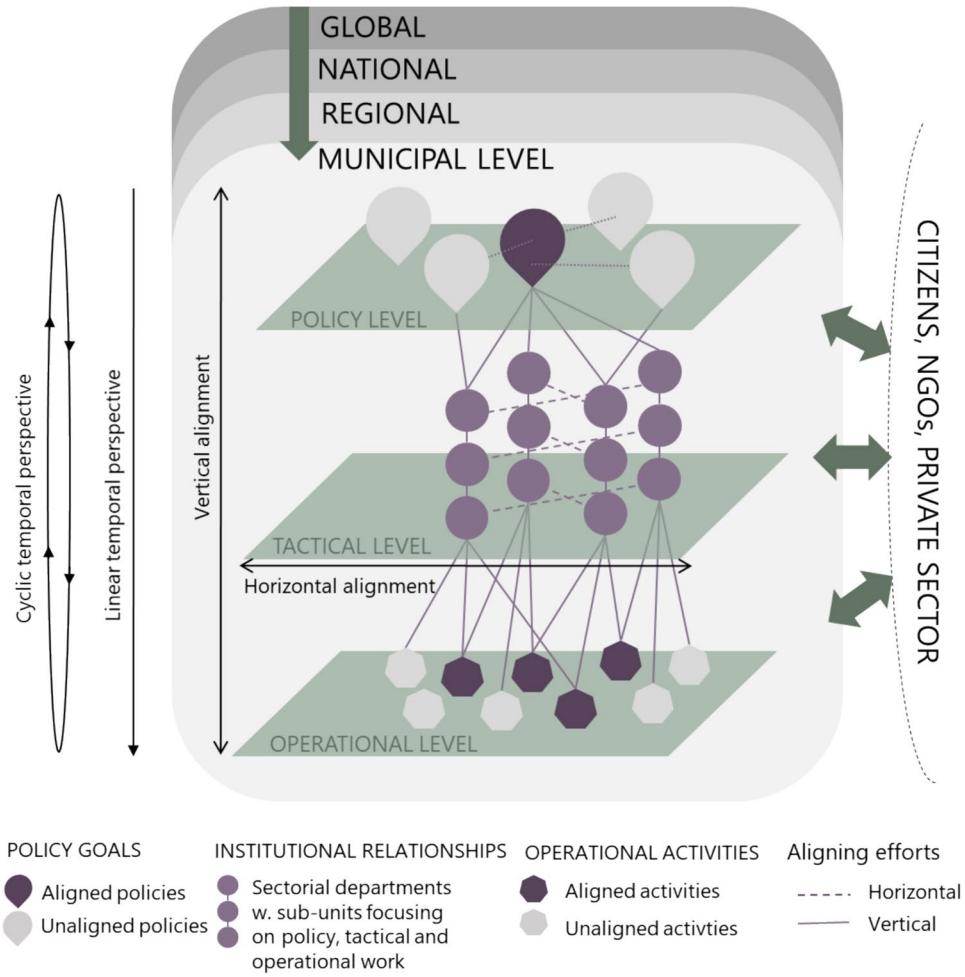

Fig. 1 Programmatic alignment (Sunding and Randrup 2024) adapted from (Singh et al. 2021). Unaligned policies and activities are those lacking relevant horizontal or vertical alignment, in this context a connection to two sectorial departments

2.3 Temporal perspectives on UGI planning and management through the lens of programmatic alignment

Planning and management of UGI are commonly understood as a linear process, reflecting a hierarchical and sequential landscape development process of planning, design, construction, and maintenance (Jansson et al. 2020, p. 11). This linear understanding of landscape development processes implies a top-down approach in the model of programmatic alignment. Similarly, the top-down view of policy implementation that is prevalent in both practice and research understands implementation as the following policy formation in a sequential, causal, and hierarchical relationship (Hupe and Hill 2016, p. 104).

This linear understanding results in UGI management often being considered as the end phase with little relevance beyond maintenance operations, leading to a focus on short-term operational effectiveness (Randrup and Persson 2009, p. 37), rather than long-term strategic development (Dempsey and Smith 2014, p. 17; Randrup et al. 2017, p. 107). However, as UGI is a dynamic system, merely maintaining it will lead to a gradual degeneration (Randrup and Persson 2009, p. 37). In contrast, a more cyclic approach, as described by Jansson et al. (2020, p. 11), implies a more complex relationship between policy and implementation. This is, in effect, a combination of bottom-up and top-down approaches (Singh et al. 2021, p. 3), allowing for reflexive feedback which functions as a complex adaptive system, correcting and developing as needed (Loorbach 2010, p. 96). As such, monitoring and evaluation resulting in feedback between levels are key tools for the informed and continued re-development of space (Smith et al. 2014, p 172).

3 Understanding everyday practice through practitioner interviews

To gain a deeper insight into the everyday practice related to the UGI-HH&W relationship in a local government context, the study was conducted using semi-structured interviews. The interviews targeted practitioners working with UGI planning, UGI management, and strategic health promotion in four Nordic municipalities.

3.1 The participating municipalities

The municipalities participating in the research project NORDGREEN were chosen as potential sources of best practice, based on experiences in related fields. The reasons include being acknowledged for sustainability ambitions in Espoo (Zoeteman et al. 2016), smart city research in Stavanger, (Haarstad 2017; Stavanger 2016), comprehensive participation in research projects in Aarhus (e.g. Frydenlund et al. 2020; Hansen et al. 2016, p. 58, 65), and on the UGI-HH&W relation specifically in Täby (Åshage and Bengtsson 2021; Bengtsson et al. 2025). They can therefore be expected to be instrumental (Stake 1995, p. 3) as potential forerunners in terms of contributing to, and applying research-generated knowledge into everyday work. As instrumental cases, both their common traits and their distinctiveness are of interest (Stake 1995, p. 1). The selected cities represent a combination of second-tier city municipalities (Cardoso and Meijers 2016, p. 997), and municipalities in capital regions, geographically spread across the Nordic Region (Table 1), see Fig. 2. The cases consist of three cities (> 50% of the population living in high-density clusters), and one town and its suburbs (< 50% living in high-density clusters and < 50% living in rural areas) (Grunfelder et al. 2018, p. 42).

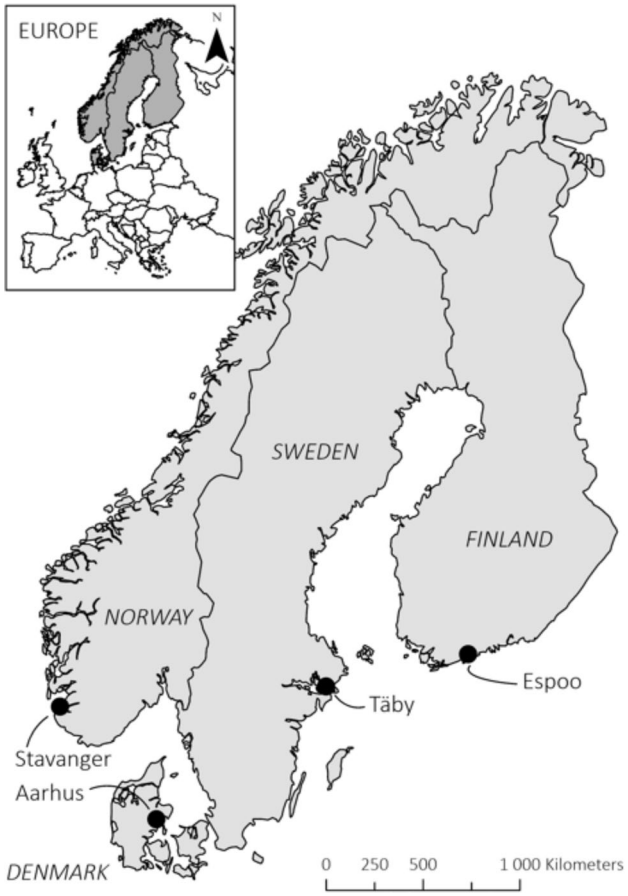

Fig. 2 Map of the Nordic countries and cities addressed in this study

3.2 Selection of interviewees

Three key informants were selected from each of the four municipalities (Tables 1 and 2), for a total of 12 interviews across the cities. The roles included a planner, a manager, and a health strategist in each municipality. These cover overarching and/or tactical planning levels, green space management responsibilities, and responsibilities for public health from a strategic perspective. Interviewees were selected by providing an existing municipal contact with written role descriptions (see Appendix A) who then suggested relevant interviewees. The municipal contact was familiar with different roles within various planning processes and subsequent construction, management, and maintenance.

Table 1 Population, urbanisation, geographical location, and area of the four selected municipalities

	Täby, Sweden	Aarhus, Denmark	Stavanger, Norway	Espoo, Finland
Population	73,307[1]	361,554[2]	143,985[3]	293,576[4]
Urbanisation	Town	City	City*	City
Geographical setting	Capital area	Second-tier city	Second-tier city	Capital area
Area tot., km^2 Area land, km^2	71[1] 60[1]	468[2] –	262[3] 256[3]	528[5] 312[5]
Total area greenspace per inh. m2, (of which forest) within the municipality6	1146.3 (1118.8)	479 (465.8)	10,202.8(10,200.7)	1725.5 (1711.7)
Perceived health[7]	76.0	86.0	78.0	75.2
Working population (%)[6]	61.6	70.5	67.9	66.8

*Before merger with two rural municipalities

[1]SCB (2024) [2]DST (2021) [3]SSB (2021) [4]Statistics Finland (2022) [5]Lantmäteriverket (2021) [6]Aamodt et al. (2023) [7]Nordh et al. (2024a)

3.3 Interviews

The first author conducted qualitative individual semi-structured interviews (Kvale and Brinkmann 2009) through video calls between September 2021 and February 2022 with all selected interviewees. The interviews lasted between 50 and 85 min. A week before the interview, an email was sent out describing the focus of the study, informing participants that the interview was voluntary and anonymous, and describing the overarching topics for the interview, see Appendix B. The interview guide consisted of five themes related to the UGI–HH&W nexus: *professional role and work, cooperation with internal and external actors, use of plans and strategies, monitoring and evaluation,* and *looking forward/future development.* Each theme consisted of a group of questions, presented in Appendix C. Each interview was based on the interviewees' current job situation and assessed how interviewees perceived the local context. Here, HH&W was used to represent a broad understanding of health (see e.g. Nilsson et al. 2011) to avoid interviewees assuming that addressing public health requires certain methods or approaches, but to get a more personal insight into how they approach it.

Swedish, Danish, and Norwegian interviews were conducted in their respective languages, meaning the interviewer spoke Swedish and the interviewees their mother tongue, using English terms when clarifications were needed. Two Finnish interviews were held in English and the third was held in Swedish, which is an official language in Finland and spoken by 5% of the population. Interviews were recorded, transcribed verbatim, and timestamped using an automatic transcription service. The interviews were then listened to in their entirety and the text was corrected for mistakes and appropriate clarifications were made, totalling between 7000 and 13,700 words.

3.4 Coding and analysis of interviews

The first author read the material carefully and inductively coded it using thematic analysis (Braun and Clarke 2021) with the software NVivo. A manifest level (ibid. p. 52) of the text was analysed based on the expressed perspectives and understandings provided by the transcriptions. When the written material was potentially unclear in its meaning, the recordings were revisited to clarify the sentiment conveyed by tone and phrasing. The analysis then examined the codes created from the perspective of programmatic alignment, focusing on aspects addressing either horizontal or vertical alignment. Horizontal alignment is mainly represented by the cross-sector interaction between public health-related responsibilities and UGI responsibilities. Vertical alignment is mainly represented by cross-level interaction, such as perceived impact of policies at the tactical level, or the relations between tactical and operational level. Mentions of e.g. formal structures for cross-sectoral collaboration, or daily collaboration between roles was identified as pertaining to a perceived alignment. Conversely, lacking support from plans, or mentions of negative effects of organisational silos was identified as unaligned practices. As per the design of the interview questions (see Appendix C), interviewees' expressed opinions often clearly addressed the perceived alignment. In some cases, the similarity or difference between responses from different roles was used to parse out whether the perceptions indicated an alignment between levels or sectors.

3.5 Methodological concerns

3.5.1 Interviewee selection

Interviewees were selected through contact persons within each municipality. They then suggested relevant interviewees based on role description for each of the three roles. For role descriptions, see Appendix B. Here, interpretations on what was meant by "green space planner", and "green space manager" varied. This variation resulted in a slightly overlapping gradient where a role that was considered as a planner in one city could be considered a manager in the other. This creates uncertainty when attempting to strictly differentiate between the two types of roles and their subsequent difference in discourses. On the other hand, as municipal organisations vary, roles and tasks are in fact distributed differently between primarily planning and technical departments. Having more strict divisions or criteria might therefore risk being similarly mismatched.

3.5.2 Language and translations

The Danish, Norwegian, and Swedish interviews were all held in the interviewees' mother tongue to ensure their ease of communication, with clarifications made in English when needed. Although the three languages are similar enough to be understood by all Scandinavians, there is still a risk of overlooking more subtle nuances when interacting across languages.

Table 2 Occupational title and department for each of the interviewees representing the three roles within each of the four municipalities

	Täby, Sweden	Aarhus, Denmark	Stavanger, Norway	Espoo, Finland
Planner	(PT) Senior Landscape architect, project leader, Technical and Urban Planning Dept **Works at tactical level**	(PA) Municipal planner in comprehensive planning section at Technical and Environmental Dept **Works in the policy–tactical interface**	(PS) Landscape architect in comprehensive planning unit, Dept. of Urban Development **Works in the policy–tactical interface**	(PE) Landscape architect in comprehensive (general) planning in the Urban Planning Dept**Works in the policy–tactical interface**
Manager	(MT) Group leader maintenance unit, Technical and Urban Environment Dept **Works in the tactical–operational interface**	(MA) Unit leader in the Green Areas Unit at the Technical and Environmental Dept **Works in the tactical–operational interface**	(MS) Nature and outdoors advisor, thematic coordinator for Parks at Recreation and Open Spaces Dept **Works in the tactical– operational interface**	(ME) Landscape architect at City Technical Dept **Works at the tactical level**
Public health strategist or equivalent	(HT) Public health strategist at the municipal management office **Works in the policy–tactical interface**	(HA) Green bridge builder, 50% Technical and Urban Environment and 50% Health and Care **Work with policy–tactical–operational connections**	(HS) 50/50 Public health advisor and project manager at Preparedness and Community Development Dept **Works in policy–tactical connections**	(HE) Senior [health] planning officer at Health and Welfare Dept **Works at the tactical level**

4 Results

4.1 How do involved practitioners address the relation between UGI and HH&W in their daily work?

In the following, we refer to the interviewees using acronyms, as explained in Table 2: P = planner, M = manager, H = health strategist, and a letter indicating the municipality, e.g. HT means health strategist from Täby.

4.1.1 UGI planners

The planners in our study generally view their work as a part of the UGI-HH&W relationship (PA, PS, PE). While their knowledge and focus on aspects of HH&W varies, planners see HH&W promotion as generally overarching for all work; *"In that sense, it's clear that city planning actually is one of the first parameters that act on people's health, that we plan for proximity and accessibility and so on"* (PA). They describe how they work with health promotion in relatively general terms, mentioning the use of spaces, proximity, and accessibility to UGI as key aspects. One planner (PT) also describes aspects such as opportunities for stress reduction through e.g. mapping of serene and silent places.

4.1.2 UGI managers

UGI managers' view of their work in relation to HH&W varies more widely than planners'. The two interviewees with a more strategic role (ME, MS) see their work as contributing to HH&W. Conversely, the two interviewees with a more operational focus (MA, MT) did not immediately see a direct link between their work and HH&W. However, like the planners, they acknowledge the need for securing accessibility, while also stressing their responsibility of keeping spaces and facilities fit for use. "*I mean, it is kind of a fluffy topic, we make sure there is accessibility to the parks and facilities we are responsible for"* (MA). Aspects of quality are mentioned, but rarely beyond accessibility and general use.

4.1.3 Public health strategists

In the four cities, public health strategists' roles vary from coordination of cross-departmental focus groups (HE, HS), to project management (HA, HS), and knowledge support for departments (HS, HT). *"I work with the different departments in different ways, depending on how they work. Currently, my role is in a very overarching position in the organisation, since the theme of public health needs to be*

addressed more centrally. We can't expect the different departments to have that overview" (HT).

Two of the health strategists (HA, HS) have an explicit focus on the UGI-HH&W relationship, as they are hired 50% in each of the two departments, the Technical Dept. and the Health Dept., respectively, with a formal focus on linking the two sectors.

The health strategists generally describe a wider conceptualisation of health than the planners and managers by relating to more than physical aspects of health. These aspects include the social dimension, the need for rest, mental health, depression, and even suicide prevention (HE, HT, HA, HS). They remark on planners' conceptualisation of health being more "one-dimensional" (HS), either in more critical terms, or as an opportunity for improvement and collaboration: *"They [the planners] already started the work, and the first aspect you might consider is physical activity and access to nature. Well, they are very good at those, and then I think we can go one step further, adding public health aspects other than just physical activity" (HT).*

4.1.4 General notions shared among the roles

When describing health, views shared among the roles the touch upon the UGI-HH&W links as part of a prevention approach (HA, HS). Sentiments such as "*money invested in green space is money saved in healthcare*" (MA), and "*park lanes and outdoor trails are cost-effective considering the health outcomes*" (ME), indicate a clear understanding of UGI as a resource-effective way to increase HH&W. Physical activity is mentioned by representatives of all roles (HE, MS, PS, HT, PT) with a focus on active recreation with related facilities, such as outdoor gyms or playgrounds. Another aspect relates to social cohesion. All roles (HA, ME, MS, HS, PS, PT) describe approaches for creating meeting places and social connections as an important part of their work. Representatives of all three roles (HA, PA, HE, HS, MS, PS, PT) also mention the need to identify vulnerable user groups when they analyse where and how to develop existing UGI.

4.1.5 Aligning agendas

Interviewees mention a range of agendas acting in parallel of which HH&W is only one of many, including climate adaptation and biodiversity (MA, MS, PS). A key aspect of UGI planning and management is aligning several agendas to create more functions or values, or to make stronger arguments for an intended future development. This works well in cases where joint agendas create stronger incentives for health-promoting development of UGI. For example, biodiversity is described as contributing to HH&W (PS). However, joining agendas can also result in challenges, such as in the frequently mentioned conflict between HH&W and biodiversity, through intensive use and subsequent wear and tear (MA, PA, ME, PE, HS, PT).

The UGI planners and managers do not explicitly describe HH&W as their main focus. The wide range of other discussed aspects emphasises their very general description of HH&W. As such, the general character of these issues reveals how the interviewees perceive their task. In some cases, health is seen as a central part of their work (ME, PS), even if it is not always explicitly mentioned. *"The green plan intends to solve many things and one of them is public health […] and we don't explicitly state that the reason we say that everybody should have 300 m to the closest hiking trail is due to public health, but it is still the rationale behind it"* (PS).

4.2 Which factors support or hinder the promotion of HH&W in UGI planning and management?

Concerning the factors that affect the daily work of promoting HH&W through UGI planning and management, a range of themes relating to programmatic alignment are mentioned. From a horizontal perspective, the two main themes are: 4.2.1) everyday collaborations on specific plans or projects, and 4.2.2) formal cross-departmental initiatives with a public health focus. From a vertical perspective, cross-level coherence is considered important, but is challenged by 4.2.3) the lack of support from policy and the perceived need for site-based evidence, as well as 4.2.4) the insufficient involvement of operational levels.

4.2.1 Horizontal alignment in everyday collaboration

Organisational silos are perceived to hinder collaboration, having a clear impact on the lack of relationships between UGI and HH&W (MA, PA, PS, MT, HT). *"We are in the Technical Department, and it is very closed off. The Health Department is also very closed in themselves, and it is difficult to break down the silos"* (PA). The existing collaboration is considered ad hoc (PA), characterised by a general lack of coordination (MA, HE, PT), which also partly hampers collaboration with the public. A common opinion is that cross-collaboration could or should be better or more comprehensive (MA, PA, MS, PS, HT). Here, the perceived distance between different departments or units is a key hindering factor. This becomes tangible in examples of personnel moving from one department to another being considered a loss by the remaining colleagues, resulting in decreasing horizontal alignment expressed as less communication (HS).

The lack of alignment between departments is perceived to be amplified by the size of the organisation. In larger

organisations, it is difficult to create an overview of all relevant activities and initiatives (HE, PS). For instance, in Stavanger each department had their own system for the interrelations of different strategic planning documents (PS, HS). This confused the plans' purpose and use between departments: "*Each department was making plans without thinking, maybe we don't own this issue alone, perhaps other departments should be in on this. How is this going to be implemented, what do we need to relate to?*" (PS). This lack of coordination risks potential strategic collaborations going unnoticed, or double resources being spent on similar projects or plans. In Stavanger, it eventually resulted in a municipal-wide "clean-up" of plans to create coherence and a clearer overview (PS).

4.2.2 Horizontal alignment in formal cross-departmental initiatives

Despite the strong perception of silos affecting everyday work, collaboration exists between public health roles and UGI planning in all four municipalities. In Täby, the public health strategist has a supportive role, working with each department to support ongoing work. In Aarhus, a new policy requires more general cross-sectorial collaboration following a new case-based approach. In Espoo and Stavanger, the cross-sectorial collaborations are manifested as formalised cross-sectorial groups, working in different ways to ensure public health is permeating other departments. The cross-sectorial working groups in Espoo are well established and have representatives from all municipal departments.

*"The main point [*of the groups*] was to increase cooperation between different departments and sectors, in order to make visible that it is everyone's responsibility to promote HH&W. All sectors need to be involved and take responsibility, and this is actually stated in the law as well"* (HE).

However, while the cross-sectorial working groups are considered to be a support by members from each department, it is a challenge to engage colleagues outside the group. While public health is the focus in the formalised working groups, UGI is not necessarily seen as equally relevant throughout the organisation (PS, MS), meaning the relative focus on UGI is less weighty than that on public health. This applies in both planning and management contexts. "*I feel that we have to fight for the street trees, e.g. when there is digging for district heating,* [we need] *to also increase awareness about how green infrastructure and green elements are equally important as other infrastructure*" (MS).

In two municipalities, a new type of professional role has recently been established. The health strategists interviewed in both Aarhus and Stavanger have their employment shared by two separate departments. In Aarhus, the role is called green bridge builder and is responsible for community health-promoting efforts in conjunction with UGI developments such as increased storm water management. The green bridge builder is employed 50% at the Technical Dept. and 50% at the Health Dept. In response to the lack of horizontal alignment, the purpose of this organisational strategic approach is to align policies and practices between the two departments. Nonetheless, the green bridge builder sees further challenges in transferring these ideas to other departments which aren't as ready to see the relevance of the UGI-HH&W connection:

"They don't see nature as a solution [to HH&W] *because they have a different perspective […]. I see this as completely straightforward, as there is a lot of research-based evidence that shows us that nature can help a lot with health and better well-being and better mental health and physical activity. But I think that's definitely the big challenge, […] that the mission is different in the other departments" (HA).*

4.2.3 Vertical alignment through support from policies and research-based evidence on HH&W

The degree to which policy and strategy documents guide everyday work and decision-making varies between the interviewees. The documents' ability to support the UGI–HH&W relationship depends on how specific they are in relation to defining goals and ambitions. Plans need to be general or "spacious" (PA) enough to allow leeway for adaptation over time and for potential shifts in party politics. However, criticism is levelled at visions that are either too overarching or too general to provide sufficient support or guidance. *"Now I'm supposed to work with the green agenda, and that's not so hard, right? Because nobody is going to say that there shouldn't be more biodiversity, or that something shouldn't be sustainable "(*MA). In other cases, existing plans are still not strong enough to withstand other interests in practice." *The tree strategy is not legally binding, […]. So, with trees, we face challenges of not having sufficient protection in the current plans. It's simply a bit too easy to cut down a large street tree!*" (MS).

While the general sentiments of visions can provide UGI planners and managers with the leeway to do what they feel is important, conversely they also allow "*anyone to do what they want*" (PA) when visions are operationalised. *"We have a political goal stating that everyone must have proximity to a green area. But if it is not clearly concretised in some way, then you can't really use it for anything. […] and I think it would be nice if the politicians were clearer" (PA).*

Consequently, operationalising strategies are equally as important as overarching visions (PS, PA, ME). The lack of an effective operationalising strategy is exemplified by Täby where the overall planning vision declares "*half of Täby, green*". The lack of an operational strategy led to the detailed calculating of the exact percentage of GUI in new

development projects—all in order to ensure that the letter of the vision (and not the spirit) was kept to. As part of this calculation there was "hard bargaining" (PT) about whether all water surfaces should be counted as part of the "green half", significantly affecting the space available for urban development. Thus, policies are not always sufficient to guide strategic implementation, since they can be interpreted as a bar to be cleared (TP), or—even worse—completely ignored [ME).

While evidence of a positive GI-HH&W relationship is considered vital by many interviewees, this is not readily taken into account by politicians. The interviewees express a general perception of working against an overall "economic rationale" (MA, ME, HS, PE, PT) at the political level. This economic rationale also promotes a short-term focus on investment projects, and the absence of long-term perspectives in urban development. "*It's based on rationality, and specifically economic rationality in the short term […] But often it seems to lack perspective; what are the consequences in 100 years, if the city is developed like this?"* (HS). The lack of long-term perspectives results in interviewees feeling they need detailed, site-scale evidence in order to keep UGI from urban development or to make improvements to green areas, such as supporting HH&W (ME, HS, PS). *"It is not enough to say that everyone loves green and nature, you must have heavy documentation on the connection between the fact that too little green leads to more illness or more people dropping out of school or, more bullying…It's a bit sad that it has to be like that, but when these heavy processes go on, it's the only way you can get your message across" (HS).*

Despite scientific evidence demonstrating the importance of UGI for HH&W, the absence of clearly calculated economic benefits at site scale makes it challenging when advocating for them against values that are directly measurable as economic gains. *"The starting point is: How small can we make the green areas? So, you try to valorise green spaces and to find arguments for how much we need them […]. It's hard when green space values aren't monetary in the same way. Ok, there are studies, and some values have been calculated, but that's so much more difficult to compare"* (ME). Similarly, there is a perceived disconnect between increasing demand for quantitative indicators and the complexity of subjective measures such as perceived safety or the health effects of UGI (PA, PT, ME).*"Most have a sense that it makes a difference when we make green areas, but how do we measure it and how do we follow up? We miss being able to show the effect of that, or show the effect of removing green areas, […] in relation to, e.g. noise"* (PA).

4.2.4 Vertical alignment through involvement of operational levels

The implementation of plans is hampered by unaligned organisational structures, wherein a plan is created without a clear responsibility for operationalisation: *"Our plan is on a very strategic level, where we point out different areas where we could add value by creating something blue and green. And now we sit and wait and hope that someone will take it up as an action plan, but there are no plans for that to happen. We will just have to wait and see"* (PA).

The amount of cross-level collaboration varies between cities and departments. In Täby, opinions differ on how much collaboration there actually is. The planner (PT) perceives collaboration as increasing due to a recent reorganisation. The manager (MT) conversely expresses that while the issue may be addressed in the overall organisation through a new unit linking projects and running operations, this removes the direct contact and leaves them feeling disconnected from the investment projects.

In Aarhus, the UGI manager mentioned that participation in early planning stages has increased. "*This is something new. It wasn't like this 5 years ago. Maybe we were involved in some parts, but it's becoming more and more […] it's just 20 years too late*" (MA). However, increased involvement needs to be carried out using existing resources, on top of already assigned responsibilities. While UGI managers feel that collaboration is long overdue, planners mention how management focuses on technical details. Innovative thinking is seen as a skill more common in strategic and development-oriented roles, while operational staff are less trained in thinking strategically, or in seeing new connections and possibilities (HA, PA, PE): "*I mean, we can be strategic enough on our own, but I also think their knowledge is incredibly important, and therefore it is also necessary that we figure out how to talk to each other, and I think sometimes they lack the understanding that they would also benefit from being more strategic"* (PA).

However, the scale of ongoing development leads to increasing pressure on existing UGI, straining management (ME, MA). "*The development in the city centre is going completely berserk. There is construction going on everywhere, and new citizens need to go out in* [green] *areas. So we get enormous pressure on existing green spaces*" (MA). This is coupled with a more general concern for long-term development due to a critical lack of financial resources for management and maintenance (MA, MT, ME). In practice, this means that maintenance budgets do not increase with new green areas or elements, meaning existing budgets are stretched over increasingly larger areas.*" I mean, our budgets aren't going up […]. There are plans for 100 million DKK [1.34 million EURO] to be invested over 10 years, and it's all construction, and no maintenance"* (MA). While this

has incentivised the calculation of maintenance costs in early stages of planning, it has not influenced actual budgets (ME).

The stretching of resources reduces the prospects of doing more than minimal maintenance and critical upkeep, which stymies any ambitions to increase the values of existing spaces. *"With the time and resources we have, we have to put most into making ends meet"* (MT). The lack of connection between investments and maintenance frustrates managers and is seen as a political blind spot. *"Politicians need to wake up to this reality. Whatever we plan, it causes, it requires maintenance"* (ME).

5 Discussion

In this study, we aimed to uncover how practitioners address the relation between UGI and HH&W in their daily work (RQ1), and explore the perceived support and barriers to collaboration and implementation (RQ2). In 5.1, the first question regarding how practitioners view their work in relation to the UGI-HH&W relation is discussed. Factors that affect collaboration and implementation (5.2) are synthesised in three main themes, followed by a discussion of their implications for practice and research (5.3).

5.1 Practitioners' views on addressing the UGI-HH&W relation in daily work

When considering how practitioners address the UGI-HH&W relation in their daily work, our results suggest that planners and managers do not perceive HH&W to be a clear and singular area of focus. Instead, they work to promote a multifunctional agenda including a range of—sometimes conflicting—interests when advocating for the need for UGI. Conversely, the public health strategists shared a broader view of health, and see potential in complementing planners' and managers' current foci.

A central challenge shared by both planners and managers profoundly shapes their perceptions is their struggle to keep existing UGI from urban development and convince other departments and political levels to see UGI as important. This notion confirms research that shows UGI is not considered equal to other types of infrastructure in the planning process (Hislop et al. 2019, p. 648). Urban development increases the pressure on urban UGI through decreasing amounts of open space and subsequent increasing use of the remaining spaces (Randrup et al. 2021, p. 7). As open spaces become smaller, increased multifunctionality is demanded from those spaces (Haaland and Konijnendijk 2015, p. 768; Hansen et al. 2019, p. 107). However, the urban development focus that puts increased pressure on UGI also leaves less resources available for a strategic development of this multifunctionality, and its related benefits (Kabisch et al. 2016, p. 7 of 15), such as fostering health promotion. This negative view on lack of resources available for strategic development is most strongly voiced by managers, whereas planners and health strategists are more positive towards the current trajectories in relation to cross-sectorial collaboration.

5.2 Collaboration and implementation efforts challenged by short-term rationales and lack of long-term stability

Regarding factors affecting the promotion of HH&W in UGI planning and management, three main takeaways are conveyed in this study and discussed in the following subsections as 5.2.1) barriers and support for *horizontal alignment*, 5.2.2) barriers and support for *vertical alignment*, and 5.2.3) how these factors affect *temporal alignment*.

5.2.1 Barriers and support for horizontal alignment

Overall the results reveal a perception among interviewees that cross-sectorial collaboration could be improved, with the organisational structure being mentioned as an important hindrance. Silo mentality is often described as creating a barrier to better utilising ecosystem services (Hagemann et al. 2020, p. 289) and nature-based solutions (Kabisch et al. 2016, 6 of 15; Sarabi et al. 2020, p. 2, 4). Our results confirm these findings and also show how a lack of horizontal alignment creates potential redundancy when strategies are produced without coordination between relevant departments. In cities that have formal cross-sectorial thematic groups spanning all sectors, the challenge is then to incentivise and motivate those colleagues *not* directly involved in the groups. As such, having formal cross-sectorial groups is no guarantee that discussions and outputs will trickle out and become ingrained throughout the organisation. Finding common ground between departments that are most clearly relevant is still seen as more straightforward than including other sectors that are not currently engaged in the UGI-HH&W nexus.

In this study, the green bridge builder represents a type of knowledge broker (Clar et al. 2013) or intermediary (Frantzeskaki and Bush 2021) as a strategic approach to address the lack of horizontal connections between organisations and sectors. While the role formally has a cross-sectorial focus, a key factor has been working to ensure long-term implementation by forming citizen associations that continue after the project's completion. However, in this case the green bridge-building role in Aarhus has been discontinued and the employee is currently working on other tasks. Thus, a risk with innovative governance experiments is that they remain as isolated measures (Hölscher et al. 2023, p. 1; Quitzau et al. 2022, p. 9) that fail to be strategically integrated into the permanent organisation (Godenhjelm et al. 2015, p. 343)

as involved actors and generated knowledge disperse after the experiment ends.

The need for more cross-sectorial and cross-level collaboration is additionally challenged by a lack of resources in terms of both time and funding. This is explicitly mentioned by all three roles, with planners and managers feeling constrained as cross-sectorial collaboration is stacked on top of existing work, with no or few additional resources. Thus, the UGI-HH&W relationship is not only hindered by organisational silos. Rather, its potential benefit is not politically prioritised enough to warrant increased resources, leading to a situation where knowledge existing outside of the immediate sphere of a plan or project is not considered.

5.2.2 Barriers and support for vertical alignment

The results show that UGI is understood by interviewees as a viable approach to address a range of challenges. However, there is a perceived lack of formal priorities guiding subsequent steps towards implementation. This is also found in other studies (Hislop et al. 2019, p. 648; Kauark-Fontes et al. 2023, p. 25), including those where the stated formal vision is impossible to achieve in practice (Dempsey 2020, p. 173; Whitten 2020, p. 100). This lack of support for implementation results in a fight for precedence within projects over the values to be prioritised. Interviewees in this study felt they required detailed, situated and preferably quantitative evidence demonstrating UGI benefits to convince politicians that investment in UGI is worthwhile. Thus, while the continued need for evidence on UGI-HH&W linkages is an important focus for future research, it is equally important to address this as a challenge of policy formation (Barton and Grant 2013, p. 133). The results confirm that policies provide insufficient support to counter other land use interests, as suggested by Sunding et al. (2024, p. 10). Dobson and Dempsey (2020, p. 13–14) show a related mismatch, where politicians are perceived to be more inclined to listen to economic arguments than purely health-based ones. However, the complex nature of both UGI and HH&W, and even their more complex interrelation, makes it difficult to acquire quantifiable metrics (Hislop et al. 2019, p. 637) such as direct revenue (King and Shackleton 2020, p. 1). Instead, the positive effects of the UGI-HH&W relation will appear elsewhere and be indirect, such as strengthened public health and reduced costs for health care (Dobson 2018, p. 74–75).

Furthermore, our results indicate that plans risk going unused if they lack formal responsibilities for implementation, or sufficient budgets for continued maintenance and development. In particular, the absence of clear responsibilities for implementation risks hampering long-term realisation (Kabisch et al. 2016, p. 6 of 15) and affects long-term collaboration and knowledge integration (Wickenberg et al. 2021, p. 49). In short, stronger visions and clearer prioritisations in policy formation are vital, but are not sufficient in themselves to ensure programmatic alignment.

5.2.3 Temporal alignment: aligning collaboration and implementation in the long-term

While a range of different issues were addressed in the interviews in this study, the strongest concern was voiced by managers describing a mismatch between budgets for investments and long-term management. Previous research discusses the challenge of low budgets for implementation and maintenance of UGI in times of financial constraint (Kabisch 2015, p. 564). Our results complement this insight by showing that while investments are at times extensive, budgets for UGI management and maintenance remain unchanged. This suggests that maintenance budgets are low independent of the rate of investments, a pattern also indicated by others (Dobson and Dempsey 2020, p. 11; Randrup et al. 2021, p. 8). This directly conflicts with the long-term perspective required for implementation to ensure sustainable UGI values (Kabisch et al. 2016, p. 6 of 15; Mercado et al. 2024, p. 87; Randrup et al. 2021, p. 10; Randrup and Jansson 2020, p. 8), as management is crucial for UGI to support HH&W after construction phases are completed (Dobson et al. 2021, p. 3).

Our results suggest that a lack of resources applies not only in a geographical dimension, meaning UGI managers have more spaces to maintain with the same funds, but also include an increasing breadth of responsibilities for managers. Both planners and health strategists mention the involvement of the operational level in early planning stage—or throughout project implementation—as crucial for integrating the experience of what works in "the field". Gentin et al. (2023, p. 4188), and Molin and Konijnendijk (2014, p. 559) also show how a wide range of activities are piled on top of managers' existing tasks without increasing resources. This results in operational resources (i.e. time and funding) being stretched over larger areas and more tasks, shifting the focus from the strategic development of UGI, to making ends meet.

Taken together, this focus on favouring investments over maintenance, combined with a lack of attention to effective and long-term management, reflects an expectation that the right management will "simply happen" (Dempsey et al. 2014, p. 9) with a top-down and linear understanding of the policy implementation process. However, if managers are forced to focus on delivering the least possible maintenance at the cheapest possible cost, the more strategic or evaluative measures will go unpursued (Dobson et al. 2021, p. 9), leaving the potential for a more versatile utilisation of operational skill, experience, and time unfulfilled. In short, the issue is not solely about a need for increased resources, but

also a redistribution from short-term project-based investments to strategic long-term UGI development.

5.3 Implications for research and practice

The results from this study can be seen to impact policy, practice, and research in different ways. The study shows that as challenges become increasingly complex and transdisciplinary, clearer policy prioritisations are key for the perceived support in subsequent stages (e.g. Sunding et al. 2024, p. 10). The studied countries' high rank in sustainability measures on a global scale (Aguiar Borges et al. 2017; Sachs et al. 2024) indicates that even potential frontrunner cities struggle with implementation gaps between policy and operational levels. In the face of limited resources in implementation stages, general policy statements are less useful if the prioritisation of potentially conflicting values are not made explicit. In effect, with several competing interests, any implementation measures that aren't easily translated into short-term financial gain risk being deprioritised.

Therefore, decision makers need to consider the conditions of implementation and the long-term budgetary effects of planned investments in order to ensure their longevity and avoid gradual degeneration. Studies in the USA (Hauer and Peterson 2016), the UK (Whitten 2018), and Germany (Kabisch 2015) have indicated significant budget cuts as a factor detrimentally impacting UGI maintenance and management. By comparison, Nordic countries seem to follow a less volatile trend in funding for UGI (Randrup et al. 2021). However, the gap between policy ambitions and long-term management remains, with our results showing that even cities with high ambitions and available resources are facing challenges caused by a lack of long-term thinking. This underlines that the problem is more than just resource allocation; it is also the lack of a strategic approach to long-term management and maintenance during early planning stages.

The issue of omitting the operational level in overall planning and management is not unique to the UGI-HH&W relation. Management of public space has been called a "blind spot" in urban planning and design, accompanied by a call for academia to embrace management as a societal and academic challenge (Duivenvoorden et al. 2021, p. 2–3). This study joins that call, only adding the need to recognise that a dynamic and continuous development is intrinsic to UGI. This entails a need for studies that include operational level systems and perspectives, as well as an understanding of the intended development of the UGI over time. However, this is not a call for policy and planning to better adapt to the constraints of the current management regimes. On the contrary, we want to inspire practitioners and academia to address system integration across all organisational levels to ensure implementation of policy in a way that is sustainable in the long term.

6 Conclusion—why programmatic alignment matters

This study set out to uncover how practitioners address the relation between UGI and HH&W in everyday practice, and explore the factors that support or challenge this work. Perhaps unsurprisingly, planners' and managers' perceptions are not primarily focused on specific health outcomes and their promotion. Rather, their focus is embedded in layers of multiple societal challenges, general day-to-day constraints, and a lack of vertical, as well as horizontal, alignment. Current discourse around cross-sector collaboration offers insights into a perceived lack of resources for the coordination required to secure a more systematic approach between departments. Combined with a perceived mismatch between policy formation and implementation, cross-level alignment becomes overlooked, at the expense of long-term development. While cross-sectorial collaboration is crucial for health-promoting planning and management of UGI, this study shows that the challenge goes beyond horizontal alignment. Systemic approaches to vertical alignment and funding beyond investment projects are imperative for long-term development.

The mismatch results in the continued creation of visions and plans that either remain unrealised or degrade over time, as operational levels lack the resources to maintain and develop the investments in UGI. Conversely, an organisation-wide attention to programmatic alignment paves the way for reflexive feedback, while acknowledging the messy complexities of both organisational practices and UGI. A focus on programmatic alignment leads to better goal achievement at the policy level, as visions are better linked to what is practically achievable. At the tactical level, planning strategies and design proposals that take long-term management into account mean that created UGI can be sustained over time. This is necessary as UGI often takes time to develop the full range of intended benefits. On the operational level, this would mean allocating sufficient resources to develop existing spaces in order to sustain and increase these benefits. In effect, it is not clear that aligned practices will instantly lead to *more* or *better* GI. However, it will align what we set out to do with what is actually made and sustained over time.

Appendix A: Description of professional roles for interviewee selection

Hi [Municipal contact person]! date.

Earlier this spring, you got information that interviews would be conducted within [research project] during late spring–summer.

The interviews will examine how planners, managers, and health strategists (or the equivalent) work with the link between green space and health, how they relate to formal policy and strategy documents, and what the collaboration looks like between their respective departments.

As a contact person, you may be a suitable interviewee, but it is not necessary depending on what your role looks like. We now need your help to find suggestions for roles / people that may be suitable. A description follows, detailing these roles.

Profile for planners

The role must be at an overall policy level and function primarily as a strategic planner: Work with comprehensive plans or strategic green planning documents, i.e. not primarily with constructions developers, with detailed plans or building permits.

Profile for managers

The role must be at a tactical level—with insight into or responsibility for operational activities linked to green areas (e.g. purchasing function or administrative manager). It must be a person who not only collaborates with planners but has contact with management and maintenance of green spaces.

Profile for health-related role

The role should be working with health issues on a strategic level, such as health promotion work—public health or strategic health planning. If such a role does not exist, a role with a focus on outdoor life and / or leisure planning also works.

The role must be located within the municipality and can be found within e.g. a leisure / culture administration or social / health administration. This means that the role does not primarily focus on primary care, but can exist in primary care if it has a public health strategic focus.

It is not necessary for the role to collaborate with municipal planning or specifically strategic nature or green space planning today, but they should preferably work in a way where a collaboration could be possible (also in relation to individual groups, e.g. children or the elderly).

If you have any trouble identifying relevant roles, please don't hesitate to ask for clarifications or refer me to someone you think can have good suggestions.

Thank you for your help!

Kind regards.

Appendix B: Preparatory information before interviews

Hi [Health strategist/Planner/Manager]!

Thank you for agreeing to participate in this interview within the NORDGREEN project!

The ambition of NORDGREEN is to generate practical, applicable and policy relevant knowledge on how to plan, design and manage urban green space in ways that support sustainable development and public health and wellbeing.

The interview will be recorded in order to facilitate the analysis process. The interview material will be anonymized, and you will not be identified by name.

The material will be analysed and used in scientific publications within the project, as well as in any news, popular scientific publications and handbooks produced as a part of the project result.

The main focus of the interview is captured by the questions below. *We will ask more specific and follow up questions on each topic, the questions are to be seen as general indication of what we will be discussing.*

Similar questions will be asked regardless of if you answer as a planner, green space manager or public health strategist in your municipality. You are asked to think about the questions from the perspective of your role/department.

Background (H/P/M)

- Describe your role and work within the organisation; What do you work with?
- What is the size and budget of your department?

Today's approach (H)

- What is your primary focus in your work with public health?
- How do you (your department) use public green spaces as a part of your work with public health?
- How do you (your department) cooperate with actors within and outside the organisation?
- How do you use formal municipal documents such as plans, policies and strategies in your work?

- How do you use health data and statistics in public health related work?
- How do you monitor and evaluate outcomes of strategies and projects?

Today's approach (P/M)

- How do you work with the green infrastructure / public health-relation in your department today?
- How do you (your department) cooperate within and outside the organisation?
- How are the formal municipal documents such as plans and strategies used in your work?
- How do you use formal municipal documents such as plans, policies, and strategies in your work?
- How do you use health data and statistics in planning related work?
- How do you monitor and evaluate outcomes of strategies and projects?

The future (H)

- Looking forward–do you have ideas or coming work to promote the use of municipal green space in public health work?

The future (P/M)

- Looking forward—do you have ideas or coming work to promote public health in GI work?

If you have and questions, please contact me at XXXX. See you soon!

Appendix C: Interview questions

Information before the interview

Shortly describe the NORDGREEN project. Inform that the interview is voluntary and anonymous: Cities will be described but interviewee will not be mentioned by name. Reiterate that the focus in the project is the GI/HH&W nexus, but that the interviewee can relate the questions to their general work as they see fit.

You and the organisation

- Describe your role and task; what do you work with?
- How large is your department? *(number of people / budget)*
- *How is your department organised? In sections, units? (one step below the org. schedule)*
- *What do these sections do?*
- *Which have a HH&W / Green space relation?*
- *(What are these relations?—in brief)*
- What departments or sections do you cooperate with HH&W / GI work?
- Informal individual contacts or formal close contacts with the entire section?
- Regular contact or separate projects?
- Can you describe the general focus of the work of your department?
- Can you describe how you (your section) work with the HH&W—GI nexus in your work? (e.g. give examples of *projects or strategic actions*)
- *Do you focus on health equally much in all areas throughout the city?*
- *Do you address different user group's needs?*
- What external actors (user groups, private sector) do you cooperate with HH&W / GI work?
- In which settings do you work together?
- What type of projects? (large, long term, costly, small quick trials).
- What works well within the cooperation?
- Is there anything you miss in the cooperation, in e.g. specific knowledge or roles, more time?

Use of plans/strategies

- Which documents do you refer to in your HH&W / GI planning/management work?
- Who were involved in producing the plan/document? What depts., external consultants?
- *Are they clear/useful—what support do you get from them?*
- How do you use them?
- How are these visions/ policies implemented?
- Do the documents mention co-operation between HH&W & GI planning/man? If so, who takes the initiative to get the co-operation started?

Monitoring & evaluation

- Do you monitor or evaluate outcomes of projects or strategies?
- *How do you do it?*
- *Which actors/departments are included?*

Looking forward—develop

- If the HH&W / GI nexus were to be promoted even more in green space/nature-related planning and management, what could be done? *(To planner and manager)*
- If the HH&W / GI nexus were to be even more prominent in health/public health work, how can that be done? *(To health strategist)*
- Organisation-wise?
- Are there resources missing? Which? (Knowledge, time, money?)
- Are there routines or activities to promote this that are missing? What would they entail?
- Are there policies or strategies missing to promote this? What would they contain?
- Is there anything you want to mention that we have missed to talk about?

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Data availability The background data that support the findings of this study are available from the authors upon reasonable request.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Aamodt G, Nordh H, Nordbø ECA (2023) Relationships between socio-demographic / socio-economic characteristics and neighborhood green space in four Nordic municipalities—results from NORDGREEN. Urban Forest Urban Greening 82:127894. https://doi.org/10.1016/j.ufug.2023.127894

Aguiar Borges L, Nilsson K, Tunström M, Tepecik Dis A, Perjo L, Berlina A, Oliveira e Costa S, Fredricsson C, Grunfelder J, Johnsen I, Kristensen I, Randall L, Smas L, Weber R (2017) White paper on Nordic sustainable cities. Stockholm: Nordregio. https://doi.org/10.30689/R2017:3.1403-2503

Aguiar Borges L, Rohrer L, Nilsson K (2024) Green and healthy Nordic cities : How to plan, design, and manage health-promoting urban green space. https://doi.org/10.6027/R2024:11403-2503

Åshage A, Bengtsson A (2021) Health promoting urban planning: a case study of an evidence based design process. In: van der Zwart J, Bakken S, Hansen G, Støa E, Wågø S (eds) Proceedings of ARCH19: 4th International Conference on Architecture, Research, Care and Health. June 2019, Trondheim, Norway. 48–63.

Barboza EP, Cirach M, Khomenko S, Iungman T, Mueller N, Barrera-Gómez J, Rojas-Rueda D, Kondo M, Nieuwenhuijsen M (2021) Green space and mortality in European cities: a health impact assessment study. Lancet Planet Health 5(10):e718–e730. https://doi.org/10.1016/S2542-5196(21)00229-1

Barton H, Grant M (2013) Urban planning for healthy cities. A review of the progress of the European Healthy Cities Programme. J Urban Health 90:129–141. https://doi.org/10.1007/s11524-011-9649-3

Bengtsson A, Åshage A, Andersson M, Dybkjær E, Grahn P (2024) Improving green space design based on health design theory and environmental psychology. In: Aguiar Borges L, Rohrer L, Nilsson K (eds). Green and Healthy Nordic Cities. How to Plan, Design, and Manage Health-Promoting Urban Green Space. Stockholm: Nordregio, pp. 82–107.

Bengtsson A, Åshage A, Grahn P (2025) Designing urban green spaces supporting health and recovery. In: Pauleit S, Kellmann M, Beckmann J (eds) Creating Urban and Workplace Environments to Promote Recovery and Well-being. Routledge.

Berglund-Snodgrass L, Fjellfeldt M, Högström E, Markström U (2022) A healthy city for all? Social services' roles in collaborative urban development. Urban Planning, 7(4). https://doi.org/10.17645/up.v7i4.5620

Bishop I (2024) The emerging identity and reputation of SEPR. Socio Ecol Pract Res 6:1–4. https://doi.org/10.1007/s42532-023-00171-9

Bratman GN, Anderson CB, Berman MG, Cochran B, De Vries S, Flanders J, Folke C, Frumkin H, Gross JJ, Hartig T, Kahn PH Jr (2019) Nature and mental health: an ecosystem service perspective. Sci Adv 5(7):eaax0903. https://doi.org/10.1126/sciadv.aax0903

Braun V, Clarke V (2021) Thematic Analysis: A Practical Guide: SAGE Publications, Limited.

Brorström S, Willems J (2023) Getting integrative urban regeneration strategies done: insights from Antwerp and Gothenburg. Int Rev Adm Sci 89(2):346–362. https://doi.org/10.1177/00208523211029122

Bryson JM, Crosby BC, Stone MM (2006) The Design and implementation of cross-sector collaborations: propositions from the literature. Public Adm Rev 66(s1):44–55. https://doi.org/10.1111/j.1540-6210.2006.00665.x

Cardoso RV, Meijers EJ (2016) Contrasts between first-tier and second-tier cities in Europe: a functional perspective. Eur Plan Stud 24(5):996–1015. https://doi.org/10.1080/09654313.2015.1120708

Carmona M, De Magalhaes C (2006) Public space management: present and potential. J Environ Planning Manag 49(1):75–99. https://doi.org/10.1080/09640560500373162

Clar C, Prutsch A, Steurer R (2013) Barriers and guidelines for public policies on climate change adaptation: a missed opportunity of scientific knowledge-brokerage. Nat Res Forum 37(1):1–18. https://doi.org/10.1111/1477-8947.12013

Crawford J, Barton H, Chapman T, Higgins M, Capon A, Thompson S (2010) Health at the heart of spatial planning strengthening the roots of planning health and the urban planner health inequalities and place planning for the health of people and planet: an Australian perspective. Plan Theory Pract 11:91–113. https://doi.org/10.1080/14649350903537956

Davies C, Hansen R, Rall E, Pauleit S, Lafortezza R, Bellis Y, Santos A, Tosics I (2015) Green infrastructure planning and implementation—the status of European green space planning and implementation based on an analysis of selected European city-regions.

de Waal A, Weaver M, Day T, van der Heijden B (2019) Silo-busting: overcoming the greatest threat to organizational performance. Sustainability 11(23):6860. https://doi.org/10.3390/su11236860

Dempsey N (2020) Measuring the gap between rhetoric and practice: examining urban green space interventions post-implementation. In: Dempsey N, Dobson J (eds) Naturally Challenged: Contested Perceptions and Practices in Urban Green Spaces. Springer International Publishing, Cham, pp 167–187

Dempsey N, Burton M (2012) Defining place- keeping: the long-term management of public spaces. Urban Forest Urban Greening 11(1):11–20

Dempsey N, Smith H (2014) Understanding place-keeping of open space. In: Place-Keeping. Routledge. (pp. 13–29)

Dempsey N, Burton M, Smith H (2014) In: Dempsey N, Smith H, Burton M (Eds), Place-Keeping Open Space Management in Practice (pp. 1–12) Routledge

Dobson J (2018) From contest to context: urban green space and public policy. People, Place Policy 12(2):72–83. https://doi.org/10.3351/ppp.2018.3824435278

Dobson J, Dempsey N (2020) Mind the gap: Does what we know about greenspace and wellbeing change what we do? In: Dempsey N, Dobson J (eds) Naturally Challenged: Contested Perceptions and Practices in Urban Green Spaces. Springer International Publishing, Cham, pp 143–165

Dobson J, Dempsey N (2021) Known but not done: how logics of inaction limit the benefits of urban green spaces. Landsc Res 46(3):390–402. https://doi.org/10.1080/01426397.2020.1864819

Dobson J, Birch J, Brindley P, Henneberry J, McEwan K, Mears M, Richardson M, Jorgensen A (2021) The magic of the mundane: the vulnerable web of connections between urban nature and wellbeing. Cities 108:102989. https://doi.org/10.1016/j.cities.2020.102989

DST (2021) Kommunedetaljer [Municipal details] Retrieved 2024-03-30] from: https://www.dst.dk/da/Statistik/kommunekort/kommunefakta/kommune?kom=751

Duivenvoorden E, Hartmann T, Brinkhuijsen M, Hesselmans T (2021) Managing public space—a blind spot of urban planning and design. Cities 109:103032. https://doi.org/10.1016/j.cities.2020.103032

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).

FAO (2020) Forests for human health and well-being–Strengthening the forest–health–nutrition nexus. Forestry Working Paper No. 18. Rome. https://doi.org/10.4060/cb1468en

Frantzeskaki N, Bush J (2021) Governance of nature-based solutions through intermediaries for urban transitions—a case study from Melbourne. Australia Urban Forest Urban Greening 64:127262. https://doi.org/10.1016/j.ufug.2021.127262

Frydenlund K, Zhao B, Grandin G, Yang J, Barra M, Fletcher D, Ruzic M, Larsen LV, Iversen S, Xu Y, Chen C (2020) Assessment of drivers and pressures leading to urban challenges across the ULLs, including spatial and temporal components. REGREEN Deliverable D2. 1. Assessment of drivers and pressures leading to urban challenges across the ULLs, including spatial and temporal components. REGREEN Deliverable D2.1—Aarhus University (au.dk)

Geertman S (2017) PSS: Beyond the implementation gap. Trans Res Part a: Policy Pract 104:70–76. https://doi.org/10.1016/j.tra.2016.10.016

Gentin S, Herslund LB, Gulsrud NM, Hunt JB (2023) Mosaic governance in Denmark: a systematic investigation of green volunteers in nature management in Denmark. Landscape Ecol 38(12):4177–4192. https://doi.org/10.1007/s10980-022-01421-z

Godenhjelm S, Lundin RA, Sjöblom S (2015) Projectification in the public sector—the case of the European Union. Int J Manag Proj Bus 8(2):324–348. https://doi.org/10.1108/IJMPB-05-2014-0049

Grunfelder J, Roto J, Rispling L, Dubois A, Johnsen IH, Olsen LS, Weber R (2014) State of the Nordic Region 2013. Nordregio. https://doi.org/10.6027/NORD2018-001

Haaland C, Konijnendijk C (2015) Challenges and strategies for urban green-space planning in cities undergoing densification: a review. Urban Forest and Urban Greening. 14. https://doi.org/10.1016/j.ufug.2015.07.009

Haarstad H (2017) Constructing the sustainable city: examining the role of sustainability in the 'smart city' discourse. J Environ Planning Policy Manag 19(4):423–437. https://doi.org/10.1080/1523908X.2016.1245610

Hagemann FA, Randrup TB, Sang ÅO (2020) Challenges to implementing the urban ecosystem service concept in green infrastructure planning: a view from practitioners in Swedish municipalities. Socio Ecol Pract Res 2(3):283–296. https://doi.org/10.1007/s42532-020-00054-3

Hansen R, Olafsson AS, van der Jagt APN, Rall E, Pauleit S (2019) Planning multifunctional green infrastructure for compact cities: What is the state of practice? Ecol Ind 96:99–110. https://doi.org/10.1016/j.ecolind.2017.09.042

Hansen R, Werner R, Santos A, Luz A, Száraz L, Tosics I, Vierikko KH, Rall E, Davies C, Pauleit S (2016) Advanced urban green infrastructure planning and implementation—innovative approaches and strategies from European Cities: Deliverable 5.2. Technical Report of the Green Surge Project. Green surge. http://greensurge.eu/working-packages/wp5/files/D5_2_Hansen_et_al_2016_Advanced_UGI_Planning_and_Implementation_v3.pdf

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

Hauer R, Petersen W (2016) Municipal Tree Care and Management in the United States: A 2014 Urban & Community Forestry Census of Tree Activities.

Helgesen MK (2014) Governance of public health: Norway in a Nordic context. Scand J Public Health 42(15 Suppl):25–30. https://doi.org/10.1177/1403494814546925

Helliwell JF, Layard R, Sachs JD, De Neve J-E, Aknin LB, Wang S (eds) (2022) World Happiness Report 2022. Sustainable Development Solutions Network, New York

Hislop M, Scott A, Corbett A (2019) What does good green infrastructure planning policy look like? Developing and testing a policy assessment tool within central Scotland UK. Planning Theory Practice 20(5):633–655. https://doi.org/10.1080/14649357.2019.1678667

Hölscher K, Frantzeskaki N, Collier M, Connop S, Kooijman E, Lodder M, McQuaid S, Vandergert P, Xidous D, Bešlagić L, Dick G, Dumitru A, Dziubała A, Fletcher I, Adank C, Vázquez M, Madajczyk N, Malekkidou E, Mavroudi M, Vos P (2023) Strategies for mainstreaming nature-based solutions in urban governance capacities in ten European cities. NPJ Urban Sustainability, 3. https://doi.org/10.1038/s42949-023-00134-9

Hupe PL, Hill MJ (2016) 'And the rest is implementation. 'Comparing approaches to what happens in policy processes beyond great expectations. Public Policy Admin 31(2):103–121. https://doi.org/10.1177/0952076715598828

Jansson M, Vogel N, Fors H, Randrup TB (2018) The governance of landscape management: new approaches to urban open space development. Landsc Res 44(8):952–965. https://doi.org/10.1080/01426397.2018.1536199

Jansson M, Vogel N, Fors H, Demspey N, Buijs A, Randrup TB (2020) Defining urban open space governance and management. In: Jansson M & Randrup TB, Urban Open Space Governance and Management, Routledge.

Kabisch N (2015) Ecosystem service implementation and governance challenges in urban green space planning—the case of Berlin, Germany. Land Use Policy 42:557–567. https://doi.org/10.1016/j.landusepol.2014.09.005

Kabisch N, Frantzeskaki N, Pauleit S, Naumann S, Davis M, Artmann M, Haase D, Knapp S, Korn H, Stadler J, Zaunberger K, Bonn A (2016) Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. Ecology and Society, 21(2). https://doi.org/10.5751/ES-08373-210239

Kauark-Fontes B, Marchetti L, Salbitano F (2023) Integration of nature-based solutions (NBS) in local policy and planning toward transformative change. Evidence from Barcelona, Lisbon, and Turin. Ecology and Society. 28(2) https://doi.org/10.5751/ES-14182-280225

Kettl DF (2015) The transformation of governance: Public administration for the twenty-first century: Jhu Press.

King A, Shackleton CM (2020) Maintenance of public and private urban green infrastructure provides significant employment in Eastern Cape towns, South Africa. Urban Forest Urban Green 54:126740. https://doi.org/10.1016/j.ufug.2020.126740

Knudsen AK, Allebeck P, Tollånes MC et al (2019) Life expectancy and disease burden in the Nordic countries: results from the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. The Lancet Public Health 4(12):e658–e669. https://doi.org/10.1016/S2468-2667(19)30224-5

Kvale S, Brinkmann S (2009) InterViews: Learning the Craft of Qualitative Research Interviewing, 2nd edn. Sage Publications Inc., Thousand Oaks

Kyttä M, Rossi S, Kajosaari A (2024) Public participation GIS as a participatory planning tool for healthy cities. In: Aguiar Borges L, Rohrer L, Nilsson K (eds). Green and healthy Nordic cities. How to plan, design, and manage health-promoting urban green space. Stockholm: Nordregio, pp. 50–68.

Ladner A, Keuffer N, Baldersheim H (2016) Measuring local autonomy in 39 countries (1990–2014). Reg Fed Stud 26(3):321–357. https://doi.org/10.1080/13597566.2016.1214911

Lantmäteriverket (2021) Arealer kommunvis [Area by municipality] Retrieved [2024-03-30] from: https://www.maanmittauslaitos.fi/sv/information-om-lantmateriverket/organisation/statistik#Pinta-alat-kunnittain

Levrel H, Cabral C, Feger C, Chambolle, M, Basque D (2017) How to overcome the implementation gap in ecosystem services? A user-friendly and inclusive tool for improved urban management. Land Use Policy 68:574–584. https://doi.org/10.1016/j.landusepol.2017.07.037

Lipsky M (1980) Street-Level Bureaucracy. Russell Sage Foundation, New York

Loorbach D (2010) Transition management for sustainable development: a prescriptive, complexity-based governance framework. Governance 23(1):161–183

Mackenbach JP (2017) Nordic paradox, Southern miracle, Eastern disaster: persistence of inequalities in mortality in Europe. Euro J Public Health 27:14–17. https://doi.org/10.1093/eurpub/ckx160

Mäntysalo R, Jarenko K, Nilsson KL, Saglie IL (2014) Legitimacy of informal strategic urban planning—observations from Finland. Sweden nor Euro Plan Stud 23(2):349–366. https://doi.org/10.1080/09654313.2013.861808

Markevych I, Schoierer J, Hartig T, Chudnovsky A, Hystad P, Dzhambov AM, de Vries S, Triguero-Mas M, Brauer M, Nieuwenhuijsen MJ, Lupp G, Richardson EA, Astell-Burt T, Dimitrova D, Feng X, Sadeh M, Standl M, Heinrich J, Fuertes E (2017) Exploring pathways linking greenspace to health: theoretical and methodological guidance. Environ Res 158:301–317. https://doi.org/10.1016/j.envres.2017.06.028

Mercado G, Wild T, Hernandez-Garcia J et al (2024) Supporting nature-based solutions via nature-based thinking across European and Latin American cities. Ambio 53:79–94. https://doi.org/10.1007/s13280-023-01920-6

Merkus S, Willems T, Veenswijk M (2019) Strategy implementation as performative practice: reshaping organization into alignment with strategy. Organ Manag J 16(3):140–155. https://doi.org/10.1080/15416518.2019.1611403

Molin JF, Konijnendijk van den Bosch CC (2014) Between big ideas and daily realities–the roles and perspectives of Danish municipal green space managers on public involvement in green space maintenance. Urban Forest Urban Green 13(3):553–561. https://doi.org/10.1016/j.ufug.2014.03.006

Nadin V, Stead D (2008) European spatial planning systems, social models and learning. Disp–plan Rev 44(172):35–47. https://doi.org/10.1080/02513625.2008.10557001

Nilsson K, Grahn P (2024) Background. The scientific evidence for nature's positive influence on human health and wellbeing. In: Augiar Borges L, Rohrer L, Nilsson K (eds). Green and Healthy Nordic Cities. How to Plan, Design, and Manage Health-Promoting Urban Green Space. Stockholm: Nordregio, pp. 24–36.

Nilsson K, Sangster M, Konijnendijk CC (2011) Forests, trees and human health and well-being: introduction. In: Nilsson K, et al. Forests, Trees and Human Health. Springer, Dordrecht. https://doi.org/10.1007/978-90-481-9806-1_1

Nordh H, Aamodt G, Nordbø EC (2024a) Greater perceived access to green spaces near homes: safer and more satisfied residents. J Environ Psychol 96:102332. https://doi.org/10.1016/j.jenvp.2024.102332

Nordh H, Nordbø ECA, Aamodt G (2024b) Working with objective and perceived indicators of health and green space. In: Aguiar Borges L, Rohrer L, Nilsson K (eds). Green and Healthy

Nordic Cities. How to Plan, Design, and Manage Health-Promoting Urban Green Space. Stockholm: Nordregio, pp. 38–49.
Peters BG (2015) Pursuing horizontal management: The politics of public sector coordination: JSTOR.
Randrup TB, Persson B (2009) Public green spaces in the Nordic countries: development of a new strategic management regime. Urban For Urban Green 8(1):31–40. https://doi.org/10.1016/j.ufug.2008.08.004
Qiao X-J, Liu L, Kristoffersson A, Randrup TB (2019) Governance factors of sustainable stormwater management: a study of case cities in China and Sweden. J Environ Manag 248:109249. https://doi.org/10.1016/j.jenvman.2019.07.020
Quitzau M-B, Gustafsson S, Hoffmann B, Krantz V (2022) Sustainability coordination within forerunning Nordic municipalities–exploring structural challenges across departmental silos and hierarchies. J Clean Prod 335:130330. https://doi.org/10.1016/j.jclepro.2021.130330
Randrup TB, Jansson M (2020) Introduction: urban open space governance and management. In: Jansson M and Randrup TB, Urban Open Space Governance and Management, Routledge
Randrup TB, Östberg J, Wiström B (2017) Swedish green space management–the managers perspective. Urban Forest Urban Green 28:103–109. https://doi.org/10.1016/j.ufug.2017.10.001
Randrup TB, Svännel J, Sunding A, Jansson M, Sang ÅO (2021) Urban open space management in the Nordic countries. Identification of current challenges based on managers perceptions. Cities 115:103225. https://doi.org/10.1016/j.cities.2021.103225
Rehn-Mendoza N, Weber R (2018) Health and welfare: we continue to live longer, but inequalities in health and wellbeing are increasing. In: State of the Nordic Region 2018 : Theme 4: Focus chapters. https://doi.org/10.6027/NORD2018-001
Sachs JD, Lafortune G, Fuller G (2024) Sustainable development report 2024. The SDGs and the UN summit of the future. Dublin University Press. https://doi.org/10.25546/108572
Sarabi S, Han Q, Romme AGL, de Vries B, Valkenburg R, den Ouden E (2020) Uptake and implementation of nature-based solutions: an analysis of barriers using Interpretive structural modeling. J Environ Manage 270:110749. https://doi.org/10.1016/j.jenvman.2020.110749
SCB (2024) Land-och vattenareal per den 1 januari efter region och arealtyp. År 2012 – 2024 [Land and water area as of 1 January by region and area type. Year 2012 – 2024] Retrieved [2024-03-30] from: https://www.scb.se/hitta-statistik/statistik-efter-amne/miljo/markanvandning/land-och-vattenarealer/
Singh GG, Cottrell RS, Eddy TD, Cisneros-Montemayor AM (2021) Governing the land–sea interface to achieve sustainable coastal development. Front Marine Sci 8:709947. https://doi.org/10.3389/fmars.2021.709947
Slätmo E, Nilsson K, Turunen E (2019) Implementing green infrastructure in spatial planning in Europe. Land 8(4):62. https://doi.org/10.3390/land8040062
Smith H, Pereira M, Roe J, Sosenko F, Lindholst AC, Mathers A (2014) The evaluation of place-keeping: unrealised potential. In: Place-Keeping Open Space Management in Practice. Routledge, pp. 151–172.
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 [2025-02-20] from: https://www.ssb.no/statbank/table/09280
Stake RE (1995) The Art of Case Study Research. Sage Publications, Inc.
Statistics Finland (2022) Population by municipality-based units Retrieved [2024-03-30] from: https://www.stat.fi/org/avoindata/paikkatietoaineistot/vaesto_tilastointialueittain_en.html
Stavanger (2016) Roadmap for the smart city Stavanger: Vision, goals and priority areas, accessed [20240730] at: https://www.stavanger.kommune.no/siteassets/samfunnsutvikling/planer/engelske-planer/roadmap-smart-city-stavanger-2016.pdf [accessed
Sunding A, Randrup TB, Nordh H, Sang ÅO, Nilsson K (2024) Descriptions of the relationship between human health and green infrastructure in six Nordic comprehensive plans. Cities 146:104746. https://doi.org/10.1016/j.cities.2023.104746
Sunding A, Randrup TB (2024) Integrating health perspectives in municipal green space planning and management. In: Borges, Luciane Aguiar; Rohrer, Lisa, Nilsson, Kjell (eds). Green and Healthy Nordic Cities. How to Plan, Design, and Manage Health-Promoting Urban Green Space. Stockholm: Nordregio, pp. 22–34.
Torfing J, Bøgh Andersen L, Greve C, Klausen KK (2020) Public governance paradigms: competing and co-existing. Edward Elgar Publishing
Tyrväinen L, Bauer N, O'Brien L (2019) Impacts of forests on human health and well-being. In: Human Health and Sustainable Forest Management by, Marušáková Ľ and Sallmannshoferet M, et al. FOREST EUROPE Study, Liaison Unit Bratislava
van den Bosch M, Ode Sang A (2017) Urban natural environments as nature-based solutions for improved public health–a systematic review of reviews. Environ Res 158:373–384. https://doi.org/10.1016/j.envres.2017.05.040
van den Berg M, Wendel-Vos W, van Poppel M, Kemper H, van Mechelen W, Maas J (2015) Health benefits of green spaces in the living environment: a systematic review of epidemiological studies. Urban Forest Urban Green 14(4):806–816. https://doi.org/10.1016/j.ufug.2015.07.008
Wickenberg B, McCormick K, Olsson JA (2021) Advancing the implementation of nature-based solutions in cities: a review of frameworks. Environ Sci Policy 125:44–53. https://doi.org/10.1016/j.envsci.2021.08.016
Whitten M (2018) Reconceptualising green space: Planning for urban green space in the contemporary city (thesis). PhD Regional and Urban Planning, London School of Economics
Whitten M (2020) Contesting longstanding conceptualisations of urban green space. In: Dempsey N, Dobson J (eds) Naturally Challenged: Contested Perceptions and Practices in Urban Green Spaces. Springer International Publishing, Cham, pp 87–116
WHO Regional Office for Europe (2016) Urban green spaces and health–a review of evidence. Retrieved [2025-01-20] from https://www.who.int/europe/publications/i/item/WHO-EURO-2016-3352-43111-60341
WHO (n.d.) Constitution. Retrieved [2025-01-20] from https://www.who.int/about/governance/constitution
Zoeteman B, Mulder R, Smeets R, Wentink C (2016) Toward Sustainable EU Cities: A Quantitative Benchmark Study of 114 European and 31 Dutch Cities. Telos.

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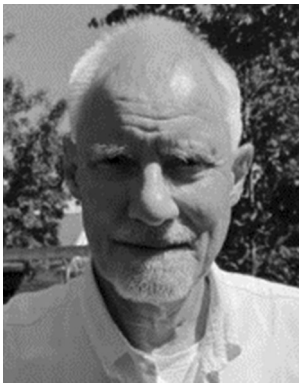

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