



Challenges to implementing the urban ecosystem service concept in green infrastructure planning: a view from practitioners in Swedish municipalities

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Abstract

In building a sustainable society, numerous ecosystem services have shown to play important roles for the benefit of urban residents. The distinct concept of Urban Ecosystem Services (UES) to accentuate and enhance the value of urban ecosystems has been proposed, primarily in research, with implementation in practice still at an early stage. This study examined challenges to future implementation of the UES concept in municipal planning and management of urban green spaces. Based on interviews in six Swedish municipalities, we identified four overall discourses challenging implementation of UES in municipal practice. These included (i) a need to prioritize UES in municipal planning in order to address the contemporary challenges of e.g., urbanization and biodiversity loss. This in turn creates (ii) a need for increased holistic thinking within the municipal organization, based on (iii) further documentation and standards, which should help (iv) initiate organizational transition and cross-sectorial approaches. These discourses provide interrelated challenges that could also act as opportunities for scientists and practitioners collaborations to advance integration of UES into planning and management, thereby increasing the sustainability of urban environments. This work provides a starting point for introduction of the UES concept into municipal planning.

Keywords Green space governance · Strategic planning and management · Urban ecosystem services · Swedish municipalities

1 Urban ecosystem services within socio-ecological practice

At international level, ecosystem services (ES) have become a central framework for interpreting social-ecological practices and interrelations. In particular, the International Panel on Biodiversity and Ecosystem Services (IPBES), two large-scale reports (TEEB 2010; MEA 2005), and a plethora of scientific writings (e.g., Costanza et al. 1997; Vihervaara et al. 2010; Mascarenhas et al. 2015; Jaligot and Chenal 2019) have stressed the importance of ES for building sustainable societies. The ES concept has helped shift the conversation from nature conservation and natural resource

management to the societal benefits of preserving functioning ecosystems (de Groot et al. 2010). It has also helped communicate and describe the significance of ecosystems to human health and wellbeing (van den Bosch and Sang 2017; Rojas-Rueda et al. 2019). Meanwhile, global urbanization trends and densification raise questions about urban ecosystems and their role in providing key services to urban residents. Urban ecosystem services (UES) have thus emerged as a distinct concept that holds promise for accentuating and enhancing the specific value of ecosystems in urban areas (Bolund and Hunhammar 1999).

Typically, UES include regulating services such as temperature, noise and pollution reduction, and supporting services such as provision of habitats, but also recreational and cultural services deriving from aesthetic values, cultural heritage, legacy, etc. (Larondelle and Haase 2013 pp.187–188; Gómez-Baggethun et al. 2013 pp.179–186). However, provision of UES is complex, as it involves engaging multiple stakeholders, requires different trade-offs between different services, and raises potential conflicts between

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different interest groups (Ernstson et al. 2010; Haase et al. 2014a; Hedblom et al. 2017). Some approaches to providing UES are well-established and have long traditions (e.g. establishing parks, planting street trees), while others are novel responses to contemporary challenges such as climate change adaptation (Kabisch et al. 2017). Furthermore, some studies suggest that it is unrealistic to build comprehensive models of trade-offs (Norgaard 2010 p.1220) and claim the focus should instead be on the potential of the UES concept to guide practitioners to facilitate radical transformations in governance to minimize harm to ecological systems and increase the socio-ecological sustainability of urban environments (Norgaard 2010 p.1226; Dempsey and Robertson 2012 p.772). Therefore, there is also a need to study how UES, aimed at balancing social and ecological needs, is implemented into existing governance arrangements and which challenges UES approaches meet in facilitating sustainable transformations. Sweden, like many other European countries, has adopted the language and approach of ES into national environmental goals (Brouwer et al. 2013). Sweden recently passed the 2018 milestone-target for implementing ES, which stated that: (Swedish Ministry of the Environment 2013, p. 10).

.....the value of ecosystem services are, by 2018, to be generally known and integrated into economic positions, political considerations and other decisions in society, where it is relevant and reasonable to do so

In the urban context, the Swedish National Board of Housing, Building and Planning has developed plans to deal with urbanization pressures and simultaneously generate UES in ‘dense and green cities’ (Boverket 2016, p. 19). Swedish national and local authorities have since pursued further integration of the ES concept, issuing various handbooks and guidelines for providing UES (e.g., C/O City 2017; Boverket 2019). These publications were a first step to implementing UES into Swedish municipal practice (Svännel et al. 2019). Initially, implementation of the UES concept into Swedish municipalities was welcomed by local governmental planning officials and politicians (Beery et al. 2016 p. 127). However, Jönsson et al. (2017, p. 63) also pointed out that implementation was still in an early stage, and that transdisciplinary collaborations between research and practice needed to be established to support local authorities working with UES. The aim of the present study was to pave the way for further implementation of the UES concept into municipal practice by *identifying* perceived challenges to UES implementation in Swedish municipal planning and management. Within this study, we want to explore how the challenges identified *interrelate* as well as how they could provide *opportunities for change*.

The remainder of this paper comprises five main sections: (2) background on UES integration into planning and

management practices in general, and Sweden in particular; (3) theoretical framing, introducing the policy arrangement model that informed our analysis of governance challenges; (4) methods section, describing the qualitative study approach based on interviews and the policy arrangement model; (5) results section, presenting the perceived challenges; (6) discussion, relating the results to other findings on challenges to introducing UES into municipal planning and management.

2 Urban ecosystem services—integration of knowledge into practice

Key insights, vocabulary, and tensions in implementation of UES approaches for mapping, modeling and evaluating UES into existing urban governance systems (e.g., spatial planning and green space management) are described in the literature. In a landmark study specifying and explaining various types of UES, Bolund and Hunhammar (1999) concluded that locally generated services in urban areas have great potential to increase quality of life in cities. Later, Haase et al. (2014a, pp. 407–408) argued that UES: “*are deeply situated in the functioning of society, and as such have unique drivers and selection pressures*”. The introduction of UES into existing governance arrangements thus provokes important questions on weighing social and ecological needs, and on how to define UES in relation to functional needs and spatial boundaries.

One key question in implementing UES policies is the spatial scale(s) at which they should be applied. Matches and mismatches between the spatial scale at which UES are generated and the scales at which they are governed have been reported (Ernstson et al. 2010; McPhearson et al. 2014; Haase et al. 2014b). For instance, case studies in Stockholm (Ernstson et al. 2010) and New York (McPhearson et al. 2014) found scale mismatches and emphasized the need for creating functional networks of green spaces both within city-level governance and at larger scales (regional-state). Furthermore, providing UES in the city depends on a larger context and can have consequences well beyond the urban area, as Gómez-Baggethun and Barton note (Gómez-Baggethun and Barton 2013, p. 235):

Conserving and restoring ecosystem services in urban areas can reduce the ecological footprints and the ecological debts of cities while enhancing resilience, health, and quality of life for their inhabitants.

Increasing urbanization thus poses threats and provides opportunities, making implementation of UES into existing governance structures particularly urgent.

Previous studies on UES have identified a gap between research and practice and a lack of implementation of

explicit UES approaches to governing urban ecosystems (Haase et al. 2014a; Luederitz et al. 2015; Mascarenhaas et al. 2015; Kremer et al. 2016). Early approaches for mapping, modeling, and evaluating UES were largely developed in academic studies (Bolund and Hunhammar 1999; TEEB 2010), and their implementation into practice has presented numerous challenges (de Groot et al. 2010; Primmer and Furman 2012; Chen et al. 2019). For instance, integration of UES into concrete decision-making contexts (e.g., economic and political considerations of UES) requires more clarity about the relationship between the various actors involved in implementation (Haase et al. 2014b pp 424–425). The need for interdepartmental and inter-scale collaboration in order to fully integrate the UES concept was confirmed in a comparison of urban green space governance in Berlin and New York (Rall et al. 2015), and in a review of challenges to decision making in urban forestry (Ordóñez et al. 2019). Rall et al. (2015 p. 235) identified challenges associated with lack of long-term funding for maintenance and monitoring and a need for effective methods for communicating and assessing benefits.

This resonates with findings for urban green space governance, where lack of co-development and co-management in urban green spaces has been cited as a contemporary challenge (Jansson et al. 2019). Similarly, unclear leadership and responsibilities, and lack of funding, cost data, space, knowledge, uniform guidelines, and stakeholder participation, are reported to be major challenges in sustainable stormwater management implementation (Qiao et al. 2018 p. 947). Reflecting on these challenges in related fields, Primmer and Furman (2012, p. 85) point to a gap between creating knowledge and creating transition into general ES governance, and see a need:

to tackle the challenges of the transition from sector governance to a more integrated model of ecosystem service governance by building on existing governance arrangements geared toward sustainability.

Therefore it is important to understand how the practitioners involved identify the challenges to implementing UES into existing governance arrangements, before avenues for fuller integration of UES into municipal planning and management can be explored.

2.1 The Swedish context of UES integration into practice

In Sweden, a recent project conducted by an inter-disciplinary research group in collaboration with the environmental protection agency (Naturvårdsverket) was entitled ‘Implementation of the ecosystem service concept in municipal practice (ECOSIMP)’ and examined the ES situation in seven Swedish municipalities using planning documents

and interviews with stakeholders (Beery et al. 2016; Jönsson et al. 2017; Schubert et al. 2018). The results showed that the ES concept was generally well-known and viewed as helpful in addressing current and future environmental concerns, but was not fully integrated into planning decisions. To date, implementation has focused on familiarizing municipalities with the ES concept and its possibilities (Jönsson et al. 2017). A key conclusion was that municipal practitioners need further support in making the ES concept explicit, which would help advance understanding and communication of ES in municipal organizations and in the public arena (Schubert et al. 2018). A subsequent study in southern Sweden (Skåne) comparing implementation of ES in planning documents for three large and three small local authorities found limited differences in frequency of mention of ES, but more types of ES mentioned in larger municipalities (Nordin et al. 2017). The results from Swedish studies indicate that the concept of UES can be useful in a Swedish municipal context and provide a good basis for implementing UES approaches in practice.

In 2017, a transdisciplinary research panel on UES was set up in Skåne to improve collaboration between research and practice, provide knowledge on practical approaches to working with UES, and strengthen awareness among practitioners of how UES quality influences the ability to provide a range of services. The research panel, which comprised representatives from regional and municipal actors and academia, aimed to fill the knowledge gap between research and practice outlined by the international literature and by governance documents for UES in Southern Sweden. The panel’s work included: a review of existing handbooks and guidelines on UES in Sweden (Svännel et al. 2019), a comparative study of how three European countries work with ES (Haaland 2020), and an assessment of the current state of explicit ES knowledge and language in Swedish municipalities.

2.2 Challenges to application of the UES concept in practice

Strategic decisions and implementation practices related to urban green spaces primarily occur at the municipal level (de Magalhães and Carmona 2009; Randrup and Jansson 2020), making it relevant to study municipal planning and management in relation to UES implementation. However, as UES are complex and often involve ‘wicked’ problems, we limited the present study to three overall issues in municipal UES planning and management: (i) Demand for multifunctional green spaces combining services provided by/related to vegetation and water; (ii) demand for increased use of urban green spaces by diverse user-groups due to urban densification; and (iii) demand for increased public engagement in decision making on green spaces. This selection

was inspired by material on UES developed by C/O City, a large Swedish transdisciplinary national collaborative project carried out in 2011–2018, including partners from all over Sweden and various stakeholders in urban planning. The project aim was to develop and disseminate tools and methods for integrating UES into planning and construction. The project is well-known in Swedish planning practice, and hence was familiar to our interviewees.

We based the present study on a set of qualitative interviews focusing on practitioners' narratives on recent developments (or lack of) in working with UES (Jovchelovitch and Bauer 2000). This approach was chosen in order to (i) complement findings in previous studies (ECOSIMP) on conceptual uptake of UES in municipal planning with relevant practical challenges; and (ii) provide detailed knowledge of UES implementation in Sweden in relation to a European context (e.g., Saarikoski et al. 2018). The study does hereby provide an example of research inspired by recent uses of Pasteur's quadrant (Xiang 2017, p. 2241), providing further findings that addresses how UES is embraced and implemented into practice. The interviews will be analyzed through the use of a policy arrangement framework. This allows us to identify and organize challenges to implementation.

3 A policy arrangement framework for identifying challenges to implementing UES in municipal planning

The policy arrangement model (PAM) is a conceptual framework developed in environmental policy studies to assist in understanding the stability of content and organization of a policy domain (Arts et al. 2006). A policy arrangement is defined as the state in which the interaction between political actors, resources, and rules of the game solidifies in a temporary stable structure (a discourse), or is institutionalized (e.g., Bührs 2004). The policy arrangement is a dynamic structure, as these four interconnected dimensions (actors, resources, rules of the game, discourses) can be forced to readjust their interdependency following a change in any one dimension (Arts et al. 2006). These domains can help understand factors and challenges to institutional change, e.g., Qiao et al. (2018) used PAM to analyze challenges to implementation of sustainable stormwater management (SSM) based on a literature review, while Ordóñez et al. (2019) applied PAM to understand factors behind decision making in urban forestry governance by analyzing 60 qualitative case studies involving municipal managers. Both studies found the approach relevant in identifying governance factors limiting actual implementation.

In the present analysis, we apply the frameworks' categories to organize the challenges to implementation of UES in various governance domains, and to understand interrelations between them *discourses* refer to ways of narrating, norms and values appearing, and approaches to solving problems or challenges that appeared in interviews. Challenges can be described as hindrances to change and integration of UES approaches in planning and management of urban green spaces, and often take the form of 'lack of ...' (funding, knowledge, etc.). We interpreted these challenges as they revolved around key *discourses* in relation to implementing UES in Swedish municipal planning and management practice. We also mapped the other dimensions in UES policy arrangements: *actors*, i.e., various departments, offices, job-roles, and functions within the municipal organization and their interrelations; *resources*, i.e., economic resources and staff hours, but also communication and teaching tools and knowledge resources available to municipal actors working with UES; and *rules of the game*, i.e., formal rules and structures within legal frameworks and organizational structures, but also unwritten informal rules within departments, societal conditions, and political circumstances that in effect govern the success of efforts to implement UES in practice.

4 Understanding implementation of UES in Swedish municipalities through interviews

4.1 Selection of six municipalities—finding relevant cases

Six focal municipalities in Region Skåne in Southern Sweden (Malmö, Lund, Ystad, Hässleholm, Tomelilla, and Klippan) were selected for the study (Fig. 1). Region Skåne is more densely populated than the rest of Sweden and the main urban center, Malmö, is Sweden's fastest growing city (Malmö Stad 2020). The region is also characterized by inter-municipal cooperation, e.g., on green densification strategies to meet housing, service, agricultural, and environmental needs (Region Skåne 2015; Nordin et al. 2017). The municipalities were selected to obtain a variation in characteristics (see e.g., Yin 2014) such as population size, location, resources available and organizational structure, and to include municipalities where the concept of UES had been taken on-board actively and implemented. We anticipated variation between governance regimes and resource levels and their level of explicit integration of the UES concept in local plans (Nordin et al. 2017). Two of the municipalities, Malmö and Lund, have also been used in other recent studies of UES (Jönsson et al. 2017; Beery et al. 2016; Nordin et al. 2017; Schubert et al. 2018). These

Location of the case studies

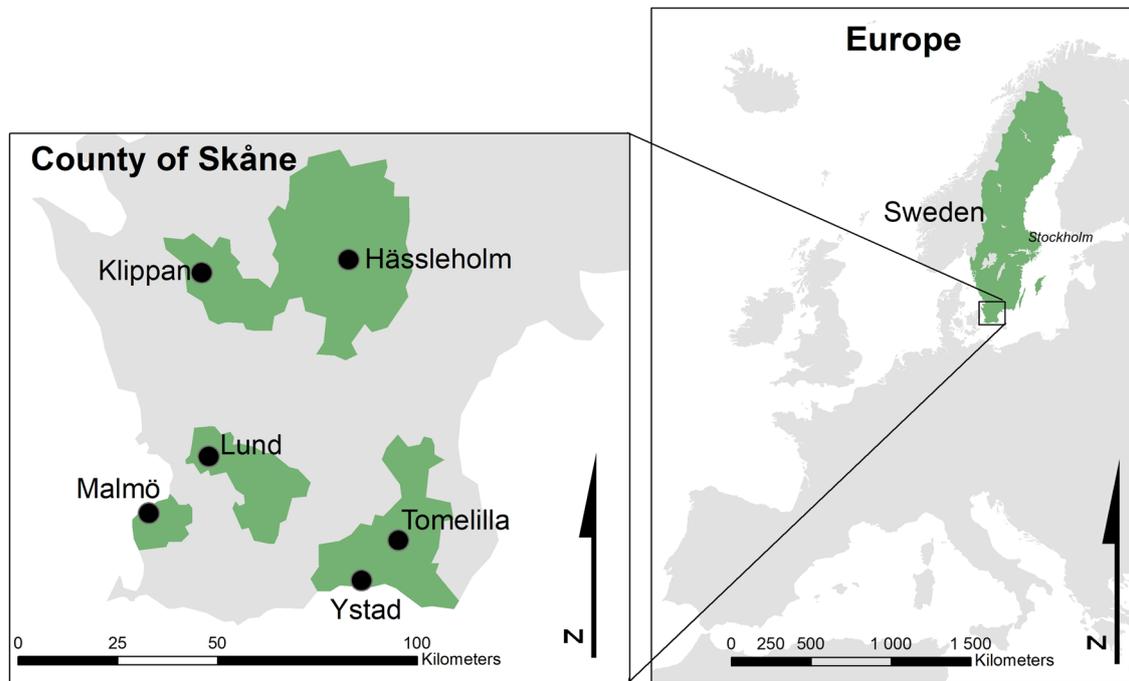


Fig. 1 Map of case-sites

overlapping municipalities can be considered the main urban centers in the region and provided a basis for comparison with other less-studied municipalities.

The municipalities were selected in close dialogue with the regional stakeholders, Region Skåne and Skåne Association of Local Authorities. Both organizations have good insights into local municipal activities regarding implementation of UES in practice, as they are responsible for regional communication and education on UES and hold seminars, workshops, and networks for local municipalities on this topic. All selected municipalities can be viewed as explanatory cases (de Vaus 2001) regarding the terms of knowledge and interest in implementation of UES in a Swedish context. Considering previous findings on perceptions (Beery et al. 2016), and explicit and implicit integration of UES (Nordin et al. 2017; Schubert et al. 2018) in Swedish municipal contexts, we chose to focus on qualitative accounts of everyday challenges to implementing UES in municipal practice. Following Stake (2006), we applied a qualitative approach to analyze and interpret the particular perspectives and experiences of our interviewees.

4.2 Qualitative interviews with practitioners regarding their views on UES implementation and its challenges

We conducted qualitative interviews with municipal practitioners¹ in all six municipalities (see Table 1 for a description and Fig. 2 for location). We sought interviewees with prior knowledge of the ES concept and who have been involved in efforts to implement it in urban settings. Interviewees were selected in dialogue with municipal representatives suggested by the regional authorities. The work roles of the interviewees varied from spatial planning to green space management (Table 1). In all cases but one, the interviewees covered both strategic and operational responsibilities for UES implementation. In the one case where only a planner was available, we secured follow-up information on operational perspectives via e-mail.

Individual interviews (Kvale and Brinkmann 2009) were performed, with seven interviews involving 1–2 participants (total of 8 interviewees), and one involving 3 participants.

¹ All interviewees were anonymized. All were asked to sign a consent-form, which was handled in accordance with GDPR requirements. This type of interview study is deemed of common public interest, and does not need approval from an ethical board in Sweden and hence there is no board to get approval from.

Table 1 Participating municipalities and interviewees in this study

Municipality (population)	Municipality population-density and character	Interview-participant, role(s) in municipality, and background
Malmö (340.000)	1022 inhabitants pr. km ² , coastal city.	(1) Spatial planning, landscape architect (2) Nature-care and management, biologist
Lund (123.000)	288 inhabitants pr. km ² , city, agricultural landscape.	(1) Spatial planning, environmental strategist and architecture (2) Property- and street-management, landscape architect
Klippan (18.000)	47 inhabitants pr. km ² , agricultural, forested.	(1) Spatial planning, architect
Tomelilla (14.000)	34 inhabitants pr. km ² , agricultural, forested.	(1) Spatial planning, ecologist (2) Spatial planning, nature-care and management
Ystad (31.000)	87 inhabitants pr. km ² , coastal, agricultural.	(1) Spatial planning and green space management, ecologist
Hässleholm (52.000)	40 inhabitants pr. km ² , forested, agricultural.	(1) Spatial planning, landscape architect (2) Sustainable development, environmental strategist (3) Spatial planning, nature management, ecologist

SUPPORTING



Biodiversity



Ecological interconnections



Soil fertility



Habitat

REGULATING



Air quality



Noise regulation



Extreme weather protection



Water quality regulation



Climate adaptation



Pollination

CULTURAL



Health



Sensoric experience



Social interactions



Nature pedagogic



Symbolic and spirituality

PROVISIONING



Food production



Fresh water



Material



Energy

Fig. 2 A list of 19 services with illustrations from C/O City (2014, p. 13) was used as visual stimuli during the interviews to inspire examples

Each interview lasted 45–75 min except in one municipality where more practitioners asked to participate. There, we held a 120-minute group interview with three participants using more discussion-oriented, open phrasings of the interview questions, inspired by focus group interview methodology (Kvale and Brinkmann 2009).

The interviews followed a semi-structured approach and built on a thematic and dynamic question guide (Kvale and Brinkmann 2009) (see Appendix). We covered three main themes in interviews: (i) practical examples of working with UES, specifically related to multifunctional spaces, addressing densification and public engagement activities, (ii) existing knowledge and further needs for UES implementation, and (iii) attention to social, economic, and cultural differences in UES planning and management. Within each theme, we had 3–4 open-ended questions.

Based on Arts et al. (2006), we traced challenges to implementation mentioned in the interviews. We identified recurring perspectives and viewpoints in the participants’ narratives, locating norms, values, definitions of challenges, and approaches to solutions. An initial analysis sheet was created for each municipality, listing challenges and relating these to each dimension of PAM (discourses, actors, resources, rules of the game).

5 Challenges to UES implementation in Swedish practice

The selected municipalities ranged in size from > 300 000 inhabitants to < 30 000 inhabitants (Table 1). The two largest municipalities had a range of employees working with UES, while in medium and small municipalities planning and management of UES were often the responsibility of one or a few individuals. We organized the challenges interviewees perceived to UES implementation in planning and management into four overall discourses with the related three dimensions in PAM (Table 2).

5.1 Discourse 1—UES is not prioritized

The interviewees’ descriptions of UES implementation efforts often revolved around notions of ‘hard’ and ‘soft’ values in municipal practice, which generated a range of challenges. It was evident that UES, as opposed to e.g., housing, was generally not considered a core responsibility in the municipal organizations (I1, ² I2, I5, I6, I7, IF). An urban planner from one of the large municipalities described several good experiments with UES implementation in

² The numbering refers to the individual interviewee, i.e., I1 – I7 refers to interview 1–7 and IF to the Focus Group interview with three participants.

Table 2 Matrix of contemporary governance challenges related to implementation of urban ecosystem services (UES) in municipal planning and management, categorized within the four dimensions of the policy arrangement model

Discourse	Actors	Resources	Rules of the game
(1) UES is not prioritized UES is under-prioritized in decision making	Lack of priority among local politicians, little understanding among powerful actors	Lack of binding, standardized tools and spatial criteria for UES integration in urban planning and development	Short-term planning horizon, conflicting goals
(2) UES is ad-hoc driven Need for holistic vision and strategic implementation	Dependence on individual actors/champions, local politicians need to be more involved and discussing UES, actors narrowly focus on specific issues and not breadth of services, actors not aware of benefits	Resources allocated only when there is a problem, lack of baseline data on local ES, lack of knowledge, strategies and standardized tools for qualitative ES valuation and management	Project-driven implementation, missing legal support, lack of clear directives across levels of governance
(3) UES lacks descriptions and standards Need for organizational transition and change	Too little staff with explicit UES responsibility, too little follow-through e.g., of UES-planners with on-the-ground managers.	Too few staff hours to work on integration of UES into everyday practices, too few good examples of UES implementation to follow	No UES in work descriptions or framework conditions like quality criteria for developers and entrepreneurs inside and outside the municipal organization
(4) Silos are hampering cross-departmental development Need for cross-sectorial approaches	Need for more departments to be engaged in implementation and negotiation of UES	Lack of internal communication tools- and networks, staff hours to work between departments, pedagogical tools for communication about ES across spheres of interest and responsibility	Land-use decisions and areas of responsibilities divided into separate departments

urban neighborhoods (I2): “*But we have a need for housing. That’s at the top of the agenda, and for the housing we need services, you know: school, mail, roads and accessibility—infrastructure. Only after this, we start getting to these soft values*”.³ Similarly, an interviewee in a medium-sized municipality (IF) stated: “*It’s the core activities first. If we need houses we build houses—after that we might look at other societal responsibilities, but they are not primary*”, and an interviewee in a small municipality (I5) said: “*we have a goal to increase the population by x, and compared with that these more soft values get scrapped*”. In terms of municipal actors, the interviewees often alluded to lack of engagement and understanding of ecosystem functions among local politicians (I7). “*It’s still hard to sell anything with nature to the local politicians; they still think it can just be substituted with something else*”. One municipality had an ambitious plan to generate UES by connecting rural, peri-urban, and urban ecosystems in a network of green hot-spots and corridors, but encountered problems e.g., when applying an integrated landscape approach to stormwater management (I4):

As soon as we hit the perimeter of the city: Bam! We hit a wall of wheat or sugar-beet—of agricultural land where we can’t do anything. It is very tricky—but interesting! (I4).

The municipalities lacked simple tools to communicate adequately and convincingly about UES to politicians (I5, I6), and many mentioned lack of standardized models to work with UES across departments and with external actors (I2, I4, I6, IF). Some called for spatial criteria for new and old developments, or standard values for services generated from urban green spaces (IF):

at this point, what we really need is a compilation of standard values like: an oak-tree on a hard surface in a residential, urban neighborhood provides these and these values when it is this old and this big.

Many interviewees described a lack of recognition of the value of UES and the short-term horizons currently dominating local politics (I2, I4, IF), for example (I4):

Often you see growth and gains only in the short-term perspective, and here it is quite apparent that building quick and paving surfaces is smooth and simple. But if you weigh in these other values... But that’s the whole issue! They are hard to see for politicians or for private developers. They are used to seeing the hard, classical values that are monetary and immediately benefit people. The big issue is how to make people see and understand the complexity in the bigger systems.

³ All interviews were conducted in Swedish, and the authors have translated the selected quotes.

It is evident that the inherent values of UES were not recognized by the political level in the municipalities studied. Thus, ‘soft’ UES were under-prioritized compared with ‘hard’ projects such as housing and infrastructure. The lack of a long-term perspective for politicians and private developers to prioritize UES was a central challenge identified in the interviewees’ narratives.

5.2 Discourse 2—UES is ad-hoc driven

The problem of priority and the overlooked values of UES also revealed a need to develop a more holistic vision within municipal practice, where UES implementation is often driven by experiments and individual projects. Establishing projects and experiments using UES, for example to manage cloudbursts and heatwaves, seemed to be a prevalent approach to garner interest among actors, free up resources, and create transitions toward UES in both planning and management. According to the interviewees, however, the results often lacked further upscaling or long-term implementation (I1, I2, I4, I5, I7). For example, one interviewee described how flooding of a local area had inspired creation of a multifunctional green area, but also hinted at this being accidental rather than planned (I7):

They had flooding problems and lacked active recreation possibilities, and in this case it became a multifunctional green space without much prior planning for that ... after the flood in a nearby town we knew we had a water issue. It’s like a problem occurs, and then we solve it, and there we could see that a new park could be both a stormwater solution, a recreational area and so on.

In small to large municipalities, the threat of cloudbursts offered opportunities for green area mapping and inventories to aid in sustainable stormwater management (I4, I5, I7). Similarly, heat stress led to increased focus on tree planting and shade provision (I1, I4). However, the interviewees also described the flipside of such problem-focused implementation, which was reflected in the lack of interest in the benefits of UES until the problem already existed (I1):

we haven’t had a proper cloudburst here; if we had, we would probably have been in a completely different state when it comes to resources and such

This resulted in a range of practical challenges to working with UES.

The lack of consistent mapping and inventories of UES in the municipalities (I4, I5, I7, IF) has resulted in a lack of systematic implementation (IF):

We wish to be pro-active, but we haven’t been able to do the inventories, so we don’t know what we’re los-

ing. This arose as both an economic challenge—“we haven’t gotten far with green planning, we’ve had a student do a green area inventory, and that’s about it” (I5)—and a pedagogic challenge— we need to be able to easily show other actors the [ecological] chain; if we lose pollination we lose this, and this too. (I7).

The strategists responsible for UES in planning in some cases criticized lack of engagement by other actors, e.g., in one of the smaller municipalities (I6):

What we wrote in the comprehensive plan about ecosystem services has just been lumped in there, it hasn’t been discussed, and then not really understood, it hasn’t been processed.

Some interviewees noted the lack of support in the planning and building legislation, e.g., there are no demands on private developers for securing UES (I1, I2, IF), no consistent implementation directives throughout multiple levels of governance ranging from national to local (I6, I7), and no binding compensation mechanism for UES lost during development (I5, I7, IF).

5.3 Discourse 3—UES lacks descriptions and standards

The problem with creating a more holistic thinking was closely related to the need to move beyond ‘business as usual’ in municipal practice. In all municipalities, implementation of UES approaches faced problems when measured against existing practices. For some, it was difficult to distinguish any added value from the UES concept:

we have worked with this for long (IF),

or it was considered a cumbersome add-on task for environmental planners and managers:

we are already jacks-of-all-trades, this new thing just feels like: No, no, no! (I6).

The interviewees described UES implementation as often

drowning in everyday-tasks, administration, and questions from the public (I1, I3),

or in the sheer volume of existing plans and documents governing work by municipal employees (I4). Management staff in particular lacked work descriptions that clearly defined UES as a work responsibility (I4, I5), and simultaneously, ideas in planning frequently did not result in changes in on-the-ground maintenance practices (I1, I3, I4). The interviewees mentioned a lack of good, clear examples to inspire change (I1, I6) and a lack of staff-hours to study and take into account local ecological synergies and trade-offs (I3, I4). Several municipalities had to hire consultants for critical tasks such as mapping UES or

for improving qualitative management, but in most cases only had limited funds to do so (I1, I3, I5, I7, IF). One interviewee also pointed out that work and job descriptions rarely mentioned UES, and that referring to UES more explicitly would help employees prioritize the topic (I4). Another criticized the existing quality-assurance systems for private developers, which slowed down change and UES implementation, as the protocols for building and construction are difficult to change. That interviewee declared that new ideas would inevitably come up against existing, slow-moving systems for e.g., ‘how to build a good street’, hampering transition to an UES approach to urban planning (I2).

5.4 Discourse 4—Silos are hampering cross-departmental development

The interviewees consistently emphasized the lack of cross-departmental collaboration and the urgent need to establish stable networks to take the next step. According to several interviewees, responsibilities and decisions were not well coordinated between departments, and they described how ‘silos’ of responsibilities, knowledge, and practice had formed within their organizations, making an integrated approach to municipal planning for UES more difficult (I2, I4, IF). Few of the interviewees felt that their defined tasks and responsibilities were easily compatible with taking an integrated UES approach, but requested further involvement and better coordination across departments, for example from legal experts, construction engineers, planners, and green space managers. “*We work quite a lot in each our own silo*”, according to one member of the focus group (IF). The lack of integration of cross-departmental knowledge seemed to exist both between planning and management departments (e.g., city planning and streets) (I2, I3, I6, IF), and between the different areas of administration where UES should be of relevance (I2, I7, IF). One interviewee described how these divisions resulted in competing, rather than complementary efforts in municipal practice (I2):

In modern planning, you have the areas for themselves: housing, work, sports and leisure, and then also infrastructure, and maybe the green infrastructure. Right now, they all compete for space: when we need more housing, more workspaces, or need more outdoor-recreational areas, it all puts pressure on the green areas. But in city planning, it is apparent at least to me, that it ought to be one big soup.

Other challenges of organizational silos were: staff in other departments failing to see the relevance of UES to their work (I2, I3, I4, IF), and individuals being stuck in their traditional roles and work descriptions even if actively trying to work with UES in a more integrative manner across departments (I4, I5, I6, I7). A common concern among the planners interviewed was the lack of contact especially with

engineers responsible for on-the-ground construction in the municipalities. Some interviewees traced the issue to a lack of tools for internal communication on how to improve the provisioning of UES across various fields of expertise and responsibility (I2, I5, I7, IF), and saw a need for staff time to implement changes in the everyday practice of different departments (I3, I4). Interviewees from all municipalities thus described a gap between the more holistic system thinking of UES and the usual departmentalization of areas of responsibility, or silos, in municipal practice.

6 Discussion

This study has highlighted four different discourses in relation to challenges in UES implementation as experienced by Swedish practitioners. Below we will outline how these challenges are often interrelated and how the identification of the challenges could be used as opportunities for improved UES integration. The findings from this study will be reflected and discussed in relation to previous research in order to outline the generalizability of the results.

6.1 Interrelated challenges to UES implementation

This paper describes perceived challenges among municipal planners and managers to implementation of UES as a concept in practice. The interviewees welcomed the overall approach of UES to governing urban green spaces (as found by Jönsson et al. 2017), but also pointed out that the new UES approach challenged existing governance arrangements in municipal practice in four primary ways. The four discourses had implications extending beyond the initial focus of the interviews (multi-functionality, densification, and engagement). First, the lack of prioritization of UES and conflicting goals among local public and private actors underlined the need for new political thinking and a new, longer-term time horizon for UES to become a decisive factor in solving contemporary challenges faced by urban societies. Second, while UES projects and experiments often provided opportunities for creating change, the lack of systematic approaches and upscaling of good practices was a major shortcoming. Third, a degree of organizational inertia in work roles and in existing standards and systems was seen as hampering UES implementation. Fourth, the major challenge to UES implementation was considered to be the need for interdisciplinary working to solve complicated problems. In summary, the four identified challenges are interrelated as there is a need to (i) prioritize UES in municipal planning in order to address the contemporary challenges of e.g., urbanization and biodiversity loss. This in turn creates (ii) a need for increased holistic thinking within the municipal organization, based on (ii) further documentation and standards, which should help (iv) initiate organizational transition and cross-sectorial approaches.

6.2 Challenges could be opportunities

The challenges (discourses) we identified were highly inter-related, but revealed opportunities for developing new municipal governance structures through: clearer demarcation of actors and areas of responsibility in implementing UES; establishing standards and pedagogic tools for implementation of UES; creation of organizational social infrastructure for cross-departmental collaboration, e.g., between housing-, traffic-, school-, and recreational-departments; and increased collaboration between administrative and operational levels in the municipal organization e.g. between urban planners, green space managers, and engineers. This can all improve approaches for implementation of UES. However, the first challenge still seems to be the overall lack of priority given to the ‘softer’ values UES represents, compared with ‘harder’ societal goods such as roads, housing, and related infrastructure. UES was described as lacking a standardized approach and only applied in response to a problem, e.g., heat waves, cloudbursts, or stormwater emergencies. Describing similar problems, Wihlborg et al. (2019) noted that the short-term horizon in municipal practice often resulted only in sporadic implementation of urban blue-green infrastructure. Similar conclusions have been reached in studies exploring planning and policy for UES integration on regional level in Portugal (Mascarenhas et al. 2015) and Switzerland (Jaligot and Chenal 2019) and within urban planning in Italy (La Rosa 2019). Coupling social community-based infrastructure to coordinate and communicate about UES among municipal planners could be a crucial step in implementing UES in practice (Mascarenhas et al. 2015). But as BenDor et al. (2017, p. 268) notes that implementing a full ES framework into planning might be too heavy on information for the existing planning system, and hence a full adaptation of the current UES approaches into planning is not possible. This requires an identification of adaptable tools that provide sufficient knowledge for making informed decision on benefits of as well as trade-offs between UES.

The lack of resources and baseline data further hampers implementation of UES in the study region, as also suggested by Primmer and Furman (2012) and Chen et al. (2019, p. 8). These interrelated challenges indicate a need to integrate UES into the heart of decision making among local politicians, instead of making it a separate task for green space planners and managers. Provision of background data to indicate or document potential loss of UES during development could help overcome this challenge.

We also identified the challenge of lack of resources in terms of personnel and staff hours, confirming findings by Qiao et al. (2018) and Ordóñez et al. (2019) on integrating SSM and urban forestry, respectively, in municipal practice. Implementing UES in practice thus needs further investment to keep up with daily tasks while reconfiguring management

and maintenance of green structures to UES approaches, thereby moving beyond *business as usual*. A further problem is existing quality-assurance system guiding street and housing developments, which are considered very influential, but difficult to change. Integrating UES as a quality criterion in existing standards for street/housing development could engage politicians and high-level officials in promoting implementation, as found by Qiao et al. (2018) for SSM implementation. Qiao et al. (2019) and Jönsson et al. (2017) also noted a need for public awareness to create momentum for investing in changes in municipal practice. Our study of UES implementation in municipal practice confirmed this need, and also the need for informing local politicians on strategic and conceptual advantages of the UES approach.

6.3 Generalizability in Sweden and beyond

While this study focused specifically on municipalities in Southern Sweden, the results are likely to be valid in other contexts, as previous comparative studies in different countries reflecting a range of planning and management contexts have highlighted similarities in UES implementation (e.g., Primmer and Furman 2012; Rall et al. 2015; Luederitz et al. 2015; Kremer et al. 2016; Haaland 2020) and in challenges to urban green space governance (Qiao et al. 2018; Ordóñez et al. 2019; Jansson et al. 2019). The findings from this study also resonate with the suggestion put forward by Woodruff and BenDor (2016, p. 98) for how to integrate ES in planning, emphasizing the need for clear goals with regards to desired ES outcomes, a solid foundation of data to build the plan on and specific policies for guiding decision making and planning.

Other municipalities might have different development trajectories, but the discourses highlighted in our analysis occurred in all six participating municipalities. In the study by Nordin et al. (2017) of six partly overlapping municipalities, similarities in the frequency of ES mentioned were similar regardless of municipality size, confirming that there are some commonalities in ES implementation. Thus, we believe that the four discourses identified provide a good starting point for further discussions of common challenges to UES implementation at local government level in the Skåne region, Sweden, and beyond. The results complement previous findings, e.g., the reported prevalence of organizational silos relates closely to findings by Ordóñez et al. (2019) for urban forestry, where a key challenge to successful governance is lack of coordination among actors, especially departmental units. Similarly, Qiao et al. (2018) found that a key challenge in SSM was lack of clear responsibilities. The ECOSIMP study found that ‘lack of clarity and guidelines’ undermined the otherwise positive reception of the ecosystems services approach in Swedish municipalities (Jönsson et al. 2017). Elsewhere, Haase et al. (2014b) found a lack of clarity on relationships among actors, and Rall et al. (2015), in a comparison of urban green space management in

New York and Berlin, found lack of cooperation and of clear areas of responsibility and guidelines.

UES approaches have yet to make their way into policies, e.g., in creating balanced assessments of blue-green alternatives to traditional gray infrastructure solutions (Saarikoski et al. 2018). For the case of urban planning, La Rosa (2019) made similar findings for Italy, where UES is mentioned within planning statements and general strategies, but rarely informs actual planning decisions. The municipalities included in the present study cited common challenges, ranging from instrumental to conceptual use of UES, in a range of municipal contexts, and expressed in common discourses by interested key stakeholders from small to large municipalities. Similarities in UES implementation on an overall level between large and small municipalities were also found by Nordin et al. (2017). Due to this commonality and the similarity of findings in related fields and studies, we suggest that the four discourses and their interconnected challenges identified in this study should be focal points for further studies and transdisciplinary collaborations on integration of UES in municipal practice. Overcoming the challenges they encompass would be an important step toward implementing a UES approach that is instrumental, strategic, and conceptual, giving it the pedagogic advantages (Waylen and Young 2014; Schubert et al. 2018) to facilitate sustainable transformations in the governance of urban social-ecological systems.

7 Conclusions

This study confirmed the need for new insights into the design and implementation of UES in urban planning practice. For knowledge to be integrated among planners and managers, we found that they need actual data on values and impacts of UES to enable comparisons with other professional priorities. We also found that the ES approach, UES in particular, is welcomed in municipal practice, but faces severe governance-related challenges as there is a need for more integrated urban planning and management, breakdown of silos, and integration of different departments to implement UES in urban green space planning and management. The key challenges can be described as interrelated: UES is not sufficiently prioritized in municipal planning, which require a need for increased holistic thinking, breaking down of silos, and cross-sectorial approaches which will benefit from further documentation and standards related to UES. All this is difficult to achieve in contemporary governance arrangements in local government, and therefore new cross-sectorial administrative and organizational approaches, as well as new integrative planning approaches should be tested in the future in order to promote the integration of UES in contemporary green space planning and management.

The UES concept is fully rooted in the academic literature and the social-ecological relationship has been comprehensively documented. However, there is a need for further research into the organizational and governance aspects of implementation of UES with emphasis on (i) further documentation of the actual benefits of UES and standards for implementation, and (ii) collaboration on development and testing of new organizational structures, with emphasis on holistic and long-term approaches to planning and management of UES. The four main discourses and their related challenges were documented here and can help scientists and practitioners identify bottlenecks in advancing UES into planning and management, create transformations in governance, and thereby increase the socio-ecological sustainability of urban environments.

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Appendix: interview-guide

The guide is structured around themes and main questions that were asked to all practioners interviewed, with the questions in bold forming the basis for the results presented in the article.

Theme	Main questions
Intro	<p>Can you start out by briefly describing your role and the character your work here in the municipality?</p> <p>Throughout the interview, we will refer to ecosystem services (ES) and the Swedish milestone target for their integration in governance and political decision making (Naturvårdsverket 2016): <i>“The importance of biodiversity and the value of ecosystem services are, by 2018, to be generally known and integrated into economic positions, political considerations and other decisions in society, where it is relevant and reasonable to do so”</i>.</p> <p>Can you give a brief overview of how the municipality have integrated the ES approach in practice?</p>

Theme	Main questions
Rational choice	<p>Can you give an example of an ES that you have been explicitly working with here in the municipality? Or one that is urgently lacking?</p> <p>If we look at the list of ES...:</p> <p>Which ES are highly prioritized in your work here in the municipality?</p> <p>Which ones are less prioritized in your work here in the municipality?</p> <p>Which ES do you find are often combined, or are you trying to work with in combination in your work here in the municipality?</p> <p>Which, if any, ES are in conflict with each other in your work in the municipality?</p>
Knowledge-use and integration	<p>Where are ES integrated in municipal planning?</p> <p>In which municipal documents are ES explicitly mentioned?</p> <p>How is it translated between various levels of planning?</p> <p>Which guidelines, tools, or systems do you refer to when working with ES?</p> <p>Are you experiencing any particular lacks of expertise or knowledge in your work with ES?</p> <p>Does the municipality hire consultants for any particular tasks related to ES?</p> <p>Which other staff or departments are working with ES?</p> <p>Which other staff or departments would you like to see engaged in working with ES?</p> <p>Is the ES approach integrated into any management and maintenance-work of urban green structure?</p>
ES distribution and needs	<p>Referring to an overall map of the municipality, and a more detailed map of the main city/town...</p> <p>How do you see the geographical distribution of ES in the municipality?</p> <p>Are there any specific areas you would point out as important for- and lacking in ES-provision?</p> <p>How are different preferences and needs for ES addressed in your work in the municipality?</p> <p>Are there any examples of public engagement processes related to ES?</p>

References

Arts B, Leroy P, Van Tatenhove J (2006) Political modernisation and policy arrangements: a framework for understanding environmental policy change. *Public Organ Rev* 6(2):93–106

Beery T, Stålhammar S, Jönsson IK, Wamsler C, Bramryd T, Brink E, Schubert P (2016) Perceptions of the ecosystem services concept: opportunities and challenges in the Swedish municipal context. *Ecosyst Serv* 17:123–130

- BenDor TK, Spurlock D, Woodruff SC, Olander L (2017) A research agenda for ecosystem services in American environmental and land use planning. *Cities* 60:260–271
- Bolund P, Hunhammar S (1999) Ecosystem services in urban areas. *Ecol Econ* 29(2):293–301
- Boverket (2016). Rätt tatt. <https://www.boverket.se/sv/om-boverket/publicerat-av-boverket/publikationer/2016/ratt-tatt/>. Accessed 26 Mar 2020
- Boverket (2019). Ekosystemtjänster i den byggda miljön – vägledning & metod. <https://www.boverket.se/sv/PBL-kunskapsbanken/Allmant-om-PBL/teman/ekosystemtjanster/>. Accessed 26 Mar 2020
- Brouwer R, Brander L, Kuik O, Papyrakis E, Bateman I (2013) A synthesis of approaches to assess and value ecosystem services in the EU in the context of TEEB–TEEB follow-up study for Europe. Final report. University of Amsterdam, Institute of Environmental studies, 144 s
- Bührs T (2004) Sharing environmental space: the role of law, economics and politics. *J Environ Plan Manag* 47(3):429–447. <https://doi.org/10.1080/0964056042000216546>
- Chen C, Wang Y, Jia J, Mao L, Meurk C (2019) Ecosystem services mapping in practice: a Pasteur’s quadrant perspective. *Ecosyst Serv* 40:101042
- C/O City (2014) Ekosystemtjänster i stadsplanering - en vägledning. <http://www.cocity.se/wp-content/uploads/2018/06/ekosystemtjanster-i-stadsplanering-ENVAGLEDNING-co-city.pdf>. Accessed 25 Mar 2020
- C/O City (2017) Grönnytefaktor för allmän platsmark 2.0. <https://hallbarstad.se/cocity/wp-content/uploads/sites/121/2018/02/Manual-Gr%C3%B6nytefaktor-f%C3%B6r-allm%C3%A4n-platsmark.pdf?x14227>
- Costanza R, Arge Groot R, Farberk S, Grasso M, Hannon B, Belt M (1997) The value of the world’s ecosystem services and natural capital. *Nature* 387:253–260. [https://doi.org/10.1016/S0921-8009\(98\)00020-2](https://doi.org/10.1016/S0921-8009(98)00020-2)
- De Groot RS, Alkemade R, Braat L, Hein L, Willemen L (2010) Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecol Complex* 7(3):260–272
- de Magalhães C, Carmona M (2009) Dimensions and models of contemporary public space management in England. *J Environ Planning Manag* 52(1):111–129
- De Vaus D (2001) Research design in social research. Sage, Thousand Oaks
- Dempsey J, Robertson MM (2012) Ecosystem services: tensions, impurities, and points of engagement within neoliberalism. *Prog Human Geogr* 36(6):758–779. <https://doi.org/10.1177/0309132512437076>
- Ernstson H, Barthel S, Andersson E, Borgström ST (2010) Scale-crossing brokers and network governance of urban ecosystem services: the case of Stockholm. *Ecol Soc* 15(4):28
- Gómez-Baggethun E, Barton DN (2013) Classifying and valuing ecosystem services for urban planning. *Ecol Econ* 86:235–245
- Gómez-Baggethun E, Gren Å, Barton DN, Langemeyer J, McPhearson T, O’Farrell P, Andersson E, Hamstead Z, Kremer P (2013) Urban ecosystem services. In: Elmquist T (ed) Urbanization, biodiversity, and ecosystem services: challenges and opportunities: a global assessment. SpringerOpen, Berlin
- Haaland C (2020) Hur arbetar man med ekosystemtjänstkonceptet i Storbritannien, Tyskland och Norge? (How has the implementation of UES been carried out in the UK, Germany and Norway?) Rapport inom projektet Mistra Urban Futures: urbana Ekosystemtjänster—Skåne Nod. Internrapport. LTV-fakultetens rapportserie Published by SLU Alnarp 978-91-576-8974-0
- Haase D, Frantzeskaki N, Elmquist T (2014a) Ecosystem services in urban landscapes: practical applications and governance implications. *Ambio* 43:407–412. <https://doi.org/10.1007/s13280-014-0503-1>
- Haase D, Larondelle N, Andersson E, Artman M, Borgström S, Breuste J, Elmquist T (2014b) A quantitative review of urban ecosystem service assessments: concepts, models, and implementation. *Ambio* 43:413–433. <https://doi.org/10.1007/s13280-014-0504-0>
- Hedblom M, Andersson E, Borgström S (2017) Flexible land-use and undefined governance: from threats to potentials in peri-urban landscape planning. *Land Use Policy* 63:523–527
- Jaligot R, Chenal J (2019) Integration of ecosystem services in regional spatial plans in Western Switzerland. *Sustainability* 11(2):313. <https://doi.org/10.3390/su11020313>
- Jansson M, Vogel N, Fors H, Randrup TB (2019) 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>
- Jönsson KI, Ekelund NGA, Wamsler C, Brink E, Beery TH, Palo T, Schubert P, Stålhammar S, Bramryd T, Johansson M (2017) Implementering av ekosystemtjänstbegreppet i kommunal verksamhet—Slutrapport. Naturvårdsverket, Stockholm
- Jovchelovitch S, Bauer MW (2000). Narrative interviewing [online]. London, LSE Research Online. <http://eprints.lse.ac.uk/2633>
- Kabisch N, Korn H, Stadler J, Bonn A (2017) Nature based solutions to climate change adaptation in urban areas. Theory and practice of urban sustainability transitions. Springer, Berlin
- Kremer P, Hamstead Z, Haase D, McPhearson T, Frantzeskaki N, Andersson E, Kabisch N, Baró F (2016) Key insights for the future of urban ecosystem services research. *Ecol Soc* 21(2):29
- Kvale S, Brinkmann S (2009) InterViews: learning the craft of qualitative research interviewing, 2nd edn. Sage Publications Inc., Thousand Oaks
- La Rosa D (2019) Why is the inclusion of the ecosystem services concept in urban planning so limited? A knowledge implementation and impact analysis of the Italian urban plans. *Socio Ecol Pract Res* 1:83–91. <https://doi.org/10.1007/s42532-019-00016-4>
- Larondelle N, Haase D (2013) Urban ecosystem services assessment along a rural–urban gradient: cross-analysis of European cities. *Ecol Indic* 29:179–190
- Luederitz C, Brink E, Gralla F, Hermelingmeier V, Meyer M, Niven L, Panzer L, Abson DJ (2015) A review of urban ecosystem services: six key challenges for future research. *Ecosyst Serv* 14:98–112
- Malmö Stad (2020) Befolkningsprognos. Samhällsplaneringsavdelnings, stadskontoret (Ed. McShane, Karl) Accessed 2020-03-26 from Malmö Stad webpage
- Mascarenhas A, Ramos TB, Haase D, Santos R (2015) Ecosystem services in spatial planning and strategic environmental assessment—a European and Portuguese profile. *Land-use Policy* 48:158–169. <https://doi.org/10.1016/j.landusepol.2015.05.012>
- McPhearson T, Hamstead ZA, Kremer P (2014) Urban ecosystem services for resilience planning and management in New York city. *Ambio* 43(4):502–515
- MEA (2005) Millenium ecosystem assessment. Island Press, Washington, DC
- Naturvårdsverket (2016) Integrera ekosystemtjänster i myndigheters verksamheter. Naturvårdsverket, Stockholm
- Nordin AC, Hanson HI, Alkan Olsson J (2017) Integration of the ecosystem services concept in planning documents from six municipalities in southwestern Sweden. *Ecol Soc* 22(3):26. <https://doi.org/10.5751/ES-09420-220326>
- Norgaard RB (2010) Ecosystem services: from eye-opening metaphor to complexity blinder. *Ecol Econ* 69(6):1219–1227. <https://doi.org/10.1016/j.ecolecon.2009.11.009>
- Ordóñez C, Threlfall CG, Kendal D, Hochuli DF, Davern M, Fuller RA, van der Ree R, Livesley SJ (2019) Urban forest governance and decision-making: a systematic review and synthesis

of the perspectives of municipal managers. *Landsc Urban Plan* 189:166–180

- Primmer E, Furman E (2012) Operationalising ecosystem service approaches for governance: do measuring, mapping and valuing integrate sector-specific knowledge systems? *Ecosyst Serv* 1(1):85–92
- Qiao XJ, Kristoffersson A, Randrup TB (2018) Challenges to implementing urban sustainable stormwater management from a governance perspective: a literature review. *J Cleaner Production* 196:943–952
- Qiao XJ, 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
- Rall EL, Kabisch N, Hansen RA (2015) comparative exploration of uptake and potential application of ecosystem services in urban planning. *Ecosyst Serv*. 16:230–242
- Randrup TB, Jansson M (2020) Introduction: urban open space governance and management—the long-term perspective. In: Jansson M, Randrup TB (Eds) *Urban Open Space Governance and Management*. Routledge. ISBN 9780367173036
- Region Skåne (2015) *Ett Grönare Skåne - Hur fysisk planering kan möta Skånes miljöutmaningar*. Projektgrupp: Andersson T, Hellström L, and Liljehov A, Region Skåne – Enheten för fysisk planering
- Rojas-Rueda D, Nieuwenhuijsen MJ, Gascon M, Perez-Leon D, Mudu P (2019) (2019) Green spaces and mortality: a systematic review and meta-analysis of cohort studies. *Lancet Planet Health* 3:469–477
- Saarikoski H, Primmer E, Saarela SR, Antunes P, Aszalós R, Baró F, Berry P, Dick J (2018) Institutional challenges in putting ecosystem service knowledge in practice. *Ecosystem services* 29:579–598
- Schubert P, Ekelund NGA, Beery TH, Wamsler C, Jönsson KI, Roth A, Palo T (2018) Implementation of the ecosystem services approach in Swedish municipal planning. *J Environ Policy Plann* 20(3):298–312
- Stake RE (2006) *Multiple case study analysis*. Guilford, New York
- Svännel J, Ekelund N, Sang OÅ (2019). *Urbana ekosystemtjänster i praktiken – en översikt av svenska publikationer för praktiker—internrapport*. LTV-fakultetens rapportserie
- Swedish Ministry of the Environment (2013) *Making the value of ecosystem services visible*. Summ SOU 2013:68
- TEEB (2010) *The Economics of Ecosystems and Biodiversity: mainstreaming the economics of nature: a synthesis of the approach, Conclusions and recommendations of TEEB*
- van den Bosch M, Ode Sang Å (2017) Urban natural environments as nature-based solutions for improved public health—a systematic review of reviews. *Environ Res* 158:373–384
- Vihervaara P, Rönkä M, Walls M (2010) Trends in ecosystem service research: early steps and current drivers. *Ambio* 39(4):314–324
- Waylen KA, Young J (2014) Expectations and experiences of diverse forms of knowledge use: the case of the UK national ecosystem assessment. *Environ Plan C: Gov Policy* 32(2):229–246
- Wihlborg M, Sörensen J, Olsson JA (2019) Assessment of barriers and drivers for implementation of blue-green solutions in Swedish municipalities. *J Environ Manag* 233:706–718
- Woodruff SC, BenDor TK (2016) Ecosystem services in urban planning: comparative paradigms and guidelines for high quality plans. *Landsc Urban Plan* 15:90–100
- Xiang WN (2017) Pasteur's quadrant: an appealing ecophronetic alternative to the prevalent Bohr's quadrant in ecosystem services research. *Landsc Ecol* 32:2241–224
- Yin RK (2014) *Case study research: design and methods*. Sage, Los Angeles



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