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Ecosystem service implementation and governance challenges in urban green space planning—The case of Berlin, Germany

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ABSTRACT

Urban landscape planners are increasingly becoming aware of the value of ecosystem services to the quality of life of city residents. However, the ecosystem service framework has not yet been integrated in spatial planning in a systematic way. In this paper, we assess how the ecosystem service framework is organized and implemented in the current urban green planning structure of the city of Berlin. Based on an analysis of strategic planning documents and expert interviews with local stakeholders, this work explores to what degree the ecosystem service framework is integrated in the planning system and identifies major challenges in urban green governance. As an output of the analysis of planning documents, it is identified that only very recently developed informal strategies explicitly relate to the ecosystem service framework although stakeholders are aware of the term. Identified main challenges in Berlin's urban green governance include (a) increasing development pressure from population growth and financial constraints on the municipal budget, (b) loss of expertise and (c) low awareness of green benefits among different actors through insufficient communication. The concept of ecosystem services, however, may provide a useful argument to promote the conservation of existing urban green spaces and to communicate the benefits that urban nature provides for citizens to all levels of green space governance.

Introduction

Present-day urban areas face many challenges. They are home to an increasing number of people while simultaneously striving to provide sufficient economic and social infrastructure and a high quality urban environment. Cities are also hotspots for global changes such as ongoing urbanization and climate change. Urban planning is attempting to react to these challenges by developing planning strategies and policy guidelines. In order to support urban planning in spearheading climate change and urbanization-induced developments, the natural and social sciences develop frameworks that help to identify values from the natural environment for the urban population and propose specific planning recommendations. In particular, the *ecosystem service framework* (Millennium Ecosystem Assessment, 2005; TEEB, 2011) was developed by researchers to highlight the benefits of ecosystems for human society. Ecosystem services were originally defined as "... the conditions and processes through which natural ecosystems and the species that make them up sustain and fulfill human life" (Daily, 1997: p. 3). Later on, the Millennium Ecosystem Assessment (2005) classified four different groups of ecosystem services: provisioning services, regulating services, supporting services and cultural services. In their paper, Bolund and Hunhammar (1999) introduce the term "urban ecosystem services" for the first time. The authors outline the value and benefits that urban residents may attribute to internal ecosystems located within a city. The authors underscore that urban ecosystem services provided by urban green spaces might be the most effective in counteracting environmental problems caused by increasing urban population (density) or by climate change, such as higher temperatures, air pollution or traffic noise.

Urban green spaces provide a number of environmental and social benefits for city residents. Such benefits include processes of local climate stabilization via air filtration (Jim and Chen, 2008) and cooling through shade provision (Bowler et al., 2010; Gill et al., 2007), which has gained importance in the discussion on mitigation strategies of urban heat island effects (Stewart and Oke, 2012). Further, the strategic location of street trees has been identified to reduce overall energy consumption (Simpson, 2002). Urban green spaces also reduce noise (Bolund and Hunhammar, 1999), increase carbon storage and sequestration (Strohbach and

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Haase, 2012), and have positive effects on rainwater interception and infiltration which, consequently, leads to water purification (Bolund and Hunhammar, 1999). Through different structured areas, urban green spaces provide habitats for a range of species and, in consequence, counteract biodiversity loss (Niemela, 1999). Social benefits relate to the exposure of residents to urban green spaces, which can positively influence mental and physical health through stress reduction and relaxation (Kuo et al., 1998; Maas et al., 2006; Völker and Kistemann, 2013) Urban green spaces provide recreational benefits such as opportunities to engage in sports, relax, and meet other people, while fostering social interaction or simply an experience with nature (Chiesura, 2004). Finally, urban green spaces enable experiential learning about the natural environment (Irvine et al., 2013; Joh et al., 2011; McMillan, 2007).

Based on the number of studies that highlight the human benefits of ecosystem services, researchers have shown the value of considering ecosystem services and the framework itself in land use planning and management (Gómez-Baggethun and Barton, 2013; Nelson et al., 2009). The framework has been considered for use in indicator assessment (Lakes and Kim, 2012; Radford and James, 2013), ecosystem capacity mapping (Hauck et al., 2013a,b), synergy and trade-off identification (Haase et al., 2012), as a management assessment tool (Daily et al., 2009) and for communication and database development (De Groot et al., 2010; Hauck et al., 2013a,b).

Accordingly, urban landscape planning, management and decision-making are increasingly becoming aware of the value of ecosystem services for the quality of life of city residents (Lakes and Kim, 2012). However, the framework has not yet been integrated into spatial planning in a straightforward manner (Piwowarczyk et al., 2013), and decision-making often fails to integrate a number of concrete ecosystem services (De Groot et al., 2010). Radford and James (2013) argue that this failure in planning integration is often due to a limited understanding of definitions and classifications and insufficient communication between practitioners, planners and researchers. In some cases, practitioners may not possess a professional background on the framework (Piwowarczyk et al., 2013) because the terminology of the ecosystem service framework is typically used for scientific purposes (Niemelä et al., 2010). Further, Hauck et al. (2013a) noted that local and regional situations are generally more complex than could simply be assessed using the ecosystem service framework. Nevertheless, the ecosystem service framework is seen as a useful tool for understanding the synergies and trade-offs caused by land use changes and for tackling challenges related to urbanization and climate change.

The focus of this paper is to explore to what degree the ecosystem service framework has been incorporated into the planning system of the city of Berlin, Germany. In addition, the paper explores challenges related to governance processes of urban green spaces and how these challenges are connected to the provision of ecosystem services. Governance processes are concerned because they refer to current practice of developing policies in interaction with divers societal actors (Loorbach, 2010) at different levels. Berlin was chosen as case study because a large part of the city area comprises green spaces. Some parts of the green spaces might become under presser in the next years because an increase in population is expected and repurposing existing green space into residential land is already discussed by several actors involved in land use planning of the city. These actors include planners at the city and district administrations, decision makers, local stakeholders such as owners of allotment gardens, representatives from nature conservation organizations and others.

The following research objectives are addressed:

(1) Assessment of a general recognition of the ecosystem service framework in green space planning.
(2) Identification of challenges in urban green space governance including processes, practices, responsibilities, implementation and monitoring.

Methods

The case study

Berlin is situated in the eastern part of Germany and its administrative boundaries extend over a region of more than 89,000 ha. Berlin's population is estimated to have increased to 3,543,676 inhabitants by 2012 (Amt für Statistik and Berlin-Brandenburg, 2013). Total population growth in Berlin over the last decade was accompanied by a 16% increase in residential area between 2000 (18,023 ha) and 2011 (21,044 ha) while urban green spaces increased to a lesser extent (2000: 9087 ha and 2011: 9677 ha). New population projections suggest a further increase of 254,000 inhabitants by 2030 which will certainly lead to increased densification in the inner city area because approximately 137,000 new flats will need to be provided (Senatsverwaltung für Stadtentwicklung und Umwelt Berlin, 2014). At present, public green spaces and forested areas represent more than 30% of the city area, making the city one of the greenest large cities in the world. Public green spaces include parks (>10 ha), private yards, allotments, cemeteries, recreational areas, sport grounds and street greenery (Senatsverwaltung für Stadtentwicklung und Umwelt, 2013b).

Research approach

To understand urban green space planning and ecosystem service framework application in Berlin, a qualitative multi-method approach was chosen. The approach included two main phases: first, data collection through the selection of Berlin planning documents and the conduction of stakeholder interviews; and second, data analysis through a content analysis of strategic planning documents and a governance context analysis using information from interviews.

Data collection

A number of planning documents related to green space in the city were selected for analysis. The selection process based on the criteria that documents should represent strategies which refer to the development and conservation of green spaces and biodiversity on a regional, city or specific green space level. The latter include planning documents that directly refer to a certain category of green space such as allotment gardens. Table 1 shows the final list of planning documents. They belong to strategic planning since they provide long-term visions, objectives and measures for the further development of the planning area.

Data collection further included eight, key-informant face-to-face interviews with stakeholders that are involved in urban green space planning and development processes. The focus was on stakeholders that are involved in the development of guidelines for green space documents for the whole city area, stakeholders that work on a lower level such as on the district level and stakeholders, that are involved in the development of a specific local green space. Table 2 highlights which stakeholders were interviewed and the main issues why they were asked for participation. The interviews were realized from May of 2013 until September of 2013 and lasted between 45 and 90 min. Interview questions contained four main blocks: the role of the interviewed person in the urban green space planning of the city; the most important planning instruments with respect to implementation and evaluation; the interviewed person's specific expertise in reference to networking and their main challenges including positive and negative developments and; finally, the stakeholder's personal awareness of