

## Editorial

## Synthesizing different perspectives on the value of urban ecosystem services

A 2011 Arbor Day campaign by the Chicago-area Morton Arboretum and municipal, civic, and corporate partners aimed to raise citizen awareness of the value of trees by placing tags on newly planted trees in major pedestrian areas that estimated the monetary value of environmental benefits they would provide (Fig. 1). A major tree planting effort begun under former Mayor Richard M. Daley has added more than 600,000 trees to Chicago's urban forest, which now counts about 3.5 million trees. The effort is motivated by an increasing awareness of the benefits that trees bring to human health, translating into economic development prospects, quality of life, and reputation of the city (City of Chicago, 2011).

Similar motivations have inspired the authorities of other cities, leading to ambitious initiatives such as Million Trees Los Angeles, Million Trees for New York, and countless other projects undertaken by urban stakeholders worldwide. While these activities have gained increased support from research that has quantified their environmental benefits (e.g. Pugh, MacKenzie, Whyatt, & Hewitt, 2012), further research is needed to better understand and improve their institutional setup, social consequences, and economic effectiveness (McPherson, Simpson, Xiao, & Wu, 2011; Pincetl, Gillespie, Pataki, Saatchi, & Saphores, 2012; Young & McPherson, 2012).

As an introduction to this theme Special Issue of *Landscape and Urban Planning* on urban ecosystem services, we provide a brief overview of the literature, emphasizing the importance of five distinct but complementary categories of research that supports urban planning: modeling studies, governance, tools, economics, and social issues. It is also in the context of these categories that we introduce the articles that are contained within the Special Issue.

### 1. Literature on urban ecosystem services

"Ecosystem services" is a concept increasingly used to refer to the benefits that people derive from the functioning of ecosystems. Part of its practical appeal lies in how it helps reframe the value of conserving nature, not as something that is extra or in conflict with human goals, but as an indispensable partner in achieving these. Made popular by its use in the Millennium Ecosystem Assessment, the ecosystem service concept is frequently discussed with regard to air, land, and water resources in rural and natural landscapes. But because of the importance of cities in the modern world, urban issues have also received much attention in all of the major reports on ecosystem services (Davies et al., 2011; McGranahan et al., 2005; Robrecht et al., 2010).

To investigate how the concept of urban ecosystem services has been reflected in the literature, we carried out a simple

Scopus search of article titles, keywords, and abstracts on October 8th, 2012. While a search for the term "urban ecosystem services" provided only 23 results, a Boolean search combining "ecosystem services" AND "urban" returned 563 records published since 1995. We verified the relevance of these records by checking article titles, keywords and abstracts and ended up with 463 articles that specifically dealt with ecosystem services in an urban context.

Many of the articles identified by the Scopus search looked only at the consumption (or use) side of ecosystem services that takes place in cities, while the ecosystems themselves may exist outside cities. Other articles referred to the peri-urban context, which is important for analyzing the generation and consumption of ecosystem services along a rural–urban gradient. Indeed, urban ecosystem services need to be discussed in the broader context of larger ecosystems. As suggested by Jansson (forthcoming), the "ecology in cities," focusing on environmental issues within cities, has to be combined with the "ecology of cities," within which urban areas are perceived as ecosystems intertwined in a myriad of interactions with the surrounding world.

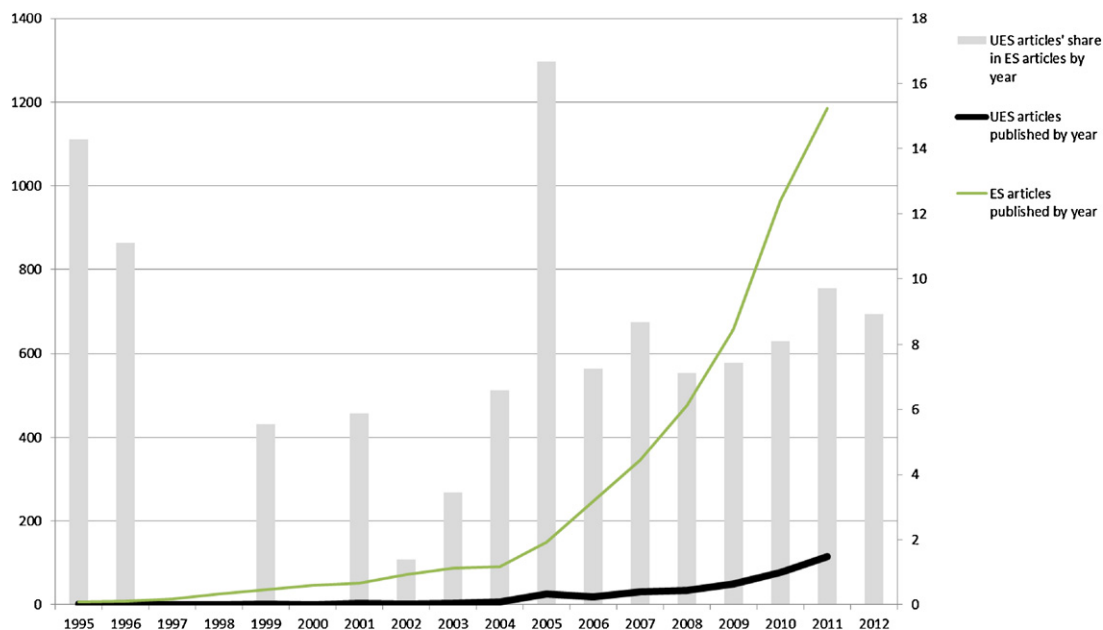
The publications in Scopus were not spread evenly over time but, as one would expect, reflect exponential growth (Fig. 2) paralleling the growth of publications on ecosystem services in general (cf. Fisher, Turner, & Morling, 2009). Indeed, this follows the classical logistic growth curve of innovation diffusion (Rogers, 1995). The parallel between urban ecosystem services and ecosystem services publications is also visible in a relatively stable share (ranging from 1.4 to 16.7%) of the former in all of the ecosystem services publications. In the same period (1995–October 8th, 2012), the total number of publications referring to "ecosystem services" was 5557, and when we included earlier publications (since 1984), the number increased only minimally to 5579.

The fact that no articles on urban ecosystem services were published before 1995 does not mean that these issues were not discussed. To the contrary, much had been written on the importance of urban ecosystems within the fields of urban ecology, landscape planning, urban management, urban forestry, environmental psychology, environmental health indicators and many others. Indeed, this rich literature preceded the emergence of the concept of ecosystem services and dates back to ancient civilizations, with already some awareness of health and esthetic benefits derived from urban nature (cf. Barthel, Sörlin, & Ljungkvist, 2010; Ward Thompson, 2011). This literature developed further only partly overlapping with the concept of ecosystem services.

Interestingly, the first short article that directly referred to ecosystem services in the urban context (Cairns & Palmer, 1995) was published four years earlier than the most widely cited



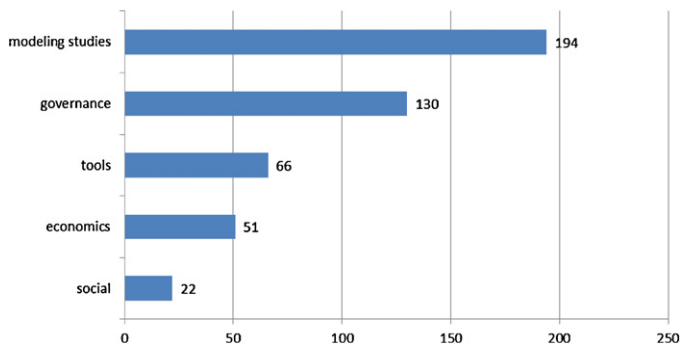
**Fig. 1.** 'This tree gives back \$1436 worth of environmental benefits over the next 15 years.' Tags like this one, placed on new tree plantings along popular pedestrian routes in Chicago, help convey the monetary value of urban ecosystem services to the general public.  
Photo by Tomasz Jeleński (2011).



**Fig. 2.** Number of articles (left scale) referring to urban ecosystem services (UES) and percent share (right scale) of UES articles with respect to all of the ecosystem services (ES) articles published in a given year. *Note.* For 2012 there were 97 papers on UES and 1088 papers on ES as of October 8.

article by Bolund and Hunhammar (1999). In it, Cairns and Palmer suggested that the concept of ecosystem services offered a perspective particularly useful for managing cities toward a sustainable development. Subsequent research on urban ecosystem services involved specific models that indicate how ecosystem functioning affects human activity and how human activity affects ecosystem functioning, limiting ecosystem's capacity to provide services. Simultaneously, tools were discussed for managing urban ecosystem services, along with governance structures and economic and social aspects of the management of urban ecosystem services. Indeed, the 463 articles on urban ecosystem services can be divided into five broad categories and Fig. 3 shows how many articles fall within each category.

1. **Modeling studies.** Articles most often undertaken from an environmental science perspective. Examples include studies specific to various ecosystem components, ecosystem services or types of urban and other ecosystem interactions, pressures on ecosystem services related to urbanization, urban ecosystem health and soil quality, and restoration programs.
2. **Governance.** Articles which refer to governing or managing ecosystems, including institutional or organizational structures, and policy instruments or analytical tools (such as social network analysis) that are relevant in the context of urban ecosystem services. The major focus here is on management; explaining how decisions are made and what tools or mechanisms might enhance decision making processes.



**Fig. 3.** Number of articles on urban ecosystem services falling into each of the five main categories (1995–October 8th, 2012).

3. **Tools.** Articles describing urban planning support tools with specific consideration of ecosystem services include approaches that can be used to model (or manage) urban ecosystem services related issues, as well as physical tools (such as discussions on the functioning of green roofs) and modeling tools (such as spatial models or analysis frameworks). This category is the closest to solutions that could be implemented in the area of urban ecosystem services management.
4. **Economics.** Articles that focus specifically on economic rather than ecological or technical assessments as in the case of modeling studies. This category mostly consists of valuation studies, complemented by cost–benefit analyses and other assessments of economic consequences of some activities. They also provide information which can be used to support decision making.
5. **Social.** Articles dealing with social behavior, perceptions and norms, discussed from a sociological, anthropological or

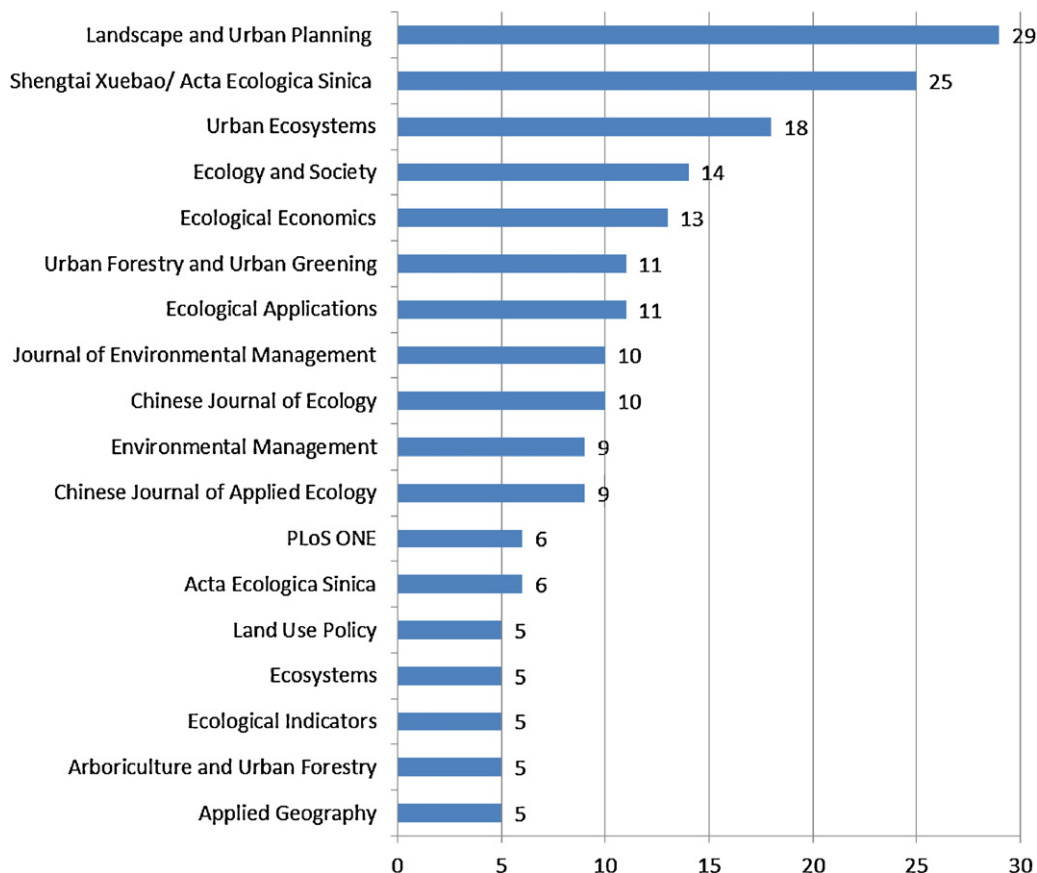
philosophical perspective. Some of them suggest how to include social science considerations into urban planning or modeling of land use changes.

As there are overlaps between the above categories, the division serves as a heuristic, and the numbers of articles falling into each category can only provide a general guidance on what kinds of studies are pursued in the area of urban ecosystem services and what weight has been attributed to different aspects in the literature.

Finally, it is useful to see which journals have published most articles on urban ecosystem services. Fig. 4 shows those journals which published at least 5 articles related to urban ecosystem services so far, indicating the leading role of *Landscape and Urban Planning* which also explains the publication of this Special Issue. It also shows that most articles are spread thinly among many different journals and disciplines (the total number of journals and proceedings within which the 463 articles were published was 201). It is also interesting to see a large number of Chinese journals and articles on urban ecosystem services, reflecting in many cases the urban pollution problems in Chinese cities.

## 2. Motivation for this Special Issue

Different perspectives on the value of urban ecosystem services have been revealed, including economic (benefits and savings), socio-ecological (resilience), psychological (well-being), cultural, spiritual (e.g. inspiration), and philosophical or ethical. On the one hand, such a multitude of perspectives suggests that at least some of these perspectives should be meaningful to different groups of stakeholders. On the other hand, ultimately, this variety might weaken the message delivered to decision makers who often only



**Fig. 4.** Number of articles on urban ecosystem services published in different journals (1995–October 8th, 2012).

follow narrow economic reasoning. The objective of this Special Issue is to bring together the various perspectives on the value of urban ecosystem services and discuss the potential of merging and synthesizing these perspectives. Ultimately, this should lay foundations for a more sustainable management of ecosystem services in urban areas.

Previous reviews of literature on urban social–ecological systems suggested that important gaps still affect our understanding of how human activities affect urban ecological functions and what ecosystem services can be obtained from urban ecosystems (cf. Cook, Hall, & Larson, 2012). However, it has also been emphasized that ecosystems cannot be seen from the perspective of benefits only, as in some cases they are also responsible for nuisance for human populations (Lyytimäki & Sipilä, 2009). Thus, the different perspectives on the value of urban ecosystem services are “the product of cultural preferences that emerged from a particular time in history” (Pincetl et al., 2012). In Los Angeles, one of the cities that has implemented a Million Trees program, the perspective on urban greenery was very different in the early 1970s. Then, the authorities also adorned the main boulevard with 900 trees and shrubs, but to minimize the future maintenance costs, they chose trees and shrubs made of plastic. These were deemed equally appropriate to meet the need for “contact with nature” that had been expressed by the city’s residents (Tribe, 1974).

### 3. Different perspectives on the value of urban ecosystem services

Perspectives on the value of urban ecosystem services not only change over time, but their values, elicited with different methods and by different stakeholders, can vary significantly. Thus, the abovementioned five categories of articles related to urban ecosystem services complement each other and provide a consistent picture for synthesizing the different perspectives on the value of urban ecosystem services. The articles in this Special Issue can also be classified according to these categories, although we do not have any that we allocated as belonging to the modeling category.

#### 3.1. Social

The differences in how ecosystem services are perceived and consequently distributed within cities are highlighted by Ernstson (2012) in an article on “The social production of ecosystem services.” When seen from the perspective of urban political ecology, values depend on different socio-political circumstances. As a result, the distribution (or availability) of ecosystem services is primarily affected by the ability of different actors to express their needs and priorities. More powerful actors have access to better methods and artifacts (e.g. being able to organize relevant research or funding to secure the availability of ecosystem services) while the disadvantaged groups are pushed to areas where ecosystem services are less available. This highlights the importance of taking environmental justice issues into consideration in urban planning and suggests that the trade-offs involved may in reality be more difficult than generally assumed. A framework for analyzing these issues put forward by Ernstson (2012) provides a useful first step in improving urban planning in this direction.

In “Civic greening and environmental learning in public-access community gardens in Berlin”, Bendt, Barthel, and Colding (2012) use a case of Berlin not only analyze how participation in community gardening enhances social learning about gardening and local ecological conditions but also wider issues such as urban politics, and entrepreneurship were analyzed. The authors indicate that such learning occurs in public access community gardens and to a much smaller extent in allotment gardens and gated community

gardens, which do not allow for enough interaction among users. Apart from learning about social–ecological conditions, community gardening helps develop a sense-of-place in degraded neighborhoods. This has important implications for urban planning that would incorporate public access gardening.

Kaźmierczak (2012) addresses the related problem of declining social ties in cities in an article entitled “The contribution of local parks to neighborhood social ties.” Investigating the types of visits and rationale for visiting parks in different neighborhoods, the author identifies associations between the quality of the parks, the character of visits, and the extent of social ties. In particular, social ties are promoted by longer visits that involve social activities. It is also suggested that the potential of parks to promote social ties could be enhanced if parks were better managed so as to attract longer, sociable visits.

#### 3.2. Economics

Economic studies complement the above reflections of social preferences with use of economic instruments and econometric analyses. Although both valuation studies in our Special Issue use the same method (hedonic valuation), both are also unique. Larson and Perrings (2012) used a very large set of data for the Phoenix metropolitan area (over 47,500 records), partly benefiting from the Central Arizona – Phoenix Long Term Ecological Research project (CAP LTER), one of the few data sets with so much information on environmental changes in a large urban area. Melichar and Kaprová (2012) offer one of the first urban ecosystem services valuation studies for Central and Eastern Europe, a region that has received very little attention so far in the literature on urban ecosystem services.

In an article entitled “The value of water-related amenities in an arid city,” Larson and Perrings (2012) disaggregated the metropolitan area into school districts which provided further information on how ecosystem services are valued in different parts of the city. Indeed, it turned out that the preferences varied and in some cases what was considered an amenity in one area could be classified as a disamenity in another, reflecting another aspect of the diversity of perspectives on the value of urban ecosystem services. As their focus, Larson and Perrings chose those environmental amenities that depend on a substantial use of water resources for their maintenance. This is a particularly important aspect of planning urban development in an arid area, and will be increasingly important because of climate change.

Melichar and Kaprová (2012) emphasize the impacts of urban green areas on residential prices in an article entitled “Revealing preferences of Prague’s homebuyers toward greenery amenities.” Prague is particularly relevant because these impacts constitute a considerable part of housing prices. Although in general proximity to protected areas and urban forest significantly increases the price of nearby residential properties, there are important differences between the price effects related to different types and sizes of green areas. As yet another interesting example of differing perspectives, in Prague smaller parks are particularly valuable as reflected in real estate prices, while in Phoenix the proximity to small parks is generally not revealed as an amenity.

#### 3.3. Governance

The environmental governance and policy literature shows a paradigm shift from more centralized top-down approaches to more bottom-up and lateral governance approaches. The paper “Governing metropolitan green infrastructure in the United States” by Young and McPherson (2012) investigates whether large-scale, metropolitan tree-planting initiatives in six cities had been planned and executed as a component of traditional municipal government



or represent a new bottom-up strategies in environmental governance. Using qualitative interviews with stakeholders the authors explored the roles of public vis-a-vis private sectors in these green infrastructure initiatives and the institutionalization of these initiatives and their relationships.

Connolly, Svendsen, Fisher, and Campbell (2012) explore similar issues when they ask how stewardship groups contribute to the management of urban ecosystem services. Using a mixed-methods approach, their paper “Organizing urban ecosystem services through environmental stewardship governance in New York City” explores how stewardship groups serve as bridging organizations between public agencies and civic organizations, working across scales and sectors to build the flexible and multi-scaled capacity needed to manage complex urban ecosystems.

A precondition for managing such complex systems is to have the correct guide posts. The paper by Piwowarczyk, Kronenberg, and Dereniowska (2012) entitled “Marine ecosystem services in urban areas: do the strategic documents of Polish coastal municipalities reflect their importance?” investigates how marine ecosystems are perceived in the practice of urban planning and long-term management. Using content analysis, the authors analyze strategic documents of the 10 largest Polish seaside towns and cities with regard to references to marine ecosystem services and disservices, trade-offs between them and postulates for environmental protection.

#### 3.4. Tools

A large variety of tools have been developed to support decision makers in urban planning but also other stakeholders to creatively engage in the planning process or simply help them learn about their natural urban environment. An example of the former is described in the article by La Rosa and Privitera (2012), who provide a planning tool with specific focus on the last remnants of nature with significant amounts of vegetation in metropolitan areas. In their article, “Characterization of non-urbanized areas for land-use planning of agricultural and green infrastructure in urban contexts,” they propose a land-use suitability strategy, based on five different analytical phases, to address the land-use of natural urban areas. The procedure, applied to three case study municipalities within the Catania metropolitan area (Italy), proposes new spatial configuration of natural urban areas giving municipalities a varied range of possibilities for the implementation of planning policies aimed at the conservation and increased provision of urban ecosystem services.

Grêt-Regamey, Celio, Klein, and Wissen Hayek (2012) broaden the focus to other stakeholder groups in their article “Understanding ecosystem services trade-offs with interactive 3D procedural modeling for sustainable urban planning.” In their study, they explore virtual environments to allow stakeholders to interactively assess trade-offs between ecosystem services including esthetic values. By using interactive sliders, the user can learn the impact of the selection of landscape elements on trade-offs between the esthetics of the urban designs and a set of indicators describing the provision of relevant ecosystem services. The authors provide a case study in Abu Dhabi, Masdar City, a new city designed from scratch using interactive rulers embedded in a 3D GIS-based procedural modeling environment. This article highlights that while artificial ecosystems can be created and managed to provide desired services, the costs of the delivery of those services depend on the broader ecosystems within which a given city is located (such as the arid surroundings of Masdar City affecting water availability for artificial ecosystems within this city).

There has been some uneasiness with the economic dominance in the ecosystem service discourse when translating different qualities of services into one super-numeraire, i.e. translating every

ecosystem service into monetary values. It is argued that lots of useful information is being lost, especially when dealing with trade-offs amongst different services. The paper by Radford and James (2012) on “Changes in the value of ecosystem services along a rural–urban gradient: A case study of Greater Manchester, UK” develops a tool that allows assigning non-economic values of 0–10 to nine different ecosystem services. This allows planners and stakeholders to evaluate the quality between, as well as within, each category of ecosystem service. It also gives planners and decision makers the choice between the trade-offs, depending on their views and aspirations for the future of their urban environment.

#### 4. Conclusions

One of the reasons for the emergence of the concept of ecosystem services was to promote the broad understanding of human dependence on nature, and to raise political support for conservation. In this way, the concept responded to earlier calls for better understanding of the importance of urban nature for the quality of life in cities. As suggested by Dwyer, Schroeder and Gobster back in 1991, “Urban forestry programs that aim to improve quality of life in urban areas will be most effective if urbanites learn about the basic biological needs of trees. At the same time managers and planners must learn about the many psychological, social, and cultural needs that trees and forests fulfill for urbanites” (Dwyer, Schroeder, & Gobster, 1991, p. 276).

The uptake of the concept of ecosystem services in urban planning research could be one of the measures of the concept’s success, but the adoption of this concept by urban planners would be even more important. Nevertheless, urban planners also have to be aware of the diversity of perspectives on ecosystem services and their value, and they have to take that diversity into account when making or facilitating relevant decisions. As a result, any decision that aims at managing urban ecosystem services needs to be based on a careful analysis and management of the different perspectives on the value of those services. As argued by Pincetl et al. (2012), such decisions “should be arrived at through public, transparent and democratic processes”.

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