



## Research paper

# Ecosystem services in urban planning: Comparative paradigms and guidelines for high quality plans

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## HIGHLIGHTS

- We compare a traditional and an ecosystem service based comprehensive plan.
- Ecosystem services help achieve sustainable development goals.
- Plans that integrate ecosystem services may better link diverse community goals and protect natural resources.
- Additional guidance is proposed to integrate ecosystem services into plans.

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## ABSTRACT

Ecosystem services are a powerful tool for land-use and environmental planning, which can help decision makers better understand the tradeoffs between different development scenarios. However, there is limited guidance about how ecosystem services should be used in the land-use and environmental planning context. While existing plan quality guidance for sustainability recognizes benefits of ecosystems by promoting conservation and green infrastructure, it fails to provide specific direction on the type of ecosystem service information to collect and how it should be incorporated into land-use planning processes. We explore this gap by using criteria from American Planning Association (APA) Sustaining Places guidance to analyze two comprehensive plans: Damascus, Oregon, which uses ecosystem services as an organizing framework, and Cincinnati, Ohio, which has received recognition for advancing the science and art of planning. In addition, we compare the extent to which the plans incorporate ecosystem services (both concepts and language) into their goal setting, fact base, policies, and public participation process. We find that incorporating ecosystem services into land-use planning may help achieve sustainability goals by elevating the importance of conservation and providing a lens to link multiple community objectives. APA rewards these attributes of Damascus' plan, but fails to identify the plan's strong ecosystem service strategies or weak analysis of ecosystem service information. Based on these findings, we propose additional metrics to help practitioners incorporate ecosystem services into comprehensive plans.

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## 1. Introduction

Ecosystem Services, defined as the benefits that people obtain from ecosystems, are essential for human well-being (MEA, 2005). This is particularly true in cities, where economic productivity, quality of life, safety, and public health are tied to natural surroundings – both inside and outside city boundaries – in unique

and generally under-appreciated ways (Grêt-Regamey, Celio, Klein, & Hayek, 2013; Salzman et al., 2014). Despite the importance of ecosystem services, they continue to be eroded, particularly in urban environments, where strong development pressure typically eclipses consideration of ecosystems contribution to quality of life (Díaz, Fargione, Chapin, Tilman, 2006; Grêt-Regamey et al., 2013; MEA, 2005).

Efforts to protect natural areas are frequently hampered by the inability to appraise the value of services provided by natural features (Hirokawa, 2012). Ecosystem services recast natural areas on a continuum of their use to humans, which spans from

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expendable (extremely low quality) to an indispensable source of clean air, flood protection, recreation, clean water, and other services (Brauman, Daily, Duarte, & Mooney, 2007). By relating the health of natural systems with human well being, ecosystem services provides a powerful lens to advance sustainable and resilient urban development (Biggs, Schlüter, & Schoon, 2015; Brauman et al., 2007; Grêt-Regamey et al., 2013). The characterization of ecosystem function and outputs as human-centered services offers several advantages, such as the opportunity to measure and evaluate different development patterns, urban form, and designs (Dorning, Koch, Shoemaker, Meentemeyer, 2015; Logsdon & Chaubey, 2013). Ecosystem services can help better identify and weigh tradeoffs inherent in development decisions in both developing and developed countries (Biggs et al., 2015; MEA, 2005).

In the United States, city and regional planning contributes to the design, implementation, and enforcement of policies that help balance many of the tensions inherent in urbanized and rapidly urbanizing environments (Berke & Kaiser, 2006). In contrast to European countries where national governments have historically been responsible for planning and metropolitan development (Salet, Thornley, & Kreukels, 2003), in the United States this power is devolved. Cities and counties have the authority to develop comprehensive plans, which direct where and how development occurs. Although planning is far from the last voice on conservation or development decisions, its role in developing community visions, agendas, policies, designs, and strategies is an opportunity to influence decision-making within the development process (Hopkins, 2001). The geographic coverage, integration of multiple systems, and public engagement of comprehensive planning has made it an important vehicle for sustainability goals (Conroy & Berke, 2004; Godschalk & Anderson, 2012) and represents an opportunity to protect ecosystem services.

Many current and past planning movements, such as the garden city and smart growth, implicitly recognize ecosystem services (Colding, 2011; Salzman et al., 2014). Wilkinson, Saarne, Peterson, and Colding (2013) demonstrate the long recognition of ecosystem services in planning by analyzing land use plans for Melbourne and Stockholm from the last 90 years. The authors found that ecosystem services were recognized as early as 1929 in Melbourne and 1936 in Stockholm. Although these plans (as well as nearly all other efforts documented in the literature) did not use the term “ecosystem services”, they recognized that natural areas provided valuable benefits such as water purification; provision of freshwater and recreation is mentioned in every plan analyzed by Wilkinson et al. (2013). More recent plans have made stronger connections between environmental assets and quality of life (Wilkinson et al., 2013), demonstrating the alignment between the services provided by natural systems and the services urban planning strives to provide (Colding, 2011).

Recent work has begun to argue that explicitly incorporating ecosystem services into plans could better target environmental protection during the course of urban development (Albert et al., 2016; Langemeyer, Gómez-Baggethun, Haase, Scheuer, & Elmqvist, 2016; Nin, Soutullo, Rodríguez-Gallego, & Di Minin, 2016). By recognizing the values of functioning urban ecosystems to human well-being and social welfare, ecosystem services could help improve land use decisions by better reflecting the tradeoffs between different development scenarios (Dorning et al., 2015; Logsdon & Chaubey, 2013). Integration of ecosystem services in urban land-use planning and decision-making, however, is still in its infancy (Albert, Aronson, Fürst, Opdam, 2014; Colding, 2011; Lopes & Videira, 2013; Mascarenhas et al., 2014).

Considerable effort has been dedicated to improving mapping, quantification, and valuation of ecosystem services (Albert et al., 2014; Crossman, Bryan, de Groot, Lin, & Minang, 2013; Faith, 2012; Hubacek & Kronenberg, 2013), but a meta-analysis of studies on

urban ecosystem services found that few address implementation or provide recommendations to policy makers (Haase et al., 2014). More recently, studies have proposed modification of existing and development of new frameworks to integrate ecosystem services into land-use planning and decision-making. Biggs et al. (2015) propose principles to sustain ecosystem services and details how they may be applied and operationalized in a policy context. Albert et al. (2016) incorporate ecosystem service valuation into the Driving Forces, Pressures, State, Impacts and Responses model commonly used in Germany to assess the current state of the environment and how it may change in the future. Langemeyer et al. (2016) explore the potential of integrating ecosystem services into multi-criteria decision analysis, a tool commonly used to assess land-use decisions. Nin et al. (2016) draws on conservation practices to develop methods of prioritizing protection of ecosystem services in the planning process in Uruguay.

Despite this growing scholarship, there is a lack of plan quality guidance that incorporates ecosystem services. Plan quality guidance is intended to help practitioners improve plans by highlighting specific planning processes and elements that should be included in plans themselves. In the United States, where planning is decentralized, plan quality guidance plays an important role in advancing planning practice. Plan quality guidance can also serve as a tool to evaluate the extent to which plans incorporate ecosystem services. To promote the incorporation of ecosystem services into land-use planning greater attention must be dedicated to understanding how current plan quality guidance treats ecosystem services and how it can better incorporate these concepts.

In this paper, we use existing sustainability plan quality guidance (The American Planning Association's (APA) Sustaining Places guidance; APA, 2012) to compare a traditional comprehensive plan (i.e. one that does not include ecosystem services; Cincinnati, Ohio's *Plan Cincinnati: a comprehensive plan for the future*; Cincinnati, 2012) to a plan that uses ecosystem services as an organizing framework (Damascus, Oregon's *Envision Damascus: Comprehensive Plan*; Damascus, 2010) to highlight the limited direction existing plan quality guidance provides on ecosystem services. How does an ecosystem service-based plan compare to a traditional plan on the criteria developed by the APA? In addition, we compare the ecosystem services content of the two plans to identify promising practices and areas for improvement. Specifically, how do these plans incorporate ecosystem services into their goal setting, fact base, policies, and public participation process? Through these analyses, we identify and propose additional metrics to help practitioners incorporate ecosystem services into comprehensive plans.

In the following section, we provide additional background on the origin and purpose of plan quality guidance. We then discuss in detail the American Planning Association (APA) Sustaining Places guidance (Godschalk & Anderson, 2012). In describing our methods, we expand on our coding techniques and the two plans used in our analysis. We then present how the two plans scored on the APA Sustaining Places guidance and discuss the extent to which they incorporate ecosystem services ideas. Drawing on these findings and the ecosystem services literature, we propose additional criteria for plan quality guidance to improve the integration of ecosystem services into planning.

## 2. Background

### 2.1. The evolving role of plan quality guidance

Plan quality guidance is intended to help practitioners improve plans and ultimately planning outcomes, by highlighting specific issues and elements that should be included in comprehensive plans. For example, multiple checklists and guidance have been

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