



# Unexploited opportunities in understanding liveable and biodiverse cities. A review on urban biodiversity perception and valuation



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## ABSTRACT

Many researchers and policymakers from various disciplines highlight the role of urban biodiversity in delivering ecosystem services to enhance human wellbeing in a rapidly urbanising world. This suggests powerful synergies between approaches that are often disciplinarily separated, aiming either at human wellbeing or biodiversity conservation. Strategies towards liveable and biodiverse cities would gain support from insights into the people–biodiversity interface in cities. Yet, the question of which scale of biodiversity (from ecosystems to genes) benefits urban people in general and different socio-cultural groups in particular, remains largely open. To assess the current scientific knowledge as well as potential for further research, we systematically reviewed literature on people's perception and valuation of urban biodiversity (200 studies). We also quantified the outcomes of studies in terms of the effects of biodiversity on valuation for studies that addressed biodiversity valuation below the ecosystem scale. We found that the current literature is critically biased in four ways. (1) Most studies cover temperate climates, while regions with the most pronounced urban growth are underrepresented. (2) Studies focus on urban forests and parks while important informal greenspaces are largely neglected. (3) Biodiversity is mostly addressed at the ecosystem scale (habitat or land-use types) while diversity at the species community or gene scale—key issues in biodiversity conservation—is covered to a much lesser extent. Most studies below the ecosystem scale show positive biodiversity effects, but universal patterns are not apparent due to the scarcity and low comparability of research. (4) Almost no studies consider the cultural diversity of urban residents by systematically targeting people from different socio-economic and cultural backgrounds or specific age groups. Our review reveals critical knowledge gaps about the people–biodiversity interface in cities, both in approaching cultural and biological diversity ('biocultural diversity'). This shows unexploited opportunities and future directions in linking usually separated strategies on enhancing human wellbeing and biodiversity conservation in sustainable cities.

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## 1. Introduction

Rapid urban growth and associated environmental changes have been identified as major threats to biodiversity at a global scale (Grimm et al., 2008; Güneralp and Seto, 2013; Seto et al., 2012; Schwartz et al., 2014a). One strategic response, currently the topic of debate, argues to make cities more compact in order to curb the pace of urbanisation and biodiversity loss outside cities (Lin and Fuller, 2013; Soga et al., 2014). As cities become denser, urban greenspaces might become smaller or more segregated. However, recent reviews illustrate that a broad range of urban

greenspaces, or 'urban nature' all in all, enhances the liveability of cities by underpinning a range of ecosystem services and benefits to physical health, psychological wellbeing and social cohesion (Elmqvist et al., 2013; Haase et al., 2014; Jørgensen and Gobster, 2010; Kabisch et al., 2015; Keniger et al., 2013; Lovell et al., 2014; Shanahan et al., 2015).

Smaller or more segregated greenspaces would also reduce the access of urban people to related ecosystem services and at the same time would impair the contribution of these spaces to biodiversity conservation (Beninde et al., 2015; Ives et al., 2016; Kowarik, 2011; McKinney, 2008; Schwartz et al., 2014a). In the face of rapid urbanisation, urban biodiversity functions are of global importance, also because an 'extinction of nature experience' might negatively affect people's engagement in biodiversity conservation inside and outside cities (Miller, 2005). As a

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consequence, researchers and policymakers highlight the role of biodiversity as an important component of the urban green infrastructure in enhancing human wellbeing via ecosystem services (Elmqvist et al., 2013; European Commission, 2013). This indicates potential synergies between urban planning strategies that are often targeting different disciplinary angles, either aiming at improving human wellbeing or biodiversity conservation.

Current debates on land sharing vs. land sparing (Lin and Fuller, 2013; Soga et al., 2014) and on enforcing urban green infrastructure (Elmqvist et al., 2013; European Commission, 2013) would gain support by deeper insights into the people-biodiversity interface in cities. Yet, despite increasing research in this field, the question of which scale of biodiversity (from ecosystems to genes) benefits urban people in general, and which socio-cultural groups in particular, in terms of cultural ecosystem services (Milcu et al., 2013) remains largely unresolved. Whereas cultural ecosystem services are generally understudied in urban regions (Haase et al., 2014), research specifically needs to move on from *whether* nature benefits human health to *how* it does (Shanahan et al., 2015).

Since many studies outside of the ecological field use the terms 'nature', 'green' or 'biodiversity' synonymously, it remains unclear which particular elements of 'nature' and thus which scale of biodiversity they refer to (Keniger et al., 2013; Schwartz et al., 2014a). One critical challenge therefore is to identify the 'service provisioning units' (Kremen, 2005), i.e. those components of urban 'nature' or 'biodiversity' that matter with regard to supporting cultural ecosystem services.

To assess the current scientific knowledge, we systematically review the literature on people's perception and valuation of urban biodiversity and cover papers from both social and environmental sciences. We analyse the studies regarding the following key issues:

- (1) *Geographical range.* Urbanisation trends largely vary among and within continents (Kabisch and Haase, 2013; Seto et al., 2012) and between developing and developed countries (United Nations, 2014b). This implies important differences in biological and cultural patterns and likely modulates the perception and valuation of urban greenspaces by people from different geographic regions as well as in different climates.
- (2) *Urban greenspace types.* We define urban greenspaces as all types of public or private greenspaces that together form the urban green infrastructure. Given that studies on urban ecosystem services generally fail to cover the range of urban greenspaces equally (Haase et al., 2014), we explore to which extent studies on the perception and valuation of biodiversity address major types of both formal greenspaces (e.g. parks) and informal components (e.g. wastelands; sensu Rupprecht and Byrne, 2014; Fig. 1).
- (3) *Biodiversity scales.* Following the definition of the Convention on Biological Diversity (CBD), biodiversity is an overarching term that comprises different scales, including the diversity of ecosystems (or of habitats), between species (diversity at community and single species scale) and within species

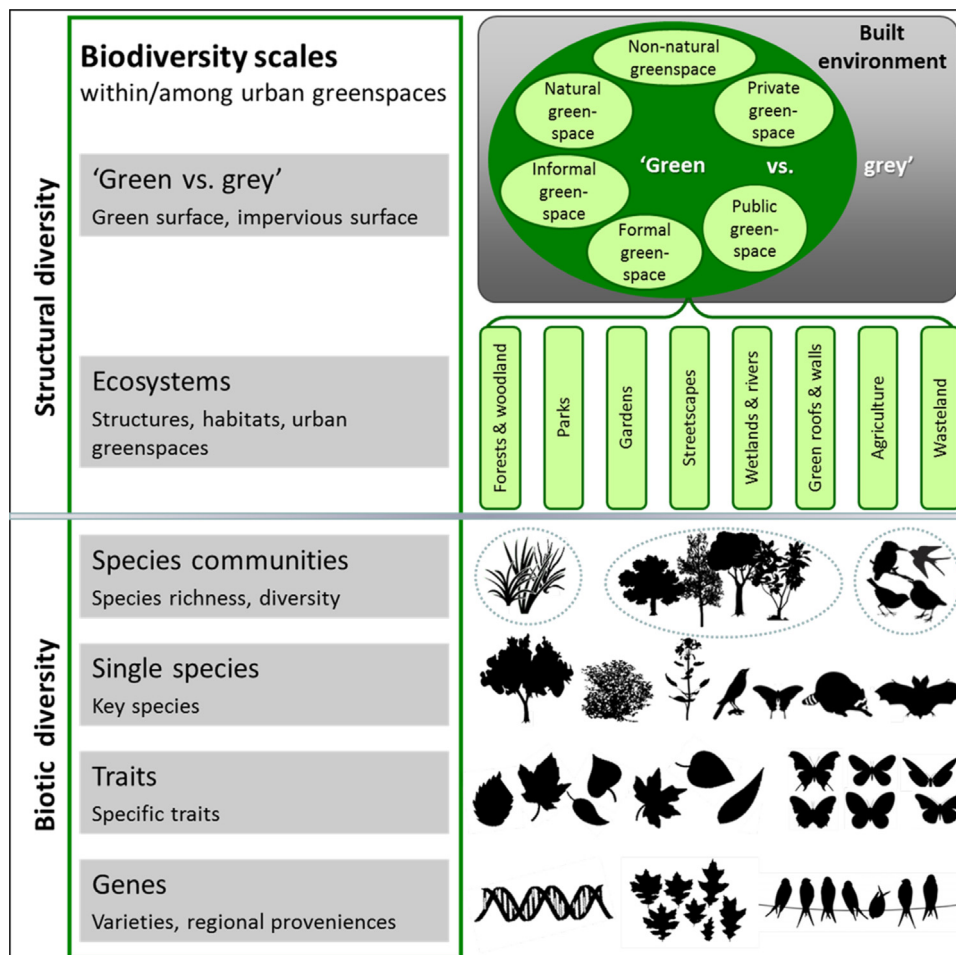


Fig. 1. Conceptual scheme of the six biodiversity scales used to analyse the studies on the perception and valuation of urban biodiversity. See Table 1 for more details.

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