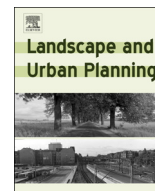




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Research Paper

## Diverging perceptions by social groups on cultural ecosystem services provided by urban green

Maraja Riechers<sup>a,b,\*</sup>, Jan Barkmann<sup>b,c</sup>, Teja Tschardt<sup>a</sup><sup>a</sup> Agroecology, Department of Crop Sciences, Georg-August-Universität Göttingen, Grisebachstraße 6, 37077 Göttingen, Germany<sup>b</sup> Environmental and Resource Economics, Department of Agricultural Economics and Rural Development, Georg-August-Universität Göttingen, Grisebachstraße 6, 37077 Göttingen, Germany<sup>c</sup> Hochschule Darmstadt – University of Applied Sciences, Fachbereich Gesellschaftswissenschaften, Germany

## GRAPHICAL ABSTRACT



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## ABSTRACT

Global environmental and social changes will have great impact on the development of cities in the coming decades. Impacts of climate change, demographic shifts and conservation of biodiversity should be incorporated into urban green space planning to balance for the increasing development pressure of cities. Urban green spaces provide multiple ecosystem service benefits to diverse social groups. In this paper, we analyzed inhabitant perceptions of cultural ecosystem services provided by urban green spaces in the city of Berlin based on a face-to-face questionnaire ( $n = 558$ ). As analysis tool, we used proportionate cluster sampling and focused on non-monetary statements on the perceived importance of a broad spectrum of cultural ecosystem services. Results show that cultural ecosystem services can be perceived through bundles and that those bundles may have negative influence on each other. The perceived importance of cultural ecosystem services was influenced by spatial and social factors: Older inhabitants living in periurban areas preferred cultural ecosystem services related to nature experiences. Younger inner city dwellers tended to prefer cultural ecosystem services facilitating social interactions. Those diverging perceptions should to be taken into account through urban development strategies to create a socially just and sustainable city planning in the face of global environmental changes. The ecosystem service framework can be one tool to facilitate a more participatory planning process to find solutions for urban sustainability challenges.

\* Corresponding author at: Agroecology, Department of Crop Sciences, Georg-August-Universität Göttingen, Grisebachstraße 6, 37077 Göttingen, Germany.  
E-mail addresses: [Riechers@leuphana.de](mailto:Riechers@leuphana.de) (M. Riechers), [jan.barkmann@h-da.de](mailto:jan.barkmann@h-da.de) (J. Barkmann), [tschar@gwdg.de](mailto:tschar@gwdg.de) (T. Tschardt).

## 1. Introduction

More than 50% of the world population lives in cities (World Bank., 2013), in Europe this percentage already amounts to 76% (World Bank., 2016). These percentages are expected to grow, prompting unprecedented challenges for sustainable urban development (Seto, Guneralp, & Hutyra, 2012; Niemelä, 2014). One major aspect of sustainability in cities is the presence of urban green spaces, which contribute positively to urban quality of life through an increase of biodiversity, improve urban microclimate and decrease of pollution and noise (e.g. Bolund & Hunhammer, 1999; Bowler, Buyung-Ali, Knight, & Pullin, 2010; Faehnle, Bäcklund, Tyrväinen, Niemelä, & Yli-Pelkonen, 2014). Other benefits of urban green spaces are the improvement of the overall health, especially through the provision of recreation and relaxation possibilities (Konijnendijk, 2008; Jennings, Larson, & Yun, 2016). By providing possibilities for passive and active recreation in urban green spaces, ecosystem services contribute greatly to urban quality of life (Byrne & Wolch, 2009). However, due to the growing number of inhabitants, urban green spaces are under severe development and use pressure. Shrinking city budgets, low priority on green space development and urban densification can cause balancing difficulties for green space planning. As growing populations demand more space for housing and industrial areas, these demands present substantial challenges to green space planning (Bolund & Hunhammer, 1999; Chan et al., 2007; Seeland, Dübendorfer, & Hansmann, 2009).

To enhance the social and economic productivity of green spaces and the provided ecosystem services, urban green space planning needs to account for the heterogeneity of urban areas. Many studies use a variety of approaches and disciplinary perspectives to analyze urban green spaces (Bertram & Rehdanz, 2015). The concept of ecosystem services developed by the Millennium Ecosystem Assessment (MEA, 2005) can add to the existing literature through a more comprehensive assessment (Daniel et al., 2012), while enabling cross-country and international comparisons (MEA, 2005; TEEB, 2010). Cultural ecosystem services (CES) can be defined as “ecosystems’ contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships” (Chan et al., 2011:206). They refer, inter alia, to aesthetical, educational and religious human–ecosystem relationships (MEA, 2005). CES are still under-researched especially in urban areas, yet will become increasingly important for human well-being in urban environments (Guo, Zhang, & Li, 2010; Radford & James, 2013). Research on CES often uses the overarching term of “cultural services” without distinguishing further or focusses on concepts such as “recreation and tourism”. Limited knowledge exists on how differing social groups value a holistic set of services from urban green spaces (see exceptions by e.g. Chiesura, 2004; Kabisch & Haase, 2014). Social groups perceive nature based on their culturally defined value and belief systems (Faehnle et al., 2014; Friggens, Raish, Finch, & McSweeney, 2014), hence, many previous studies on ecosystem services pointed at difficulties to assess and value CES quantitatively (Daniel et al., 2012; Plieninger, Dijks, Oteros-Rozas, & Bieling, 2013). This is especially challenging in the urban setting, where various green space types, social groups and user demands occur at the same time (Gómez-Baggethun & Barton, 2012). Even though nature-based solutions to environmental problems are usually implemented by policymakers, research shows that experts’ and laypersons’ understanding of CES can differ (e.g. Riechers, Noack, & Tscharnatke, 2017). To account for those difficulties we show the opinion of the general public using face-to-face questionnaires to account for personal, contextual and spatial influences on urban CES importance (e.g. Oteros-Rozas et al., 2014).

Urban planners and decision-makers are in need of new planning/development strategies to guarantee the sustainability of their green spaces. We therefore aim in our study to answer 1) how CES are perceived in Berlin, 2) whether and how ten different CES suggest contrasting preferences between the services and 3) assess how the socio-

demographic status influences the perceived importance of the different CES features. The expected future global changes will affect urban ecosystems and their service provision and pose new challenges for the already tight budgets and contrasting demands cities face regarding urban green space development. Understanding inhabitants’ awareness of ecosystem service provisions and their perceived importance holds promise for informing effective planning and design (Jim & Chen, 2006).

## 2. Methods

### 2.1. Study site

Our study area was Berlin, capital city of Germany and one of its 17 federal states (*Bundesländer*). With 892 km<sup>2</sup> and 3.5 million inhabitants in 2013, Berlin is Germany’s largest and most populated city. The boroughs (*Bezirk*) of Berlin have a population density ranging from 13,818 inhabitants/km<sup>2</sup> (Friedrichshain-Kreuzberg) to 1466 inhabitants/km<sup>2</sup> (Treptow-Köpenick) with even more pronounced differences at the district (*Ortsteil*) level (in 2013, Amt Statistik Berlin-Brandenburg, 2014). Districts also show a great variety of socio-demographic factors such as age and migration background (Kabisch & Haase, 2014). In Berlin, demographic predictions estimate an increase of 250 000 inhabitants until the year 2030 (Senatsverwaltung für Stadtentwicklung und Umwelt, 2015). Social groups such as elderly people and inhabitants with migration background are expected to grow by 29% and 26%, respectively, until 2030 (Senatsverwaltung für Stadtentwicklung und Umwelt., 2012b).

In total, 44% of Berlin is covered by green spaces or bodies of water. The city aims to provide 6 m<sup>2</sup> of urban green space per person (Senatsverwaltung für Stadtentwicklung und Umwelt, 2013). While the aim is mostly reached, green spaces are distributed unequally among the city. Outer districts that have been incorporated into Berlin through urban sprawl contain large amounts of urban green spaces (about 35 m<sup>2</sup> per person) (Kabisch & Haase, 2014). Berlin’s development, including the green spaces, has been shaped by its turbulent history. Many green spaces are located along the former line of the Berlin Wall. Another example is the no longer used airport Tempelhofer Feld in the city center that provides a 300 ha open green space with multiple, often bottom-up use patterns. Berlin is a city that recently incorporated various programs and policies that aim for a greener, more sustainable city (see description in Thierfelder & Kabisch, 2016). With its current Urban Landscape Strategy, the Berlin Senate Department of Urban Development and the Environment implemented a general orientation that aims to further develop socially and environmentally conscious urban green spaces (Senatsverwaltung für Stadtentwicklung und Umwelt., 2012a). In Berlin, the green space planning is structured and developed by the Landscape Program/Species Conservation Program that has been implemented in 1994 and the Land Use Plan. Those two approaches are the base for the city-wide green space planning. Through established policies such as the Urban Development Plan, the Biodiversity Strategy and the Urban Landscape Strategy, Berlin aims to support sustainable development and to include differing perspectives on urban green spaces (Senatsverwaltung für Stadtentwicklung und Umwelt, 2015; overview in Thierfelder & Kabisch, 2016).

### 2.2. Research design and data analysis

This is a study on 10 categories of urban CES based on face-to-face questionnaires done in the city of Berlin. Prior to the questionnaire development, we conducted a qualitative study to uncover perceptions of CES provided by urban green spaces using semi-structured interviews with Berlin inhabitants and experts ( $n = 41$ ; see Riechers, Barkmann, & Tscharnatke, 2016 for details). This resulted in an adjustment of the Millennium Ecosystem Assessment CES categories (MEA, 2005:40) to the urban context and to locally specific perceptions of Berlin

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