



# Contextual variations in perceived social values of ecosystem services of urban parks: A comparative study of China and Australia



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## ABSTRACT

Parks are an integral part of urban environment which provide a range of ecosystem services. While a great deal of efforts has been invested to investigate monetary and biophysical benefits of natural ecosystems, very few studies have explored socio-ecological values of urban parks. Comparative studies of ecosystem services from urban parks between multiple countries are even rarer. To address this research gap, we have compared users' perceptions of ecosystem services of two major urban parks in China (Dufu Cottage, Chengdu) and in Australia (Kings Park, Perth). Using an ecosystem services framework, we explored three key questions: (i) which ecosystem services are perceived to be most important? (ii) what are the trends of ecosystem services provided by the park? and (iii) which demographic and socio-economic factors influence users' perceptions most? We observed that there is no substantial difference in users' perceptions (in terms of importance and trend) of ecosystem services between two countries, except for microclimate service. Respondents in Dufu Cottage perceived microclimate as the most important service while in Kings Park, a number of services (e.g., aesthetic, habitat and recreational) received almost equal importance. Almost two-thirds of the respondents have perceived an increased level ecosystem services over the last five years. Various socio-demographic factors, such as gender, age, income level and frequency of visits influenced users' perceptions most significantly. These results have critical implications in designing more environmentally sensitive as well as user-oriented urban parks.

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## 1. Introduction

The ecosystem services (ES) framework is now increasingly used in environmental management and conservation research. It defines the “characteristics and functional process of the natural environment that provides benefits to sustain and fulfil human life” (Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012 p. 164). In other words, ES “seeks to identify, describe, and quantify the importance of natural landscapes” such as urban parks (Brown, 2013 p. 58). The Millennium Ecosystem Assessment (2005) identifies four broader categories of ecosystem services: provisioning services (e.g., food, fuel, and timber); regulating services (climate and flood control); cultural services (e.g., recreational, spiritual, and aesthetic values) and supporting services (e.g., pollination, population control and soil formation) (Oteros-Rozas et al., 2014). These services “affect human well-being through impacts on security, the basic material for a good life, health, and social and cultural relations” (MEA, 2005 p. 5). The UNESCO World Heritage Conference (2003) and

Millennium Ecosystem Assessment (2005) further recognise the holistic perspectives of social value of nature and emphasise on better understanding of human-nature relationships in terms of culture, people and place (Turner & Daily, 2008; Raymond et al., 2009). Within urban context, a better understanding of ecosystem services “undergoing dynamic changes is required to meet sustainability and resilience goals in urban policy and planning” (Campbell, Svendsen, Sonti, & Johnson, 2016 p. 34).

ES have three major values: economic, place-based and social values or local ecological knowledge (Raymond et al., 2009; Brown, 2013; Oteros-Rozas et al., 2014). Economic valuation denotes monetary pricing of the ecosystem services whereas place-based valuation is more concerned with spatial distribution of resources and their benefits to the society. Both economic and place-based valuations underpin the process related to different forms of land use (Brown, Montag, & Lyon, 2012). Social values of ES, on the other hand, are defined as human perceptions of qualities and benefits of natural landscapes. An in-depth review of ES literature suggests that a great deal of efforts has been invested in order to investigate monetary and biophysical benefits of natural ecosystems, but very few studies have explored more intangible socio-cultural perceptions and preferences (Martín-López et al., 2012; Oteros-Rozas et al., 2014; Villamor, Palomo, Santiago, Oteros-Rozas, &

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Hill, 2014). Discussion on relative importance of ecosystem services defining the relationship between people and place is also quite limited (Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012).

Local knowledge on ES could play a critical role in determining future course of conservation and management of urban green areas or open spaces (Lynam, De Jong, Sheil, Kusumanto, & Evans, 2007; Cowling et al., 2008). Manzo (2005) indicates that seeking users' perceptions about natural ecosystems is a meaningful way to identify degraded areas and management options. It is contended that such perception shapes individual's motivation to contribute in local conservation. According to the Theory of Reasoned Action, human attitude and behaviour are basically driven from one's evaluation of natural resources which can be either positive or negative (Ajzen & Fishbein, 1980). Raymond et al. (2009) define local knowledge "as critical in developing place-based solutions to societal problems" (p. 1313). For example, local knowledge and users' perceptions have immense importance in determining options for activating and managing urban parks. Kumar and Kumar (2008) further show that ES can be varied due to place and scale differences. However, it is evident from literature that a wide range of studies focussed on individual case studies and do not demonstrate the contextual implications of ES of urban green areas or parks (Kline et al., 2013; Asah, Guerry, Blahna, & Lawler, 2014).

To contribute to this knowledge gap, this study investigates the contextual difference of users' perceptions of ecosystem services from urban parks. Based on a survey and perception analysis of visitors in two key urban parks in China and Australia, we have investigated and compared two different, developing and developed countries, contexts. In this process, effort is made to understand the local significance of socio-economic factors influencing variations in users' perceptions. The aim of the study is to qualitatively explore how the respondents perceive the importance of the parks and use those facilities in reality (Asah et al., 2014). The users' perception survey allows us to answer four key questions: (i) which ecosystem services are perceived to be most important? (ii) what are the trends of ecosystem services provided by the park? (improved or degraded over the last 5 years) and (iii) which demographic and socio-economic factors influence users' perceptions most?; and (iv) what are the key differences in perceptions of the visitors between the two parks?

## 2. Understanding ecosystem services of urban parks

Urban parks are an integral part of the complex urban system which has significant environmental, social and economic functions (Tyrväinen, 2001; Lütz & Bastian, 2002; Li, Wang, Paulussen, & Liu, 2005). Large urban green patches are maintained for various reasons, such as environmental sustainability, reduction of urban heat island effects, enhanced land value and a range of social, psychological, aesthetic and health benefits. It is noted that "the urban forest [green areas] and its associated ecosystem services allow for the consideration of the broader issues of climate change, urban heat island effects and population growth" (WAPC, 2014 p. 1). Apart from long term climatic impacts, loss of urban vegetation adversely affects local air temperature. Empirical studies suggest that dense vegetation and large tree canopy on the streets improves local thermal environment and stop aggravating 'heat island' effects and thus promote urban cooling, carbon sequestration, air and water pollution remediation (e.g., Fernández-Juricic, 2000; Kenneth, Innes, Martin, & Klinckenberg, 2005; Cavanagh & Clemons, 2006; Deng, Song, Chen, & Rong, 2008).

A range of literature demonstrates social and economic benefits of urban greenery. Kuo and Sullivan (2001) found people in buildings surrounded by urban parklands socialised more with neighbours, had a stronger sense of community and felt safer. Ulrich (1984) found exposure to greens reduced stress (measured by reduced blood pressure/muscle tension) (cited in Brunner & Cozens, 2013). Finally, the proximity of urban parks and open spaces influences potential homebuyers/renter decisions and affects real estate market structure (Jensen et al.,

2009). These studies suggest that people with different backgrounds (such as socio-economic conditions, ethnicity and gender) could perceive ecosystem services provided by urban parks differently. However, an understanding of interrelationships between the socio-economic characteristics of the users and their perceived ecosystem services provided by the urban parks are quite limited in the literature (Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012; Sherrouse, Clement, & Semmens, 2011).

There are two main streams of comparative studies: studies relying on data collected from different sources and fitting in regression-based or econometric models [some relevant examples are Ehrhardt-Martinez, Crenshaw, and Jenkins (2002), Clausen and York (2008), DeFries, Rudel, Uriarte, and Hansen (2010) and Misselhorn (2005)] and studies where case-studies are conducted in individual countries and results are compiled in the same framework [some relevant examples in this group are Wang, Brown, Liu, and Mateo-Babiano (2015a), Babigumira et al. (2014), Sunderland et al. (2014), Horton, Colarullo, Bateman, and Peres (2003), Carlsson et al. (2012) and Tait et al. (2011)]. While the first type of studies allow to quickly assess the impact of key variables (for which reliable country-specific data are available), the second type of studies allow thorough examination of selected key variables by collecting primary data. A relevant example is the study conducted by Goličnik and Thompson (2010) where they examined usage patterns of two urban parks in Slovenia and Scotland. Similarly, Wang, Brown, Zhong, Liu, and Mateo-Babiano (2015b) studied the impacts of socio-economic conditions and proximity on access to urban parks in Brisbane (Australia) and Zhongshan (China). However, we are not aware of any similar study on to what extent perceptions of ES from urban parks are different in different countries and how they are influenced by the socio-economic condition of the users. In this paper, we aim to contribute to this knowledge gap.

An ecosystem service framework is a useful tool for our purpose. It is frequently used to generate functionally meaningful values of a range ecosystem services (for example, see: De Groot, Wilson, & Boumans, 2002; Millennium Ecosystem Assessment, 2005; EME Spain (EME, 2011); Raymond et al., 2009; Oteros-Rozas et al., 2014; Brown, 2013; Jim & Chen, 2006). Using such a framework, it is possible to systematically explore the relative importance of different types of services (such as biophysical, sociocultural and economic) provided by urban parks. This would ultimately allow us to understand the influence of socio-economic factors on perceptions of ecosystem services from various perspectives. We elaborate our use of an ecosystem service framework below.

## 3. Methodology

We intend to seek both collective and disjointed identification of the services or benefits the users can perceive including relative importance of different services. A disjointed form of identification enables us deeper and nuanced understandings of the users' perception on this topic (Esses & Maio, 2002). A qualitative trend-analysis addressed by the second question provides an insight into the growth and decline of ecosystem services resulting in a valuable input for future policy implications. It is argued that qualitative approach is more suitable for social enquiry rather than a quantitative approach as Asah et al. (2014) point out that "... quantitative approaches may paint a partial picture of people's perceptions, acquisition and use of ecosystem services and consequent management and policy efforts" (p.183).

### 3.1. Population and sample

In this study, we focused on comparing users' perceptions of selected ecosystem services of two major urban parks in Australia and China. We considered major parks located in Perth and Chengdu. Both cities are State Capitals (of Western Australia and Sichuan Province respectively) with comparable level of urbanisation and demand for public open

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