



Citizens' voice: A case study about perceived ecosystem services by urban park users in Rotterdam, the Netherlands

Sophie Buchel^{a,b}, Niki Frantzeskaki^{a,*}

^a Dutch Research Institute For Transitions (DRIFT), Social Sciences Faculty, Erasmus University Rotterdam, Rotterdam, The Netherlands

^b Environmental Policy Group, Wageningen University, Wageningen, The Netherlands

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ABSTRACT

To create a city in which green space is designed to address not only ecological priorities but also user perception, it is essential for planners and policy makers to explore the experiences of urban green space users. This study developed a method to guide the translation of the concept of ecosystem services to citizens. Through a three-step process urban ecosystem services were re-categorized into a subset of directly perceivable services, fine-grained and formed into understandable statements. These statements were presented to urban park users in Rotterdam using Q methodology. Three main user profiles emerged around 'love of nature', 'recreation and connection' and 'social setting and relaxation'. Overall the most valued ecosystem subservice was aesthetic appreciation. Other ecosystem subservices that scored highly were recreation, air quality control and social setting. Awareness of types of users in terms of park perception could aid urban planners in designing user-focused urban green spaces.

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1. Introduction

Urban green spaces deliver valuable ecosystem services to city inhabitants in terms of environmental regulation (Bolund and Hunhammar, 1999; Elmqvist et al., 2013; Ernstson et al., 2010). Urban green spaces can increase the resilience of a city to extreme (weather) events and the effects of pollution (Ernstson et al., 2010; Jansson, 2013). However, a sustainable city is more than ecologically resilient. As Chiesura (2004) reviewed, green spaces in an urban setting increase the wellbeing and quality of life of its inhabitants in many ways, for example by reducing stress and providing a sense of tranquility and health. To city inhabitants the benefits derived from urban ecosystems are not always explicit or evident, since not all of them can be directly perceived by the human senses. It is however important to shed light on which ecosystem benefits are recognized by urban citizens in order to evaluate the perceived value and quality of existing urban green spaces.

It is essential for planners and policy makers to consider the experiences of urban green space users in order to plan and create a city in which green space is designed to address not only ecological priorities but also user demands including also ways to evaluate the performance of these spaces by social and ecological metrics (Jim and Chen, 2006a; Baur et al., 2013). Developing metrics to consider social value of urban green spaces is a very challenging

task. In this paper we address it by conceptualizing perception as a way to understand how social value of urban green spaces can be accounted in specific geographical contexts.

Urban planners and policy makers are increasingly aware of the need to take the citizen (or user) perception aspect of urban nature design and use into account, and there are many different ways in which they attempt to study this subject. In the Netherlands, which is the context of this study, many studies and policy documents regarding nature planning in cities or municipalities have focused on spatial quality and values as indicators nature perception. More specifically, spatial quality is often not very clearly defined (Bulkens, 2006). The Dutch Council of Advice on Spatial Development (RARO) considered spatial quality to consist of at least these three key values: use value, experience value, and future value (RARO, 1990). This classification of values can be found in several other publications with or without links to policy and planning (Bulkens, 2006). Another classification of spatial quality is that of the Nota Landschap as described by Van Zoest (1994) and developed for landscapes in general, not limited to cities. Van Zoest explains landscape quality as "the degree to which the physical characteristics of the landscape connect to the pattern of interests – needs, values – of the user or user group".

Environmental psychology has also looked at the way in which people observe and value their surroundings. Environmental psychologist Coeterier (in Dijkstra and Klijn, 1992) states: "Quality of surroundings is more than just spatial quality. It also includes developments in time, forms of maintenance, sensuous experiences, use and use options, etc." In the context of spatial quality, there are

* Corresponding author.

E-mail address: n.frantzeskaki@drift.eur.nl (N. Frantzeskaki).

many thoughts and theories on the way people value their natural surroundings. One example is given in [Paasman et al. \(1999\)](#), stating that people value nature because it enables them to escape from their everyday reality. As such, urban ecosystems create oases where people can recover their mental strength and vitality ([Kaplan and Kaplan, 1989](#); [Andersson et al., 2014a,b](#); [Berman et al., 2008](#)).

1.1. Perceiving urban ecosystem services

Quality and values are interpreted in many different ways, described with varying terminologies, and are often determined by scientists and planners without a clear translation to or from citizens' perception. Studies in this trend map preferences, attitudes or values of citizens, like that of [Reneman \(1999\)](#). He showed the preferred types of natural (rural) areas by citizens, and showed that people preferred those intrinsic characteristics of nature that they cannot experience in their daily surroundings, e.g. high valuation of silence and tranquility by urban residents ([Bulkens, 2006](#)).

User perception is one indicator of place-based ecological knowledge ([Fagerholm et al., 2012](#); [Plieninger et al., 2013](#)). User perception of urban green spaces has been examined by measuring the users' self-reported behavior and values. Perception has mostly studied through value-attitude or attitude-behavior linkages, seeing as attitude cannot be measured directly. In this context attitude is seen as "a learned and summary evaluation that influences thoughts and actions" and values are "consistent knowledge and belief about the worth and importance of an object" ([Balram and Dragićević, 2005](#)). Many studies with this aim use structured questionnaire survey methods.

[Chiesura \(2004\)](#) uses a survey method to gather value-attitude results about motives for nature and emotional dimension and perceived benefits in the Vondelpark in Amsterdam, the Netherlands. The three most prevalent motives for nature were 'to relax', 'to listen and observe nature', and 'to escape from the city'. 'Freedom' was the most reported feeling, followed by 'unity with nature'. When asked to score the importance of these feelings to their daily wellbeing, 94% of respondents rated them important to essential.

[Jim and Chen \(2006a\)](#) used a survey to study knowledge and perception of ecosystem services in urban green spaces in Guangzhou, China. The majority of respondents rated ecosystem services as important to very important. Most ecosystem functions that are psychologically remote to citizens, in comparison to health and comfort benefits, got low scores in the survey. This supports the scope chosen in the current study, which excluded ecosystem services that cannot be directly perceived.

[Chen et al. \(2009\)](#) used a survey to study aesthetic user preferences in Hangzhou Flower Garden in Hangzhou, China. Respondents identified the most important reasons for their appreciation of the garden to be 'scenic beauty', 'a suitable environment to relax', and 'peace with nature'. This study shows that even when studying a limited element of an urban green space (in this case aesthetic perception), it is valuable to look at the wide range of aspects this element contains. The current study tries to take this into account by fine-graining the ecosystem services studied.

The abovementioned studies and fields of research show the value of studying user perception of urban green spaces, and the wide range of methods in which perception can be measured. Often these methods come from a landscape design perspective. Rather than focusing on the perception of landscape design and use aspects, we aim to understand user perception of the natural benefits of urban parks. For this reason the current study uses the ecosystem services framework rather than spatial quality frameworks. The ecosystem services framework is also increasingly used in city planning ([Rieke et al. 2015](#); [McPhearson et al., 2014](#); [Kabisch, 2015](#)), but the link to urban green space user perception is often not made directly. In research the ecosystem services framework and

urban nature perception are also not well integrated, although some of the abovementioned value-attitude studies ([Chiesura, 2004](#), [Jim and Chen, 2006a](#)) make valuable steps in this direction. We aim to integrate user perception into existing frameworks of ecosystem services and benefits, and develop a methodology to objectively measure this perception qualitatively.

1.2. Mapping perceived ecosystem services within local context

[De Groot et al. \(2010\)](#) present the cascade model; a framework that provides a structural way of linking ecosystems to human wellbeing. This model is valuable to our study because of its step-by-step representation of the links between ecosystems and ecosystem users. The cascade model states that from the biophysical structures and processes of an ecosystem, ecosystem functions arise. Ecosystem functions are defined as the "capacity of ecosystems to provide goods and services that satisfy human needs, directly and indirectly" ([De Groot et al., 2010](#)). These ecosystem functions generate ecosystem services, which in turn provide people with benefits (e.g. nutrition, health, pleasure).

Benefits however are then linked to values, or more specifically benefits, finally, could be given a value in monetary terms if needed. What we add to this conceptualization is the analytical step of translation: Benefits translated into values via perception.

Experience and recognition of ecosystem benefits differentiate perceived from non-perceived benefits. The starting point of our study is that *perception of ecosystem value is the experienced and recognized ecosystem benefits by humans in their local context*. As such, perception is a contextually dependent variable to consider for understanding human-nature interrelations.

In cities, urban parks are the urban ecosystem 'elements' of interest since they are the places in which urban citizens relate with nature in cities ([Andersson et al., 2014a,b](#); [Andersson, 2015](#)). A user of an urban park directly experiences and recognizes the benefits only of a fraction of the ecosystem services the space provides. The user could, for instance, experience a cooling effect in the air compared to the urban areas surrounding the park, but the user will not directly perceive the carbon sequestration and storage by trees in the park. [Fig. 2](#) illustrates which ecosystem services can or cannot be experienced directly by urban green space users. Supporting services are at the basis of the regulating and provisioning services and make it possible for them to function well. People cannot perceive them directly. Only some of the provisioning and regulating services can be directly perceived by users. The green spaces studied determine which of these specific services are relevant to the local context. In other words, a context-dependent translation process mediates between the ecosystem services and how people perceive them. We reposition and enrich the cascade model to represent this intermediate social-cultural process in [Fig. 1](#). Our study focuses on urban parks, and the relevant ecosystem services in [Fig. 2](#) were filtered accordingly.

Furthermore, we propose a distinction in the cascade model between cultural ecosystem services and other ecosystem services. Cultural ecosystem services are often characterized as subjective ([Daniel et al., 2012](#)). We go one step further and conceptualize that cultural ecosystem services arise from human perception of the ecosystem, rather than from the ecosystem itself ([Andersson et al., 2015](#); [Kaplan and Kaplan, 1989](#)). Although the ecosystem services framework inherently categorizes those aspects of ecosystems that serve humanity, the functions underlying the provisioning, regulating and supporting services are produced by the ecosystem regardless of human perception or interaction. Without human perception however, cultural services would not exist. They come into being when people perceive nature and interpret nature and its effect on their wellbeing. Cultural services are not tangible and therefore

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