



Research paper

Contrasting collective preferences for outdoor recreation and substitutability of nature areas using hot spot mapping



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HIGHLIGHTS

- We explore the duality between collective preferences for outdoor recreation and substitutability of recreational sites.
- We investigate the substitution question in stated preference nature valuation from the respondents perspective.
- We use public participation GIS (PPGIS) for data collection.
- We use local indicators of spatial association and kernel density mapping to map outdoor recreation hot spots.
- We provide environmental planners with insightful information related to people's recreational activities.

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ABSTRACT

This paper investigates one specific cultural ecosystem service: outdoor recreation. We present a method to map the collective preferences for outdoor recreation and to identify the substitutability among nature sites in the context of the province of Antwerp, Belgium. We propose an indicator of substitutability among nature areas, contrasting unique but poorly substitutable sites (hot spots) with highly substitutable sites (cold spots). Using a combination of survey information, public participation GIS (PPGIS) and kernel density mapping, we produce density surfaces representing the distribution of the collective preferences for outdoor recreation and identify the spatial characteristics of the market (e.g. extent, discontinuities) for outdoor recreation. We also compute Getis-Ord G_i^* spatial statistics to identify local outdoor recreation clusters. In addition, we explore how recreational behaviour affects substitutability. Our results suggest a duality between the social value of outdoor recreation and the level of substitutability among nature sites. Highly substitutable sites tend to be found near areas of higher population density, which are as well highly visited sites. The type of recreational activity – hiking, cycling, dog walking or jogging – appears to substantially modify substitutability patterns among nature sites. We conclude by discussing the methodological implications of this research in the context of stated preference ecosystem service valuation and stress several policy-related implications.

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1. Introduction

In heavily urbanised regions like Flanders (Belgium), nature remnants are increasingly recognised for their cultural ecosystem services (De Valck et al., 2014; MEA, 2005), especially for their

recreational potential. Outdoor recreation has long been studied and is considered as one of the most important cultural services (Hanley, Shaw, & Wright, 2003). Yet some questions remain overlooked: What types of natural areas do people visit exactly? Where are they located? Why do people go there? Can nature areas be easily substituted one for another? In short, how does the spatial context influence recreationists?

In stated preference (SP) studies for nature valuation it has been demonstrated that controlling for the spatial context of the good being valued was essential to reduce the risk of biased estimates

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(Boxall, Adamowicz, Swait, Williams, & Louviere, 1996) and to improve the transferability of value functions (Bateman, Day, Georgiou, & Lake, 2006; Bateman et al., 2011). The availability of substitute sites is generally recognised as one of the most common sources of spatial heterogeneity in SP studies (Pellegrini & Fotheringham, 2002; Schaafsma, Brouwer, Gilbert, van den Bergh, & Wagtendonk, 2013; Schaafsma & Brouwer, 2013). Peterson, Stynes, Rosenthal, and Dwyer, (1984) define two groups of substitution studies: (i) leisure activity substitution and (ii) site substitution. Here we are only interested in exploring the latter, also known as 'spatial substitution'. Substitution has been included in a large variety of models, such as gravity models (Ewing, 1980), count data models (Hausman, Leonard, & McFadden, 1995), destination choice models (Thiene & Scarpa, 2008), travel cost models (Moons, Saveyn, Proost, & Hermy, 2008), hedonic pricing (Tyrväinen & Miettinen, 2000) or SP models (Cummings et al., 1994; Hoehn & Loomis, 1993).

However, despite the rich body of literature attempting to control for the substitution effect, few studies actually confront that issue directly. Substitution is often approached from the site perspective rather than from the recreationist perspective, leaving the analyst the responsibility to select eligible substitutes. Similarly, the level of substitutability among recreational destinations is often not considered (Lo, 1991), assuming homogeneous consumer preferences and perfectly substitutable destinations.

The individual-specific dimension of the spatial context to control for is generally overlooked. Moreover, past research on spatial cognition (Cadwallader, 1981; Lloyd, 1999) and mental mapping (Soini, 2001) has demonstrated that perception could substantially distort the spatial context. Likewise the 'landscape experience', driven by each individual's perception of nature, is still poorly covered regarding its potential impact on recreation (Hunziker, Buchecker, & Hartig, 2007; Hunziker et al., 2008; Kaplan and Kaplan, 1989).

We argue that controlling for substitutes to improve the reliability of a value function in SP research should imply the collection of local and relevant information about the spatial context of the site being valued prior to the valuation exercise. This implies the definition of the market for outdoor recreation and the assessment of the substitutability between eligible nature destination sites within that specific spatial context. As the human decision-making process is central to the question of choosing a recreational destination, one should also have a clear idea of the recreational behaviour of the people valuing the site prior to claiming that substitutes are appropriately controlled for. This means that information should be collected about local residents in order to help the definition of relevant substitutes.

In this paper, we aim (i) to map collective preferences for outdoor recreation and (ii) to identify the substitutability of nature sites within a specific spatial context. Note that 'recreation' should not be confused here with tourism. We define 'recreation' as a leisure activity implying a maximum of a 1-day trip with no overnight stay at the destination site, contrary to 'tourism' that does imply an overnight stay (Neuvonen, Sievänen, Tönnnes, & Koskela, 2007). Our goal is to better understand where eligible nature recreational sites are collectively identified by local residents and why people recreate there. This will enable a more accurate definition of substitutes for the primary site under valuation and, in turn, improve the reliability of value functions calculated for that site. In addition, we will develop a better understanding of the importance of certain nature areas in delivering cultural ecosystem services.

We conduct an Internet-based survey involving public participation GIS (PPGIS). PPGIS is a spatially-explicit method for capturing information originating from local survey respondents (Sieber, 2006). Respondents are asked to locate up to three of their latest outdoor recreational destinations on a dynamic map. Along with this mapping exercise, we collect socio-demographic infor-

mation about these respondents and question them about their recreational behaviour: frequency of visits, type of activity, total time spent recreating, etc. Using a technique called 'hot spot analysis', we present the supply of outdoor recreation substitutes for respondents located in the province of Antwerp, Belgium. Spatial planners are currently looking for solutions to meet the increasing demand for outdoor recreation in this peri-urban context, which makes the province of Antwerp an ideal study case.

Thanks to a combination of local and global indicators of spatial association, we identify local clustering patterns of site substitutability for different profiles of recreationists and deduce the most popular outdoor recreation destinations as measured through collective preferences. We conclude the paper by discussing the implications stemming from these results, present various applications and propose potential further improvements.

2. Methods

2.1. Case study

The research was conducted in the province of Antwerp (northern Belgium). Compared to the monotonous, flat lands in western Flanders and the densely vegetated province of Limburg in the east, the province of Antwerp presents a diversified landscape. Traditional farmlands stand alongside woodlands, heathlands, moors and wetlands. Most of the province belongs to the Campine region ("De Kempen" in Dutch), a natural region famous for its extensive, anthropogenic heathlands of which a great part is now protected as part of the Natura 2000 network.

Covering most of the western border of the province, the city and the port of Antwerp create the second largest conurbation in Belgium (after Brussels). With ~1.8 million inhabitants and 609 inhabitants/km² (Belgian Federal Government, 2013a), Antwerp is the most populated Belgian province. As a consequence of urbanisation, the Campine region is becoming a popular recreational destination among urban citizens looking for nearby nature to escape the city. Local authorities are putting in place a well-connected network of cycling trails and local recreation is expanding rapidly. The progressive transformation of this formerly rural area into a new configuration involving urban, rural and natural areas makes the province of Antwerp an ideal case to study the supply of outdoor recreational sites.

2.2. Data collection

We designed an Internet-based questionnaire for data collection. To test the clarity and respondent-friendliness of the questionnaire, we organised two focus group discussions with Flemish citizens and pre-tested the questionnaire to prevent technical issues. The questionnaire included three sections: (i) warm-up questions; (ii) PPGIS mapping exercise (see next section) and (iii) follow-up questions. The warm-up questions covered socio-demographic characteristics (e.g. age, income, address) and recreational habits. The follow-up questions controlled for the general understanding of the survey.

In February 2014, we sent the questionnaire to a firm specialised in Internet-based survey deployments. The firm used an online research panel of citizens representative of the Flemish population in terms of age, gender, education and income. Respondents were recruited proportionally to the population density of the different municipalities within the province of Antwerp. Respondents were encouraged to participate in the survey by the chance to win a 10€ shopping voucher mentioned in the invitation email.

Our survey was deployed in two stages. A total of 9750 emails were sent and invited recipients to participate in the survey, which

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