Identifying the supply of nature substitutes through hotspot mapping. Evidence from the Province of Antwerp, Belgium

Main theme:

7.9. Cultural ecosystem services: Frontiers in theory and practice

Sub-themes:

2.3. Ecosystem services: debating, valuing, preserving and providing

2.2. Natural resources: management, use and conservation

7.13. Ecosystem services and natural resources of the north – sustainability, values and trade-offs

Summary

In Flanders (Belgium), outdoor recreation in nature is becoming a popular activity in peri-urban areas. Because of the scarcity of natural areas, outdoor recreation is observed in various types of landscapes. In this paper, we combine survey information, GIS and statistics to: (1) better understand people's recreational behaviour, (2) map the supply of nature sites suitable for outdoor recreational activities, and (3) understand how those sites can be substitutes one to another. The analysis focuses on the Belgian Province of Antwerp. The 1201 survey respondents show very informative behavioural patterns. From the 2336 recreational destinations pointed by the respondents, we observe different spatial effects. Spatial regressions are run to explain the characteristics of the recreational substitutes. Our results suggest the presence of context-specific distance-decay effects and corroborate the theory of cognitive distance. Regarding nature substitutes, we observe hotspots inside and outside the borders of the study area.

Extended abstract

Increasing urbanisation is having a drastic effect on the role played by nature in our modern society. As a consequence, nature is getting valued for other reasons than for what it used to be. In heavily urbanised regions like Flanders (Belgium), nature remnants are increasingly recognised for their *cultural* ecosystem services (MEA, 2005), and for recreation in particular. The expanding phenomenon of outdoor recreation is having important impacts on landscape policies. The interface between nature and man-modified areas is, however, poorly understood.

What is exactly that "nature" where people recreate? Where is it located? What do people do there? Outdoor recreation in nature has been studied for many years and in various manners. Yet there is a lack of understanding of what attracts recreationists to one natural site rather than to another site. In the context of nature valuation, it is important to understand how recreational sites compete against each other. Nature is a non-marketed good, which makes it harder to compare nature sites. We need to better understand the different elements that influence a respondent's recreational decision. Exploring respondents' outdoor recreational behaviour is therefore of utmost importance to understand site attractiveness characteristics and infer the supply of nature substitutes.

Past research has demonstrated the need to control for spatial heterogeneity in nature valuation in order to improve the transferability of value functions (Bateman et al., 2006, 2011). Different attempts were made to account for the effects of substitutes and distance, recognised as the two most salient sources of spatial heterogeneity (Schaafsma et al., 2013; Schaafsma & Brouwer, 2013). In the context of stated preference valuation, it appeared that the substitution and distance-decay effects were individual-specific.

Prior attempts to account for substitutes without making it individual-specific forgot an important dimension, being individuals' spatial cognitive capacities. The theory of spatial cognition implies that each individual stores information about their spatial environment in a unique manner which depends on that individual's socio-psychological background (Lloyd, 1999; Soini, 2001). That is, perception may substantially distort the spatial context.

Therefore, we postulate that obtaining accurate information about individuals' outdoor recreational preferences is of great help to identify the supply of nature substitutes they actually consider.

In this research, we present a method to identify the supply of nature substitutes within a specific spatial context. Our goal is to provide an answer to the three following questions: (i) what are 'substitutes'?, (ii) where are substitutes located?, (ii) and (iii) why do people recreate there? We conduct a web-based survey that asks respondents to locate up to three of their latest outdoor recreational destinations on a dynamic map. Along with this mapping exercise, we question respondents about different aspects of their recreational behaviour: frequency of visits, type of activity, total time spent recreating, etc. We also ask respondents questions about what contributes for them to the attractiveness of the natural site(s) they refer to.

The analysis focuses on the Belgian Province of Antwerp. The 1201 survey respondents show very informative behavioural patterns. From the 2336 recreational destinations pointed by the respondents, we observe different spatial effects. Using a technique called "kernel density mapping" to relate destination points, we observe substitute "hotspots" inside and outside the study area, depending on the search radius that is imposed.

Inside the study area, we observe that the supply of nature substitutes takes different configurations when applying three different configurations for the kernel distribution (search radiuses of 10km, 5km and 2.5km). These three configurations intend to approximate three levels of geographic neighbourhood: province, district and local levels. We note the presence of "edge effects" every time near territorial and geophysical boundaries. That is, the density of recreational visits drops drastically when crossing the province borders, the national border or the Western edge of the Province (Scheldt River). Outside the study area, we observe several hotspots generally well-known for being popular for recreation: the Belgian coast, Zeeland (Netherlands), Limburg, and the Ardennes.

Destination sites located at equal distance from a respondent's home but situated within different geographic entities show dissimilar visitation rates. This suggests that the distance-decay effect is context-specific and made more complex due to the presence of spatial obstacles. This corroborates the theory of cognitive distance stating that individuals are heavily affected by the spatial context when trying to remember destinations and evaluate distances.

Consequently, additional factors such as the type of recreational activity, the frequency of visits and the perceived quality level of the nature sites play a significant role in determining eligible substitutes. We observe a diversity of recreational behaviours corresponding to different groups of recreationists. For instance, joggers and dog walkers are often constrained by their activity which obliges them to recreate in their close neighbourhood. On the contrary, recreational hikers and cyclists are experience-driven. They tend to cover significantly larger distances to reach certain nature sites that will allow them to enjoy a particular experience.

Different spatial regressions are run to explain the characteristics of the recreational substitutes. We explore the effect of the population density, the distance to the closest large cities, and the distance to some natural sites on the location and characteristics of the hotspots. Finally, we compare results for different groups of recreationists, different frequency of visits and different distance groups to nuance our conclusions.

References

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