

VGI crowdsourcing of recreational use patterns and experiential place values for national park planning in Denmark

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Introduction and study purpose

A growing number of studies are exploring new participatory mapping approaches focused on visitor monitoring for protected area planning and management. Such participatory mapping approaches make use of different types of Volunteered Geographic Information (VGI) derived from e.g. public participatory GIS (PPGIS) and social media activities. In general, the potential of such approaches are believed to be promising in terms of revealing recreational use patterns and experiential place values. In addition, studies have documented good accordance between social media activities and official visitor counts, highlighting the potential of rapid and inexpensive social media based visitor monitoring for protected areas (Wood et al 2013, Levin et al 2017, Tenkanen et al 2018, Walden-Schreiner et al 2018). However, challenges and limitations of such data sources have also been identified including issues of representativeness such as digital divide (Goodchild 2007) and missing socio-demographic information, upload errors and mapping errors, and diverging patterns between social media and official statistics in less visited areas (Levin et al 2017; Tenkanen et al 2018). In general, there seems to be a call for more empirical studies exploring VGI approaches for visitor monitoring in protected areas.

This study seeks out to explore and discuss the potential of VGI approaches by triangulating findings between three PPGIS surveys with different sampling strategies, and findings from a social media VGI study of Flickr photos. Findings from all four studies are focused on a fjord landscape in a new national park situated in Roskilde, Denmark.

Elaborated case presentation

The case study area is a fjord landscape of Roskilde (water area of 60km², 99km coastline). The fjord is a key part of a new national park (2015) around Roskilde city called 'Skjoldungernes Land' with a clear reference to the Viking age. The part of the Fjord included in the park is well-known for its rich water bird life and the Viking ship museum. National parks in Denmark are rather new (first national park inaugurated in 2008), and they are generally characterized as rather multifunctional cultural landscapes with multiple ownerships and relatively low protection. Besides the fjord, the national park in Roskilde includes woodlands, farming landscapes, cultural heritage, urban areas, and outdoor museums.

VGI approaches

This study makes use of data derived from four different VGI approaches. The four approaches are all summarized in Table 1 with focus on both methodological issues and a brief description of highlights and problematic issues.

Table 1. Overview of visitor-based VGI approaches in the study area (Roskilde Fjord). *data collection is still ongoing and hence the number of participants and mapped places are the minimum.

**Harvested Flickr data will need cleaning of upload errors before summarizing.

Study #	Source	Focus	Sampling	#respondents	Mapped places (and routes) in case area	Highlights	Problematic issues
PPGIS #1	Extract from national panel survey	Waterside and water-based recreation	Participants recruited through a panel (gender and age representative at regional level)	93	119 (20)	Recreational use patterns and main activities	Representativeness concerns related to recruiting from a panel. Sampling size. No international tourists
PPGIS #2	Extract from national crowd-sourced survey	Marine recreation (specialized activities)	Participants recruited by invitations to organized users, i.e. members in (clubs) and self-organized members (facebook groups)	96	170 (13)	Recreational use patterns and spatial data on a diversity of marine activities (sailing, kayaking, surfing, hunting, fishing, etc)	Representativeness concerns (age and gender). Sampling size. No international tourists
PPGIS #3	National park survey focused on eco-tourism development	Mapping of self-expressed experience qualities and park narratives (qualitative PPGIS)	Local users recruited by invitations through national park media, and through local associations	69*	261*	Spatial perceived attractions as 'favorite places', 'places you would show to a guest', and 'the heart of the park' enriched by elaborated argumentations (open questions)	Representativeness concerns. Sampling size. No tourists.
Social media VGI	Flickr	Digital photos	Extract of geocoded photos from the Flickr API	(**)	(**)	Spatial patterns of actual visitation. Content analyses of experiential place values (photos and tags). Temporal data.	Representativeness concerns. Possible misinterpretation. No socio-demographic data. No division between locals and tourists.

Results and conclusions

Recreational use patterns

Overall the four VGI approaches seem to confirm each other in identifying the main recreational use patterns in terms of visitation hotspots and cold spots in the study area. Mapping of places from all VGI approaches are foremost clustered in waters near recreational harbours next to urban communities, as well as clustered along accessible parts of the coastline (public roads/trails, viewpoints, and boat jetties). However, deviations

between the VGI approaches were also present. No official visitor information is available; hence it's not possible to compare these results with external data.

Experiential place values

The extracts from the crowd-sourced national PPGIS survey on marine recreation (PPGIS #2) revealed a diversity of marine recreation activities on the Fjord. Furthermore, the qualitative PPGIS approach (PPGIS#3) highlighted bottom-up perceived attractions by rich individual place-based expressions and narratives which overall was somewhat comparable to content analysed categories of photos from Flickr.

Planning implication perspectives and conclusions

We argue for the need for building a rigor, scientific, and trustworthy visitor monitoring system of Danish national parks. Such a visitor monitoring scheme is needed in order to secure the basis for a balanced use and protection planning, as well as securing a base for evaluation of the multiple planned programs focused on increasing and improving nature-based outdoor recreation and nature-based tourism opportunities in the coming decades. Danish national parks are challenged by being complex cultural landscape conglomerates consisting of different ownerships, land uses and attractions which are not easily monitored by a single methodological approach. Ideally such a future visitor monitoring scheme will need to cover multiple different visitor monitoring and mapping techniques in order to produce reliable and valid visitor information. We argue for the use of social media VGI and PPGIS in this work. VGI approaches cannot stand alone, but will be able to provide a much needed overview of visitor use patterns and experiential place values. Furthermore, this study shows how using multiple VGI approaches makes it possible to conduct cross-analyses and thereby more reliable results, which is severely needed in times of missing official visitor data of Danish national parks.

References

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