

58 Spatial and temporal patterns of visitation: Insights from Flickr images of Chitwan National Park, Nepal

Pragya Bhatt, Catherine Pickering, Griffith University, Australia

Introduction

Nature-based tourism is popular including to many national parks globally (Balmford et al. 2015). To conserve these natural areas and their biodiversity, while facilitating appropriate tourism, it is important to monitor visitors including when they visit, where they go and what they value. Well established monitoring methods including surveys, direct observations, interviews, track counters, ticket sales, permits, indirect observations (e.g., cameras, satellite images) as well as newer methods such as GIS tracking and Public Participatory GIS. In the last few years, social media has started to be used to monitor visitation including in protected areas. One of the most common data sources examined so far is geolocated images posted to the photo sharing platform Flickr (Teles da Mota and Pickering 2020). However, there is very limited research assessing if there is Flickr data available and if it would be useful for parks in developing countries where nature-based tourism is important, economically, socially, and environmentally but resources for monitoring are limited, such as in Nepal.

Here we test how social media could be used to monitor visitation in parks in countries such as Nepal. We analyzed images about Chitwan National Park posted to Flickr, including assessing: 1) when do people visit the Park and how similar are the patterns to ground visitor data, 2) where do people go and how does this vary seasonally and 3) what do people value in the Park.

Methods

Chitwan National Park was the first national park in Nepal and covers 953 km² in the core park and an additional 729 km² in the buffer zone. It is an UNESCO World Heritage Site and is popular with domestic and international tourists. Metadata about publicly available geolocated images in the core and buffer zone of the Park till the end of 2019 were obtained using Flickr's Application Programming Interface (<https://www.flickr.com/services/api>). To

minimise bias from some people posting many images, a maximum of three photographs (the most viewed) per visitor were selected resulting into 1,214 images from 503 visitors for analysis. The number of images were compared with monthly visitor data from the Park webpage (Nepal Government 2021). The geolocation of images was plotted using QGIS to generate the visitor distribution maps for the Park overall, and per season. To explore what visitors valued, word cloud showing the 50 most common words used by visitors in the tags, titles and description of their images was generated online in '<https://www.wordclouds.com>'.

Results

Most images of the Park were taken in the main tourism seasons: autumn (September-November) and spring (March-May) (Figure 1a) and the proportion of images per month were similar to the number of visitors per month (Spearman Rank correlation $r^2 = 0.748$, $p = 0.005$). Visitation in the Park was concentrated with more than half (58%) of the images in the buffer zone and many others in the Sauraha area in the central east of the Park which is the main entrance to the Park (Figure 1c). Although there is clear seasonality in visitation, the spatial distribution of visitors was similar among seasons (Figure 1c). Visitors were found to value wildlife, landscapes and culture with words describing such attributes prevalent in the tags, titles, and description of their images (Figure 1b).

Discussion

This study demonstrates how metadata from geolocated Flickr images can provide insights into visitation to national parks such as Chitwan including when and where people visit and what they value. Such information is useful for planning and maintaining tourism facilities such as trails, accommodation, food outlets, information centres, signs, and drinking water, and minimizing social conflict and impacts on natural resources. The results highlight the potential of social media as an

inexpensive, time-effective, and accurate method in visitor monitoring in natural areas (Rossi et al. 2019) including in developing countries. However, there are important limitations of social media, including that it does not represent all visitors and is more popular with younger, wealthier, and educated people from some countries, different platforms vary in popularity among regions, demographics and countries, and platforms are increasingly restricting access to data, and ethical and privacy issues are important when analysing this and other types of social science data (Hausmann et al. 2018).

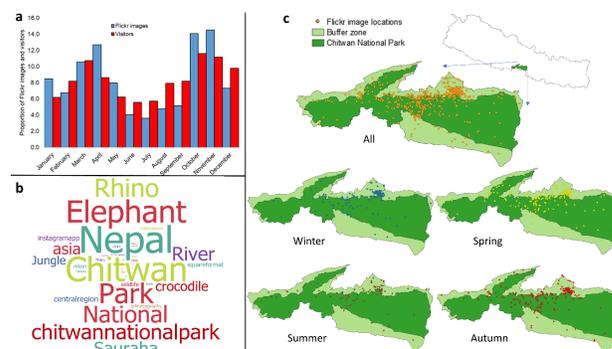


Figure 1: Results from an analysis of metadata associated with 1,214 Flickr images posted by 503 visitors to Chitwan National Park, Nepal: a) Proportion of Flickr images and actual visits per month, b) Word cloud showing the 50 most common words used in the tags, titles, and description of the images, with the larger the size of the word, the often it was used, and c) Location where the images were taken in the Park including per season.

References

- Balmford, A., Green, J.M., Anderson, M., Beresford, J., Huang, C., Naidoo, R., Walpole, M. and Manica, A. (2015). Walk on the wild side: Estimating the global magnitude of visits to protected areas. [PLoS Biology](https://doi.org/10.1371/journal.pbio.1002074), 13(2), e1002074. doi:10.1371/journal.pbio.1002074.
- Hausmann, A., Toivonen, T., Slotow, R., Tenkanen, H., Moilanen, A., Heikinheimo, V. and Di Minin, E. (2018). Social media data can be used to understand tourists' preferences for nature-based experiences in protected areas. [Conservation Letters](https://doi.org/10.1111/conl.12343), 11(1). doi:10.1111/conl.12343.
- Nepal Government. (2021). Website of the Chitwan National Park. <https://www.chitwannationalpark.gov.np/>.
- Rossi, S.D., Barros, A., Walden-Schreiner, C. and Pickering, C. (2019). Using social media images to assess ecosystem services in a remote protected area in the Argentinean Andes. [Ambio](https://doi.org/10.1007/s13280-019-01268-w). doi:10.1007/s13280-019-01268-w.
- Teles da Mota, V. and Pickering, C.M. (2020). Using social media to assess nature-based tourism: Current research and future trends. [Journal of Outdoor Recreation and Tourism](https://doi.org/10.1016/j.jort.2020.100295). 30:100295. <https://doi.org/10.1016/j.jort.2020.100295>.