Landscape permeability for elephant movement

Assessing the cumulative impact of game-proof fences and land management by applying least-cost corridor analyses

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Research context

Study area

- South-west of Etosha National Park (ENP), Kunene Region, Namibia
- habitat to elephants that are bulkfeeders moving over long distances
- communal and commercial farmers engaged in livestock farming, tourism and hunting practices
- human activities incl. game-proof fences restrict elephants to move in search for water, forage grounds and potential mating partners.

Research goals

- 1. Contributing to a better understanding of the interactions between humans and elephants in the study area
- 2. Assessing the cumulative impact of game-proof fences and land management on the landscape permeability for elephant movement







Methods

The study applied an interdisciplinary approach by combining social science perspectives with a geospatial data analysis:

1 Socio-empirical survey

respondents selected by snowball sampling, consultation of 9 experts and 11 local stakeholders, semi-structured questionnaires **2** Participatory mapping

manually on a DIN A1 map, provision of a comprehensive overview on the land use activities and the location of game-proof fences

3 Geospatial analyses

impact assessment of slope, NDVI, fences, management on location of GPS records of 7 collared elephants (provided by MET); suitability analyses to identify suitable habitats as core areas based on home range estimations (Calenge 2019); least-cost corridor analyses (Linkage Mapper by McRae & Kavanagh 2017) for different landscapes to assess the connectivity between core area pairs

Results

Contextualization of variables influencing human-elephant interactions

2 Management patterns and fence locations

Pulse/press disturbances • Climate change: droughts **Conservation policies: Nature Conservation** Ordinance, CITES, Policy on HWC Globalization: beef export **Human variables Elephant variables**



(slope + vegetation availability)

(slope - vegetation availability fences - management)

320,000 - 640,000

measures and activities may have a significant cumulative and far-reaching impact on the permeability for elephant movement and on corridor characteristics.



Theoretical future scenarios (slope + vegetation availability + management + current fences + added fences to the west (S1)/north (S2))

> 640,000

Area within max. 10 cost-weighted km Area within max. 25 cost-weighted km

core areas

Fig. 3: Map of cost-weighted distances depicting corridors where the permeability in different landscapes is high. The general functional connectivity between core area pairs persists, however, corridor locations and their extent change locally.

3. Overarching strategies are necessary in order to avoid that isolated measures only lead to a shift or intensification of conflicts rather than to improved conflict regulation.

Calenge, C. (2019): Home Range Estimation in R: the adehabitatHR Package. URL: https://cran.rproject.org/web/packages/adehabitatHR/vignettes/adehabitatHR.pdf McRae, B. H. and Kavanagh, D. M. (2017) 'User Guide: Linkage Pathways Tool of the Linkage Mapper Toolbox', pp. 1–24 Shaffer, L. J. et al. (2019) 'Human-elephant conflict: A review of current management strategies and future directions', Frontiers in Ecology and Evolution. Frontiers Media S.A., 6, pp. 1–12. doi: 10.3389/fevo.2018.00235

Background photo: Paul Tessier/Stocksy (https://www.nrdc.org/stories/status-check-african-elephants) Elephant photo: Morgan Hauptfleisch

