Abstract Book

IENE 2020
INTERNATIONAL CONFERENCE

LIFELINES
Linear Infrastructure Networks
with Ecological Solutions

ONLINE | 12-14 January 2021

Organisers

UNIVERSIDADE DE ÉVORA

IENE Infrastructure and Ecology Network Europe

LIFE LINES

Infraestruturas de Portugal

Câmara Municipal de Évora

MONTEMOR | O | NOVO câmara municipal

CREDITS

NAME IENE 2020 International Conference "LIFE LINES – Linear Infrastructure Networks with Ecological Solutions" – Abstract Book, January 12 – 14, 2021, Évora, Portugal

EDITORS António Mira, André Oliveira, João Craveiro, Carmo Silva, Sara Santos, Sofia Eufrázio, Nuno Pedroso

PHOTOGRAPHY Luís Guilherme Sousa

PUBLISHER Universidade de Évora

LAYOUT E DESIGN Rui Manuel Belo, Unipessoal, Lda.

ISBN 978-972-778-182-9

DATA January 2021

DOWNLOAD AT https://www.iene2020.info/index.html

RECOMMENDED CITATION IENE 2020 Organising and Programme committees (2021). IENE 2020 International Conference - LIFE LINES – Linear Infrastructure Networks with Ecological Solutions. Abstract Book. January 12 – 14, 2021, Universidade de Évora.

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#2 Dry pathways and flowing water within culverts jointly promote crossings by carnivore mammals

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Roads are linear infrastructures causing high wildlife mortality. Transportation administrations make large investments on mitigation measures to promote safe road crossings by wildlife. Yet, many roads worldwide rely on culverts as the only passages available for fauna even though they were primarily designed to drain water. Indeed, culverts inundate repeatedly, becoming unavailable to most terrestrial fauna during rainy periods. How much this pervasive flooding affects the crossing of culverts by animals remains unknown. This was addressed in an Action of the LIFELINES project (LIFE14 NAT/PT/001081) focusing on the effects of flooding on mammal crossings. In this context, we covered wet and dry seasons along three national roads in the Alentejo region of southern Portugal, to understand if water-related variables (pathway dry width, water cover, and water depth at crossing time) explain differences in the probability of crossing by medium-sized carnivore mammals and if they are correlated with crossing frequency too. We also wonder whether crossing frequencies would be similar between seasons. We hypothesized that carnivores would overall be less likely to cross and cross less often if the culvert had more water (e.g., narrower dry width), possibly leading to more crossings during the dry season. To assess carnivore crossings, we installed track stations inside 30 drainage culverts (out of 307 crossing passages inventoried), which were spaced 2 km apart along the roads. According to the degree of flooding, the plates were raised using roof tiles and stone blocks up to 10 cm or lowered when the culvert was drier. We also developed an evaluation to distinguish animal visits to the culverts from actual crossings and used only the latter for analysis.To further validate our crossing assessments using track stations, we concurrently used infrared cameras in 20 of the culverts. We recorded 1211 crossings, averaging 0.96 and 1.01 crossings / day over the wet season and dry season, respectively. Egyptian mongoose (*Herpestes ichneumon*), European badger (*Meles meles*), Common genet (*Genetta genetta*) and Eurasian otter (*Lutra lutra*) were the species that crossed most. Except for otters, as expected, greater dry widths increased both the probability and the frequency of crossings through the culverts. Dry width was the only significant predictor for the probability of crossing by genets. From our model for all species combined, enlarging the dry width from 0.5mup to 1 or 2m increased the probability of crossing by ~11% and~35%, respectively. Surprisingly, the presence of flowing water within the culverts also correlated positively with crossings by most species in addition to the positive effect of the increase in dry width. For the species most represented in our study, the Egyptian mongoose, contrary to expectations, was more likely to cross culverts when they had ~30 to ~60 % water cover than when they were drier. The significance of the difference in crossing frequencies between wet and dry seasons varied with the species. Broadly, our results show that flooding degree and dry width together influence the probability and frequency of crossing by these carnivore species.

KEYWORDS: Mitigation measures, Road ecology, Dry ledges, Fauna passage, Wildlife corridors

#3 Why, When and How Giant Anteaters Cross Roads? Understanding Impacts and Effects of Roads on Giant Anteater Populations

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A The main goal of the Anteaters & Highways Project is to understand and quantify the impacts of roads – road-kills and barrier effect – and their consequences for Giant anteater densities, population structure and health; and to define landscape and road management strategies to prevent potential Giant anteater local population extinctions in Mato Grosso do Sul, Brazil. Entering in its final year, we provide in this talk an overall summary of the main findings and how they will be used to delineate regional planning toward the mitigation of road impacts on this Vulnerable species. So far, we have surveyed ca. 77,000 km (transects totalling 1,337 km, surveyed every 2 weeks), in which we recorded 10,194 roadkills, including 689 giant anteaters. We tracked 44 giant anteaters, of which four were road-killed during the study. The movement data allowed us to identify different individual behaviours toward roads, which vary significantly with traffic volume (lower crossings in high traffic road). Yet, a great variability of behaviours was observed, reflecting individual reactions to road presence, ranging from frequent crossings to absence of crossing events. Face-to-face structured interviews were conducted with truck drivers (n=126) to collect information about the human dimensions of wildlife-truck collisions. Necropsies performed in 59 giant anteaters allowed us to test if health and body condition were affecting the roadkill likelihood. Finally, ongoing estimation of animal density near the studied roads will allow us to model the impact of roads on giant anteater population persistence using population viability models. Such output is being processed, but preliminary results suggest a significant impact on population viability. Overall, the project outputs suggest that the giant anteater populations are at risk, and the ongoing expansion of the road network may constitute a serious threat to its persistence in Brazilian Cerrado. Careful road planning and mitigation, integrating the information of land use changes and human population is needed, particularly in Brazilian Cerrado in face of the new massive infrastructures planned to be built therein.

KEYWORDS: Population persistence, Population viability, Roadkill, Animal movement, Brazil

Full Presentations