

TRACING ANTHROPOGENIC PRESSURES ON BIODIVERSITY IN THE AFRICAN SAHELO-SAHARAN REGION – A CASE STUDY FOR NIGER BASED ON RADAR IMAGERY

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ABSTRACT:

The global human population is continuously growing, with the highest dynamics occurring in Africa, Asia, and Central and South America. The resulting expansion of built-up area and man-made infrastructure into the natural and semi-natural hinterland is a key challenge to nature conservation and environmental management. Hence, a precise knowledge on the location of human settlements and infrastructure inside or in the vicinity of high-value and/or vulnerable biomes is vital for the development of effective strategies to protect wildlife against encroachment from anthropogenic activity.

A promising approach to detect and monitor man-made structures is the analysis of Earth observation (EO) imagery. However, considering human settlements layers (HSL) for developing countries, the capability of existing data sets to accurately delineate small and scattered towns and villages or industrial complexes is quite limited. Therefore, recent EO-based initiatives have started with the aim to provide more accurate HSL based on high resolution EO imagery. One of these new data sets is the Global Urban Footprint (GUF) layer that has been derived from very high resolution radar imagery collected by the German TanDEM-X (TerraSAR-X add-on for digital elevation measurement) mission in the years 2011-2013. The GUF data represents a binary raster layer indicating built-up and non-built-up areas in a spatial resolution of 75 m on a global scale.

In this study we analyse the potential of SAR data and the GUF layer to detect human structures such as oil refineries in Niger which are threatening the ecosystem intactness. A regionally adapted GUF data set for the parts of the African Sahelo-Saharan region is developed where in-situ data is available. A first validation of the outcome was conducted based on reference data available for Niger. We can demonstrate the importance of using SAR data for conservation. The predictions of human disturbances to habitats using a variety of EO parameters are aimed at in the future. Here, a specific focus will be set on the potential of the method to detect oil exploration sites across the whole of Sahara. The presented data sets and methods can help to improve the ecological understanding of the drivers affecting changes in the biodiversity patterns.

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