Tropentag, September 17-19, 2014, Prague, Czech Republic

"Bridging the gap between increasing knowledge and decreasing resources"

Integrated Analysis of Household and Remote Sensing Data for Settlement Characterisation in Tamale, Northern Ghana

Rafael Hologa, Hanna Karg, Johannes Schlesinger

University of Freiburg, Dept. of Environmental Social Sciences and Geography; Physical Geography, Germany

Abstract

Urban growth and land use change in the northern region of Ghana and especially around the region's capital, Tamale, have a severe impact on the characteristics of urban, peri-urban, and rural settlements. However, there is a lack of studies systematically analysing the relationship between urban growth, land use changes, and its manifestation in different types of settlements.

For the study, a total of 460 households distributed over 23 grids of a size of 25 hectares each were randomly selected. A stratified sampling was implemented, based on building densities and theoretical travel times. These were derived from recent satellite images and a statistical algorithm tool for geographic information systems (GIS).

A multi-method approach based on household survey and remote sensing data was chosen. Both data sources were linked in order to allow verification, triangulation and up scaling of the findings. Household data was collected using a standardised household questionnaire in March/April 2014. The questionnaire included indicator groups focussing on accessibility, supply, prosperity, migration background and other social indicators. The remote sensing data base consisted of a mix of available images with varying ground resolutions, such as LANDSAT-8, Pleiades and others. The data was analysed in order to quantify land use change and to gain a rough understanding about overall land use trends such as urban growth or conversion of agricultural land. Furthermore, an unmanned aerial vehicle (UAV) was used in selected grids to allow for a more detailed view on small-scale land use dynamics. The study showed that urban growth has a significant impact on a wide range of characteristics of urban, peri-urban, and rural settlements. Furthermore, it could be shown that household characteristics, such as market access or agricultural activities are significantly correlated to the location of the respective settlements.

A typology was developed in order to allow for a more sophisticated understanding of settlement characteristics in the western African context. This could eventually lead to a more adjusted spatial planning process in rapidly growing cities of the region.

Keywords: GIS, remote sensing, settlement typology, Tamale, UAV, urban growth

Contact Address: Rafael Hologa, University of Freiburg, Dept. of Environmental Social Sciences and Geography; Physical Geography, Werthmannstr. 4, 79085 Freiburg, Germany, e-mail: rafael.hologa@gmx.de