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# 学位論文審査の要旨

博士 (環境科学)

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## 学位論文題名

Studies on urban growth in Conakry, Guinea, using geo-spatial data  
(地理空間データを用いたギニア、コナクリの都市拡大に関する研究)

Rapid urban growth in many countries of the African continent is one of the key issues in land science for sustainability. This study examined the dynamics of land-use and land-cover (LULC) changes in Conakry, the capital city of Guinea, in 1986, 2000 and 2016. LULC changes were observed through Landsat sensors: Thematic Mapper (TM), Enhanced Thematic Mapper Plus (ETM+), and Operational Land Imager (OLI). Furthermore, the Logistic Regression Model (LRM) was used to examine the relationship between urban growth with two categories of socioeconomic and physical drivers. Subsequently, the integrated Cellular Automata and Markov (CA-Markov) module in IDRISI Software was used to predict the future LULC patterns in Conakry. In addition, data of the Defense Meteorological Satellite Program's Operational Line-scan System (DMSP/OLS) were used to analyze the night-light patterns in each of the five communes of Conakry from 1992 to 2013 as a proxy of urbanization and urban expansion.

The urban area increased from 15% (60.73 km<sup>2</sup>) in 1986 to 49% (206.58 km<sup>2</sup>) in 2016. The area of vegetation decreased from 52% (217.48 km<sup>2</sup>) in 1986 to 35% (147.32 km<sup>2</sup>) in 2016. Bare ground decreased from 27% (114.76 km<sup>2</sup>) in 1986 to 9% (39.88 km<sup>2</sup>) in 2016. LRM revealed that the elevation is the most important driver of the urban growth, followed by other variables of population density, distance to major roads, distance to urbanized area and slope. The future LULC projection was conducted through the hybrid Cellular Automata (CA) and Markov Chain (CA-Markov) showed that proportion of the urban area was 49% in 2016, and it is expected to increase by 52% in 2025, while the vegetation will decrease from 35% in 2016 to 32% in 2025. The Vegetation Adjusted Night Urban Index (VANUI), an indicator of urban night-lights, revealed increasing night-lights in all communes but at different increasing rates.

This study discussed that the rapid urban growth in Conakry has been led by the rapid population increase, which has occurred mainly both by the migration from the rural regions (because of poverty) and from the surrounding countries (because of the civil wars) into the city. In the commune level, the difference in the VANUI is explained by the difference of the historical development, which is strongly related to the topography (horizontal distance to the port and the elevation). The urban core communes on the high elevation (Dixinn and Matam) showed the highest VANUI value, while the active commercial center near the port (Kaloum) showed the mid-value. The lowest VANUI was identified in the suburban communes (Matoto and Ratoma). This difference supports the effects of the historical development of the city, which is strongly related to the topography (horizontal distance to the port and the elevation) on the period of the actual LUCL changes and the urban probability.

The results of this study will provide bases for assessing the sustainability and the management of the urban area and for taking actions to mitigate the degradation of the urban environment in the future. There is still some uncertainty about unpredictable international immigration from the surrounding countries, suggesting that both national and international addresses are necessary on the future urban sustainability.

The examination committee recognized that this thesis would contribute to the better plan and management of urban growth not only in the city of Conakry but also in some other cities in the African countries, and to the discipline of land science in urbanization, particularly in Sustainable Cities and Communities, one of the goals of the UN's SDGs. The committee evaluated enthusiasm of the applicant in intensive, time-consuming laboratory work together with field survey, and for collaboration with many students during the course of graduate school, thereby concluded that the applicant is eligible for the degree of Doctor of Philosophy (Environmental Science).