Are Cities Growing too Rapidly?

Urbanization Risks in Nigeria

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GIS 101—Introduction to Geographic Information Systems

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Introduction: LEDCs, Agriculture & Population

LEDCs or **Less Economically Developed Countries** around the world are experiencing urbanization at a rapid rate. Many countries on the African continent are included in this number and one of them is Nigeria. Urbanization which signifies, an increase in the proportion of people living in urban areas compared to rural areas, generally sounds like a positive thing, however, in reality for these LEDCs, the rate they are urbanizing at is dangerous for their people and their environments. Nigeria, is one of the many nations in Africa with promise, however, the country has continuously experienced adversities during the struggle of building the nation up after experiencing many years of colonialism. In areas such as infrastructure, healthcare provision, and environmental efficiency, Nigeria is moving slowly. However, the growth of the population and the rate with which municipalities in the country are urbanizing is faster than it has ever been. About 50% of Nigeria's 150 million population currently lives in cities. This is in comparison to the 35% of the population who lived in cities in 1990. The issue with the rapid urbanization is that a lot of it is unplanned and uncoordinated. Many LEDCs are not ready for the rate that people are migrating into their major cities. This situation is leaving Nigeria without the adequate resources to provide access to land for farming and housing, to handle urban waste and pollution, and to provide sufficient infrastructure throughout the country.

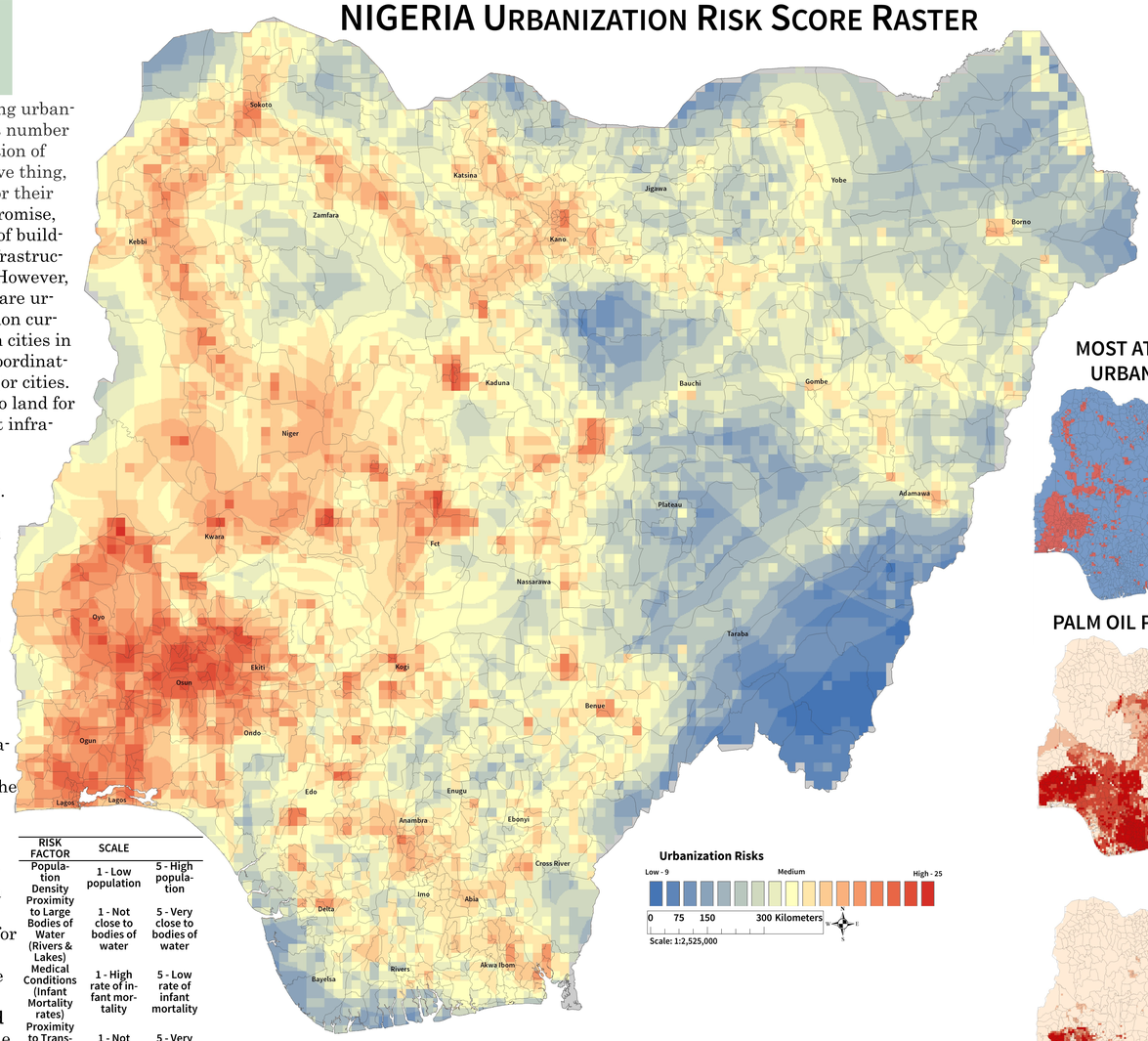
I hypothesize that scarcity of adequate resources to support the economy and the population will lead to a reduction in the amount of crops Nigeria is able to produce. Agriculture is the most important sector in Nigeria's economy in terms of employment; 70% of the labor force is in this sector. If farmers are not able to keep up with the rate of urbanization, this could affect the food that is produced for Nigeria. Thus, this project seeks to understand how rapidly urbanization is happening through determining the regions and municipalities that are at risk for unsteady urbanization in Nigeria. Additionally, if many crops are produced in these high risk urbanization regions, will that affect the amount of food that Nigeria will be able to produce in the future? Will rapid and unsteady urbanization potentially cause the crop yield to decrease?

Methodology: Scoring Risks

To understand which regions have high urbanization risks a suitability for urbanization model was created. For each urbanization risk factor the data was added to ArcGIS using add-XY method. The risk factor using the infant mortality data and the population density data was then converted into raster form using the Conversion Tool (point to raster). To determine the risk factor that had to do with proximity (roads and bodies of water), the Euclidean Distance tool was used. Each layer that was changed into a raster was then reclassified so it was on a 1-5 scale of urbanization risk (see table). Using the raster calculator with equal weights an urbanization risk map was created by adding my 6 layers together (4 risks). The scale for the Urbanization risk map is 0 - 25; 0 being the lowest risk and 25 being the highest risk for urbanization. Using the raster calculator again to select for all the scores that were 20 and above, the highest urbanization risk region was determined. The agriculture data was added to ArcGIS and converted to raster with the same method above. Three out of the most popular crops in Nigeria were used, **Cassava, Groundnut, and Palm Oil**. To determine the regions of possible crop decrease due to urbanization, the raster calculator with equal weights was used to multiply the highest risk urbanization map with each crops raster map.

RISK FACTOR	SCALE	
Population Density	1 - Low population	5 - High population
Proximity to Large Bodies of Water (Rivers & Lakes)	1 - Not close to bodies of water	5 - Very close to bodies of water
Medical Conditions (Infant Mortality rates)	1 - High rate of infant mortality	5 - Low rate of infant mortality
Proximity to Transportation (Proximity to Roads)	1 - Not close to roads	5 - Very close to roads

Nigeria Urbanization Risk Score Raster



Analysis: Urbanization Risk Models

Population Density

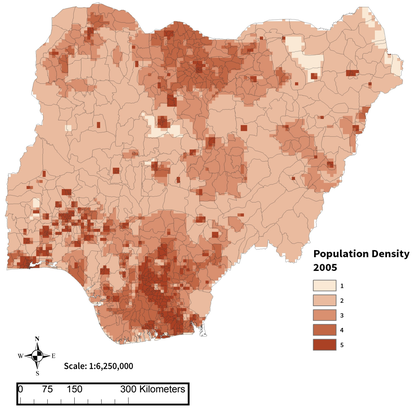
The Nigerian population density increased drastically from 2005 to 2012. People are one of the major driving forces behind urbanization. For sites to be considered at risk for urbanization they must be located in areas with high population density.

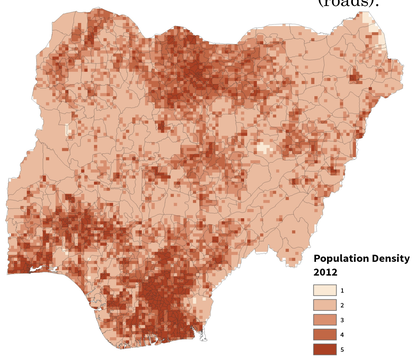
Transportation

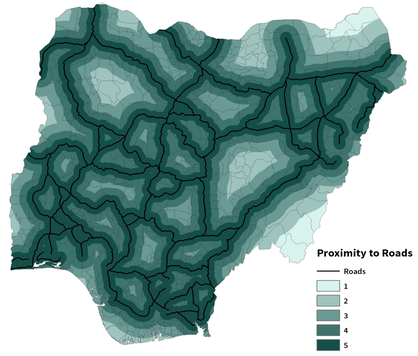
Proximity to major roads represents the proximity to all transportation means as a risk for urbanization. The majority of highways and railroads in Nigeria are in the same area as the majority of roads. More transportation means access to more people and resources. For sites to be considered at risk for urbanization they must be located near transportation means (roads).

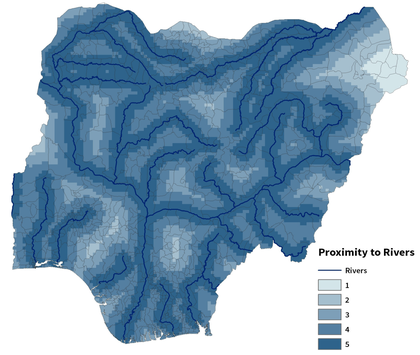
Large Bodies of Water

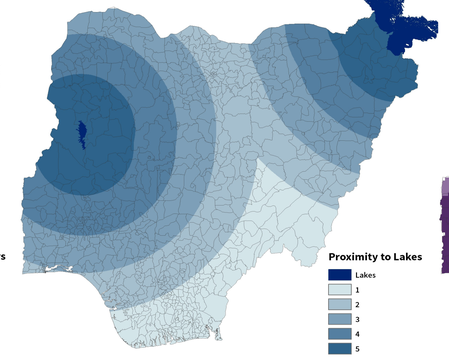
Populations tend to increase around areas with large bodies of water to meet water and food needs. They are also needed to sustain industries that lead to urbanization. For sites to be considered at risk for urbanization they must be located near large bodies of water.

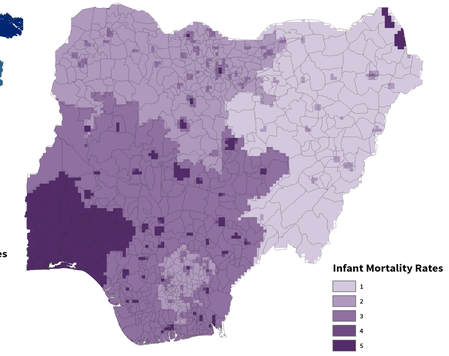












Data & Sources

Data

Harvest Choice: https://harvestchoice.org/products/data

Tufts M Drive: World, GfK, Africa, Nigeria Data

Projection: Africa Albers Equal Area Conic

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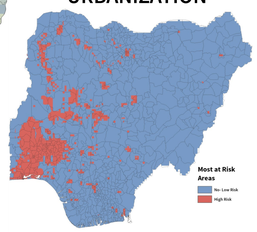
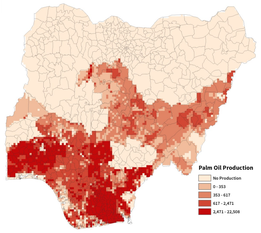
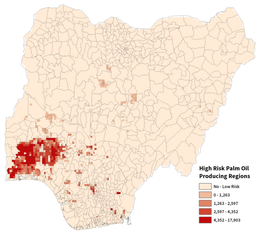
Most at Risk for Urbanization



Palm Oil Production





Results & Conclusions: Southern & Eastern Nigeria

Scores on the Urbanization Risk Map range from 9—25, the scores are evenly distributed in terms of how many areas are at low risk for urbanization, medium risk for urbanization, and high risk for urbanization. Most of the highest risk regions that scored between 20 & 25 are in the west and south of Nigeria. The crop production for palm oil is concentrated in the south; the crop production for cassava is concentrated in in the south of Nigeria as well; the crop production for groundnuts is concentrated centrally moving up towards the north.

The municipalities in the southeastern region of Nigeria are either already rapidly urbanizing or are at the highest risk for urbanization. These are the areas that need to be considered the most when thinking about means to slow urbanization in Nigeria. Municipalities within the Nigerian States Osun, Oyo, Ogun, Lagos, Ekiti, Niger, Abia, Sokoto, Kebi, Ondo, and others within the southeastern region are the ones experiencing the issues previously discussed due to their rapid urbanization. Regarding the crops, out of the three crops measured, palm oil production seems to be the most at risk in terms of yield because more of its high production areas fall within the highest risk regions. Neither cassava nor groundnut had as much of their high quantity production areas in this high urbanization risk region as palm oil did. If more factors were included in the urbanization risk assessment, results may have changed slightly, but generally the southeastern region of Nigeria is experiencing the most rapid urbanization.

Medical Conditions

Improved medical conditions and better life expectancy in certain regions leads to population increase in those areas. Infant mortality rates were used as a measure for life expectancy and medical conditions. Thus for sites to be considered at risk for urbanization they must be located in areas with low infant mortality rates in order to be classified as having improved medical conditions.