



Site Selection for Refugee and IDP Camps to House Population Displaced from Nigeria

Overview

Boko Haram, a militant extremist group in Nigeria, has been escalating terror attacks since 2011. UNHCR estimates that roughly 850,000 Nigerians have been internally displaced within the country due to violence between the government and armed groups, including Boko Haram. Violence in this region has displaced an estimated 74,000 Nigerians to Cameroon, 18,000 to Chad, and about 100,000 to Niger. Although Boko Haram is the most recent and most well-known source of displacement, inter-communal conflicts, political unrest, flooding, and desertification have also caused significant internal displacement.

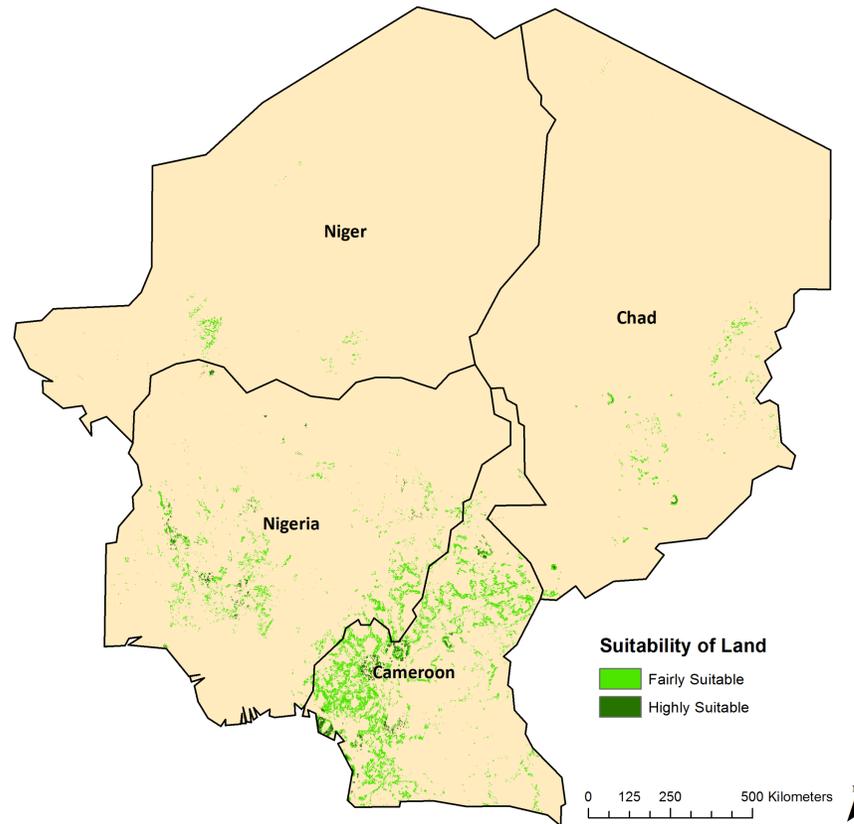
To house displaced populations, IDP and refugee camps are considered the option of last resort by humanitarian agencies, but are often preferred by governments in this region. Camps do have some significant advantages for protection and the distribution of humanitarian assistance. The location of a camp has serious and long-term implications for the well-being of the displaced population living there. Important considerations exist for site selection, which geospatial technologies, data, and analysis can inform.

Methodology

Ideally, a camp should be located at a distance from sites of conflict (at least 50 km), close to a year-round water source, on land with a slight incline to allow drainage but not so steep as to make building and living difficult, with vegetation and soil that can support livelihoods, and at a location fairly accessible by road. Each of these five factors was analyzed using geospatial software.

1. Land cover was aggregated and reclassified into appropriate versus inappropriate land cover.
2. Roads in the four countries of interest were identified, and the distance from those roads to the rest of the land in the region was calculated. The results were then reclassified and ranked from one to five, with five being the closest to roads and therefore most desirable.

Fairly and Highly Suitable Land for Supporting Camps



3. Surface water was identified, and distance from surface water to the rest of the land was calculated. The results were then reclassified and ranked from one to five, with five being the closest to water and therefore most desirable.
4. A slope preference grid was created by converting elevation data into slope data and reclassifying slopes from one to five based on desirability.
5. Conflict points were smoothed into a map reflecting density of violence. The top two quartiles of violence were then identified. Three thresholds of distance were calculated from the area encompassing the top two quartiles. Land within the first threshold of 50 km was assigned a value of zero while the other two thresholds were reclassified and ranked.
6. Individual maps were then overlaid on each other to create an overall suitability map. Scores from the final violence, roads, water, and slope maps were summed together for an aggregate suitability score. This sum was then multiplied against dichotomous land cover and violence scores to zero out any unacceptable land cover or land within 50kms of the top two quartiles of violence. The resulting suitability map above displays the results of this process.

Results

The results of this project demonstrate that GIS analysis can be a useful tool for identifying suitable land for refugee and IDP camps. The country containing the largest amount of highly suitable and fairly suitable land is Cameroon. Nigeria also has a significant amount of highly suitable and fairly suitable land. Niger and Chad have less suitable land available due to the lack of surface water and large amounts of barren land. The results of the land suitability analysis are summarized in a table below.

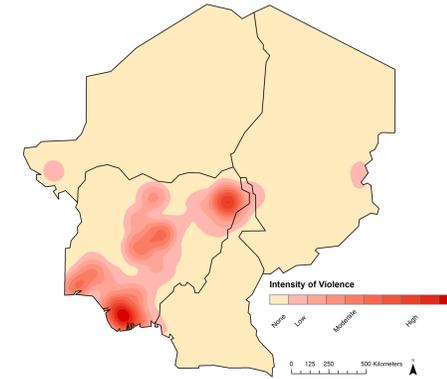
Amount of Fairly Suitable and Highly Suitable Land Available per Country in Square Kilometers		
Country	Fairly Suitable	Highly Suitable
Cameroon	48,665.25	5,355
Chad	4,923	240.75
Niger	2,286	0
Nigeria	19,948.5	2,265.75

Limitations

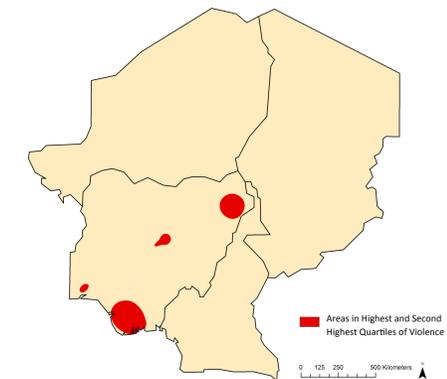
While the land shown in the final map above represents the most suitable land for refugee camps based on the five criteria assessed in this project, in reality there are other factors that would need to be taken into account. There is relatively little surface water in the region of interest, which was a major limiting factor in this analysis. Exploration of ground water would be advisable to expand the amount of suitable land. The host government, landowners, host population, and refugees or IDPs themselves all need to be included in site selection. Displaced people might be reluctant to settle in an area with a population of different religion or ethnicity than their own, while land that appears useable in satellite imagery might not in fact be available. The most suitable land highlighted above is likely to be valuable land, which governments are rarely willing to set aside for displaced populations.

Cartographer: Lauren Spink
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 Class: DHP-P207: GIS for International Applications
 Map Projection: Africa Albers Equal Area Conic
 Data Sources: ACLED; Digital Chart of the World; Global Land Cover; Shuttle Radar Topography Mission; UNOCHA

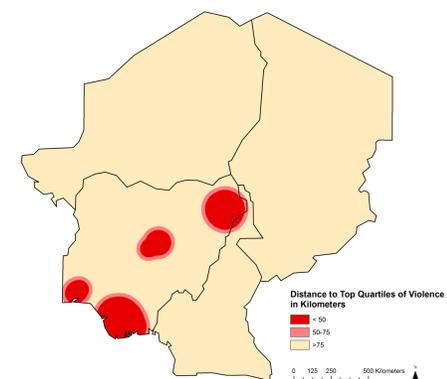
Intensity of Violence



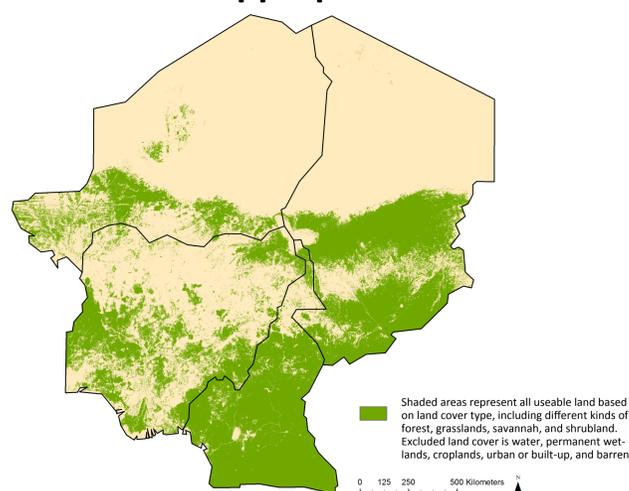
Top Two Quartiles of Violence



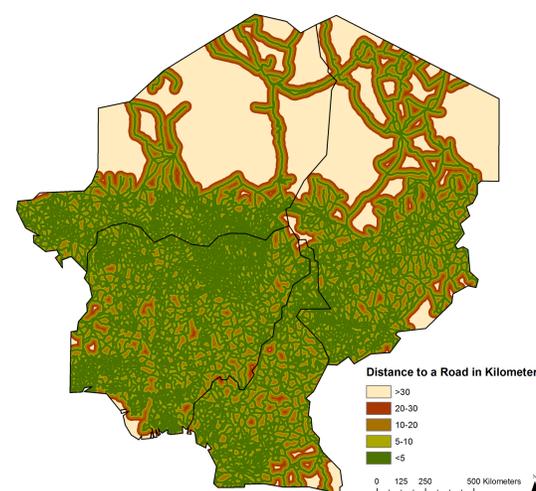
Distance To Top Two Quartiles of Violence



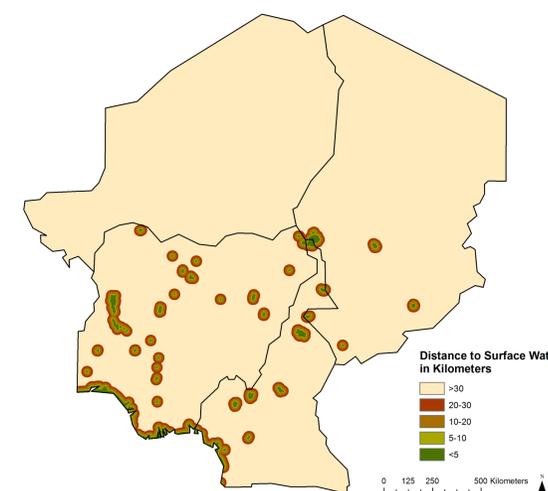
Land with Appropriate Cover



Distance to Roads



Distance To Surface Water



Slope of Land

