Conflict in North Africa: Identifying Vulnerable Areas

Context:
Since the Arab Spring in 2011, conflict has proliferated in North African states boarding Libya. Before any steps can be taken to enhance security in the region, vulnerable areas must first be identified. This is an attempt at measuring where conflict is happening and why it occurs where it does in Algeria, Tunisia, Libya, and Egypt. For the purposes of this project, after analyzing a number of different factors and mapping them independently, I used the GIS map algebra map to see where attacks are most likely to happen based on past occurrences and geography.

Research Question:
I would like to answer the question: Which areas in North Africa are vulnerable for armed conflict based on their geography, specifically since the 2011 Arab Spring?

Methodology:
1) I divided all the ACLED data into two categories: Conflict with weapons and conflict without weapons and used only armed conflict for my research purposes. I then charted them across North Africa and the Sahel.
2) I used ACLED data from attacks in 2015 to narrow the analysis to the most useful current data.
3) I created several layers that I would later reclassify based on: Topography/geology, proximity to roads, proximity to cities, and by state borders.
4) I used Euclidean distance tools to calculate distance to cities and roads on the assumption that a closer proximity to a city or road has a greater vulnerability for attack.
5) Using the kernel density tool, I calculated the special density of attacks.
6) I reclassified land cover and the above three factors into three levels of vulnerability: High (3), medium (2), and low (1).
7) I used the map algebra tool to add together all variables into a single analysis showing the highest areas of vulnerability as those that included multiple factors for a maximum score of 12 and a minimum score of 4.
8) I re-analyzed the data for zonal vulnerability by using the math algebra in combination with the shapefile including all the precinct boundaries inside the four countries (Algeria, Tunis, Libya, and Egypt) in my study.

Findings:
As anticipated, the areas closest to coastal cities have the highest level of vulnerability. Of particular concern is the areas in Northern Algeria and Tunis where attacks have clustered in the past and in Lower Egypt along the Nile.

One challenge for this analysis was a lack of a comprehensive list of security sites (ie. police stations and military bases) across the region which is important for understanding why attacks happened in certain areas while other populated areas were avoided. If a comprehensive list of security forces locations could be acquired, it should be included in further studies.

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Projection: WG5_1984_UTM_Zone_36N_Transverse_Mercator

Legend:
- Capitols
- Major Cities
- Incidents of Conflict
- Major Rivers
Vulnerability Scale

Lowest

Highest

Distance to Major City

Distance to Roads

Clustering of Conflict Incidents