FAMINE: Risk and Resilience Assessment in the Face of Conflict and Climate Change in Africa

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Introduction & Background

Globally, there are four major famines currently affecting Nigeria, South Sudan, Somalia, and Yemen—all of which were the result of a combination of unusually long and intense drought coupled with internal conflict. Three out of these four famines are in African countries. As climate change causes these areas to dry and rise in temperature, the agriculture and livelihoods of such areas becomes very vulnerable to the risk of famine. Simultaneously, armed conflict limits the potential for migration that could mitigate the human suffering resulting from the effects of climate change. But there are also factors such as GDP and estimated values of "Ecosystem Vitality" that could make some countries more resistant to these risks.

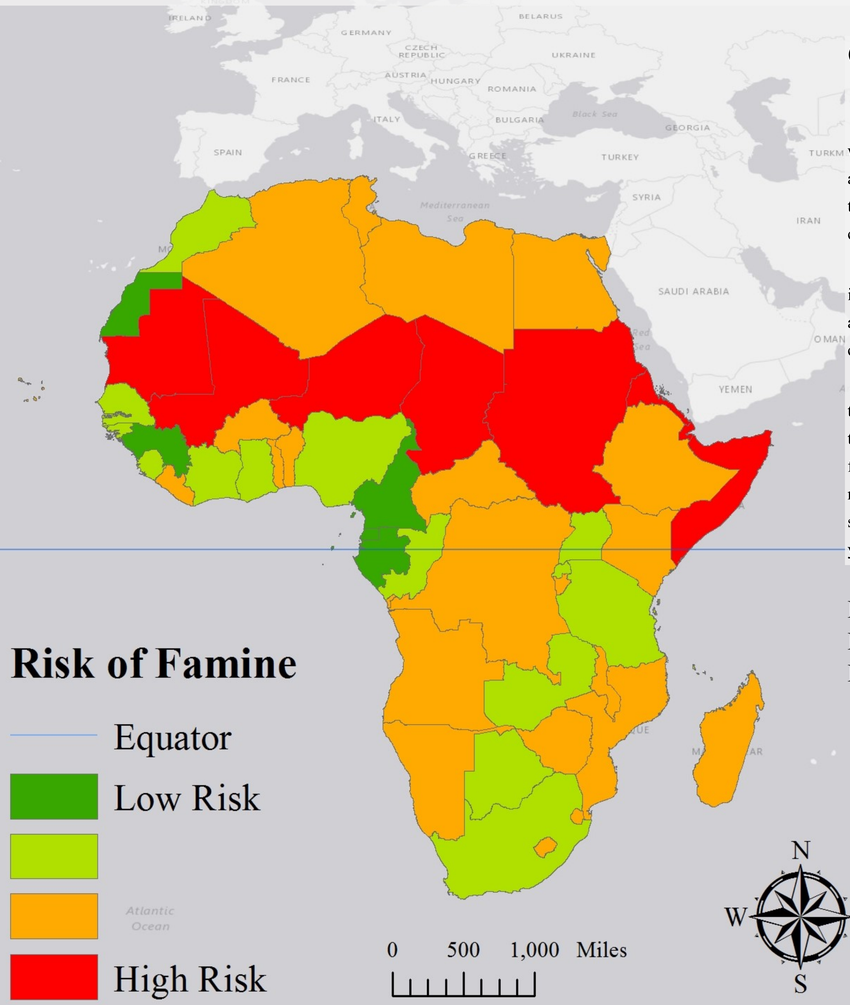
My project was a spatial risk assessment of African countries in reference to their vulnerability to famine. Overall risk was calculated based on location of conflict events, percentage of population impacted by extreme weather events (including flooding, drought, and extreme temperatures), GDP per capita (calculated with constant LCU), average annual precipitation in millimeters per year, and the most recent Environmental Performance Index (EPI) scores from 2016. These characteristics were selected based on their ability to make an area more vulnerable or more resilient to a loss of agricultural production.

Methodology

I edited and **consolidated data** into two tables (one for locations of conflict events and one with all data for all other factors) that could easily be joined to a map of African countries. I added a **basemap** and **geocoded** the location of all conflict events to the non-projected map. I then **projected** this map to **Africa Lambert Conformal Conic** and **joined** the table with the additional data. A new layer was created in which the location of conflict events was **spatially joined** to each country to add a **"count" attribute** for the number of conflict events per vector polygon.

Color ramps were used to symbolize and divide the spectrum of data for each attribute into four colors with distinct value ranges. Data was classified into four categories based on **natural breaks** ("Jenks") generated by ArcMap. A new excel sheet was generated with countries **assigned "reclass" values** to break each attribute into values of one through four (**1 being least conducive to famine, 4 being most conducive to famine**). This new data was **joined** to the existing attribute table for the continent of Africa.

A "Risk" map was created by creating a **new data field** in the attribute table and using "**Field calculator**" to generate the "Risk" factor. I used an equation in the "Field calculator," which generated the **sum of the reclassed values of all five original maps** for each country; high values represented the countries at the greatest risk for experiencing famine. A **color ramp was used to show high risk countries** as red and low risk countries as green.



Conclusion & Limitations

This project is limited mostly by the availability and accuracy of data. Some data was incomplete or missing, which kept me from including more factors of resiliency—such as education, soil quality, solar insolation, change in average temperature, and many more—to my risk analysis. In addition, there is no unbiased way to properly weight the different factors involved. To generate a more complete picture of the risk of famine, a much longer list of factors contributing to violence and climate change would need to be taken into consideration and added to the risk equation.

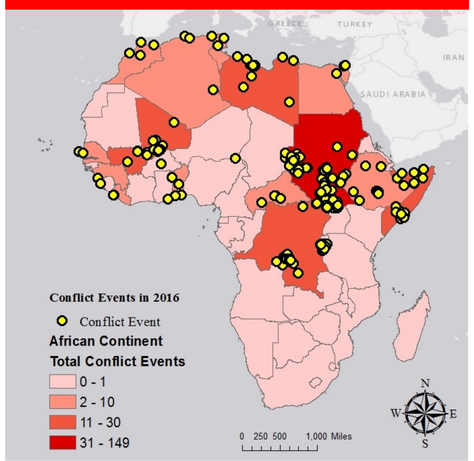
Additionally, this project was conducted at the country level, making results very broad and unspecific. This limits the utility of these results. If data were more targeted, say at the district level, the results from this project could be a great resource for deciding where to focus proactive efforts for avoiding famine and building resiliency to climate change.

Despite these difficulties and sources of error, the final product was able to successfully identify two out of the three African countries experiencing famine—Sudan and Somalia—as high risk zones. The risk calculation also identified Niger, Djibouti, Eritrea, Chad, Mali, and Mauritania as countries at high risk of famine. All eight of the identified high risk countries are located partially or entirely between the equator and the Tropic of Cancer (23.5 degree north latitude). This shows that the calculation supports the conclusions of scientists and anthropologists that hypothesize that these areas of great heat and direct sunlight will be the areas to suffer most from climate change in coming years (Gufu 2014).

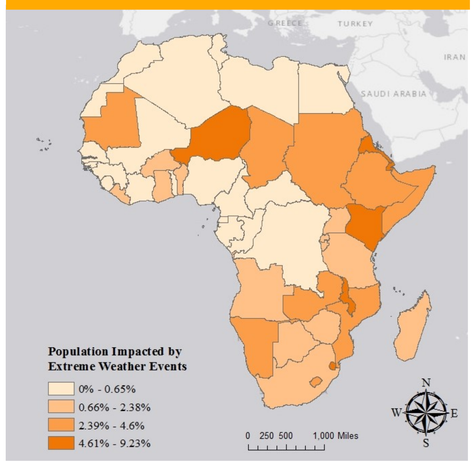
Design & Cartography: Megan Bateman
Projection: Africa Lambert Conformal Conic
Data Sources: ACLED and The World Bank Data Catalog

EPI is a metric generated from the weighted scoring of a region's environmental polies regarding the indicators shown here:

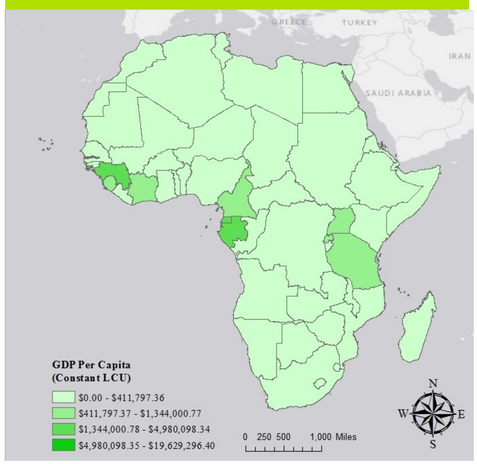
Location of Conflict Events



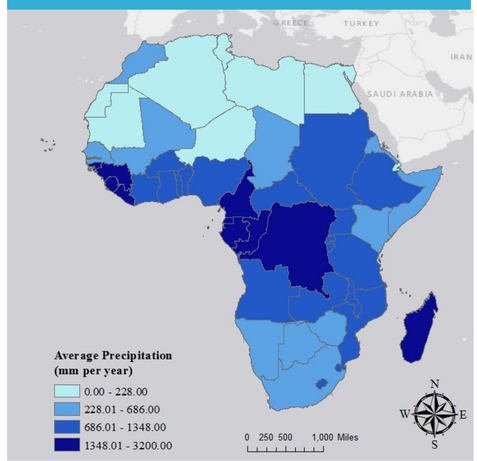
Population Impacted by Extreme Weather Events



GDP Per Capita (Constant LCU)



Average Precipitation



Environmental Performance Index