

Mine Your Business:

Measuring the Environmental Impact of Industrial Activities in Africa

RESEARCH QUESTIONS

What are the relationships between human activity and environmental degradation in Sub-Saharan Africa? Are there any potential associated links between these activities and the rise of climate-related disasters?

INTRODUCTION

Considering major climate disasters to occur on the African continent in recent years, it is highly necessary to critically evaluate the links between climate change and activities that worsen the human impact of climate change. Taking into account the deadlines of too much or too little precipitation, this map series aims to illustrate the components that worsen the effects of long droughts or flooding, like loss of vegetation through agriculture and mining activities.

SPATIAL ANALYSIS METHODS

1

Reclassify the Land Cover and Use, Livestock Presence, Watershed, Minerals/Mines, and Climate Datasets.

2

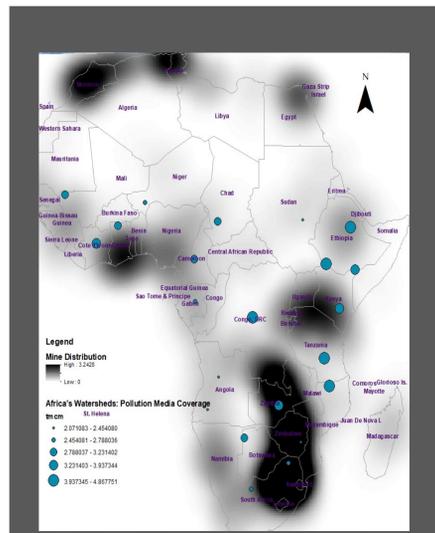
Combine the layers that are on the same scale to create two new 'summary' rasters: one for agricultural activity, and another for mapping climate.

3

Combining the mine distribution raster and the newly created agricultural activity raster, I used raster calculator to combine the two into a 'Human Impact' raster - which represents human activity that can be detrimental to human and ecosystem health when engaged in intensively.

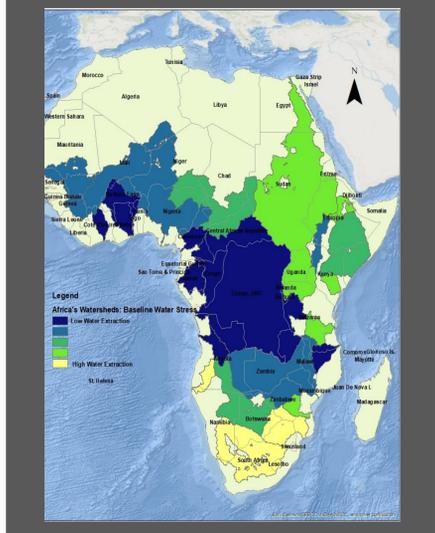
4

Zonal statistics were used to understand the extent of human activity by country.

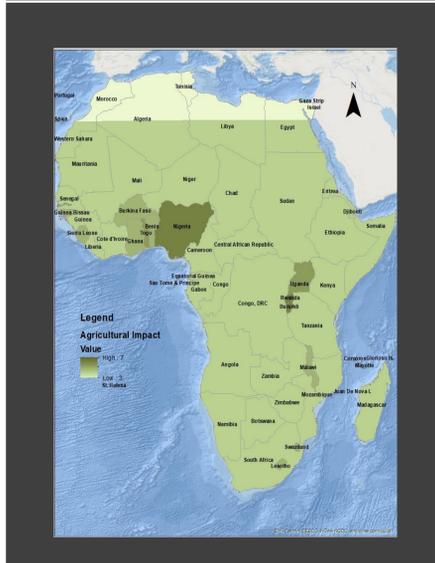


Distribution of mines (kernel density map) stacked against graduated symbols representing media coverage of stories that address industrial pollution or human-caused degradation.

PRELIMINARY LAYERS



Africa's watersheds displaying extraction: this map highlights areas that experience chronic water stress.



Agricultural Impact by Country: indicates countries with high rates of irrigated, industrial agriculture.

Cyclone Idai and the Consequences of Vegetation Loss

Between March 14 and 15, when Cyclone Idai made landfall in Mozambique and moved into the Chimanimani mountain range bordering Mozambique and Zimbabwe, intense landslides and flooding left more than 1,000 people dead and over 4,000 displaced. The highlands of Eastern Zimbabwe are home to valuable evergreen and mountainous forests, but much of the original growth have been razed for agriculture and plantation forestry, where timber merchants grow invasive tree species for international markets.

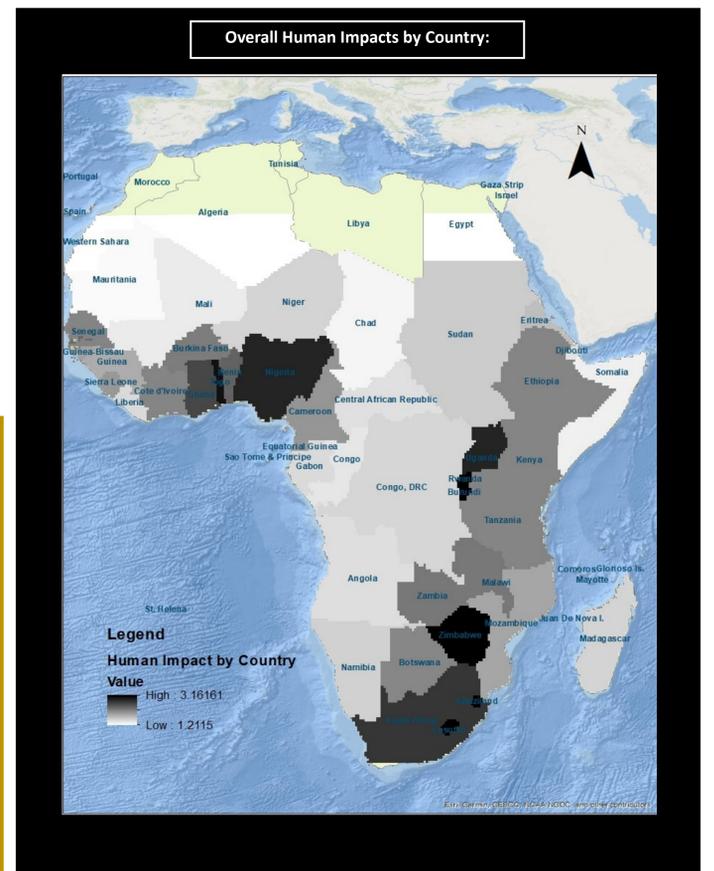


Climate Threats Risk Level by Country: indicates countries that have a higher likelihood of experiencing climate-related disasters.

Results:

As displayed on the maps, climate risks do not entirely align with high rates of human activity, however, there is strong clustering of human activity in West, East, and South-eastern Africa. Namely, the countries with the highest levels of human industrial activity (both agricultural and mining) are Eswatini, Zimbabwe, Uganda, and Nigeria.

On average, the country has lost about 3.4 square km of forest each year from 1990 to 2010. As a result, selective logging and razing the land to make way for gold mining have deteriorated natural environmental defenses from natural disasters to a point of uselessness. Overall, this narrative indicates that higher levels of industrial activity contribute to the severity of intense climate conditions experienced by residents.



		RASTER CALCULATOR
Land Cover and Use	Irrigated Cropland	Agriculture Raster
	Protected Areas	
Livestock Presence	Cattle	
	Sheep	
	Goats	
	Chickens	
Watershed Info	Pigs	Climate Raster
	Droughts	
	Floods	
Minerals and Mines	Baseline Water Stress	Mine Distribution (Kernel Density)
	Metals	
	Minerals	
Climate	Precious Stones	Climate Raster
	Agro Ecological Zones	

Discussion, Limitations, and Conclusions:

Considering the continent's extensive relationship between resource extraction and colonialism, it is interesting to see how stakes in mining concessions are multinational corporations that are not based in Africa. Overall, previous research on this subject focuses on conflict that accompanies intensive resource extraction, also known as, 'the resource curse'. In countries that struggle with political instability, the distribution of revenue from mining and large agricultural operations can be especially contentious, and can lead to a lack of regard for environmental issues that are deemed as less urgent. In the long run, such an attitude can lead to massive losses of life, particularly in regions that are already feeling the effects of climate change.

Coordinate System: Africa Albers Equal Area Conic
Projection: Albers
Datum: WGS 1984

References:
Beinart, William. 2000. "African History and Environmental History". *African Affairs* 99:395.
Mwariya, Ray. 2019. "Cyclone Idai's Deadly Impact Was Worsened by Zimbabwe's Forest Plunder". *Earth Island Journal*. <http://www.earthisland.org/journal/index.php/articles/entry/cyclone-ida-its-deadly-impact-zimbabwe-forest-plunder>.

Geographer: Sagal Alisalah, Advanced GIS (GIS 102).

Data Sources:
HarvestChoice, International Food Policy Research Institute (IFPRI); University of Minnesota, 2017. "CELLSM: A Multidisciplinary Geospatial Database for Africa South of the Sahara". <https://doi.org/10.7910/DVN/G4TBLF>. Harvard Dataverse, V5
SAGE Global Land Use Database (<https://nelson.wisc.edu/sage/data-and-models/global-land-use/index.php>) for Land Cover, Cropland, and Watershed Data
Tufts M Drive Data. For Africa country polygons, Agro ecological zones.
USGS. 2015. "Global Mineral Resource Assessments". <https://minerals.usgs.gov/global/>.