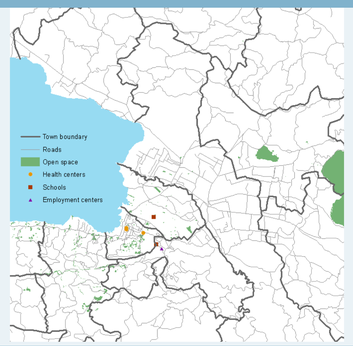
Assessing Site Suitability for Rebuilding Port-au-Prince, Haiti

Study Area: Port-au-Prince & Surrounds



Introduction

The January 12, 2010 earthquake has left Port-au-Prince in rubble and thousands homeless. These people need to be moved as quickly as possible from the tent camps where they are currently living to formal housing that will provide them with adequate shelter and provide for their basic needs. This is important not only to provide shelter, but also to help the earthquake victims' lives return to normalcy. A necessary step before large scale relocation is to examine what land is available that is suitable for housing. This project provides an example of how GIS can be used to determine locations for rebuilding.

Project goals:

- Determine what land is suitable for rebuilding in the area around Port-au-Prince
- Determine how much of this land would be needed to rehouse the homeless earthquake victims.

Input Maps

The first step of the analysis was to measure the straight line distance around nine criteria features using the following ratings, where 4 is most suitable and 1 is least:

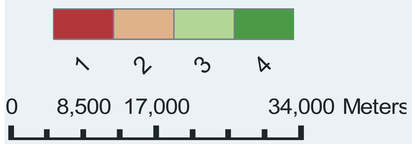
Distance from fault line and coast:
>6 kilometers = 4; 4-6 kilometers = 3; 1-3 kilometers = 2; <1 kilometer = 1

Distance from drainage line:
>150 meters = 4; 150-100 meters = 3; 100-50 meters = 2; <50 meters = 1

Distance from open space, major road, health center, schools and employment centers:
0-500 meters = 4; 500-1000 meters = 3; 1000-1500 meters = 2; >1500 meters = 1

Slope: 0-5% = 4; 5-10% = 3; 10-15% = 2; >15% = 1

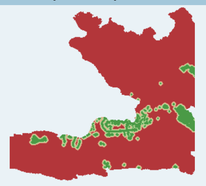
Legend



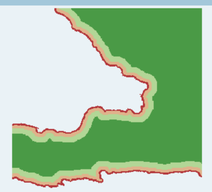
Faults

Schools

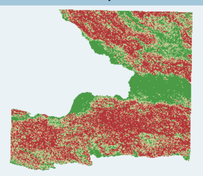
Open Space



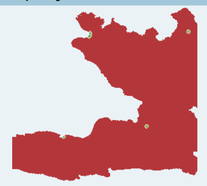
Coasts



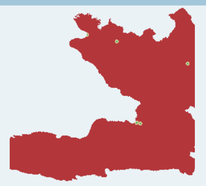
Slope



Employment Centers

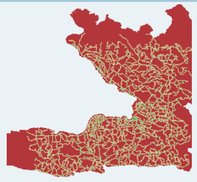


Health Centers

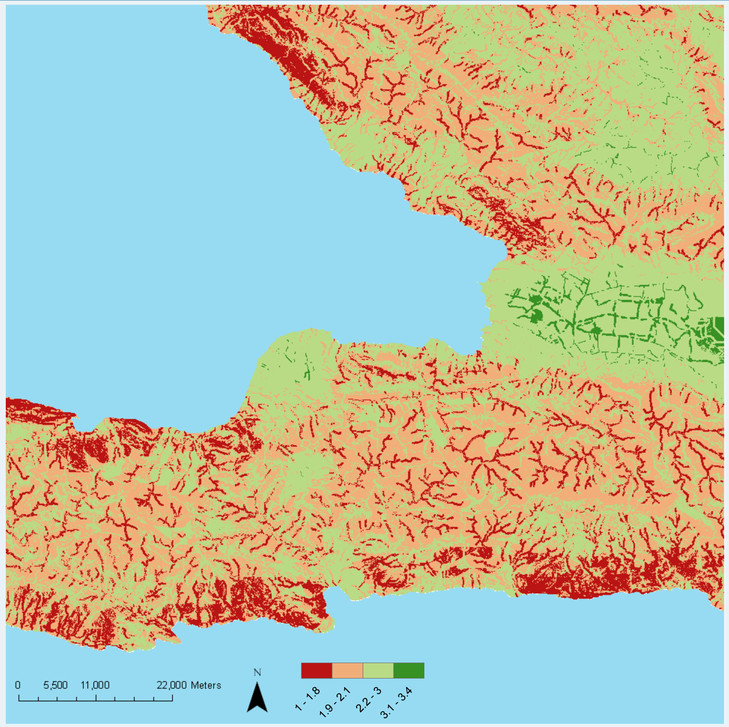


Drainage

Roads



Housing Suitability Map



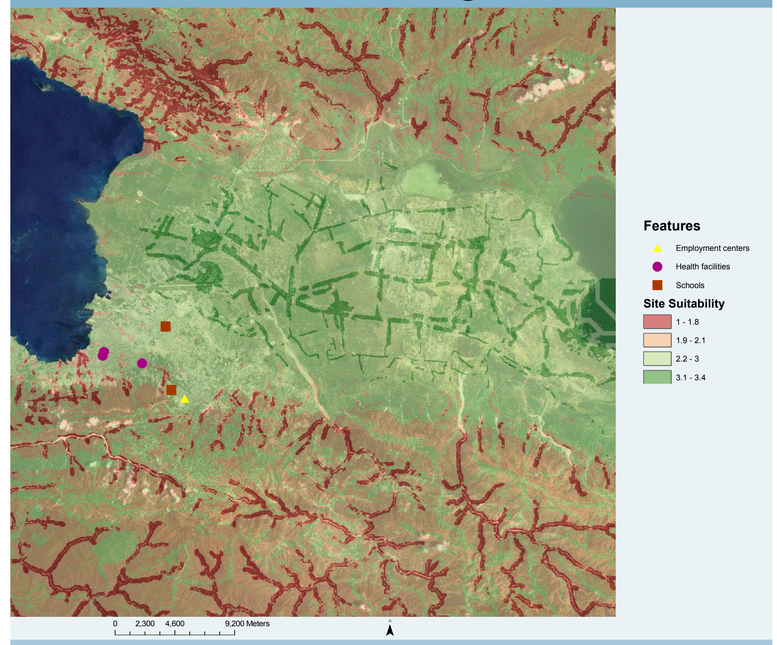
To create the housing suitability map, the following weights were applied to each of the criteria features:
Faults = 20%; Drainage = 15%; Coast = 15%; Slope = 15%; Road = 10%; Health centers = 10%; Employment = 5%; Schools = 5%; Open Space = 5%
The same ranking was applied, with 1 noting the least suitable lots and 4 the most suitable.

Data Sources

All data accessed through Tufts Haiti Geospatial Data Repository (https://wikis.uit.tufts.edu/confluence/display/GISatTufts/Haiti+Geospatial+Data+Resources)

ESRI: World imagery
Google: Employment centers, Health centers, Roads, Schools
OpenStreetMaps: Open space
United Nations Stabilization Mission in Haiti (MINUSTAH): Fault lines, Town boundaries
United States Geological Survey (USGS): Digital elevation map (DEM)

Potential Housing Area



Lot Data

Analysis was also done on the area of lots that received a ranking of 4 to determine if sufficient choice land would be available to re-house those displaced by the earthquake. A minimum lot size of 0.101 square kilometers was selected for choice housing sites. This is the area that will house 1,000 households (with an estimated average of 6 people per household). Using the average population density of Port-au-Prince of 5,971 persons per square kilometer based on the 2003 census, a total of 20.09 square kilometers are needed to re-house the estimated 1,200,000 people who lost their homes in the earthquake.

The results of the analysis show there are 71 lots with a minimum area of 0.101 square kilometers available that received a value of 4 (suitability score of 3.0-3.8).

The total area of these lots equals 41.99 square kilometers. Therefore, there is sufficient choice land available to re-house the population of Port-au-Prince.

Discussion

The results of my analysis show that there is sufficient high quality land to rehouse the 1.2 million people who became homeless in the January 12, 2010 earthquake. This is fortunate as the literature shows that lack of safe sites for housing puts residents at high risk for future loss of housing in the event of natural disaster. It is possible that more than 41.99 square kilometers of land would receive a ranking of 4 in this model. The data set I had for schools, health centers and employment centers was incomplete. This information is changing almost daily on the ground as functions move buildings as new, more structurally sound options become available and others are rebuilt in temporary or more permanent spaces.

However, in my analysis, I did not assume there are any existing usable structures on the land because of the lack of data on existing built structures. I also did not have any data on parcel ownership, so it is possible that the 71 lots I identified are not available because they currently have a usable structure sited on the land or are held by private owners who would like to use them for non-housing uses. It is also possible that Haitians would prefer an average density different from the 59,718 people per square kilometer that I used in my analysis.

Therefore, this work is limited in the information it provides that could be used to plan housing sites. A look at conditions on the ground would be required to verify the results from the GIS analysis However, these results provide a basis for how a more complete analysis could be conducted. Ideally, a future analysis would take into account the preferences of Haitians for location of housing, such as which amenities and natural features should be considered key criteria and what distances should be established.

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