



# Where Are The Right Sites To Site 'RITE'?

## Pre-positioning Supplies for the 'Rapid Isolation and Treatment of Ebola' Program in Liberia



### Project Goal

The primary goal of this project is to identify the most suitable locations for pre-positioning supplies to enable fast response to suspected cases of Ebola, thereby preventing further spread of the disease.

### Background

On March 23rd, 2014 the World Health Organization's (WHO) African Regional Office reported an outbreak of Ebola in Guinea, West Africa. Since this date, there have been over 10,000 confirmed deaths in the region from the 25,000 total cases (actual, suspected, and probable) reported thus far. In the past several months, however, the spread of the disease has been mitigated considerably due to the cooperation of the UN, WHO, local governments, NGOs, and other actors.

Though the virus is relatively contained in Liberia (only one new case has been reported in the past month), various organizations are combining efforts in hopes of preventing another wide-scale contagion such as that which was seen last summer.

#### The RITE Strategy

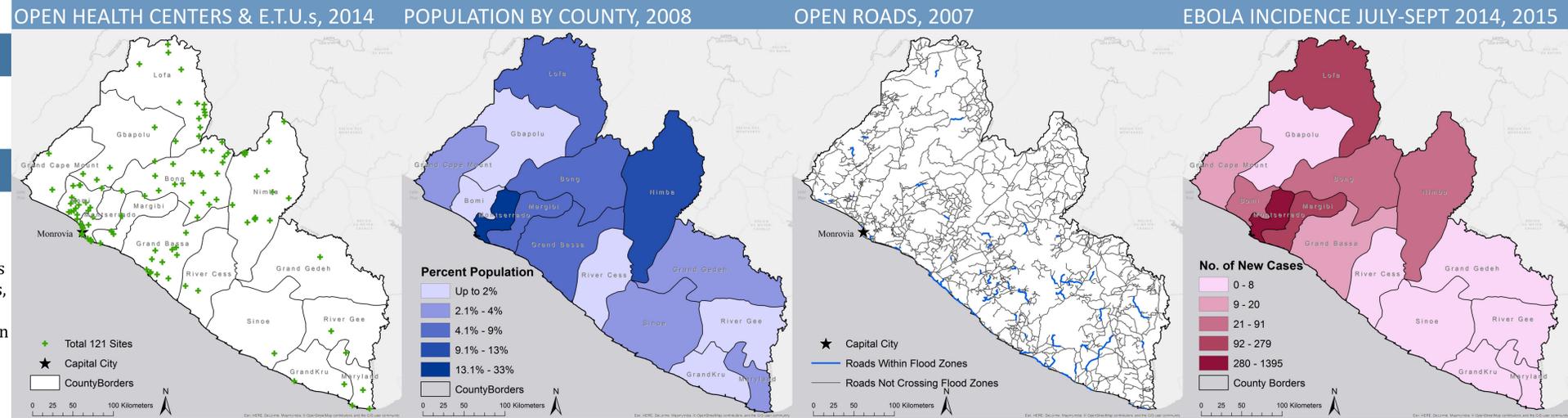
The Humanitarian Response Lab at MIT is currently working alongside other partners within the Academic Consortium Combating Ebola in Liberia (ACCEL) and the Center for Disease Control and Prevention (CDC) to establish procedures for the Liberian Ministry of Health and Social Welfare regarding Ebola response. Specifically, the organizations are working to establish "Rapid Isolation and Treatment of Ebola" (RITE) sites, a strategy developed by the latter two organizations.

The RITE strategy focuses on maintaining investigation-and response-ready health teams poised to deploy to remote areas as soon as a report of a suspected Ebola case is received. The teams have the expertise and basic supplies needed to rapidly isolate and treat Ebola patients, either by establishing facilities in the community or safely transporting patients to existing Ebola Treatment Units (ETUs).

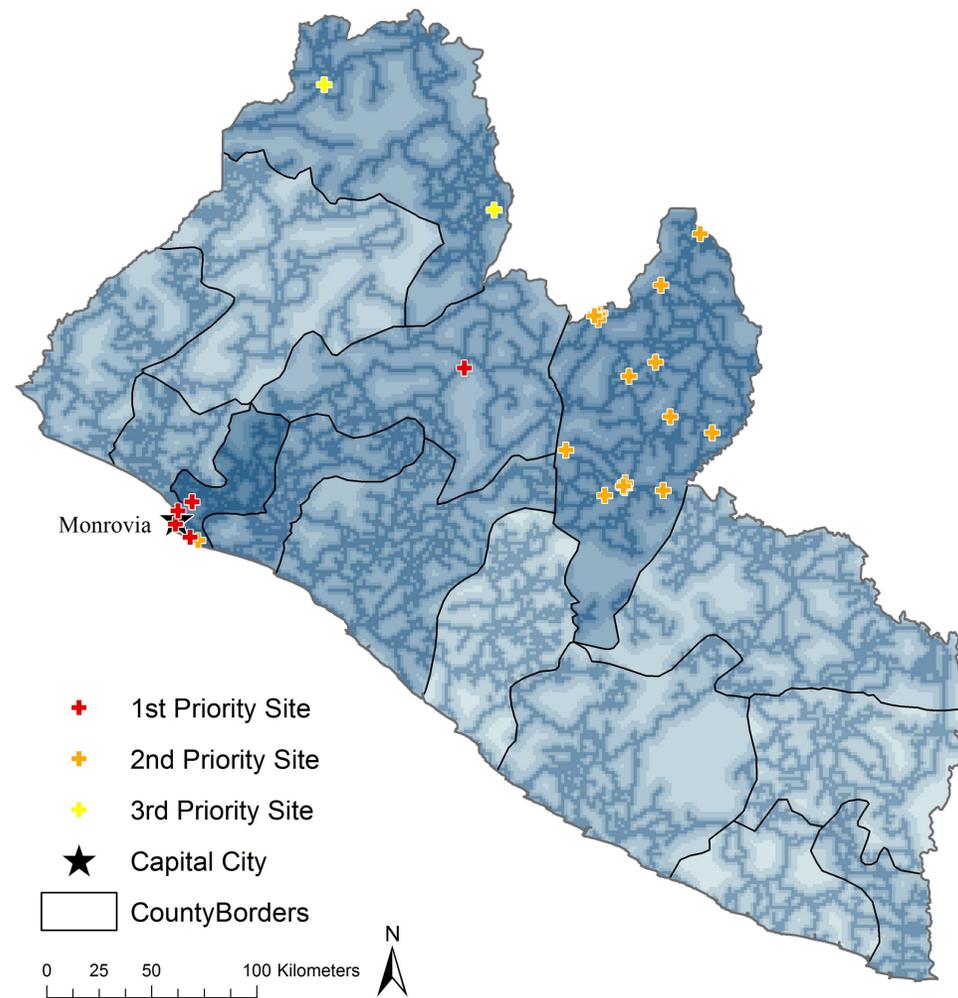
This project focuses on where to best site the materials associated with the RITE strategy.

### Methodology

- 24 RITE site locations needed to respond to 'worst case scenario' demand
- Data & information required and found:
  - Location and status of open health facilities and ETUs (121 total)
  - Location of functional/open roads
  - Location of highly populated areas
  - Location of previous high incidence of Ebola
  - Location of areas prone to flooding during rainy season (May - October)
- Data converted from vector to raster
- Data reclassified using Table 1
- Liberian government consultants and humanitarian aid professionals interviewed regarding opinion of significance of each of criteria
- Raster calculation performed using average weighting determined:
  - Proximity to viable roads = 47%
  - Proximity to large numbers of population = 35%
  - Proximity to high incidence of Ebola = 17%
- Results calculated using a binary function regarding flood zones (within/outside)
- Zonal Statistics analysis performed to provide final scores for each of 121 possible site locations



### TOP 24 SITES FOR LOCATION OF 'RITE' MATERIALS



### Results

The top-scoring 24 sites are shown on the center map and are categorized in three different groups and color-coded according to their calculated raster scores. The top five sites scored 4.95 out of a maximum of 5, the next group of 17 scored 4.26, and the final two of the selection scored 4.08. Not surprisingly four of the five top sites are located in or near Liberia's largest city, where around 1/4 of the population live and more sites are located close to roads. If time or resources are a constraint, officials could prioritize allocation of RITE materials to each site based on this categorization.

### Limitations

The selected sites would of course be subject to review by officials, experts, or others with first-hand knowledge regarding their viability, as there may be political issues, security risks, or other such hindrances which would prevent them from being suitable should they need to be accessed. Related to this, the two 3<sup>rd</sup> Priority site locations are drawn from among sixteen others with the same score of 4.08, and these were selected in this instance due to their location to the highly populated northern border regions. Thus, officials could arbitrarily choose from many sites that had similar scores, according to their assumed utility. Due to civil unrest in the country, the population data may be out of date, as the most recent census was taken over 7 years ago and many citizens could have relocated since. Also, road status and condition may have changed since data was collected, which would have significant negative impact should RITE teams and materials need to be deployed immediately to respond to a suspected case. Another limitation could be out-of-date information regarding health facilities and ETU status since the data was reported over six months ago; certain sites could be temporarily or permanently closed, causing problems for those using this information. Overall, the datasets collected and analyzed are only related to in-country data, when in reality the disease and resources available to combat its spread are often impervious to international borders.

### Conclusion

Officials are now able to visually identify the most viable locations for RITE materials to be sited in planning for another outbreak of Ebola and in addition to this, the greater list of 121 total available sites that has been generated through this exercise. Of course, criteria and weightings for these can be altered according to changes in information within data sources to reflect different preferences in siting locations going forward. Although the disease, as mentioned, easily crosses borders, this is a useful exercise for Liberia and a useful template for other countries in the event that a nation is only able to rely on its own resources and capabilities in mitigating the spread of diseases like Ebola.

Classification	1	2	3	4	5
Site Proximity to Roads (meters)	5,001-28,000	2,001-5,000	501-2,000	51-500	0-50
Site Proximity to Population (%)	0-2	3-5	6-10	11-14	15-33
Site Proximity to Ebola Incidence Last Summer (cases per county)	0-8	9-20	21-91	92-279	280-1,395

**Data Sources:** GADM - Database of Global Administrative Areas, "Administrative Boundaries for Liberia", 2011. United Nations Mission for Ebola Emergency Response (UNMEER), "Ebola Treatment Centers of Units (ETCs or ETUs)", December 2014. Liberia Institute of Statistics and Geo-information Services, "Government of the Republic of Liberia 2008 National Population and Housing Census", May 2009. Standby Task Force, "Health Facilities Liberia October 2014", October 2014. World Health Organization, "Ebola data and statistics", March 2015. United Nations Mission in Liberia (UNMIL) and United Nations Development Programme (UNDP), "Liberia: Roads", 2007. Ebola Geonode, "Flood Inundation Extent - November 2012", 2012. Tufts GIS Data, "Liberia Cities", 1997.

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