Merging Population and Environmental Data to Construct a Spatial Analytic Framework for Assessing and Improving Food Aid Distribution

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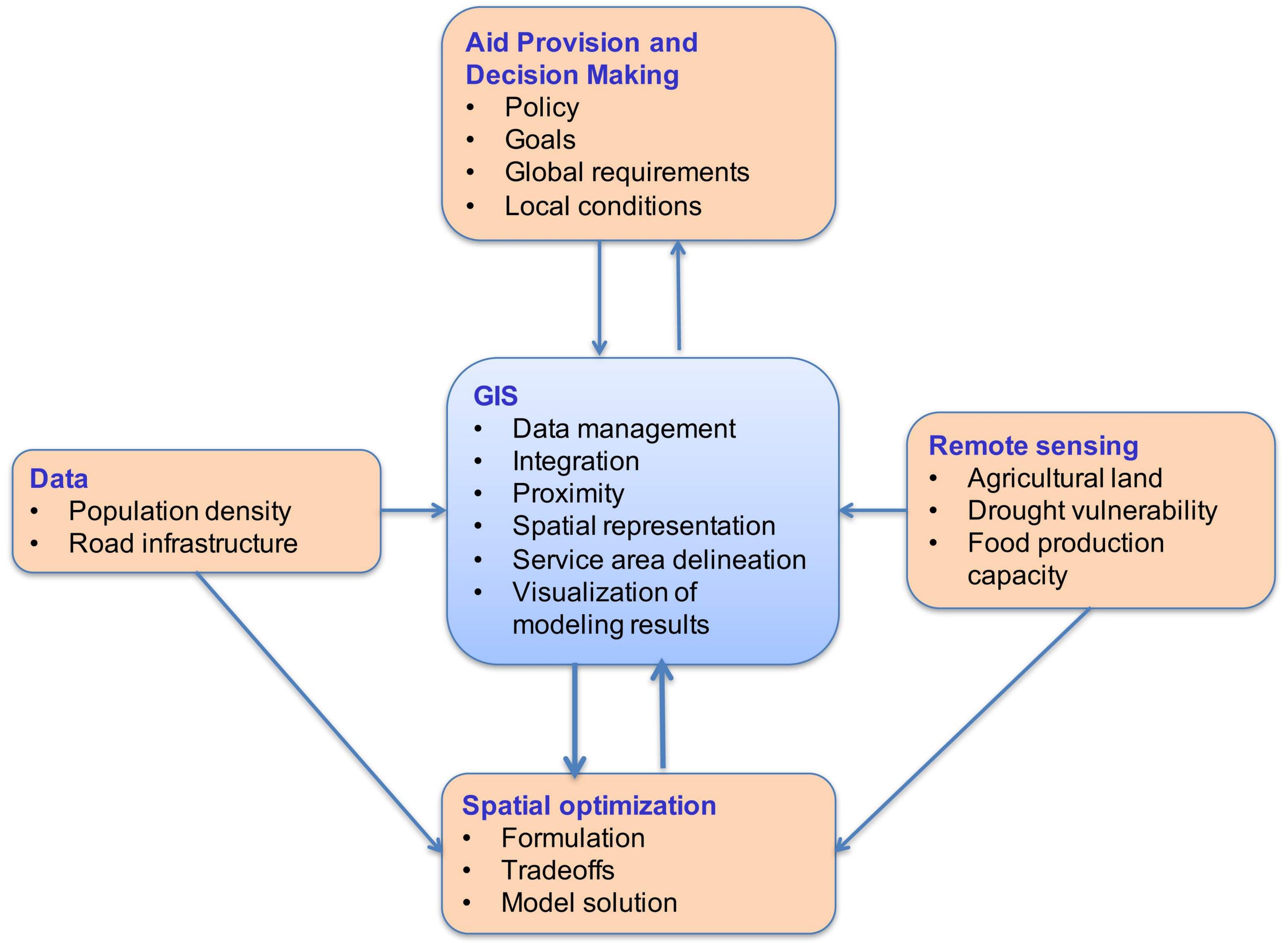
Research Goals

Many of the poorest countries in the world face chronic food insecurity partly because of severe challenges to reliable access to safe and healthy food. Food aid provides one potential solution to increase food availability and access and reduce the negative impacts of food insecurity for many poor people. Despite a history of food aid, however, chronic insecurity persists.

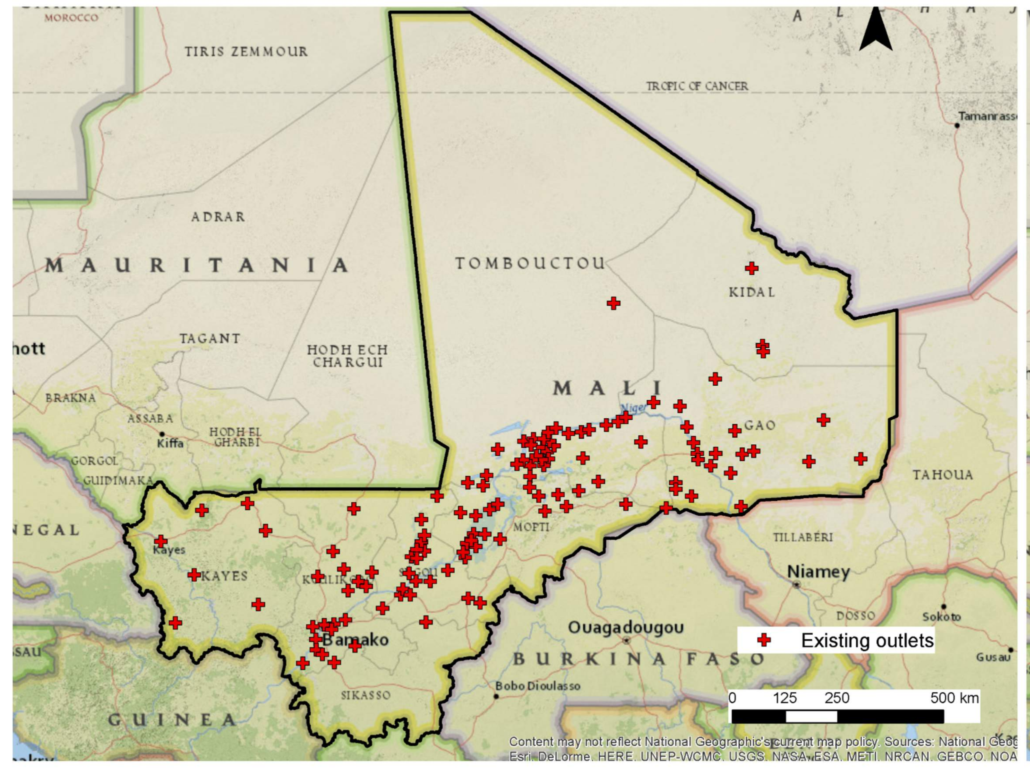
Goal 1: Use current data on population – density and characteristics, in combination with remotely sensed based estimates of agriculture, to estimate demand for food need.

Goal 2: Provide a quantitative, optimization based product identifying ideal locations for food aid outlets.

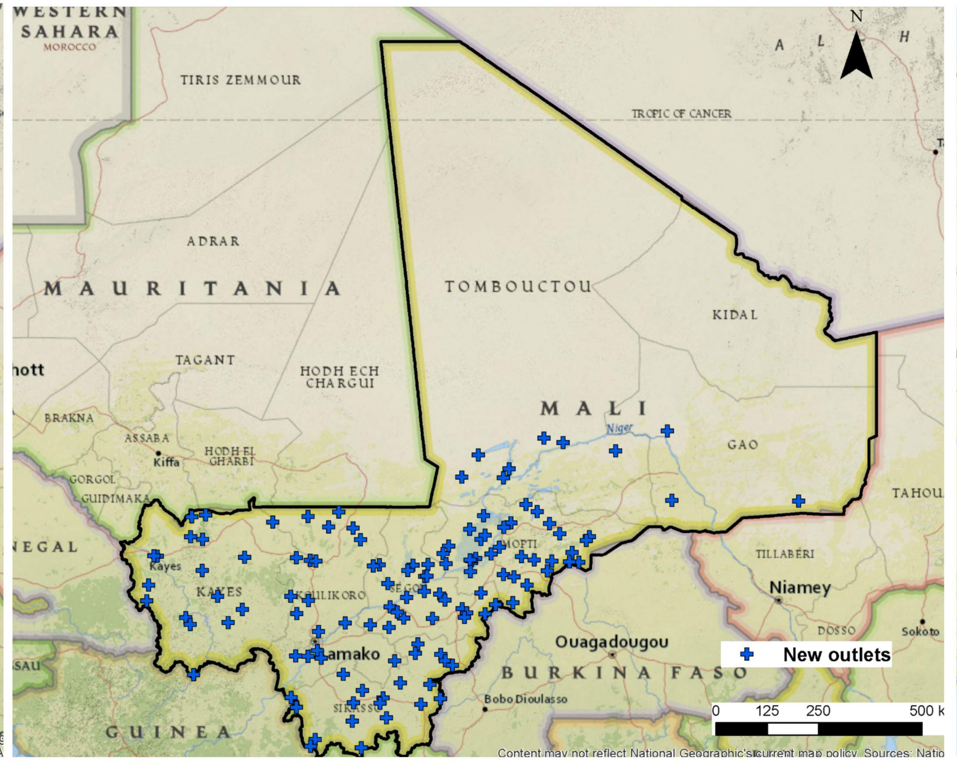
Spatial Framework



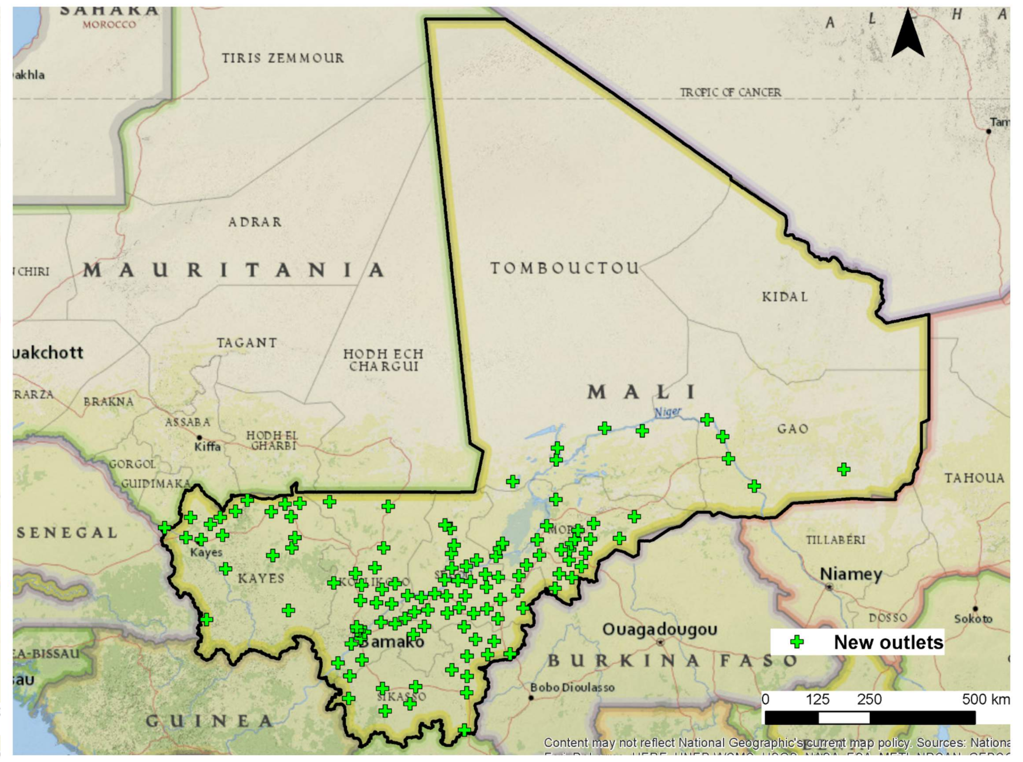
Optimizing food aid allocation



Pre-Optimization Allocation of Food Outlets
The World Food Program (WFP) currently has 122 outlets that can serve 44% of food aid demand given the local service coverage distance thresholds and require an average travel distance of 30 km to access.

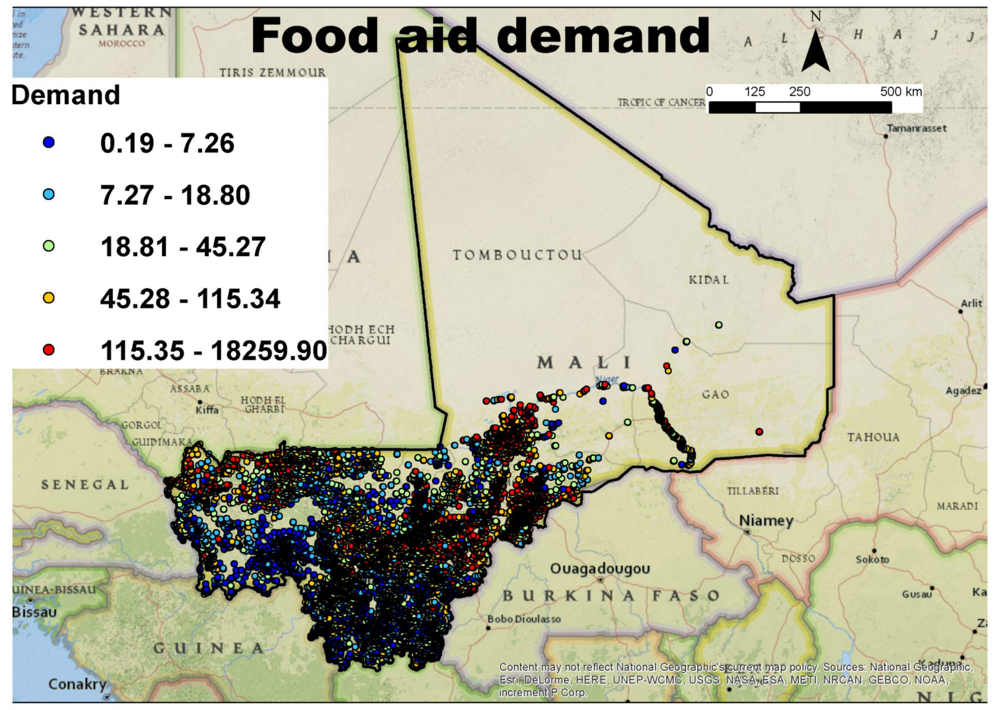


Reallocating Outlets to Reduce Travel Distance
Reallocating 122 outlets based on demand. Distribution outlets that can minimize the travel distance to get food aid, resulting in an average travel distance of 15 km to get food aid.



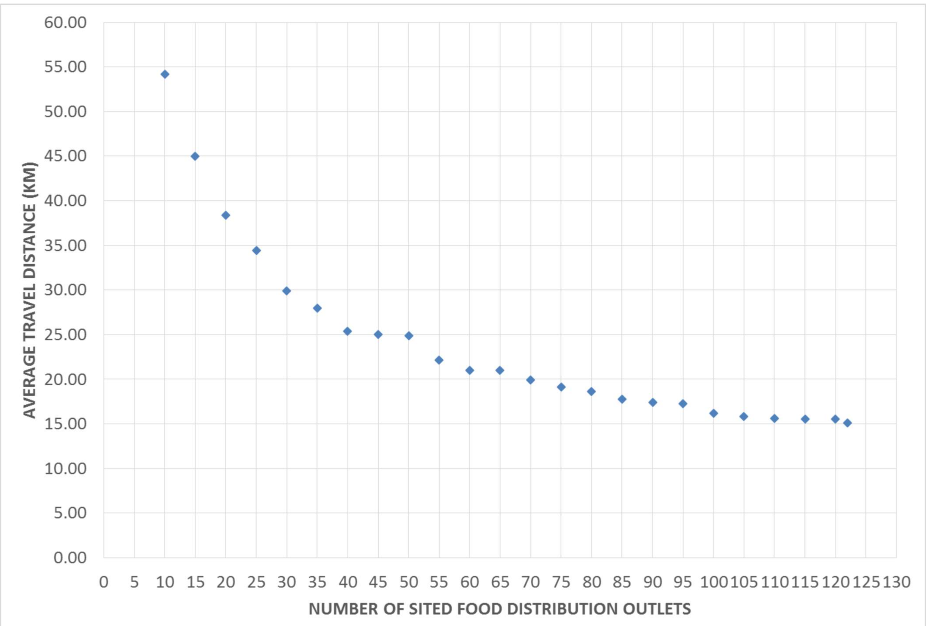
Reallocating Outlets to Improve Coverage
Reallocating 122 outlets based on demand. Distribution outlets that can maximize the coverage of food aid demand given the local service coverage distance thresholds, resulting in coverage of 86% of food aid demand

Maximizing access while minimizing costs

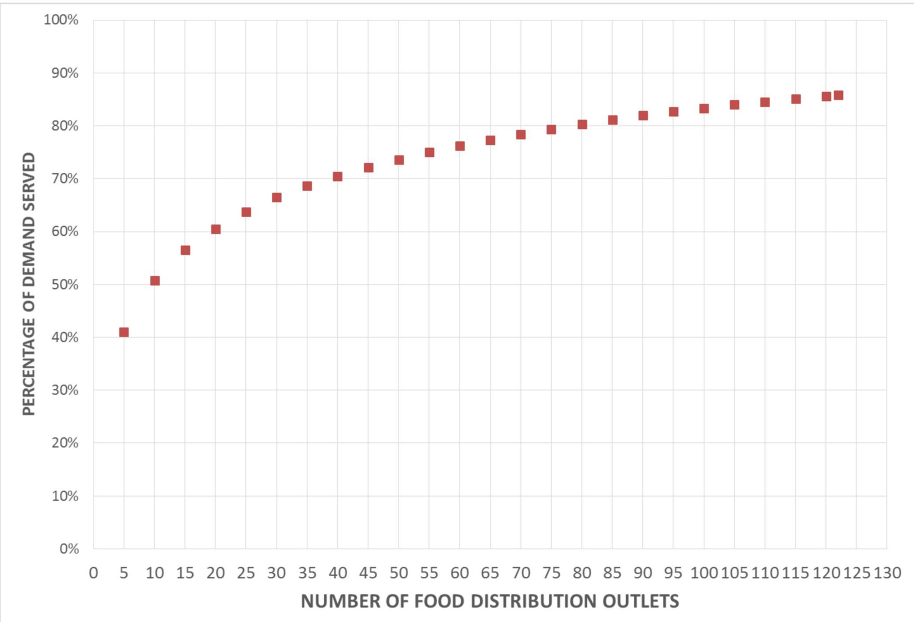


Food aid demand estimation

$$w_i = f(NDVI, Pop) = (1 - NDVI_i) * Pop_i$$



Efficiency Tradeoff Curve assuming no matter how far the households are away from the outlets, people will travel to the outlets to get food.



Demand Coverage Tradeoff Curve given the local service coverage distance threshold..

Key Findings

Outcome 1: Current data can be effectively combined to produce highly detailed food aid allocation strategies that reflect immediate needs for food aid.

Outcome 2: Optimization methods are useful in reducing travel costs and time for needy individuals, logistical costs associated with poorly situated outlets and produce an easily modifiable model of outlet locations.

- Food aid is not accessed by the neediest population groups
- Current strategies for food aid distribution are rooted in historical strategies and reflect geographic, political, social, and economic biases that reduce the utility of food aid
- Spatial optimization methods can improve food aid allocation and provide a non-biased starting point

Acknowledgments

NASA

USGS science for a changing world

FEWS NET FAMINE EARLY WARNING SYSTEMS NETWORK

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