

Final Project Proposal

DATA 604: Simulation & Modeling

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1 Problem Statement & Research Questions

TBD

Disasters can be defined as crises that overwhelm, at least for a time, people's capacities to manage and cope.

Planning for disaster relief scenarios can be a tricky endeavour. Where will the next disaster occur? When? On what scale? The historical record can be useful to understand a range of possible answers, but this raises more questions. How many supplies should be pre-positioned in anticipation of a future disaster? What type of supplies should be stocked? How might a given set of supplies be useful for multiple disasters? Questions like these are considered in current research as shown in the papers reviewed for this proposal.

2 Statement of Objectives

The humanitarian logistic chain entails procurement of supplies, storage, transportation, in-country arrival and custom clearance, in-country storage and transportation and distribution. We plan to use a combination of R and Simio to develop and execute a simulation model in order to model key components in this logistics chain.

The *system* being modelled will be the aspects of the humanitarian logistics chain associated with (perhaps global hubs storage locations → transport to disaster country → custom entry → local storage → local transportation). JN comment: may need to cut this down to what is doable in the time we have.

Events will include the occurrence of disasters.

3 Data Set(s)

The Humanitarian Data Exchange provides many different data sets which could be beneficial for this project (United Nations Secretariat, 2016).

Disaster profiles from 1900 to 2015 can be accessed from the Centre for Research on the Epidemiology of Disasters (EM-Dat, 2016). These data will be used to profile the probability distribution of disasters regionally. We will leverage this information when simulating disaster occurrences that will demand the movement of relief supplies.

TBD

4 Recent Journal Papers

4.1 Multi-criteria logistic modeling for military humanitarian assistance...

This paper describes a model complete with objective function an array of constraints for aiding in decision support for humanitarian assistance and disaster relief (HA/DR) efforts. Specifically, the model aims to determine the optimal the aerial supply chain network for HA/DR given target goals for response time, supply chain cost and unmet demand in the disaster zone (Bastian, Griffin, Spero, and Fulton, 2015).

4.2 Emergency Logistics Planning in Natural Disasters

This paper describes a model for delivering disaster relief via multiple transportation methods (Ozdamar, Ekinici, and Kucukyazici, 2004). The model focuses on minimizing demand for various disaster relief commodities at various disaster locations, while considering an array of constraints. The model considers a disaster that encompasses a region which includes the supply depots whereby a given delivery of disaster relief to one location might simultaneously be a pickup of disaster relief destined for another location in the same disaster. One might imagine an earthquake in which one area has excess food but not enough water, and logistics planners desire to optimize the sharing of supplies.

4.3 Evaluation

TBD

5 References

- Bastian, N., P. Griffin, E. Spero and L. Fulton. “Multi-criteria logistics modeling for military humanitarian assistance and disaster relief aerial delivery operations”. In: *Optimization Letters* (2015). DOI: 10.1007/s11590-015-0888-1.
- EM-Dat. International Disaster Database. 2016. URL: http://www.emdat.be/advanced_search/index.html.
- Ozdamar, L., E. Ekinici and B. Kucukyazici. “Emergency Logistics Planning in Natural Disasters”. In: *Annals of Operations Research* (2004).
- United Nations Secretariat. Humanitarian Data Exchange. 2016. URL: <https://data.hdx.rwllabs.org/>.