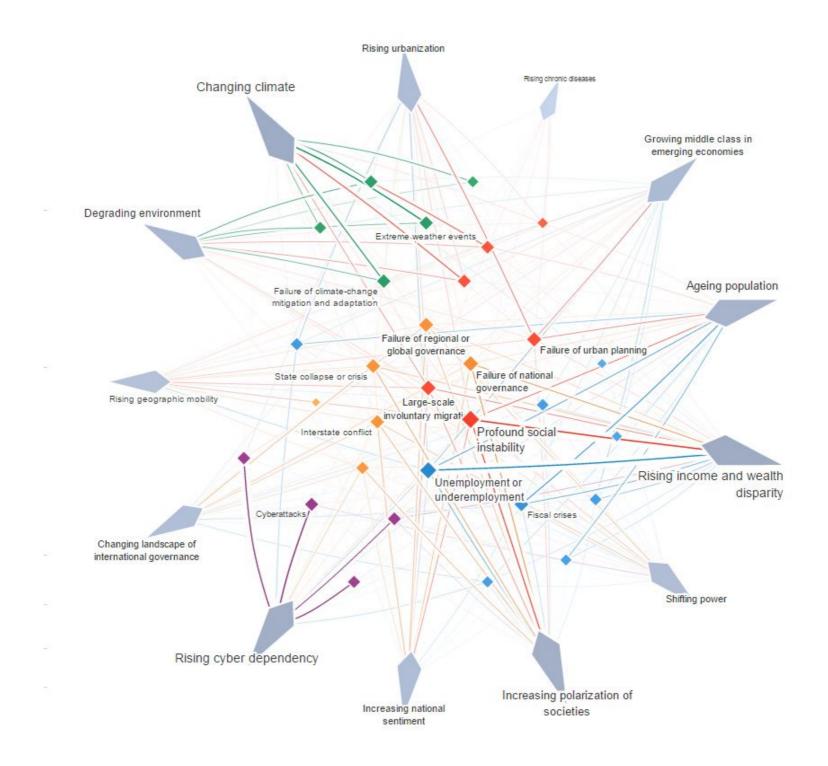# Tempus Fugit: Time as a driver of uncertainty

Dr. Tina Comes
t.comes@tudelft.nl
@tinacomes

Prof. Dr. Bartel Van de Walle
b.a.vandewalle@tudelft.nl
@bvdwalle

TUDelft

Rising urbanization

Changing climate

Rising chronic diseases

Growing middle class in emerging economies

Degrading environment

Extreme weather events

Ageing population

Failure of climate-change mitigation and adaptation

Failure of regional or global governance

Failure of urban planning

State collapse or crisis

Failure of national governance

Rising geographic mobility

Large-scale involuntary migration

Interstate conflict

Profound social instability

Rising income and wealth disparity

Unemployment or underemployment

Cyberattacks

Fiscal crises

Changing landscape of international governance

Shifting power

Rising cyber dependency

Increasing national sentiment

Increasing polarization of societies

https://www.weforum.org/reports/the-global-risks-report-2017

Humanitarian Disaster Response

- **Uncertainty**

- **Complexity**

- **Volatility**

- **Time pressure**

- **Shifting preferences, values, norms**

- **Guided by humanitarian principles**

The Signal Code

The Right to Information

Access to information during crisis, as well as the means to communicate it, is a basic humanitarian need. Thus, all people and populations have a fundamental right to generate, access, acquire, transmit, and benefit from information during crisis. The right to information during crisis exists at every phase of a crisis, regardless of the geographic location, political, cultural, or operational context or its severity.

The Right to Protection

All people have a right to protection of their life, liberty, and security of person from potential threats and harms resulting directly or indirectly from the use of ICTs or data that may pertain to them. These harms and threats include factors and instances that impact or may impact a person's safety, social status, and respect for their human rights. Populations affected by crises, in particular armed conflict and other violent situations, are fundamentally vulnerable. HIAs have the potential to cause and magnify unique types of risks and harms that increase the vulnerability of these at-risk populations, especially by the mishandling of sensitive data.

The Right to Privacy and Security

All people have a right to have their personal information treated in ways consistent with internationally accepted legal, ethical, and technical standards of individual privacy and data protection. Any exception to data privacy and protection during crises exercised by humanitarian actors must be applied in ways consistent with international human rights and humanitarian law and standards.

The Right to Data Agency

Everyone has the right to agency over the collection, use, and disclosure of their personally identifiable information (PII) and aggregate data that includes their personal information, such as demographically identifiable information (DII). Populations have the right to be reasonably informed about information activities during all phases of information acquisition and use.

The Right to Rectification and Redress

All people have the right to rectification of demonstrably false, inaccurate, or incomplete data collected about them. As part of this right, individuals and communities have a right to establish the existence of and access to personal data collected about themselves. All people have a right to redress from relevant parties when harm was caused as a result of either data collected about them or the way in which data pertaining to them were collected, processed, or used.
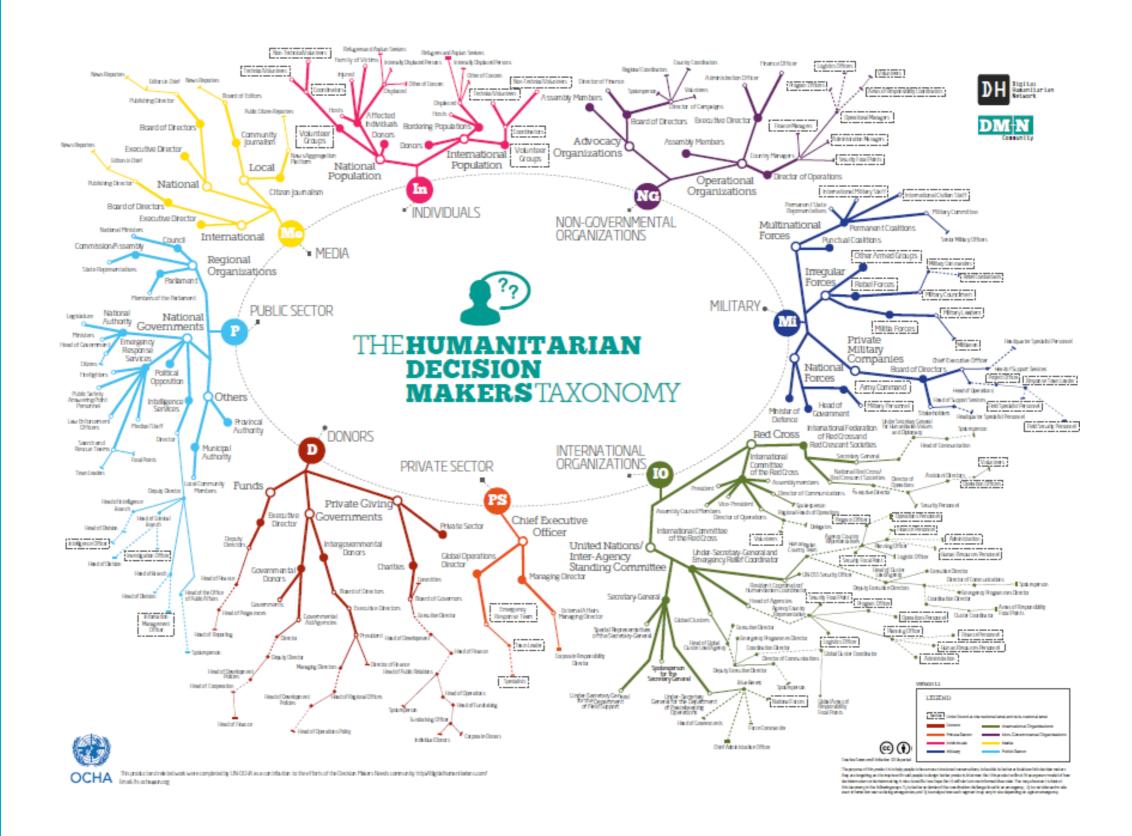
HARVARD HUMANITARIAN INITIATIVE

Signal
Human Security + Technology

TUDelft

**Field Research:
Humanitarian Decisions, Information (and) Systems**

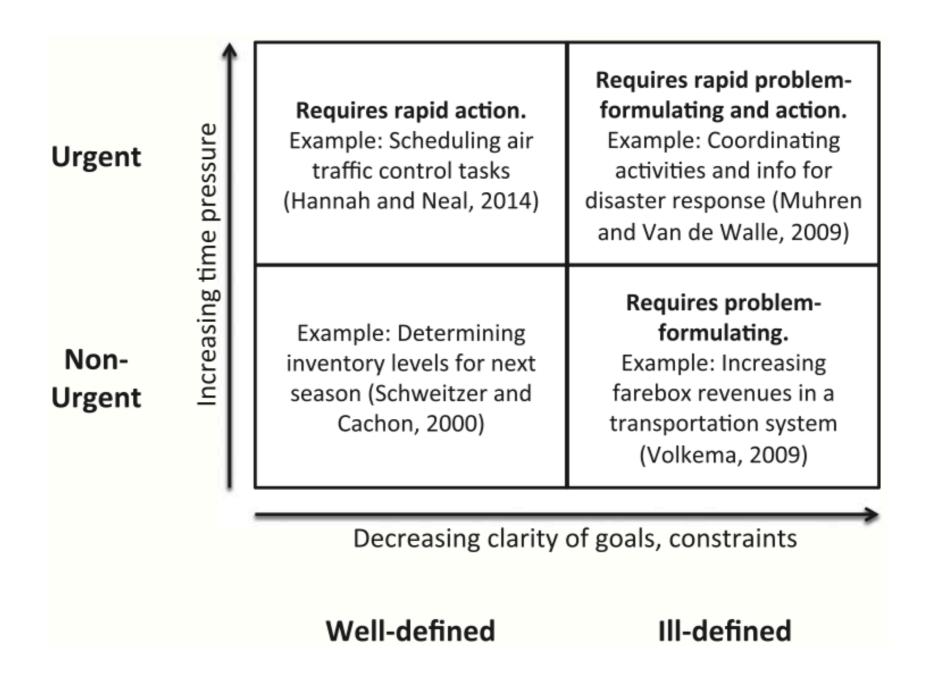**TU**Delft

THE **HUMANITARIAN DECISION MAKERS** TAXONOMY

Problem formulation and Decisions

Dominance of individual perceptions and trusted networks

Fragmentation and volatile coordination

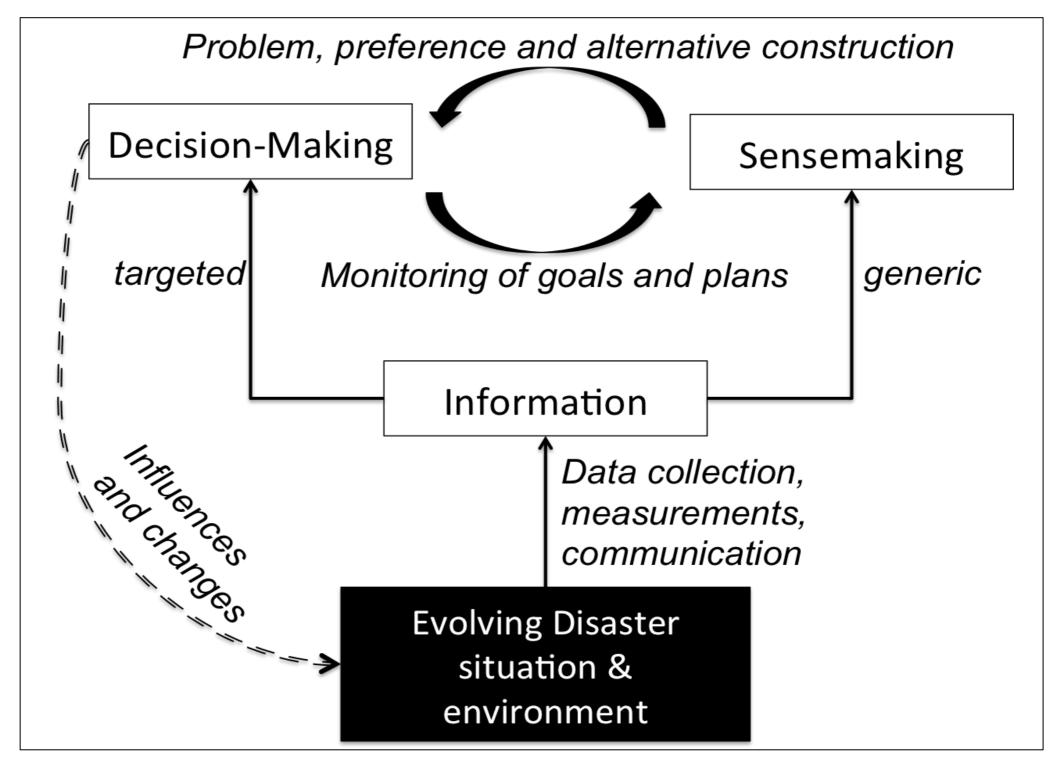*Simplification and satisficing as dominating strategies under time pressure*

Gralla et al., 2016: Problem Formulation and Solution Mechanisms: A Behavioral Study of Humanitarian Transportation Planning. *POMS*, 25(1), 25-35.

The role of Sensemaking

- provide a framework to **structure** chaotic streams of information into meaningful patterns that are the basis for decision-making

- **continuously on-going process,** adding to the narrative of expected events or paths
  [sensemaking trajectories]

- **social** activity

Comes, T. (2016, March). Cognitive biases in humanitarian sensemaking and decision-making lessons from field research. In *Cognitive Methods in Situation Awareness and Decision Support (CogSIMA), 2016 IEEE International Multi-Disciplinary Conference on* (pp. 56-62). IEEE. http://ieeexplore.ieee.org/document/7497786/
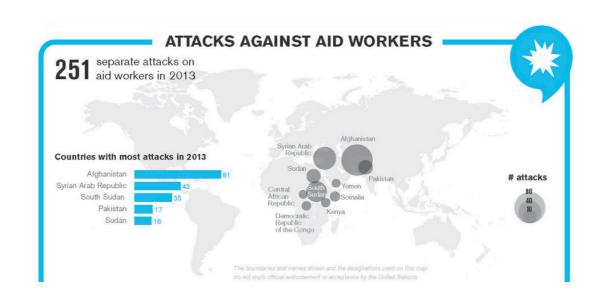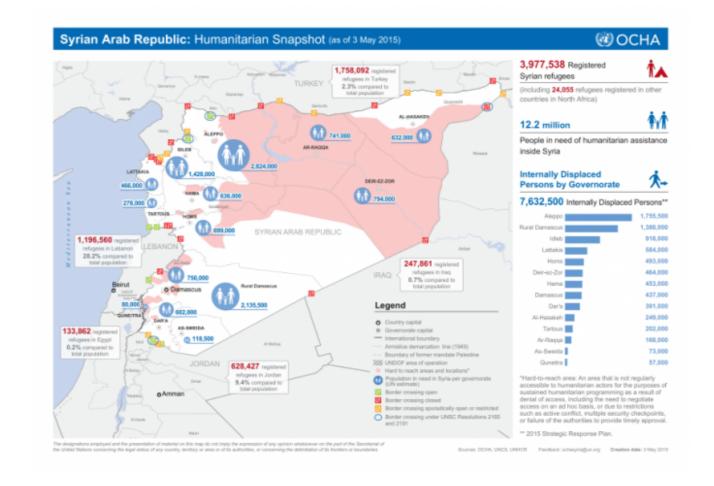
iTRACK
Protection and safety of humanitarian missions

In 2000 there were 41 significant attacks on aid workers recorded across the globe. By 2014, it had risen to 190. In those 15 years, **over 3,000 aid workers have been killed, injured or kidnapped**.
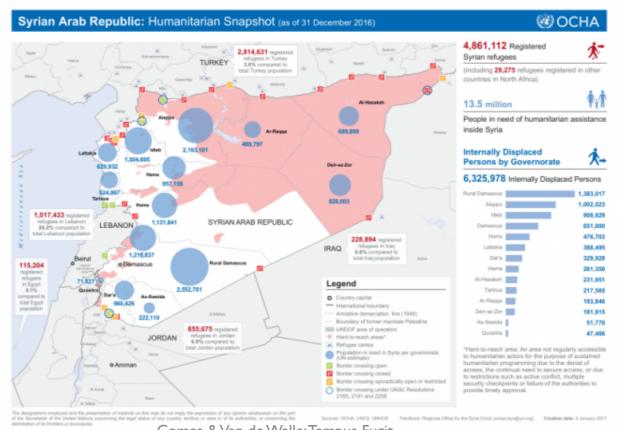
http://www.itrack-project.eu/

ATTACKS AGAINST AID WORKERS

251 separate attacks on aid workers in 2013

Countries with most attacks in 2013

Afghanistan 81
Syrian Arab Republic 43
South Sudan 35
Pakistan 17
Sudan 16

Comes & Van de Walle: Tempus Fugit

"In Syria, it is impossible to separate operational from strategic or political information.
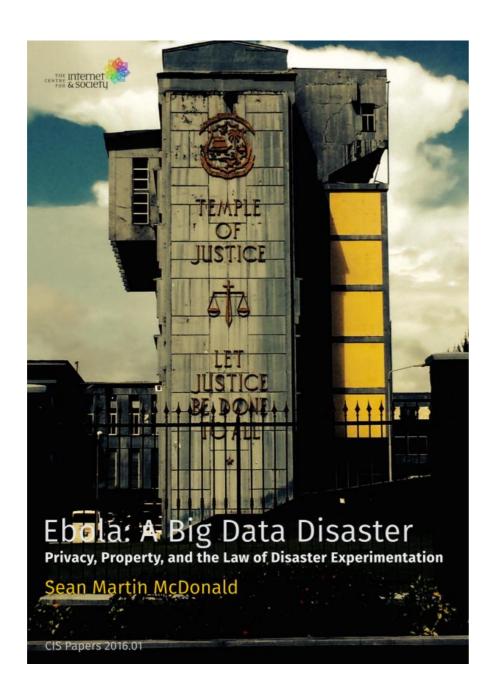**More than anywhere else, information is power here.**"

"The level of uncertainty is extreme. We don't know enough.
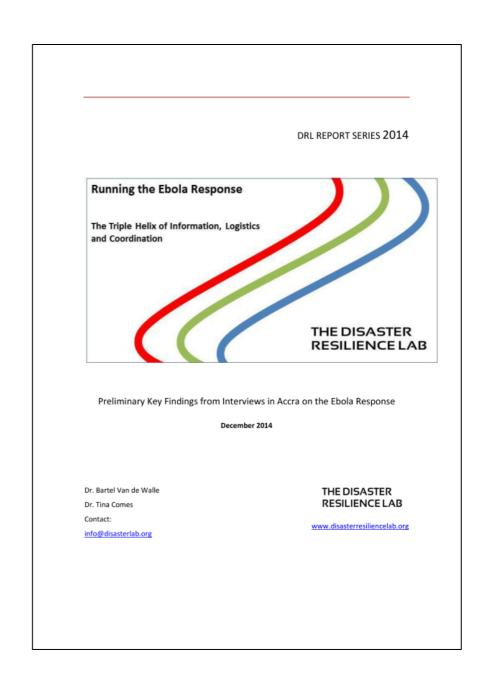**We are responding in the dark.**"

(Excerpts from interviews of the author on the Syria Crisis, May 2014 & June 2015).

Understanding the Ebola Response

https://cis-india.org/papers/ebola-a-big-data-disaster

https://reliefweb.int/report/ghana/running-ebola-response-triple-helix-information-logistics-and-coordination
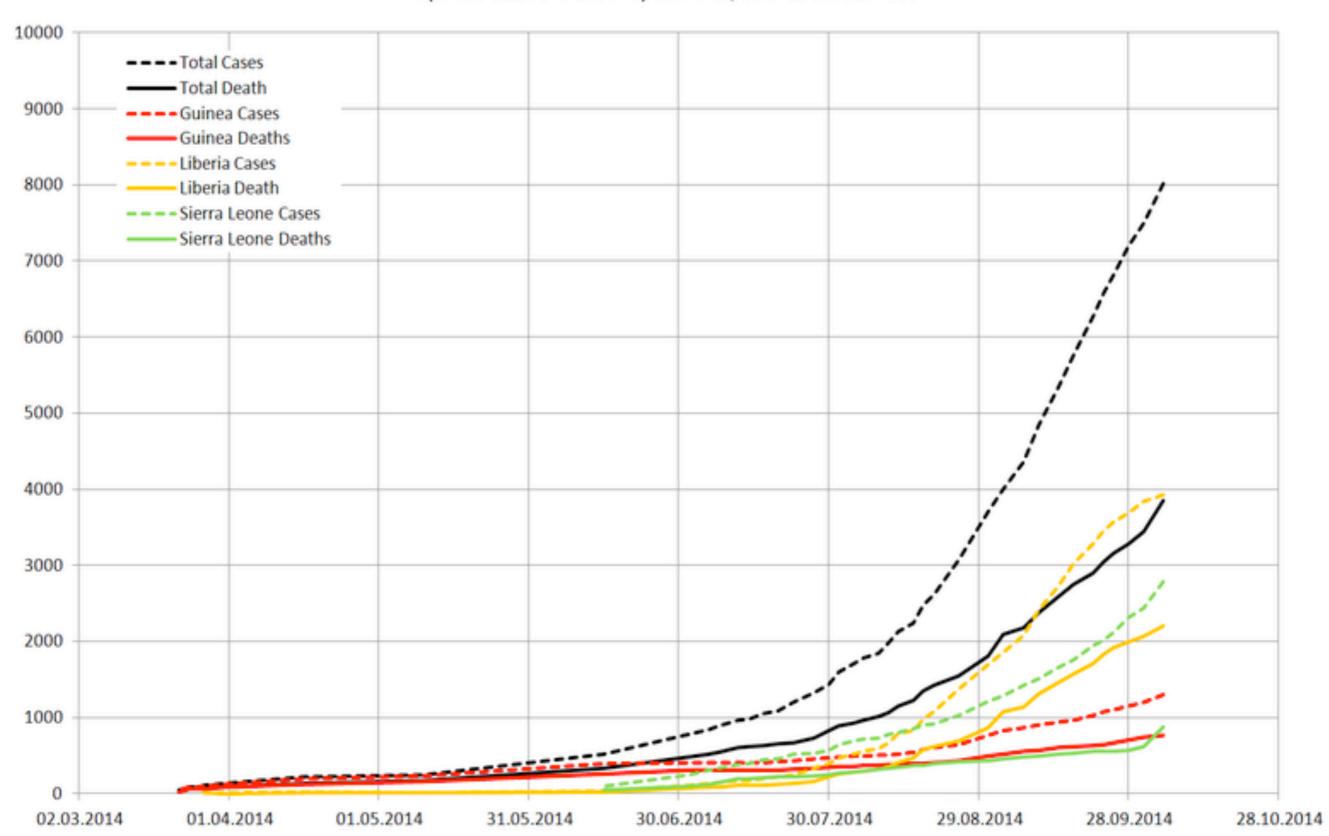
TUDelft

Ebola

- Outbreaks in underfunded health systems where failing health service is "part of the problem"

- Historical outbreaks (DRC and Uganda)

- This outbreak started late 2013 in border areas
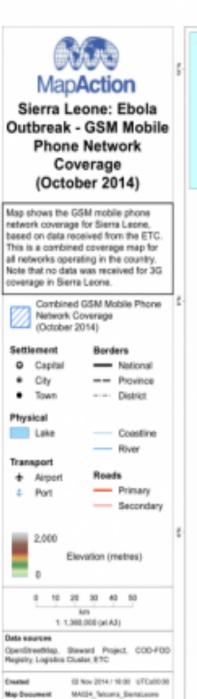
- Health care staff infected and dies

TUDelft

2014 West African Ebola epidemic

Reported cases and death by countries, as of 05 October 2014
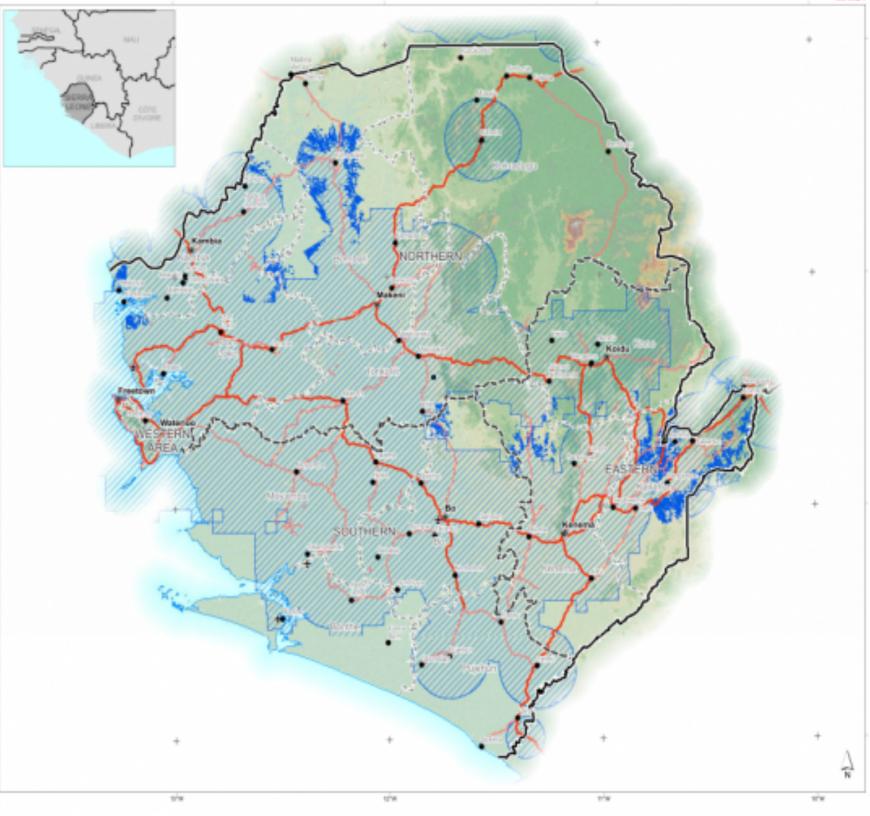
Legend:
- Total Cases
- Total Death
- Guinea Cases
- Guinea Deaths
- Liberia Cases
- Liberia Death
- Sierra Leone Cases
- Sierra Leone Deaths

Data & Coordination

Expected

"So many problems with data from the field; access to information is really difficult; difficult information flow from the country level. Most of them [in the field] do not have time to think about data or information."

Maybe not so expected…

"A lot of information that we need is going directly to Geneva, and not been shared with us here in Accra, although it is really important."

"It is of course difficult when you take out the normal structures everybody is used to working under and you try to impose a new coordination structure, and everybody trying to figure out who is doing what and where do we go for information."

Excerpts from Interviews in Accra, December 2014

TUDelft

Humanitarian Operations Management – state of the art?!

Research assumptions.

ID	Assumption	Type	Comments on classification
1	Immediate availability of supplies and other resources after the occurrence of the disaster (Görmez et al., 2011; Zaric et al., 2008)	Limited	For unpredictable disaster, this assumption is not reasonable. Also, it would be of value to take into consideration restrictions concerning production lead times and transportation delays when planning the distribution of relief supplies
2	Deterministic and given post-disaster travel times, costs and demand. (a few papers assume statistical distribution for demand) (Fiorucci et al., 2005; Minciardi et al., 2009). If scenarios are used, these parameters are assumed deterministic and given within each scenario (Beamon and Kotleba, 2006; Yi and Kumar, 2007)	Unrealistic	Several factors involved in a typical disaster setting introduce uncertainty into parameters such as demand, costs, and travel times. Therefore, it is important to model the uncertainty of such parameters. The use of scenarios might help, but some uncertainty might need to be considered within each scenario, as well
3	A given set of scenarios whose probabilities and behavior are based on experts opinions and historic data (Chang et al., 2007; Rawls and Turnquist, 2010)	Limited	For predictable disasters it would be more reasonable to consider disaster characteristics, e.g. for hurricanes consider path and wind speed as in Taskin and Lodree (2010). When the information about scenarios characteristics is based on historical data, an important consideration is that the scarcity of previous data and the low frequency of previous disasters may lead to highly inaccurate predictions
4	Static parameters (demand, travel time, costs, etc.) (a few consider dynamic parameters) (Chang et al., 2007; Nagurney et al., 2011)	Unrealistic	Costs, demand, travel times, etc. may change as disaster relief evolves. Also, if using penalties for unmet demand, these should be time dependent
5	Resistant buildings and network infrastructures (Stepanov and Smith, 2009; Sbayti and Mahmassani, 2006)	Unrealistic	Disaster typically affect infrastructures which may significantly affect travel times and costs
6	For distribution of relief goods and humanitarian supply chains, total resource availability generally considered enough to cope total demand (otherwise, a penalty for unmet demand is considered as an input) (Nagurney et al., 2011; Rawls and Turnquist, 2010)	Limited	Not reasonable for unpredictable disasters, since there is no warning for gathering all the required resources. Also, it does not account for possible damage to inventories. In the case in which penalties are used for quantifying the cost of unmet demand, such penalties need to be carefully analyzed since unmet demand of vital assets may be a matter of death or life
7	Network topology is given for transportation problems (Chiu and Mirchandani, 2008; Opasanon and Miller-Hooks, 2009)	Reasonable	It is reasonable to assume that there is some basic knowledge regarding the transportation network in disaster relief, based on the existing network infrastructure
8	Set of candidate locations considered as an input for location-allocation problems (Rawls and Turnquist (2010), Jia et al., 2007)	Reasonable	Consider the problem of prepositioning supplies. It would be reasonable to have a given set of candidate locations, instead of assuming that we could virtually preposition in any random point
9	Statistical independence of events (Taskin and Lodree, 2010; Matisziw and Murray, 2009)	Limited	Statistical independence is a strong assumption and it should be verified, e.g.in Taskin and Lodree (2010), the authors assume that successive forecasts of hurricane's characteristics are statistical independent, but no supports are given for such an assumption
10	Information about disaster impact (demand, network status, etc.) available immediately after the disaster (Georgiadou et al., 2007; Chen and Chou, 2009)	Unrealistic	During disasters, chaos and communication failures are not uncommon, which may lead to disruptions and delays regarding the transmission of the disaster's information
11	Perfect information of evacuees about road network and traffic conditions (Kongsomsaksakul et al., 2005; Chen and Zhan, 2008)	Unrealistic	In disasters, we would expect that it might take some time to state traffic conditions. Also, this assumption does not leave room to population without knowledge about road networks, such as tourists
12	No time-windows delimiting delivery times in relief goods distribution (Rawls and Turnquist, 2010; Campbell et al., 2008)	Unrealistic	In disaster, demand (especially of vital items) need to be satisfied within a given period. After a certain time, it may be too late to serve demand. This must be considered in research related to distribution of relief goods

Galindo, Gina, and Rajan Batta. "Review of recent developments in OR/MS research in disaster operations management." *European Journal of Operational Research* 230, no. 2 (2013): 201-211.

Over to you!

- Drivers of uncertainty
- Timescales
  (linked to different decision-making levels)
- Decisions and intervention windows
  (and uncertainties)

Set up
- One 'moderator' per table that will report back to plenary.
- You can move around and discuss what you think is most interesting!
- Total of ~20 minutes

TUDelft

Discussions & Summary