“Preparedness in Humanitarian Supply Chains - Exploring the Benefits of Investments in Different Operational Settings”

Jonas Stumpf, HELP Logistics
Maria Besiou, KLU
Tina Wakolbinger, WU

Academic Marketplace, GLM 2021
A Multi-Year Journey


2. Supply Chain Expenditure Analyses - 2017-2018

3. Preparedness investment studies based on System Dynamics modelling - 2018

4. Presentation of findings to humanitarian community and donors - 2018-2019

5. USD 500k investments into supply chain preparedness - 2019 - 2022


7. More private and institutional donors investing into supply chain preparedness to close funding gap - 2022 - ...

"1 USD invested in preparedness saves 7 USD on emergency response"

"73% of total response cost is in the supply chain"

#preparedness works (GLC Media Campaign 2019)
Introduction

“There is a world of opportunities for relevant and impactful research” (Besiou and Van Wassenhove 2019)

- Different and new ways of operating are needed (High-Level Panel on Humanitarian Financing 2016, Lewin et al. 2018)
- Investing and building capacity in the supply chain as powerful trigger to save time, cost and lives (Jahre et al. 2016, HELP and KLU 2018, Lewin et al. 2018)
- Systematic proof and fact-based evidence on the actual impact of preparedness investments is lacking (Jahre et al. 2016)
Suitable method to study systems that are characterized by dynamic complexity due to “uncertainty, constraints and trade-offs, unfamiliar context with multiple stakeholders with conflicting goals having to engage in uneasy alliances with new players, and unexpected and sometimes counter-intuitive behavior” (Besiou and Van Wassenhove 2015)

The combination of in-depth case studies and modeling establishing causal relationships generates strong and valuable findings (Jahre et al. 2016)

SD model based on 5 case studies of different disaster responses with 4 humanitarian organizations with different operational settings
Different Operational Structures

Figure 1 Centralized Setting

- Emergency responses in other countries
- International staff deployments, global IT infrastructure and processes
- Supply chain response capacity
- Relief operation
- Humanitarian needs
- Relief items
- International procurement

Figure 2 Decentralized Setting

- Local staff deployments, local IT infrastructure and processes
- Supply chain response capacity
- National office
- Relief operation
- Humanitarian needs
- Local procurement
- Relief items

Figure 3 Hybrid Setting

- Emergency responses in other countries
- Staff deployments, IT infrastructure and processes
- Supply chain response capacity
- Global headquarters
- National office
- Relief operation
- Humanitarian needs
- Relief items
- Local and international procurement
Supply Chain Setting

Figure 4 Supply Chain Setting

<table>
<thead>
<tr>
<th>Humanitarian Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR Supply Chain Capacity</td>
</tr>
<tr>
<td>Sourcing and Procurement</td>
</tr>
<tr>
<td>International Transport</td>
</tr>
<tr>
<td>In-country Transport and Storage</td>
</tr>
<tr>
<td>Distribution</td>
</tr>
</tbody>
</table>

Preparedness Investments
(based on Van Wassenhove 2006, Kunz et al. 2014 and Jahre et al. 2016)

Supply Chain Cost, Lead Time (10% and 90% Delivery) and Social Impact
Performance Metrics

- We build on the broader ROI concept to provide a more comprehensive understanding of how supply chains are affected by preparedness activities.

\[ \text{ROI Cost} \ (\%) = \left( \frac{(\text{Total Response Cost (without investment)} - \text{Total Response Cost (with investment) - Investment Amount})}{\text{Investment Amount}} \right) \times 100 \]

\[ \text{Delivery Lead Time Saving} \ (\%) = \left( \frac{\text{(Lead time (scenario without investment)} - \text{Lead time (scenario with investment)})}{\text{Lead time (scenario without investment)}} \right) \times 100 \]

\[ \text{Local Social Impact Increase} \ (\%) = \left( \frac{\text{(Social Impact (without investment)} - \text{Social Impact (with investment)})}{\text{Social Impact (without investment)}} \right) \times 100 \]
## Disaster Context (Focus on High-risk Countries)

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Type of Disaster</th>
<th>Start Date</th>
<th>Simulation Day</th>
<th>Affected Population</th>
<th>Targeted Population</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Asia</td>
<td>Flood</td>
<td>24 June 2012</td>
<td>905</td>
<td>5,148,475</td>
<td>514,848</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Asia</td>
<td>Flood</td>
<td>10 August 2011</td>
<td>586</td>
<td>1,640,023</td>
<td>164,002</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Columbia</td>
<td>Central America</td>
<td>Flood</td>
<td>06 April 2010</td>
<td>95</td>
<td>2,791,999</td>
<td>279,200</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Haiti</td>
<td>Central America</td>
<td>Earthquake</td>
<td>12 January 2010</td>
<td>11</td>
<td>3,700,000</td>
<td>370,000</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Asia</td>
<td>Wildfire</td>
<td>01 September 2015</td>
<td>2069</td>
<td>409,664</td>
<td>40,966</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Lao</td>
<td>Asia</td>
<td>Flood</td>
<td>01 August 2011</td>
<td>577</td>
<td>430,000</td>
<td>43,000</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Madagascar</td>
<td>East Africa</td>
<td>Insect infestation</td>
<td>01 October 2010</td>
<td>273</td>
<td>2,300,000</td>
<td>230,000</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Malawi</td>
<td>East Africa</td>
<td>Drought</td>
<td>01 October 2015</td>
<td>2099</td>
<td>6,700,000</td>
<td>670,000</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Mozambique</td>
<td>East Africa</td>
<td>Drought</td>
<td>01 March 2010</td>
<td>59</td>
<td>460,000</td>
<td>46,000</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>Philippines</td>
<td>Asia</td>
<td>Storm</td>
<td>04 December 2012</td>
<td>1068</td>
<td>6,246,664</td>
<td>624,666</td>
<td>EM-DAT</td>
</tr>
<tr>
<td>South Sudan</td>
<td>East Africa</td>
<td>Conflict</td>
<td>15 December 2013</td>
<td>1444</td>
<td>3,200,000</td>
<td>320,000</td>
<td><a href="https://reliefweb.int/report/south-sudan/south-sudan-humanitarian-snapshot-7-february-2014">https://reliefweb.int/report/south-sudan/south-sudan-humanitarian-snapshot-7-february-2014</a></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>East Africa</td>
<td>Drought</td>
<td>01 January 2013</td>
<td>1096</td>
<td>4,300,000</td>
<td>430,000</td>
<td>EM-DAT</td>
</tr>
</tbody>
</table>

Table 1: Disasters reflected in simulation model
Findings - Non-investment Case and Different Scales of Disaster

- Disaster strikes at day 400 (no conflict with other emergencies)
- Low value items (USD 2.78 – 3.3)
- In-country capacity low-medium
- International staff 8-10 times more expensive than local staff
- International staff capacity 2.5 times higher than local staff

→ Decentralized setting cheaper than centralized and hybrid setting
→ Decentralized setting faster than centralized setting for small scale disasters (for 10% delivery lead time)
Findings - With-investment Case and Different Scales of Disaster

- Disaster strikes at day 400 (no conflict with other emergencies)
- Investments in all categories have unfolded (most of) their impact

→ Decentralized setting remains cheapest but hybrid setting with largest relative impact
→ Decentralized setting fastest in 10% delivery time
→ In smaller disasters decentralized setting also faster in 90% delivery time
Findings – Impact of Shocks

- Disaster strikes at day 400 (no conflict with other emergencies)
- Investments in all categories have unfolded (most of) their impact
- Supply chain capacities reduced by 50%

→ Decentralized setting mostly affected in terms of increased delivery lead time
Summary of Findings

- Overall, preparedness pays off for all operational settings
- Holistic investments with more impact than isolated investments (e.g. only pre-positioning)
- Largest impact potential in decentralized setting
- Decentralized setting most vulnerable to shocks
- Critical influential factors such as **impact of other emergencies, the available capacity in country** and the **value of items** have to be considered
What performance metrics do you measure when investing in your supply chain?

<table>
<thead>
<tr>
<th>Metric</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response-cost reduction</td>
<td>0</td>
</tr>
<tr>
<td>Lead-time reduction</td>
<td>0</td>
</tr>
<tr>
<td>Increased demand fulfillment</td>
<td>0</td>
</tr>
<tr>
<td>Environmental impact (e.g., CO2 reduction)</td>
<td>0</td>
</tr>
<tr>
<td>Local social impact</td>
<td>0</td>
</tr>
<tr>
<td>Other metrics</td>
<td>0</td>
</tr>
<tr>
<td>We do not have significant investments in our supply chain</td>
<td>0</td>
</tr>
<tr>
<td>We do not measure the impact at great detail</td>
<td>0</td>
</tr>
</tbody>
</table>
Preparedness framework (Jahre et al. 2016) to identify links between investment activities and improved processes.

SCOR framework to map and measure supply chain process performances.
End-to-end Preparedness Investment Cycle

1. **Data-based Problem Statement**
   (e.g. Funding Gap, SCM Cost)

2. **Gain Understanding of Context through Theoretical Modelling**
   (System Dynamics)

3. **Measure Impact**
   Generated

4. **Make Investment and Implement Activities**

5. **Develop Investment Plan with Clear Impact Focus**

Figure 11 Preparedness Investment Cycle
Thank you