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Defining logistics preparedness:
A framework and research agenda

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Abstract

Purpose of this paper

This paper aims to contribute to a more complete understanding of logistics preparedness. By comparing research in preparedness and logistics with findings from empirical analysis of secondary data, we develop a definition of and framework for logistics preparedness, along with suggestions for a future research agenda.

Design/methodology/approach

We link the way in which humanitarian organizations define and aim to achieve logistics preparedness with extant academic research. We critically analyze public data from 13 organizations that are active in disaster relief and review papers on logistics preparedness and humanitarian logistics.

Findings

We found that, despite the increased attention, there is no unified understanding across organizations about what constitutes logistics preparedness and how it can contribute to improvements in operations. Based on our review of the academic literature, we found the same is true for humanitarian logistics research. The lack of a common understanding has resulted in low visibility of efforts and lack of knowledge on logistics preparedness.

Research limitations/implications

Based on research and practice, we suggest a definition of and framework for logistics preparedness with related suggestions for future studies.

Practical implications (if applicable)

Findings can help the humanitarian community gain a better understanding of their efforts related to developing logistics preparedness and provide a better basis for communicating the need for, and results from, funding in preparedness.

Societal implications

Results can support improvements in humanitarian supply chains, thereby providing affected people with rapid, cost-efficient, and better-adapted responses.

What is original/value of paper

Our findings contribute to humanitarian logistics literature, firstly by identifying issues related to the lack of a common definition. Secondly, we extend the understanding of what constitutes logistics preparedness by proposing an operationalized framework and definition. Finally, we add to the literature by discussing what future topics and types of research may be required.

Keywords

Disaster relief, Emergency preparedness, Humanitarian, Logistics preparedness, Framework

Paper Type: Research paper

1 Introduction and purpose

An increase in the number of disasters worldwide has created complex and multi-party disaster relief operations, with associated duplications of efforts, limited information availability and transparency, lack of resources and funding, and accountability and coordination issues. The challenges have triggered a need to re-evaluate relief efforts with the purpose of increasing operational efficiency, reducing duplications, and better managing resources. In this respect, emergency preparedness, in which suitable structures are set up before the occurrence of disasters, is indisputably important (Holguín-Veras et al., 2012). Humanitarian organizations, the donor community, and researchers have all called for better preparedness to improve performance during operations. The United Nations Development Program (UNDP), for example, contends that for every US dollar invested in emergency preparedness the humanitarian community can save $7 in the disaster aftermath (UNDP, 2015). Organizations such as the International Federation of Red Cross and Red Crescent Societies (IFRC) and the United Nations (UN), as well as donors such as the British Government, have made public calls for more preparedness (e.g. British Government, 2014; UN, 2010). However, the humanitarian world spends only 1 percent of its total international aid on minimizing disaster impact (UNDP, 2015). Accordingly, while there appears to be universal agreement about the importance of preparedness, few turn it into action. Furthermore, logistics of disaster relief operations, ranging from procurement to warehousing and delivery, can account for up to 80 percent of total costs (Van Wassenhove, 2006). This makes logistics preparedness particularly important for improving the quality, cost, and speed of operations (www.ifrc.org, 2015).

Research on logistics preparedness is limited having mainly focused on goods prepositioning (Kunz, et al. 2014). Although some studies have discussed pre-disaster structure improvements under terms such as capacity building (Pazirandeh, 2010; Tadele and Manyena, 2009) and risk management (Whybark, 2007), explicit reference to logistics preparedness, and a definition thereof, is missing. It is also unclear how logistics preparedness relates to emergency or disaster preparedness in general. Accordingly, more knowledge is needed in academia and practice on (i) what logistics preparedness is compared with general preparedness; and (ii) how organizations (and societies) prepare their logistics for disasters. This study aims to shed light on these issues and developments in practice in order to develop a more complete understanding

of logistics preparedness. By comparing extant research in preparedness and logistics with findings from empirical analysis of secondary data, we develop a definition of and framework for logistics preparedness with suggestions for a future research agenda.

In order to access a broad range of information and organizations, we systematically searched for and analyzed data published online by humanitarian organizations. We found that despite the increased attention, there is no unified understanding across organizations of what constitutes logistics preparedness and how it can contribute to improvements in operations. Based on our review of the academic literature, we found the same is true for humanitarian logistics research. The lack of a common understanding has resulted in low visibility of efforts and a lack of knowledge about logistics preparedness. Our findings make three main contributions to the humanitarian logistics literature. Firstly, we identify issues related to the lack of a common definition. Secondly, we extend the understanding of what constitutes logistics preparedness by proposing an operationalized framework and definition. Finally, we add to the literature by discussing what future topics and types of research may be required.

2 Literature review

Experiences from previous disasters made researchers and practitioners realize the importance of investments *between* relief operations and not just *during* them (Thomas and Muzishima, 2005; Chaikin 2003; Van Wassenhove, 2006). Authors have connected poor logistics preparedness and a lack of understanding of logistics issues by practitioners to several problems during disaster relief operations. Extant research has claimed that practice often overlook logistics preparedness and is seldom included in general preparedness plans (Chaikin, 2003). One cause of this is a lack of financial resources. In general, it is challenging to get funds to support preparedness efforts as funding is commonly earmarked for specific operations (Van Wassenhove, 2006; Jahre and Heigh, 2008; Besiou et al. 2014; Jahre et al. 2016). Consequently, there is a need for an increased donor attention to preparedness efforts (Majewski, et al. 2010). In the following, we present a review of research on definitions and frameworks for preparedness and humanitarian logistics with the purpose of identifying a basis on which to compare results from an inductive empirical study.

2.1 Preparedness in a humanitarian logistics context – definitions and frameworks

Being better prepared can help organizations improve their performance during operations, changing their focus from tactical planning alone to longer-term strategic planning (Maon et al. 2009). However, preparedness not only concerns the organizations and other actors providing international assistance. Preparedness of disaster-prone countries and the local communities is equally if not more important (Dilley et al. 2005; Wisner et al. 2003; Franklin and Todt, 2013). Cutter et al. (2008) is one of many observers to propose the term "resilience", which she defines as "the ability of a social system to respond and recover from disasters" (p. 599). Accordingly, preparedness concerns all involved parties and is about preparing for disasters to the extent that one can respond well and return to a normal state as quickly as possible.

The humanitarian logistics literature does not offer a clear definition of general preparedness or explain how *logistics* preparedness links to it. Other concepts, such as capacity building, strategic planning, and risk mitigation are considered part of, connected to, and/or synonymous with preparedness. For example, Holguín-Veras et al. (2012) used mitigation and preparedness synonymously, defining them as the activities performed before disasters and aimed at enhancing safety and reducing impact for both people and infrastructure. Humanitarian logistics scholars often use general terms when discussing logistics preparedness. Kunz et al. (2014) and Tomasini and Van Wassenhove (2009) used "disaster preparedness"; Jahre and Heigh (2008) and Heaslip et al. (2012) simply used the term "preparedness"; while Kovács et al. (2012) and Kaneberg et al. (2016) used "emergency preparedness". Following this broad and unclear approach to logistics preparedness, the humanitarian logistics literature suggests a wide range of (logistics) preparedness efforts, including personnel training, establishment of institutions, financial resource measures, prior planning of logistic centers and shelters, prepositioning, custom agreements with local governments, mock drills, household preparedness, handling community equipment, understanding warning/de-warning messages, first aid, and coordination.

In terms of logistics preparedness *frameworks,* Kovács and Spens (2007) provided an overall framework that distinguished between preparation, immediate response, and reconstruction phases, linking disaster prevention, risk management, strategic planning, coordination and

collaboration to the preparation phase. They mentioned decision support systems and technologies, simulation techniques, route planning in emergencies, coordination, pre-positioning and pre-purchasing, but depicted typical logistics activities such as demand and supply planning as part of the immediate response only, and not preparedness. Building on Kovàcs and Spens (2007), de Leeuw et al. (2012) suggested a framework for flood emergency preparedness focusing on logistical decision aspects. They included demand management (forecasting needs and logistics accessibility), supply management (outsourcing, contracting, procurement, coordination), inventory management (what items to stock, target levels, locations), and resource management (planning distribution, training, disaster preparation, cooperation). Kaneberg et al. (2016) built on Listou (2015) and Van Wassenhove (2006) and presented an empirical study of the Swedish preparedness system. Scholten et al. (2014) presented what they term an integrated resilience framework – a rather general approach constituting supply chain re-engineering, collaboration, agility (flexibility), risk awareness, and knowledge management. Caunhuye et al.'s (2012) framework, which was more concrete but rather limited and based on an extensive literature review, exemplifies the humanitarian logistics literature's focus on prepositioning and facility location when it comes to preparedness.

The most encompassing and detailed framework we identified is that of Kunz et al. (2014), who built on Kunz and Reiner (2012) and provided an extensive review of preparedness aspects put forward in the humanitarian logistics literature. They added inventory management and infrastructure planning to Van Wassenhove's (2006) five key preparedness elements, defining the two first as physical and the other five as intangible:

- Inventory – prepositioning of items
- Infrastructure – establishing networks of physical and communicational nature
- Human resources – selecting and training of organizational and local skills
- Knowledge management – streamlining learning and experiences
- Operations and process management – framework agreements, responsive supplier base and transport channels
- Financial resources – obtaining sufficient money to prepare and initiate operations

- Community – finding effective ways to collaborate with other key players, such as governments, military, business, local community, and other humanitarian organizations.

Our review discloses that neither of the identified frameworks explicitly link to *logistics* preparedness, nor do they define it. The only definition we identified in the academic literature was Listou (2015), who said that logistics preparedness is the "*efforts to design organizational structures, to organize supply chain resources, and to plan and train to ensure efficient response if preparedness is called for*" (p.115). However, his definition seems very limited and not in line with ongoing developments on resilience, and links between disaster response, preparedness, recovery, and long-term development. Furthermore, it focuses on a specific group of agencies – namely, peacekeeping missions providing international assistance – which seemingly excludes preparedness of local communities or other responding agencies.

Based on the review, we conclude that the lack of a clear and well-defined logistics preparedness concept seems to lead to mixed use of terminology, the absence of clear boundaries between logistics and general preparedness, and a lack of visibility towards donors concerning investments in logistics. This gives a wide range of efforts suggested as part of logistics preparedness, some of which we would hardly consider as logistics (for example, household preparedness and warning messages). The one definition we identified seems too narrow considering the increasing focus on local community resilience as an essential element of logistics preparedness. Accordingly, while the literature offers frameworks that can provide a starting point, there is a need for greater understanding of what *logistics* preparedness might (and might not) entail. To develop this, we turn to definitions of humanitarian logistics to see what they say about preparedness.

2.2 Humanitarian logistics – definitions and frameworks

An extensive review of all definitions used in the humanitarian logistics literature is beyond the scope of this paper. However, many authors refer to the definition provided by Thomas and Mizushima (2005) or slightly adjusted versions of this (cf. Overstreet et al. 2011; Bölsche et al. 2013; Tatham 2012; Tabaklar et al., 2015). Thomas and Mizushima (2005, p. 60) argued that humanitarian logistics is "*the process of planning, implementing and controlling the efficient,*

cost-effective flow of and storage of goods and materials as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary's requirements." Thomas and Kopzack (2005) provided a slight variation – "*…for the purpose of alleviating the suffering of vulnerable people*" – and an important addition for the purpose of this paper: "*The function encompasses a range of activities, including preparedness, planning, procurement, transport, warehousing, tracking and tracing, and customs clearance*" (p. 2). Similar to commercial logistics, we see that humanitarian logistics entails efficiency and cost effectiveness of *activities* related to the planning, implementation, and control of material and information flows from suppliers to end-customers. The difference is the inclusion of preparedness and that Thomas and Kopzack (2005) defined the aim as alleviating suffering rather than increasing profits. However, they listed preparedness as one of several logistics activities without offering any further detail of what it might entail. Furthermore, although not explicitly excluding local logistics capacity, the focus seems to be assistance provided by international organizations (such as customs clearing). Finally, the definition does not include reverse logistics activities, which has increasingly been pointed out as important in the humanitarian context (UNEP/OCHA, 2011; Peretti et al. 2015; SPREP, 2016).

Van Wassenhove (2006) took a somewhat different approach, focusing on the required *resources*, suggesting that logistics of relief operations are essentially "*the processes and systems involved in mobilizing people, resources, skills and knowledge to help vulnerable people affected by disaster*". Finally, Kovács and Spens (2007) focused on involved *actors* constituting the supply network including donors, aid agencies, logistics providers, military, governments, and non-governmental organizations (NGOs). In a recent study, Vaillancourt (2016) presented a framework that includes actors (stakeholder environment) and resources (obstacles and types) for various disaster contexts. Including actors, resources, as well as activities is becoming increasingly common in logistics (Håkansson et al. 2009; Jahre and Fabbe Costes, 2005).

In terms of *frameworks*, Pettit and Beresford (2009) suggested that critical success factors for humanitarian logistics include strategies, transport, and capacity planning; resource, human resource, and information management; and technology utilization, continuous improvement,

supplier relations, and supply chain strategy. Swanson et al. (2013) found that the push/pull framework is of great importance when designing humanitarian supply chains/logistics. This is in line with findings in Jahre and Heigh (2008). Kovács et al. (2012) presented a framework constituting five skillset categories for humanitarian logisticians. Functional logistics skills (such as customs, transport, inventory and asset management, purchasing, forecasting, and reverse logistics) and humanitarian context skills (including emergency preparedness, fleet, security, facility and communication systems management, ethical conduct, and donor knowledge) are particularly relevant for our study. We see humanitarian logistics as a broad category, entailing typical logistics competencies on the one hand and extensive knowledge of the humanitarian context on the other. This makes *training* an essential aspect of developing logistics preparedness (Kovács and Spens, 2011; Bölsche et al., 2013; Lu et al. 2013; Harteveld and Suarez, 2015).

The logistics setup and requirements vary with the nature of operations, changing from development (long-term and ongoing) to less predictable disaster response. Logistics requirements will also differ with the nature of the disaster (Kovacs and Spens, 2009), as well as the location (winterized tents in mountainous and cold Afghanistan after the 2005 earthquake, for example). Recurring floods and droughts in certain locations are more predictable and allow for more planning and forecasting (Chang et al., 2007) than less predictable operations such as response to earthquakes and other fast-onset disasters, where organizations may speculate regarding future needs and preposition stocks to increase their responsiveness (Jahre and Heigh, 2008). Finally, different types of equipment may be needed depending on whether disasters destroy existing transport, energy and/or communication infrastructure (Barbarosoğlu et al., 2002), and the level of development in the local community before the disaster occurred (Wisner et al. 2003). Kunz and Reiner (2012) suggested categorizing such situational factors into government, socio-economic, and infrastructure. As these factors affect the (set-up of) logistics response, they should also be accounted for in logistics preparedness.

A final important aspect constitutes performance measures of disaster relief operations. Above, we referred to the definition that suggested the overall objective is to alleviate suffering. This

is commonly further operationalized in efficiency, effectiveness, and flexibility (cf. Balcik and Beamon, 2008; Jahre and Fabbe-Costes, 2015). Efficiency refers to resource utilization and operational cost, such as the total cost of resources used, overheads, or the cost of ordering. Effectiveness measures the characteristics of deliveries such as volumes delivered. Flexibility is about the ability to respond to different types of disasters. Accountability, as discussed in Tomasini and Van Wassenhove (2009), identifies who is responsible for the different tasks and how well they perform at these tasks. The humanitarian logistics community considers accountability and sustainability to be increasingly important parts of measuring performance (Haavisto and Goentzel, 2015).

To conclude, humanitarian logistics, similar to commercial logistics, involves activities related to sourcing, procurement, handling, warehousing, transportation, and distribution. The combination of activities, resources, and actors will vary with a range of factors, making broad assessment an important activity. The definitions in the academic literature vary regarding focus on actors, activities, or resources, with neither encompassing all three layers. Furthermore, no definitions distinguish between logistics preparedness and response, such as whether the importance of logistics activities varies with the different phases. From this, we summarize the implications for logistics *preparedness* as concerned with preparing the resources, activities, and actors of relevance for planning and design of the supply chain, including needs assessment with the accompanying support processes, structures, systems, and training. The response is the mobilization of these resources by using the processes that have been developed.

3 A systematic review of logistics preparedness within humanitarian organizations

Adapting MacPherson and Holt's (2007) method, we used a systematic review to map logistics preparedness efforts of humanitarian organizations. We started by outlining the review protocol, inclusion and exclusion criteria, and mapped publicly available information on the Internet by accessing, retrieving, and judging the quality and relevance of the organizations and the retrieved information (details in Appendix A and Tables A1 and A2). The search rounds (Stage 1, Table A1) helped us select an initial set of organizations by scanning titles of our Google search hits based on a set of predetermined criteria (Stage 2, Table A1). Based on exclusion criteria (Stage 3, Table A1), the list was reduced to 10 organizations. Finally, we

added three organizations commonly listed as partners in joint projects with the other identified organizations (Stage 4, Table A1). We identified and extracted the data from relevant documents (webpages and online publicly available reports discussing preparedness) for each organization using a five-stage keyword search (Appendix 1). We excluded reports related to specific missions or regions, and continued until we reached saturation (Table A2 in appendix gives details on the number of documents recorded and used). Table 1 lists the organizations and some main characteristics.

[Insert Table 1]

Table 1: The selected organizations (Based on information 2010–2013; approximate numbers)

Organization	Type	Level of operations	Mandate	Types of supplies	Size # Countries (Staff)	Annual budget USD	Output
WFP	Multi-lateral	Global	Food aid	Food related needs	80 (11,500)	3.73 bill.	80 mill. people reached 3.1 mill. ton food
IFRC	NGO	Global	Emergency relief	Broad range of emergency-relief-related services and products	189 (415,000)	390 mill.	150 mill. people reached
MSF	NGO	Global	Medical aid	Medical and nutritional products and related services	60 (30,000)	400 mill.	More than 15 mill. patients
UNHCR	Multi-lateral	Global	Refugee aid	Broad range of services and supplies	125 (9300)	6.8 bill.	21 mill. people of concern
IOM	Multi-lateral	Global	Migration planning and assistance	Services and non-food items for migrating population	100 (8400)	1.675 bill.	No information
UNICEF	Multi-lateral	Global	Child rights and protection	Broad range of child- and mother-related services and products	190 (11,000)	4.2 bill.	No information
WHO	Multi-lateral	Global	Directing and coordinating health aid	Needs related to the operating diseases	150 (7000)	4 bill.	No information
CARE	NGO	Global	Emergency relief and development aid	Food, relief, water, sanitation, and shelter supplies and related services	87 (9200)	647 mill.	97 mill. people reached
Mercy Corps	NGO	Global	Emergency, economic collapse, conflicts	Food, water, and shelter and related services	40 (3700)	300 mill.	16.7 mill. people reached
World Vision	NGO	Global	Emergency relief and development	Broad range of services and supplies	100 (46,000)	1 bill.	16 mill. people reached
Oxfam	NGO	Global	Rights and Poverty	Broad range of services and supplies	94 (10,000)	15.7 mill.	20.7 mill. people reached

HelpAge	NGO	Global	Elderly rights and Poverty	Broad range of services and supplies related to elderly care	65 (No information)	40 mill.	1.5 mill. people reached
FEMA	Bilateral	National	Emergency relief	Broad range of services and supplies	1 (14,800)	10.9 bill.	No information

Extracted data was inductively analyzed, coded, and reduced to map definitions of logistics preparedness and then map logistics preparedness efforts. The content analysis revealed two aspects discussed in all definitions, which we compared across organizations: Preparedness level (for example, organization, network, or community) and preparedness goal. Following Seuring and Müller's (2008) approach, we inductively coded and categorized logistics preparedness efforts before listing them in tabular form, followed by a regrouping to develop mutually exclusive categories. The frequency of efforts among organizations was re-stated and discussed based on the observations. Finally, we compared the identified categories of efforts with those identified in the literature.

3.1 Logistics preparedness as defined by organizations

Only WFP, IFRC, Oxfam, IOM, and FEMA explicitly defined *logistics* preparedness. Except for IOM, these organizations suggested that the goal of logistics preparedness is to improve overall emergency preparedness. Other organizations including MSF, UNHCR, and UNICEF, while not having explicit definitions for logistics preparedness, defined the concept using a general emergency preparedness term. The inconsistent use of terminology for logistics preparedness was apparent across the organizations. WFP recognized logistics preparedness as an integral capacity required to ensure the emergency preparedness goals. IFRC listed logistics preparedness as a subsection to emergency preparedness, recognizing it as a general preparedness tool. For other organizations, definitions of emergency preparedness were at least partly about logistical issues:

- MSF: "*Medical and logistical supplies, in the form of pre-packaged … stored in warehouses in key global locations.*"
- UNHCR: "*Emergency stockpiles of non-food aid items … long-standing agreements with freight forwarders and logistics companies … a global network of suppliers, specialist agencies and partners.*"

- UNICEF: "*… prepositioning of essential emergency items in disaster-prone states; ... partnerships with key organizations that help to improve coordination.*"

FEMA seems to consider logistics preparedness as an integral part of core capabilities to ensure the general preparedness goals, but does not discuss it within their general preparedness topics. Instead, they address it in a specific logistics unit using terms such as logistics capability and management, focusing heavily on preparedness.

Overall, the organizations discuss the *emergency* preparedness concept in relation to one or all of the following three levels: (1) local governments or communities; (2) organization; and (3) the responding network of organizations. Most organizations emphasize the importance of the whole response network, as exemplified by UNICEF's definition of emergency preparedness: "*a contingency plan developed in coordination with field offices; prepositioning of essential emergency items in disaster-prone states; institutional partnerships with key organizations that help to improve coordination; emergency training and capacity building; and rapid deployment of pre-screened consultants. Also … strengthening the capacity of governments and partners to prepare effectively and develop joint emergency planning mechanisms.*" On the other hand, organizations discussed *logistics* preparedness more on the second and third levels and not in relation to local governments or communities. IFRC, for example, mentioned how logistics preparedness means that the organization "*as a global network of National Societies has access and control of a competent, efficient and effective logistics service*". However, there is ongoing work within IFRC to extend capacity building beyond its own organization. Mercy Corps and CARE see the concept more at a network level. CARE, for example present their vision for logistics preparedness as the following: "*that coordination of the supply chain along with coordinated linkages with other stakeholders including donors, freight handlers, the Logistics, and other sector Clusters, and the broader community of humanitarian responders, will enhance and speed the delivery of humanitarian aid to those in need.*" Similar to what we found in the literature, international organizations seem to have little focus on the logistics preparedness of local communities, at least based on definitions in their public statements.

In their definitions, the organizations emphasized different goals for logistics preparedness. Table 2 shows that seven different goals were mentioned for logistics preparedness. Comparing

these goals with those stated for general emergency preparedness, it becomes evident that organizations use the two concepts rather interchangeably. Several goals were mentioned for either emergency or logistics preparedness, and many only once. WFP, MSF, UNHCR, and Oxfam stated the enhancement of emergency preparedness as a goal for their logistics preparedness. IFRC was the only organization to explicitly state a common goal for emergency and logistics preparedness; see the last column, second row of Table 2, "mitigation of impact".

[Insert Table 2]

Table 2: Organizations' specific goals for emergency and/or logistics preparedness

Goals	Number of organizations emphasizing the goal in:			
	Emergency Preparedness	**Logistics Preparedness**	**Total**	**Both definitions**
Common between the two definitions				
Rapid response	7	2	9	-
Mitigate impact	4	1	5	1
Efficient resource utilization/reduced cost	2	1	3	-
Effective and efficient management	1	2	3	-
Resource accessibility	1	1	2	-
Facilitate transition to recovery and development	3	1	4	-
Unique in either of the two definitions				
Enhancing emergency preparedness/response	-	4	-	-
Effective response/more impact	3	-	-	-
Protect community/resources	3	-	-	-
Resilient nation/community	3	-	-	-
Mobilization (staff, supplies, resources)	2	-	-	-
Reduce risk	1	-	-	-
Enhance education and training	1	-	-	-
Sustained development	1	-	-	-
Accountable response	1	-	-	-

We can conclude that there are indeed discrepancies across organizations in terms of how they see logistics differing from general preparedness regarding levels, goals, and focus.

3.2 Categorizing logistics preparedness efforts made by organizations

Table 3 summarizes logistics preparedness efforts presented in organizations' public documents. Our analysis suggested that efforts be clustered into two main groups: intra-organizational and inter-organizational. The former comprises (1) *management and control*, which encompasses human resources, knowledge management, planning and strategy, financial resources, information management, and performance measurement; and (2) *logistics operations*, including needs assessment, procurement, warehousing, and transport and

distribution. The latter is made up of (3) *recipient community*, which relates to collaboration with and involvement of the local community and development of local resilience and infrastructures; and (4) *response network*, which addresses governments, firms, and other humanitarian organizations.

Table 3: Identified logistics preparedness efforts

Categories	**Efforts**	**#**	WFP	IFRC	MSF	UNHCR	IOM	UNICEF	WHO	CARE	Mercy Corps	World Vision	Oxfam	Help Age	FEMA
Intra-organizational															
1. Management & Control															
Human resources	Training staff for general disaster response	10	**x**	**x**	**x**	**x**	**x**		**x**	**x**		**x**	**x**	**x**	
	Training logistics staff	6			**x**	**x**	**x**		**x**					**x**	**x**
	Emergency roster	4		**x**	**x**	**x**			**x**						
	Training local staff	4					**x**		**x**					**x**	**x**
	Hiring logistics specialists	1													**x**
	Hiring staff for general disaster response	1				**x**									
	Hiring local logistics staff	1													**x**
	Hiring and training leadership	1				**x**									
Knowledge management	Lessons learnt (e.g., in training)	1	**x**												
	Cooperation with academia	2		**x**						**x**					
Disaster planning and strategy	Contingency planning	6	**x**			**x**	**x**	**x**						**x**	**x**
	Decision making models	2	**x**												**x**
	Disaster strategy development	1				**x**									
	Insurance systems (e.g., supply/facilities)	1				**x**									
	Planning for security of personnel	1				**x**									
Financial resources	Securing and streamlining disaster funds	6		**x**	**x**	**x**		**x**				**x**			**x**
	Securing specific funding (e.g., for ICT)	1	**x**												
Information management	Communication technology (inter-org)	5				**x**	**x**					**x**		**x**	**x**
	Information technology (field data)	1	**x**												
	Increase visibility (e.g., SC electronic systems)	1													**x**
Performance measurement	KPIs/benchmarking (key indicators)	2	**x**			**x**									
2. Logistics Operations															
Needs assessment	Modularization/standardization of supply	7	**x**	**x**	**x**	**x**		**x**		**x**		**x**			
	Emergency items catalogue	5		**x**	**x**	**x**		**x**	**x**						
	Pre-specification of supply	3				**x**		**x**	**x**						
	Rapid analysis/planning (e.g., GIS)	2	**x**					**x**							
Procurement	Supplier partnerships (e.g., agreements)	6	**x**	**x**	**x**	**x**		**x**							**x**
	Procurement process/system	2		**x**					**x**						
	Forecasting	2		**x**				**x**							
	E-procurement	1							**x**						
Warehousing	Prepositioning	11	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**		**x**	**x**
	Inventory management systems	5		**x**	**x**	**x**			**x**						**x**
Transport and Distribution	Pre-disaster distribution centers	8	**x**	**x**	**x**	**x**		**x**	**x**	**x**					**x**
	Partnership with LSPs (e.g., agreements)	4		**x**		**x**		**x**							**x**
	Track and trace technology	3				**x**			**x**						**x**
	Increased transport fleet	2	**x**		**x**										
	Reserve air transport capacity	2	**x**	**x**											
	Distribution plans	1												**x**	
Inter-organizational															
3. Recipient community															
Coll. & involvement	Community involvement in implementation	4			**x**			x		**x**				**x**	

Resilience	Mapping community capacity/resiliency	9	x		**x**	**x**	**x**		**x**	**x**	**x**		**x**	**x**	**x**
	Early warning systems	7			**x**	**x**	**x**	**x**			**x**		**x**	**x**	**x**
	Raising awareness	7			**x**		**x**	**x**		**x**	**x**			**x**	
	Temporary housing units	2												**x**	
	Disaster resistant shelters	1									**x**				
	Evacuation routes	1												**x**	
	Understanding local laws and policies	1				**x**									
4. Response network															
Government	Agreements with local governments	7	x	**x**	**x**	**x**	**x**	**x**	**x**	**x**					
	Coordination with host government	6	x	**x**		**x**	**x**	**x**			x				
Firms	Public private partnerships	3						**x**	**x**						**x**
Humanitarian organizations	Inter-agency agreements (e.g., service provider)	8		**x**	**x**	**x**	**x**	**x**	**x**				**x**		**x**
		5	**x**			**x**		**x**	**x**					**x**	
	Logistics cluster membership	5		**x**	**x**		**x**		**x**					**x**	
	Inter-org knowledge sharing platform	5	**x**			**x**	**x**					**x**			**x**
	Inter-org communication systems/processes	2				**x**									**x**
	Coordination training of logisticians	2				**x**			**x**						
	Network mapping														
Total Count	55	199	19	19	18	31	14	20	19	8	5	6	4	15	21

Only nine of the 55 efforts listed were mentioned by more than 50 percent of the organizations reviewed, which illustrates the fragmented approach to logistics preparedness. Furthermore, some of the efforts listed in the logistics sections are general preparedness efforts, such as training and hiring staff for general disaster response, and the mapping of local resilience. Although the latter could of course also concern logistics, this is not explicit in the documents. Organizations vary in terms of the number of efforts included, from four by Oxfam to 21 by FEMA and 20 by UNICEF. Prepositioning is the one most frequently mentioned in logistics operations, while very few mentioned e-procurement and distribution plans. Although half of the organizations mentioned that mapping local resilience is important, few mentioned collaboration with or involvement from the local community in implementation.

4 Discussion

Our findings reveal that, similar to academic literature, humanitarian practice does not provide any consensus on what logistics preparedness is. The one definition we identified in the literature does not capture the increasing focus on the local community. In practice organizations are concerned with this in general preparedness, but less so when it comes to logistics. It seems that logistics is considered a more organizational issue. The academic literature and organizations use logistics and general preparedness interchangeably, leading to a broad and blurred understanding of *logistics* preparedness, including efforts that should not be included in logistics if we compare with definitions of humanitarian logistics. Examples include training and hiring staff for general disaster response, and securing and streamlining

disaster funds. Although it does not distinguish preparedness from other phases, this literature states that logistics involves activities related to assessment, sourcing (including funding), procurement, handling, warehousing, transportation, and distribution, the actors performing them, and the resources required. Although not included in any definitions, reverse logistics is viewed as important. Therefore, logistics preparedness should include aspects related to waste management.

4.1 A proposed definition of and framework for logistics preparedness

Based on our theoretical and empirical findings, we see that logistics preparedness encompasses the three layers of actors, activities, and resources. Assessment and reverse logistics come in addition to classical logistics activities such as for example procurement, and transportation. Logistics preparedness is about developing systems, structures, and processes before a disaster through planning, designing and training. Accordingly, we suggest defining logistics preparedness as "*The implementation of processes, structures, and systems connecting local community, national and international actors by designing, planning and training for efficient, effective, and responsive mobilization of material, financial, human, and informational resources when and where needed. This encompasses a range of activities, including needs assessment, procurement, warehousing, transporting and distributing, waste management, and performance measurement for the purpose of alleviating the suffering of vulnerable people.*"

The extended and concretized definition has consequences for the suggested framework depicted in Figure 1. So do the empirical findings. Comparing with the seven key elements suggested by Kunz et al. (2014), our analysis of the organizations identified additional efforts in *planning and strategy, information management, needs assessment, waste management* and *performance measurement,* as well as a broader scope of efforts related to *the recipient community* and *the response network.* The empirical analysis suggested a different grouping of efforts than the ones offered by extant research.

[Insert Figure 1]

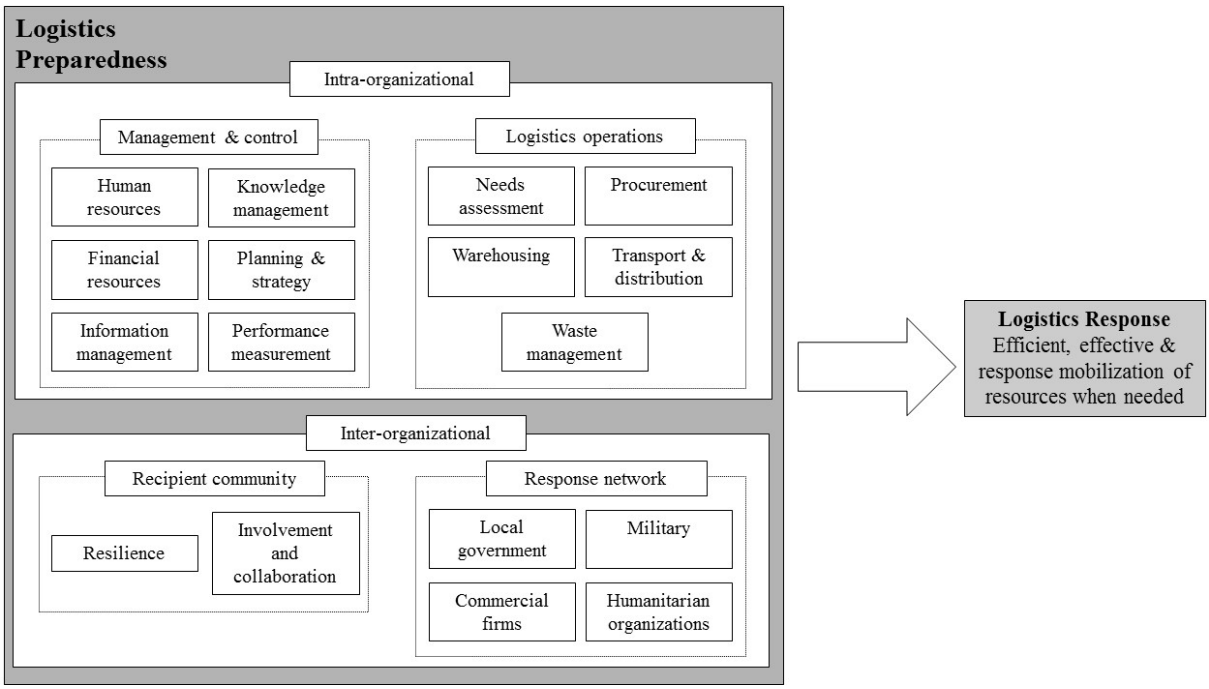

Figure 1: A proposed framework for logistics preparedness

The framework suggests that understanding and development of logistics preparedness requires attention to the design, planning, training, implementation, and measurement of the individual activities in the logistics operation as well as how they connect in the whole supply chain. In logistics operations we have included waste management, which is commonly termed reverse logistics (Peretti et al. 2015). Needs assessment, in the logistics context in particular, concerns the task of assessing available infrastructure (ports, roads, service providers, etc.) so that the logistics can be set up in an appropriate way. It also requires management and control to develop systems, structures and, processes in order to ascertain appropriate management of all resources within the organizations' own boundaries as well as those in the response network and recipient community. If we use prepositioning as an example, logistics preparedness must be concerned with preparing all resources, not only the material (physical items) needed for deployment. Human resources must be trained and financial and informational resources must be available through efficient systems and structures. Furthermore, it is not sufficient for organizations to manage and control only their own resources. Logistics preparedness requires that communication and coordination channels, and relationships be developed with other actors

before disasters occur for the purpose of jointly developing and managing resources for mobilization in the aftermath of the disaster.

4.2 A proposed research agenda

This section proposes directions for future research based on the suggested framework and definition and the efforts identified in the empirical analysis. We identified five themes for future research: needs assessment; inter-organizational resource management and development, with a particular focus on local communities; procurement and logistics services; reverse logistics; and supply chain design/strategy and planning. For each of the themes, we cross-referenced our findings with the most recent humanitarian logistics literature review (Leiras et al. 2014) and relevant papers.

We identified needs assessment as an important logistics activity. Apte et al. (2015) found that needs assessment is one of five essential capabilities in disaster response. Studies have shown that conducting assessments in the aftermath of a disaster can be very challenging (von Schreeb, 2007). New technologies are being called for (Starr and Van Wassenhove 2014) such as for example, the humanitarian community's testing of drones and social media to improve data collection (Holguín-Veras et al. 2012; Meier, 2014). On the other hand, the logistics/operations management toolbox offer complementary techniques to basing logistics set-ups on actual needs. These techniques include demand forecasting (Everywhere et al. 2011), scenario planning (Chang et al. 2007; Jahre et al. 2016), and GIS mapping (Holguín-Veras et al. 2012; Green et al. 2013). Further, organizations list pre-specification and standardization of items in order to cope with needs uncertainty, but still be able to respond quickly (Jahre and Fabbe-Costes, 2015). Future research could provide a comprehensive overview of the alternatives and their pros and cons in terms of performance and their requirements when developing logistics preparedness.

Prepositioning has been a definite area of focus. Organizations have invested in inventory management systems and additional warehouses. In fact, certain groups within practice and academia seem to think logistics preparedness is only about physical prepositioning of goods. Our study has shown it is much more than this, both in terms of the types of resources and

alternative preparedness methods. Suggested alternatives for reducing the cost of prepositioning include vendor-managed inventory (Van Wassenhove and Pedraza-Martinez, 2012), framework agreements (Balcik and Ak, 2013), and transfer mechanisms between programs (Bhattacharya et. al. 2014). The use of existing resources in the commercial sector has been suggested; for example, 'en route' vessels functioning as sea-based warehouses (Wilberg and Olafsen, 2012). Jahre et al. (2016) studied the effect of integrating supply chains for emergencies with those for long-term operations through joint stock prepositioning, while Stauffer et al. (2015) and Besiou et al. (2015) looked specifically at fleet management. An interesting avenue for future research would be to systematically compare these and other alternatives in various types of situations; for example, using the factors suggested by Kunz and Reiner (2012).

More research is also required on alternative mechanisms for preparing other types of resources, how to combine them, and how they can substitute each other. For example, what informational, funding, and human resources are needed when expanding the network for prepositioning? What are the pros and cons of using funding to insource others' human resources versus having your own roster? Humanitarian logistics research on personnel primarily concerns training, pointing out the need for more development to keep pace with practice (Bölsche et al. 2013), offer career opportunities (Allen et al. 2013), and secure learning (Lu et al. 2013; Goffnett et al. 2013). Tint et al. (2015) suggested training humanitarians to tackle the unexpected, rather than training them in specific scenarios. Our empirical study shows that organizations attempt to develop systems for lessons learnt and cooperate with academia in their efforts to streamline learning and experiences. In line with Harteveld and Suarez (2015) and others, we call for more evidence-based research comparing how various types of trainings work in practice. Related to this is research on knowledge management within the humanitarian sector. Tatham and Spens (2011) and Lu et al. (2013) suggested conceptual frameworks based on literature reviews. There is a lack of empirical studies.

When it comes to financial resources, many observers have pointed out the challenges of a lack of preparedness funding. However, apart from a few case studies (cf. Jahre and Heigh, 2008) more research is needed on the effect that a lack of funding for logistics preparedness has on

the humanitarian community's ability to respond. Research should also provide more understanding of prioritization in terms of funding concerned with investments in logistics preparedness. Due to the fragmented approach, logistics preparedness seems to include everything, including activities that are not commonly viewed as logistics. The suggested framework can function as a checklist for mapping existing logistics preparedness, thereby helping to identify gaps to argue for funding.

Concerning the fourth resource type – informational resources – our empirical study shows that organizations are concerned with developing inter-organizational ICT systems to increase supply chain visibility. While studies show that this is indeed helpful to improve disaster response (Altay and Pal, 2014; Maghsoudi and Pazirandeh, 2015), more knowledge is needed. One example would be a cross-sectional study to compare organizations' use of off-the-shelf systems with self-developed systems and the pros and cons of each.

Two of the organizations mentioned performance measurement with development of KPIs. Extant research has put this forward as important and proposed conceptual frameworks (Balcik and Beamon, 2008; Schiffling and Piecyk, 2014). Apart from a few recent contributions (D'Haene et al. 2015; Haavisto and Goentzel, 2016), there is a lack of empirical studies. Applicable performance measures both for operations and preparedness should be developed (BCG, 2015). Future research should also address misalignments and trade-offs based on empirical evidence (Jahre and Fabbe-Costes, 2015; Haavisto and Goentzel, 2016).

The recipient communities are the core of relief operations and several studies have argued for the importance of community involvement (Pardasani, 2006) and of increasing local resilience (Tomasini and Van Wassenhove, 2009). Extant research calls for studies on the incorporation and integration of local social networks and community structures (Holguín-Veras, et al. 2012). Our empirical study identified efforts in line with such suggestions. However, both practice and research seem to approach this in a rather general way. It is unclear what among these efforts are part of logistics (preparedness) and what are more general. Sheppard et al. (2013) found that local populations' contributions to logistics preparedness have been considerably undervalued and underutilized. They presented a model that future research could adapt,

implement, and test in cooperation with humanitarian actors including local governments. Another interesting research opportunity would be to investigate how disaster-prone countries can improve their resilience by developing a tool that allows actors to map their existing logistics capabilities and identify gaps and ways to improve.

While procurement can account for up to 65 percent of the cost of disaster response (Schulz, 2008), we identified few papers that dealt with this topic. Due to uncertainties in funding, unpredictable demand, and regulations similar to those of public procurement, organizations have carried out their procurement in a traditional ad hoc manner through tenders. However, organizations are increasingly developing partnerships with suppliers (we found reference to this trend among four of the reviewed organizations) and engaging in cooperative purchasing (Pazirandeh and Herlin, 2014; Pazirandeh and Norrman, 2014). There is great potential for research to document such attempts, their challenges, and effects for logistics preparedness and response. Furthermore, more research is needed on the use of logistics service providers, particularly the consequences for procurement strategies and practices. Decisions concerned with outsourcing and insourcing of logistics and how logistics preparedness can be developed in cooperation with local communities, other organizations and actors, requires understanding of what organizations do and their efforts to improve. Frameworks are available (Abidi et al. 2015; Vega and Roussat, 2015) that could be used as basis for empirical studies. Vega and Roussat (2015) suggested future research on the various roles played by logistics service providers in humanitarian logistics and their effect on performance. Bealt et al. (2016) concluded that there is a need to focus more on how relationships can influence ability for better preparedness and environmentally sound operations.

We included reverse logistics in the logistics preparedness framework. Peretti et al. (2015) noted the importance of developing reverse logistics systems for non-used and reusable items, as well as for disposable items. They concluded that future research should conduct empirical studies on existing and potential actions taken by the humanitarian community.

Our empirical study found efforts related to planning and strategy, such as contingency planning, but these were quite general and did not explicitly refer to supply chain design and

strategies. An interesting avenue for future research would be to provide more understanding of how organizations design their preparedness supply chains, and which design principles fit better in which situations. Kaneberg et al. (2016) found that coordination and planning ahead of operations (that is, the permanent (preparedness) supply chain network) is required but challenging. In a literature review, Jahre (2016) found little evidence of how preparedness strategies improve performance. An exception is Nooraie and Parast (2016), who modeled the trade-off between increased investment in supply chain capabilities and reduced supply chain risks. Other examples are the studies of fleet management by Pedraza-Martinez et al. (2011), Besiou et al. (2014), and Stauffer et al. (2015). Further research could build on their approaches.

5. Contributions and implications

In this study, we connected to the ongoing conversation in practice and academia on the importance of preparedness of logistics structures in order to improve the efficiency and effectiveness of disaster relief operations. By comparing extant research in preparedness and logistics with findings from empirical analysis of secondary data, we propose a definition of and framework for logistics preparedness with suggestions for a future research agenda. In so doing, we answer the two research questions. We found that despite the increased attention, there is no unified understanding across organizations of what constitutes logistics preparedness and how it can contribute to improvements in operations. Based on our review of the academic literature, we found the same is true for humanitarian logistics research. The lack of a common understanding has resulted in low visibility of efforts and a lack of knowledge in logistics preparedness.

5.1 Theoretical, practical and social implications

We found that while the questions are moving away from “whether” to “how” and “how effective”, there has been little research on concept development and understanding the developments regarding logistics preparedness within the sector. By categorizing and linking the efforts identified in the literature and practice, we have developed a definition of and framework for logistics preparedness, thereby closing two important gaps in extant humanitarian logistics research. This helps make distinctions between *logistics* and general (emergency) preparedness, as well as between logistics *preparedness* and response. Hence, the

present study contributes to the understanding of logistics preparedness and the efforts that involved actors are making and could make. Based on this, we suggest a number of issues for future research. In general, we found that while extant research has mentioned and discussed a number of issues, to a certain extent, it has done so mostly at a conceptual level. There is very little empirical research, particularly using approaches other than single-case studies or a limited number of semi-structured interviews. The two exceptions are prepositioning and fleet management, which use combinations of in-depth case studies and modelling establishing causal relationships and providing generic findings outside of the studied organization.

The lack of a common framework has resulted in a fragmented and low visibility state of logistics preparedness efforts in the sector. Our study has identified that organizations seem to invest in very different aspects and vary with regard to their attention to the local community. Some arguably important categories seem to have been overlooked, at least in terms of communication; these include performance measurement, knowledge management, and strategy and planning. The lack of a clear framework also makes it difficult for organizations to evaluate their preparedness efforts, assess its effectiveness, and provide evidence of the value of preparedness investments to potential donors. A common framework may help the humanitarian actors to join forces in order to obtain funding, coordinate logistics preparedness efforts, and find alternatives/complements to the item prepositioning. A framework helps in the development of a common language and increases transparency and visibility. Such a framework would also make it easier for the stakeholders and the donor community to evaluate the effectiveness of efforts. The social implications are important because they would give better use of the existing funding and possibly increase preparedness funding, particularly in local communities, thereby providing more help to affected populations.

5.2 Limitations and further research

We have based our study on extant humanitarian logistics literature, with a particular focus on preparedness. Given that many papers concern issues related to preparedness without explicitly using the term, it was challenging to conduct this review. Rather than performing a full systematic review, we used Kunz and Reiner (2012) and Leiras et al. (2014) for cross-referencing. Our empirical approach has certain limitations: (a) a limited set of organizations;

(b) the fact that we looked at international organizations only, excluding governments and other involved actors; and (c) that we used only secondary public material. We suggest that comparative case studies of numerous actors be conducted in order to gain a more detailed understanding of developments in practice and to see whether and how these developments vary with the respective stakeholders, donors, mandates, etc.

We focused on suggesting topics for a future research agenda within logistics preparedness. Rather than going into suggesting specific theories and methodological or analytical approaches, we refer to Tabaklar et al. (2015) and Heaslip (2016) for theoretical suggestions. For analytical approaches, we refer to Van Wassenhove and Pedraza-Martinez (2012) and Besiou et al. (2011) for suggestions of operations research and system dynamics, respectively.

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Appendix A: Methodological procedure – The systematic review protocol

Adapting the method from Macpherson and Holt (2007), we carried out a systematic review of organizations that are actively and explicitly involved with emergency preparedness and discuss their efforts publicly. This process starts by outlining the review protocol and mapping the area by accessing, retrieving, and judging the quality and relevance of research, and then moves to reporting the findings, identified gaps, and suggestions for future research.

Search and selection method

Following the suggestions by Tranfield et al. (2003), we conducted a systematic selection to find the relevant organizations. Five stages of search and selection were performed (Table A1). We used keywords partly based on the literature review including a broader range of terms that used by the sector (that is, humanitarian, disaster, and emergency). We conducted an additional search on the specific combination terms of "disaster relief preparedness" and "logistics preparedness" in order to identify organizations that utilize them. The keyword search resulted in 11 of the larger humanitarian organizations (Table 1, last column, second row, result of *a*). The three authors jointly decided on the inclusion and exclusion criteria, as indicated in Table 1. We excluded national American organizations that did not necessarily focus on disaster relief, local offices of the organizations, the hits related to preparedness of people against disasters, and vacancy postings for logistics positions (exclusion criteria of stage two in Table 1). However, organizations were reviewed for possible projects in the area. In a second round (that is, refine, select, and sort in Table A1), we undertook the following steps for each organization using Google searches:

1) A keyword search for preparedness OR logistics preparedness AND the name of the organization;
2) A general scan of the website for preparedness and logistics preparedness discussions;
3) A keyword search using the search function in organizations' sites for preparedness OR logistics preparedness;
4) Search for discussions in an organization's reports related to strengthening of logistics capabilities and capacities, even if not referred to as preparedness; and
5) Checking general logistics and supply documents of the organization (for example, webpages, strategy notes, reports, lessons learned, etc.) for discussions related to strengthening of logistics capabilities and capacities, even if not referred to as preparedness.

We reviewed discussions or reports that referred directly to preparedness and logistics preparedness even if they did not use those exact terms, but excluded documents discussing preparedness in relation to a specific mission or case.

Table A1: Stages of the process for selecting organizations and material for review

Stages	Details and sequence of activities	No. of records/organizations (rounded numbers from February 2015)
Search rounds	1. Google search engine a. preparedness + humanitarian b. preparedness + disaster c. preparedness + emergency d. "disaster relief preparedness" e. "logistics preparedness" f. "logistics preparedness" + vacancy 2.The titles of these hits were scanned on the Google search	a. ±4 m total hits b. 35 m total hits c. 38 m total hits d. 53,000 total hits e. 19,700 total hits f. 6700 total hits

	result pages based on the criteria listed in select and sort stage	
Select and sort	2. Exclusion criteria: ● National American organizations that do not deal with disaster relief ● Those discussing population preparedness against disasters; i.e., population education ● Local offices of international organizations ● Vacancy postings	a. 11 orgs.: IFRC, FAO[1], CARE, PAHO, WFP, UNSSC, UNICEF, Save the Children,[2] UNHCR, Oxfam, OCHA b. 2 orgs.: FEMA, IFRC c. 1 org.: FEMA d. 3 orgs.: OCHA, IAEA, UNICEF e. 9 orgs.: IFRC, Logcluster, WHO, UNJLC, IOM, FEMA, WorldVision, UNHCR, Oxfam f. excluded
Refine, select, and sort (deeper review)	3. Exclusion criteria (extensive review of organizations): ● Those only discussing local community emergency preparedness ● No focus on emergency relief ● Focus on one specific aspect of preparedness (health, elderly, etc.) ● Non-operational organizations	IFRC, CARE, WFP, UNHCR, Oxfam, FEMA, WorldVision, IOM, UNICEF, WHO
Final selection	4. Added organizations: ● Mentioned as part of joint projects in reviewed documents ● Organizations that, according to our knowledge, had logistics preparedness initiatives 5. Exclusion criteria: ● Not discussing preparedness in public documents	Mercy Corps, MSF, HelpAge

When reviewing documents from the selected organizations, other organizations named in relation to logistics preparedness were also reviewed. From these additional organizations, only those who had specific efforts in emergency preparedness were included in the final study.

Data extraction method

We followed Tranfield et al.'s (2003) recommendation and used a data extraction form to provide a historical record of decisions made during the process and to provide the data repository from which the analysis emerges. Data extraction includes coding and classification of collated documents by identifying specific characteristics in them. The following stages and *keyword* searches were carried out for each organization to compile sources of data:

1. From the Google search engine: *preparedness*/*logistics preparedness* + the org. name
2. General scan of the organization's website: preparedness and logistics preparedness discussions
3. From the organization's own webpage search engine: *preparedness*/*logistics preparedness*
4. Organization's reports: discussions related to strengthening of logistics capabilities

[1] http://www.fao.org/europe/log/activities/humanitarian-response-and-preparedness/en/

[2] http://www.savethechildren.org/site/c.8rKLIXMGIpI4E/b.8373277/

and capacities (even if not referred to as preparedness)

5. General logistics and supply documents (webpages, strategy notes, reports, lessons learnt, etc.): discussions related to strengthening of logistics capabilities and capacities (even if not referred to as preparedness)

Discussions or documents that focused on a specific mission or region were excluded in this study. Table 2 shows the number of webpages, documents and the document pages reviewed in this study. This table does not include reviewed reports and webpages on general organization information. Although the numbers in this table do not indicate the absolute amount of information on preparedness or logistics preparedness by the organizations, they can give an indication of the amount of focus each organization has allocated to communicating each topic.

Table A2: Quantity and concentration of data reviewed for each organization

Data extraction stages for each organization	**Number of documents (pages) reviewed**												
	WFP	**IFRC**	**MSF**	**UNHCR**	**IOM**	**UNICEF**	**WHO**	**CARE**	**Mercy Corps**	**World Vision**	**Oxfam**	**Help Age**	**FEMA**
Reports on disaster relief and/or preparedness	5 (146)	6 (155)	2 (131)	8 (772)	3 (699)	5 (60)	4 (148)	2 (27)	-	2 (19)	2 (49)	6 (79)	5 (77)
Webpages on disaster relief and/or preparedness	2	2	1	1	5	5	2	1	2	4	3	5	2
Reports on logistics efforts	2 (134)	2 (20)	-	1 (115)	1 (4)	1 (4)	1 (6)	1** (3)	1** (3)	1** (2)	1** (4)	-	1 (8)
Webpages on logistics efforts	2	2	5	-	3	2	1	-	-	-	-	-	2
Total*	11 (280)	12 (175)	8 (131)	10 (887)	12 (703)	13 (46)	8 (154)	4 (30)	3 (3)	7 (21)	6 (53)	11 (79)	10 (85)

**Total page numbers reviewed excluding the webpages ** Vacancy on a logistics position*

From the reports and webpages compiled, data was extracted to map each organization's: (1) definition of emergency preparedness and logistics preparedness, and (2) logistics preparedness efforts made. To identify the former, in places where an explicit definition was missing, we reviewed the explanations or goals mentioned for emergency preparedness by the given organization.

Analysis framework

Extracted data was inductively analyzed, coded, and reduced to find themes and deviations. As suggested by Seuring and Müller (2008), coding and classification of categories were based on the iterative process of content analysis of empirics and theory. Findings from this process were then compared to the academic literature presented in Section 2 to develop conclusions. Data were analyzed to (1) map definitions of emergency and logistics preparedness and (2) identify logistics preparedness related efforts.

Definitions: A content analysis of both emergency and logistics preparedness definitions was

conducted. Each concept (emergency and logistics preparedness) was analyzed separately and then compared to find the connection between the two. Definitions were reviewed to find commonalities. The following aspects were discussed in all definitions: (1) level of preparedness (e.g., organizational, network, or community), and (2) goals for preparedness. All aspects of the definitions were coded. As suggested in Miles and Huberman (1985), findings were summarized in tabular form and frequencies counted. For example, in the following definition of emergency preparedness from MSF, the goals are highlighted in bold text: "*the organizations base their emergency preparations on the concept that **urgent** medical cases cannot wait. Medical and logistical supplies, in the form of pre-packaged kits ready for **rapid deployment**, are stored in warehouses in key global locations. MSF also has a roster of experienced staff who can **leave immediately** in the emergency relief operations*."

Categorizing logistics preparedness efforts: The first round of analysis of the efforts took place at the data extraction stage by coding and classifying the data; this is in line with Seuring and Müller's (2008) suggestion. To form categories, all logistics preparedness-related efforts by the organizations were listed in tabular form. In a second round, the extracted efforts were reclassified and regrouped inductively to form mutually exclusive categories. The frequency of efforts among organizations was re-stated and discussions were made based on the observations. These categories may not be an exhaustive record of all efforts by the organizations. However, the findings of the review show how humanitarian organizations address logistics preparedness.

Comparative analysis: Finally, the organizations were compared based on their efforts. The organizations were charted according to the number of efforts made in the different pairs of categories. Clusters of organizations were identified and discussions were formed based on our observations.