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## Supply chain outsourcing in response to manmade and natural disasters in Colombia, a humanitarian logistics perspective

Juan Camilo Sánchez Gil<sup>a,b,\*</sup>, Sue McNeil<sup>a</sup>

<sup>a</sup> Disaster Research Center, University of Delaware, 166-F Graham Hall, Newark, DE 19716, USA

<sup>b</sup> INCAS, Departamento de Ingeniería Industrial, Facultad de Ingeniería, Universidad de Antioquia UdeA, Calle 70 No. 52-21, Medellín, Colombia

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### Abstract

This paper analyses the level of outsourcing among the actors of the humanitarian response system to aid those impacted by natural disasters as well as the system to aid those impacted by the armed conflict in Colombia. Based on reports produced by the actors involved, in addition to several interviews conducted with individuals directly involved in the relief operations, this paper characterizes the supply chain food aid distribution and analyses the implications drawn from the differences between the levels of outsourcing identified. Supply chains are codified in four segments for analysis purposes: logistics operations supporting the disaster area (upstream), in the disaster area (midstream), and to beneficiaries directly (downstream and last mile distribution as two individual segments). The number of third parties, whether humanitarian aid organizations or private contractors, participating in the supply chains as actors orchestrating food aid distribution to beneficiaries, drives the levels of outsourcing. Groups of supply chains from representative established organizations deploying a vast portion of food aid distribution are studied. These groups are analysed to illustrate differences and commonalities, and reach conclusions of general applicability. Based on the findings, the paper makes policy implications to increase performance of future food aid distribution operations in response to larger scale disasters as well as opportunities for future research.

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\* Corresponding author. Fax: + 1 302 831 2091.

E-mail addresses: [jcsanche@udel.edu](mailto:jcsanche@udel.edu) (J. Sánchez), [smcneil@udel.edu](mailto:smcneil@udel.edu) (S. McNeil).

## 1. Introduction

### 1.1. Background

The humanitarian response in Colombia is orchestrated by several relief organizations that vary not only in size, geographic coverage and affiliation type, but also by event type as natural hazards are not the only threats that socially vulnerable citizens have to deal with since the armed conflict began over 50 years ago. The armed conflict has caused the dispossession of land of around 6 million Internally Displaced Persons (IDPs) with a relative stable average of 300,000 new IDPs every year [1]. In addition, Colombia suffers more than 600 natural disasters a year, the highest rate of recurrent natural disasters in Latin America [2]. The number of disasters is also on the rise, with 85 percent of the population and assets located in areas exposed to two or more natural hazards and records of more than 4.5 million persons impacted by large-scale disasters [3]. Such *doble afectación*, which translates to “double effects” has caught the eye of several international NGO’s, UN agencies and other major private organizations who have witnessed the humanitarian response that Colombian governmental organizations have provided to people impacted by both natural and manmade disasters. In some cases, these witnesses have collaborated with the governmental response, but in other instances, they have been the only relief organizations who have assisted specific populations in remote areas where the humanitarian assistance from the State have been simply non-existent or untimely. The reasons that explain this absence vary from the constraints that the armed conflict imposes, to governmental operators who inherently are actors of the conflict itself, to the infrastructure and other external variables that challenge the humanitarian assistance that is to be provided by law.

Outsourcing operations throughout the supply chain is a common practice in the commercial logistics sector. However, despite the fact that the literature has stressed that care should be taken when comparing key features between commercial and humanitarian logistics [4], established relief organizations outsource a variety of logistics operations to third parties, that all together, create relief networks aiding those impacted by manmade and natural disasters in Colombia. Thus, these established relief organizations together create two humanitarian systems disconnectedly responding to manmade and natural disasters that are typically either recurrent and small or random and large.

### 1.2. Objective and Research Overview

This research focuses on Post-Disaster Humanitarian Logistics (PD-HL), understood as the most intensive form of logistics in the initial response and short-term recovery phases of an event [4]. The objective of the research is to characterize the role of outsourcing in the supply chain in order to identify opportunities for improving the performance and even opportunities to optimize the storage, transport and distribution capabilities of actors, relief networks and humanitarian response systems.

To accomplish this, this research identifies actors and relief networks that can perform better in local distribution and those that can do a better job storing and transporting bulk aid to and in the disaster area within each humanitarian response system. In addition, general policy implications are developed for achieving transverse logistics synergy among actors and relief networks belonging to a distinct humanitarian response system.

The heterogeneity among relief actors and networks in Colombia draw on the heterogeneity of the supply chains through which humanitarian aid is deployed to both the natural disasters’ and the armed conflict’s beneficiaries. Consequently, this paper elaborates on the identification of actors that orchestrate PD-HL operations responding to recurrent and multiple small-scale disasters, specifically, food aid that is distributed locally to beneficiaries, irrespective of the source of the need, from either manmade or natural disasters. This initial identification is based on secondary information found in open documents and reports available online complemented with individual interviews of practitioners who have significant experience directing humanitarian operations in Colombia.

Having identified the actors directly involved in food aid distribution, the paper elaborates on the characterization of supply chains derived from such actors. Following a similar approach for the identification of actors, a set of interviews adds specifics of the supply chains that are initially built from secondary information available from the respective actors’ websites. However, given the constraints for accessing both primary and secondary information

from all the actors initially identified, supply chains for only five strategic relief networks are fully characterized. These are characterized as follows:

- Armed conflict response system
  - International representing the UN Cluster approach<sup>†</sup>: World Food Program (WFP)
  - Domestic representing the institutional approach<sup>‡</sup>: Unit for Assistance and Reparation of Victims (UARIV)
- Natural disaster response system
  - Domestic: Colombian Red Cross (CRC),
  - Domestic representing the institutional approach: Civil Defense, and National Unit for Risk and Disaster Management (UNGRD)

Field work identified actors, both domestic and international, that have relied on third parties for certain logistics operations when aiming to deploy food aid to beneficiaries. These third parties range from other humanitarian actors to operators and suppliers from the commercial sector. The research is also based on interviews with individuals directly involved in the relief operations. The interviews took place both in person in Colombia and by videoconference. This information is complemented with media accounts and official reports.

The end product of this research identifies relief networks from five of the largest established humanitarian actors in Colombia, characterizes their supply chain logistics operations from upstream to downstream and codifies actors as they act as a third party participating in warehousing and distribution operations. The analyses' limitations stem from the fact that not all established actors and relief networks involved in food aid distribution in Colombia may have been identified due to resource limitations. Hence the supply chains captured in the study are not guaranteed to represent the total universe. In addition, not all the segments of the supply chains identified were characterized due to some constraints found in the fieldwork when accessing specific information. However, because at least one supply chain of all actors and relief networks identified has been characterized along all its segments (upstream, midstream and downstream) and given the heterogeneity of proceedings in national operations, a significant representation of the levels of outsourcing at a national basis can be inferred.

The following nomenclature is used in the paper.

#### **Nomenclature**

A1, A2	primary actors in the armed conflict humanitarian response system
N1, N2, N3	primary actors in the natural disaster humanitarian response system
PA, PB, PC, PD and PE	five private actors who provide logistical support
IA, IB, IC, ID, and IE	four institutional and one international actor, also providing logistical support

### *1.3. Outline of the Paper*

The paper has an introduction and six sections. Section 2 provides a brief summary of the methodology used. Section 3 defines the level of outsourcing approach of food aid supply chains. Section 4 and 5 introduces the characterization of supply chains and specifics on the level of outsourcing for the armed conflict response system and the natural disasters response system respectively. Section 6 analyzes and suggests implications throughout the supply chains. Section 6 is broken down into supply chain segments so that comparative analysis can take place between relief networks within the same response system. In contrast, section 7 finalizes the paper with conclusion remarks about implications for creating transverse synergy among relief networks belonging to distinct humanitarian response systems.

<sup>†</sup> Groups of organizations, both UN and non-UN, in each of the humanitarian sectors of humanitarian action, e.g. water, health and food security.

<sup>‡</sup> Groups of governmental humanitarian organizations.

## 2. Brief summary of the methodology used

The research involved:

- i) Compilation, summarization and archiving of all relevant media articles, literature and reports that led to an initial identification of actors involved in food aid distribution for both response systems and to the magnitude of the impacts of manmade and natural disasters in Colombia.
- ii) Secondary information analysis that classifies actors and relief networks within each response system in order to build an initial identification and characterization of actor.
- iii) Conduct of formal interviews whether in-person, by telephone or videoconference to refine the identification process from secondary sources and to enhance the understanding of the role that the actors were found to play when distributing food aid to beneficiaries.
- iv) Compilation and archive of relevant technical reports both provided by interviewees and links suggested for download from their websites that give better illustration of the specific logistics operations run to deploy food aid.
- v) Analysis of secondary information regarding the key logistics features through which the supply chains would be characterized.
- vi) Conduct of formal interviews whether in-person, by telephone or videoconference to refine and better elaborate and represent the flow process of food aid commodities along the supply chain.
- vii) Collective analysis of information provided to identify the level of outsourcing of the relief networks and actors identified and to suggest policy implications.

In general terms, the research protocol promised that the identity of the participants would be kept confidential. The interviewees represented established organizations large and small, international and local, governmental and non-governmental. The interviewees were individuals at different positions within the organizations, from the upper management, to those at technical and operational levels. The organizations interviewed, had different functions within the overall HL process, from procurement, transportation, and staffing, to the organization, care and distribution of critical supplies to beneficiaries.

## 3. Supply chain outsourcing

This research identified different levels of outsourcing throughout the established supply chains responding to both manmade and natural disasters in Colombia. This outsourcing impacts the overall performance of the supply chain. To better understand these impacts, we characterize the role of logistics actors, both humanitarian and private, from upstream to downstream in the supply chains. Starting with the identification of established international and domestic actors directly involved in food aid distribution during the immediate response and short-term recovery, and continuing with the identification of relief networks that these actors belong to when orchestrating food aid, the participation of logistics actors whether private or humanitarian throughout the supply chain is identified. Given the disconnect between the humanitarian response systems for those impacted by manmade and natural disasters in Colombia, commonalities and differences in these response systems resulting from contrasting transverse logistics actors and relief networks, are highlighted here.

Table 1 presents a snapshot of the results obtained after coding the data from the interviews and document analysis described in section 2, which is further elaborated in sections 4 and 5. The coding identifies the role of specific types of actors in each stage of the different distribution networks. To identify activities involving outsourcing, the following codes are defined:

- A1, A2 represents the primary actors in the armed conflict humanitarian response system,
- N1, N2, N3 represents the primary actors in the natural disaster humanitarian response system,
- PA, PB, PC, PD and PE represent the five private actors who provide logistical support,
- IA, IB, IC, ID, and IE represent the four institutional and one international actor, also providing logistical support.

For example, in a natural disaster, the distribution of food aid to beneficiaries by the Colombian Red Cross is done by the Colombian Red Cross (coded N1) and private real estate (coded PE). By combining the coding with the supply chain segment and response system, Table 1 indicates how each of these logistics actors is involved in the humanitarian operation that the actual humanitarian actors, also grouped by the type of relief network, are responsible for. Thus, the upstream segment of the supply chain displays the logistics actors that operate the facilities needed for starting to deploy food aid to the disaster area. The midstream and downstream segments displays the similar situation for facilities operated very close to the disaster area or in the disaster area itself. Finally, the beneficiaries segment is defined to specifically refer to the operation of directly handing food aid to the impacted. Links between segments exclusively denote actors running transport operations.

Table 2 shows the frequency of recurrence of outsourcing operations and the actors illustrated in Table 1. Table 2 draws on Table 1; it summarizes the number of times that an agency is directly operating either storage or transport throughout the respective supply chain segment. For instance, Table 1 illustrates that Carriers, coded as PB, directly operates the transport of all actors in the upstream segment. Hence Table 2 states that carriers indeed perform 5 transport operations throughout such segment.

The number of parties involved in a logistics operation fluctuates between 5 and 8 according to the supply chain segment and specific outsourced operations (warehousing and transportation). The midstream segment is the segment with the highest number of parties involved considering both response systems. It can be also noted that 100% of the logistics operations characterized are outsourced to at least one logistics or humanitarian actor, which explains the reason why both the UARIV and the UNGRD have no logistics operations run by themselves. Conversely, institutional actors such as the Police Department and the Civil defence, present the highest numbers of logistics operations run. This reaffirms that these two institutions are at the cornerstone of logistics support for the UNGRD and potentially to the UARIV. Likewise, carriers are the most recurring non-official logistics actor, also reaffirming their key role in both humanitarian response systems, and exposing the importance of approaching this actor strategically and centrally when considering synergies that benefit reaching those in need.

Table 1. Outsourcing coding for humanitarian and private actors running logistics operations.

Supply chain segment	Humanitarian Response System				
	Armed Conflict		Natural Disaster		
	International (UN Cluster approach)	Domestic (Institutional approach)	Domestic (Red Cross approach)	Domestic (Institutional approach)	
	WFP – A1	UARIV – A2	Colombian Red Cross – N1	Civil Defence – N2	UNGRD – N3
Upstream	A1, PC	PA	N1, PD, IA	N2, IA	PA
Link	PB	PA, PB	N1, PB, IA	N2, PB, IA	PA, PB
Midstream	A1, PC	PE, ID	N1, PD, IA	N2, IA	ID, PE
Link	PB	ID	N1, N2, PB, IA	N2, IB, IC	PB
Downstream	IE, PE	ID	N1, PE, IA	N2, IA	
Link	IE	ID	N1, N2, PB, IA	N2, IC, IA	
Beneficiaries	IE	ID	N1, PE	N2, PE	ID, PE
Facilities/links	A1	A2	N1	N2	N3
LEGEND					
Actor	Organization/ Function			Code	
Actors armed conflict humanitarian response (A)	WFP			A1	
	UARIV			A2	
	CRC			N1	
Actors natural disaster humanitarian response (N)	Civil Defence			N2	
	UNGRD			N3	
	Food suppliers			PA	
Supportive transverse logistics actors – Private (P)	Carriers			PB	
	3PLs			PC	
	Private sector			PD	
	Real estate			PE	

Supportive transverse logistics actors – Institutional (I)	Police	IA
	Air Force	IB
	Army	IC
	Local Authorities	ID
Supportive transverse logistics actors- International (I)	NGOs	IE

Table 2. Participation Frequencies of Logistics and Humanitarian Actors

Segment	WFP	UARIV	Colombian Red Cross	Civil Defence	UNGRD	Food Suppliers	Carriers	3PLs	Private sector	Real estate	Police	Air Force	Army	Local Authorities	NGOs	% Outsourced	Number of parties
Upstream	1	0	1	1	0	2	0	1	1	0	2	0	0	0	0	100	7
Link	0	0	1	1	0	2	5	0	0	0	2	0	0	0	0	100	5
Midstream	1	0	1	1	0	0	0	1	1	2	2	0	0	2	0	100	8
Link	0	0	1	2	0	0	3	0	0	0	2	1	1	1	0	100	7
Downstream	0	0	1	1	0	0	0	0	0	2	2	0	0	1	1	100	6
Link	0	0	1	2	0	0	1	0	0	0	2	0	1	1	1	100	7
Beneficiaries	0	0	1	1	0	0	0	0	0	2	2	0	0	2	1	100	6
No of logistics operations	2	0	7	9	0	4	9	2	2	6	14	1	2	7	3		
No of parties involved	5	4	5	4	4												

Switching to a relief networks analysis perspective, it can be observed that the number of parties involved range from four to five for both humanitarian response systems.

#### 4. The armed conflict’s response system

Table 3 summarizes the findings from the interviews that enrich the representation of the supply chain characterization by highlighting the storage and distribution facilities, specifics on the food aid commodities moved and the manpower employed; all three features apply for the four supply chain segments defined in the characterization: upstream, midstream, downstream and beneficiaries. In addition, special focus is also given to specifics of the transportation links between the four segments.

Table 3. Armed conflict response system: supply chain outsourcing characterization

Supply chain segment	Feature	International relief operations	Domestic relief operations
		UN Cluster approach	UARIV
Upstream	Storing/Distribution facilities	Located at harbour cities, outsourced to a third party logistics (3PL) by the WFP	Located in proximities to the affected area and in the central region, run by local/central governments or a third party (private) and outsourced to private food market suppliers
	Food aid commodities	Imported bulk commodities from UN facilities in Panama	Food aid kits set up by Sphere's standards <sup>§</sup> [5] purchased to food aid suppliers
	Manpower at facilities	Outsourced to a private third party logistics by the WFP	Outsourced or owned by the food aid supplier contracted

<sup>§</sup> One of the most widely known and internationally recognized sets of common principals and universal minimum standards in life-saving areas of humanitarian response.

Link	Transportation mode	Road, outsourced to private carriers by the WFP	Road, outsourced to carriers or owned by the food supplier contracted
Midstream	Storing/Distribution facilities	Located at midsize cities, outsourced to private third party logistics by the WFP	Typically located in urban areas nearby the beneficiaries, rented to the real-estate market by the local government
	Food aid commodities	Bulk commodities	Food aid kits set up by Sphere's standards
Link	Manpower at facilities	Outsourced to a third party logistics (3PL) by the WFP	Owned by the local government
	Transportation mode	Road, outsourced to private carriers by the WFP	Road, owned by the local government
Downstream	Storing/Distribution facilities	Located in the affected area, so that rural and urban demand fulfilment is pursued, rented to the real-estate by outsourced NGOs	Typically located in the urban areas where food is directly handed to beneficiaries by a walking distance, temporary point of distribution privately owned
	Food aid commodities	Bulk commodities, packed in rations at this point	Food aid kits set up by Sphere's standards
	Manpower at facilities	Outsourced to NGOs	Owned by the local government
Link	Transportation mode	Road and Fluvial, privately owned by outsourced NGOs	Road, owned by the local government
Beneficiaries	Storing/Distribution facilities	Located in the disaster area by a walking distance from beneficiaries. Also called sub-points of distribution. Temporary and privately owned	Occasional food aid home delivery directly to beneficiaries, temporary point of distribution privately owned
	Food aid commodities	Food aid kits are configured as handed to beneficiaries (WFP standards)	Food aid kits set up by Sphere's standards
	Manpower at facilities	Outsourced to NGOs	Owned by the local government

**5. Natural disaster’s response system**

Just like Table 3 does, Table 4 summarizes the interviews findings that enriches the supply chain characterization through which the food aid to the affected by natural disasters is deployed.

Table 4. Natural disasters response system: supply chain outsourcing characterization

Supply chain segment	Feature	Domestic relief operations	Domestic relief operations (Institutional approach)	
		Colombian Red Cross (CRC)	Civil Defence (CD)	UNGRD
Upstream	Storing/Distribution facilities	A central main warehouse, privately owned	Strategically located in smuggling-prone areas, privately owned	Mostly located in central region and occasionally in Province's capitals nearby the disaster area, run by central government and outsourced to private food market suppliers
	Food aid commodities	Food aid kits set up by Sphere's standards from material convergence (donations)	Food aid commodities from confiscated smuggled food	Food aid kits set up by Sphere's standards purchased to food aid suppliers
	Manpower at facilities	Privately owned	Privately owned and volunteers	Outsourced or owned by the food aid supplier contracted
Link	Transportation mode	Road, fluvial, aerial both outsourced to private carriers and privately owned	Road, privately owned or outsourced to local carriers by local governments	Road, outsourced or owned by the food supplier contracted



Midstream	Storing/ Distribution facilities	Strategically located nearby disaster prone areas, privately owned	Strategically located in disaster prone areas, privately owned	Located at the nearest municipality from the disaster area, temporary points of distribution run by the local governments
	Food aid commodities	Food aid kits set up by Sphere's standards from material convergence (donations)	Food aid commodities from confiscated smuggled food and purchased on the food market	Food aid kits set up by Sphere's standards purchased to food aid suppliers
	Manpower at facilities	Privately owned	Privately owned and volunteers	Privately owned by local governments or outsourced
Link	Transportation mode	Road, fluvial, aerial both outsourced to private carriers, territorial and privately owned	Road, Fluvial and aerial, privately owned or with support of Air Forces and the Army	Road, Fluvial, outsourced to local carriers
Downstream	Storing/ Distribution facilities	Located at most Province capitals and the closest municipality to the affected area (collection points), privately owned or rented to the real-estate	Located at Province's capitals and municipalities, run by the Civil Defence Headquarters in Provinces	Not applicable. Purchased food aid kits are directly transported to the disaster area
	Food aid commodities	Food aid kits set up by Sphere's standards from material convergence (donations)	Food aid commodities from confiscated smuggled food and purchased on the food market	Food aid kits set up by Sphere's standards purchased to food aid suppliers
	Manpower at facilities	Privately owned and volunteers	Privately owned and volunteers	Privately owned by local governments or outsourced
Link	Transportation mode	Road, fluvial, aerial both outsourced to private carriers, territorial entities and privately owned	Road and Fluvial, privately owned or with support of the Army	Road, Fluvial, outsourced to the local transportation market
Beneficiaries	Storing/Distribution facilities	Located at the disaster area by a walking distance from beneficiaries, also called by the CRC as points of distribution. Outsource to the real estate if needed	Located at the disaster area by a walking distance from beneficiaries, temporary points of distribution privately owned	Located in the disaster area by a walking distance from beneficiaries. Temporary points of distribution privately run by local governments
	Food aid commodities	Food aid kits set up by Sphere's standards from material convergence (donations)	Food aid commodities from confiscated smuggled food and purchased on the market	Food aid kits set up by Sphere's standards purchased to food aid suppliers
	Manpower at facilities	Privately owned and volunteers	Privately owned and volunteers	Privately owned by local governments or outsourced

## 6. Analysis and policy implications

Considering the multiple supply chains in addition to the response systems for the manmade and natural disasters in Colombia, the analysis approach is presented by supply chain segment. This is, both response systems are analysed in parallel within each supply chain segment in question in order to encourage collaboration between them under the assumption that a more efficient overall performance may be achieved if logistics capabilities of either response system in the same segment were shared or added in case a large-scale disaster occurred. Besides, some policy implications out of the mere description of the current logistics operations for each response system are presented as an approach for bridging commercial and humanitarian logistics practices in the manmade and natural disasters context.

### 6.1 Upstream

The armed conflict humanitarian response system, represented in this analysis by one international relief network (the UN cluster approach) and one domestic relief network (the National Unit for “Victims” Response and Reparation- UARIV approach), uses a variety of significantly different strategies to manage facilities through which food aid is deployed. On one hand, the UN cluster approach imports all of its food aid commodities from the UN



humanitarian response depot located in Panama through harbour cities located at both the Pacific and Atlantic coast. Relying on the storage and materials handling by a Third Party Logistics (3PL) company in these coastal cities and under the supervision of the World Food Program, the bulk of food aid is then transported by road carriers to strategic warehouses located at inland cities. On the other hand, the UARIV approach not only fully relies on the domestic private food markets when starting the food aid deployment but also directly purchases food aid kits to food suppliers under the supervision of local and central governments. These suppliers may transport food to requested locations using their own fleet or outsourcing road transportation to carriers. Such evident differences bring along challenges and implications for the upstream supply chain for the armed conflict response system. Some of these are:

- Future collaboration between the two relief networks is encouraged in order to support response to potential larger scale manmade disasters. This collaboration would be subject to resolving the differences in strategy that are a consequence of either lower costs or shorter lead times, or other operational pluses that lead the one to purchase bulk food aid internationally and the other one to purchase food aid kits in the domestic food market.
- The fact that the UARIV approach contracts private food suppliers all around the country may be a crucial factor to shorten lead times to the midstream the supply chain. However, the interview findings revealed that proximity to the impacted area might not be the driving factor for local and central authorities to choose the supplier; the supplier's selection is driven by other kind of interests.
- Local and central governments typically outsource the food aid inventory management to a third party once purchased from suppliers. The interviews revealed that such third parties may lack the knowledge and tools that help them make the right decisions about how much to order and how often, given the volatility of demand patterns of those in need, which certainly translate into longer deprivation times for beneficiaries. Although the UN cluster approach does not do a much better job managing the inventory to ensure more stable and shorter deprivation times, the fact that they have no obligation by law to distribute food aid as the UARIV does, means that the distribution strategy is based on a set deterministic demand pattern. Hence managing an inventory system that is easy to keep under control means that they fulfill 100% of the needs of the impacted population targeted.
- Outsourced carriers are the vast majority of transportation providers for both relief networks in this segment, which could be positive for achieving competitive transportation rates that benefit local authorities and the WFP with lower rates. However, for the UARIV relief network, economies of scale opportunities may also be disregarded as the number of disconnected suppliers spread out in the national territory increases.

The natural disaster humanitarian response system is represented in this analysis by three domestic relief networks; these are the Colombian Red Cross (CRC), Civil Defence (CD) and the National Unit for Disaster Management and Response (UNGRD). Although the CRC and the CD is part of the organizational framework of the UNGRD, they are treated here as independent relief networks due their own capabilities to the deploy food aid from upstream to downstream in the supply chain. Another striking factor that distinguishes among these three relief networks is the preferred sources for acquiring food aid commodities. Just like the UARIV, the UNGRD purchases 100% of the food aid kits that local authorities request for when declaring the national calamity status. Conversely, although differing from the supplying source as well, the CRC and CD fully rely on materiel convergence when setting up the food aid kits or commodities to be deployed to beneficiaries. CRC typically acquires donations from the private sector and individuals and organization that make up the social fabric. The CD acquires commodities from the Colombian Tax and Customs Organization (DIAN), which donates food commodities confiscated in smuggling-prone areas such as international borders. However, an important commonality in this segment is that carriers are typically contracted to move aid to midstream in the supply chain despite the fact that privately owned transport fleet is also operated by the CRC and CD in larger scale disasters, and also logistically supported by the Police Department. A challenge and implication out of these differences and commonality is:

- The fact that each relief network supplies from different sources and under completely different legal frameworks strongly challenges logistics partnership among the networks due to their commodity-oriented supply chain strategy despite the fact that beneficiaries are awaiting to relieve the same humanitarian needs. However, under the occurrence of larger scale disasters, these differences should not overshadow the crucial logistics capabilities,

that if not shared as much as possible, would impede logistics capabilities balancing, overwhelming some of them while underusing others in specific segments of the supply chain.

### 6.2 Midstream

When it comes to the armed conflict humanitarian response system, once the bulk of food aid arrives to the warehouses in the inland cities, the UN cluster approach remains outsourcing both the warehousing and the transportation to the next segment to carriers by contracting a 3PL. In contrast, the UARIV delivers food aid kits to a new actor in the segment, the local authorities. Either owning or renting warehousing facilities, local authorities typically proceed with materials handling and manages transportation to downstream with its fleet of vehicles. Consequently, although in the same segment, both relief networks differ significantly since the UN cluster approach continues taking the most from economies of scale by still managing bulked food aid commodities, while the UARIV approach is already transporting food aid kits to downstream in the supply chain. Using technical logistics terms, the UN cluster approach keeps postponement methods until very far downstream in the supply chain (last mile). This notable difference brings along challenges and implications for midstream in the supply chain of the armed conflict response system, one of them is:

- Being in the same segment, the UN cluster approach forwards the total national distribution strategy to only two depots, the UARIV does forward distribution to several dozen depots given the multiple suppliers contracted. Future collaboration between these two relief networks is encouraged to synergistically respond to larger scale manmade disasters caused by the armed conflict. Hence, it is worth checking, for future research and policy implications, whether completely migrating both relief networks to any of the following strategies would bring performance improvement in terms of operational and deprivation costs: i) Leveraging economies of scale by distributing bulk food aid from a single supplier and sticking to postponement strategies. ii) Completely migrating to a multiple supplier approach with food aid kits already configured at this point. iii) A combination of both, this is, each approach partially applying to each relief network.

Relying on strategic warehouses located in disaster-prone areas, the natural disaster humanitarian response system represented by the CRC and the CD, manages their own storing and materiel handling operations where materiel convergence is the focus operations in these facilities. Meanwhile, the UNGRD migrates to a new logistics actor as the contracted suppliers are asked to deliver food aid kits at facilities either privately owned by local governments or rented real estate. Transportation to downstream in the supply chain represents a key difference in this segment as well. Fully delegating the distribution process to private carriers and the local distribution capacities of the social fabric, local authorities differ from the CRC and the CD as they not only delegate on carriers and social fabrics but also support on their own distribution capabilities and other institutions' such as the Police Department, Air Force and the Army. One challenge and implication from these key differences is:

- The fact that at this segment of the supply chain, the CRC and CD strategic warehouses are located in proximity to the disaster-prone areas may be a great chance for local authorities to take the most from distribution capabilities of the CRC and CD. However, the fact that suppliers are totally disconnected with these two institutions as the food aid kits purchased by them are typically distributed to local authorities instead, make this possibility almost unreachable. Also consider that the CRC and CD strategic warehouses might be far enough from the local authority if this one is located outside a "disaster-prone" area.

### 6.3 Downstream

In regard to the armed conflict humanitarian response system, this supply chain segment presents another important difference for the relief networks responding with food aid to manmade disasters. The UN cluster migrates to a new logistics actor by relying on an NGO from this point on and up to beneficiaries' hands. Only now does repackaging for each commodity, so that food aid kit configuration takes place in the last mile supply chain segment.

Meanwhile, the UARIV approach continues delegating both the storing and distribution to a third party under the supervision of local governments. However, a commonality is the fact that both approaches typically transport commodities to beneficiaries by using privately owned vehicles in the last mile. A challenge and implication for these segments is:

- Trusting on a humanitarian NGO as a logistics operator as opposed to relying on a third party whose experience in managing food aid distribution under humanitarian contexts is typically null, may be a key issue for explaining any differential performance between the two relief networks.

A cornerstone difference within the natural disaster humanitarian response system in this segment is the existence of dozens of facilities that the provincial headquarters of the CRC and CD own for all kind of humanitarian operations. Although the CD have representation in almost 90% of Colombian municipalities, and the CRC have presence in all provinces' capital municipalities, and despite the fact that not all of them are guaranteed to facilitate humanitarian logistics operations for food aid distribution if needed, these are supporting pieces in the network. In contrast, local authorities, delegated by the UNGRD, don't count on any other facility to break down the distribution directly to beneficiaries. A challenge and an implication out of this is:

- In light of the occurrence of larger scale disasters that required the involvement of the CRC and CD network located downstream from the strategic warehouses, it is worth exploring the direct connection between the UNGRD suppliers/carriers with any of these facilities before reaching local authorities and third parties if this represented any performance improvement in the overall supply chain.

#### 6.4 Last mile (beneficiaries)

Two striking differences are easily detected in this segment regarding the armed conflict response system. The UN cluster, represented at this point by the NGO, on one hand, does not use a civil facility as such when performing distribution to beneficiaries' hands since this process takes place in the distribution vehicle itself, typically in rural areas. In addition, all commodities are repacked in individual rations so that food aid kits are configured as being handed to beneficiaries so that the postponement tactic is effective until the very last moment in the supply chain. On the other hand, the UARIV approach does use a facility, typically a shelter located in urban areas, to distribute food aid kits to beneficiaries' hands. Some challenges and implications for this segment are:

- Fully relying on the domestic food supply market intrinsically exacerbates the risks associated to disruptions in the last mile distribution due to the lack of neutrality of the carrier and supplier when delivering to communities under the influence of the armed conflict.
- Food suppliers and carriers contracted by the UARIV focus their distribution in urban areas primarily, while the like in remote areas is under the leadership of the UN cluster approach. A remaining question to justify this fact is whether suppliers and carriers find it difficult to operate the local distribution in rural areas due to potential inabilities to overcome non-conflict restrictions associated with the logistics operation itself, such as accessing beneficiaries only reachable by fluvial navigation or by multiple small cargo capacity four wheel drive vehicles.

Reaching disaster locations while facilitating beneficiaries' accessibility to aid is a commonality for the relief networks ending the supply chain for the natural disaster humanitarian response system. In fact, all of the relief networks analysed typically resort to setting up a point of distribution, or so-called sub-point of distribution, utilizing a civil facility whether rented real state or privately owned. Additionally, although carriers play an important role in the last mile distribution, institutional support is equally important as the CRC, CD, Police Department, Armed Forces and the Army count on an important transportation fleet to serve distribution operations. Still, a challenge and policy implication for the natural humanitarian response system at this segment is:

- In spite of the strong institutional capabilities that the UNGRD count on for food aid distribution capabilities in the last mile, these are strongly constrained as well as the disaster area may have limited access to non-neutral humanitarian actors in areas under the influence of the armed conflict. Hence it is worth exploring how the institutional capabilities are complemented and/or replaced with other local distribution capabilities like the ones offered by the social fabric.

## 7 Conclusions

Although the UN cluster approach is the only international relief network from the armed conflict humanitarian response system studied here, the humanitarian mission of this relief network has responded to large-scale natural disasters in Colombia as well. The fact that the UN clusters deploys food aid distribution within both response systems is a vivid recognition of how common logistics capabilities are required to respond to disasters irrespective of the kind, manmade or natural. Hence, future research should be oriented to identifying opportunities to respond recognizing synergies among relief networks across humanitarian response systems under the assumption that logistics capabilities shared in the same segment is a reasonable starting point. For instance, the UARIV and the UNGRD, the official relief networks of each response system, contract suppliers to distribute food aid kits to local authorities and third parties. However, the humanitarian logistics know how of these local authorities and third parties is not guaranteed down in the supply chain. Hence strengthening logistics capabilities of local governments, such as adopting inventory management systems that respond to the demand patterns of those in need, or bridging the social fabrics to help overcome the transportation constraints imposed by the armed conflict and the geographic conditions in the last mile, would support better overall performance of the supply chain. Such strengthening would turn the local authority into an actual humanitarian actor able to logistically respond to both manmade and natural disasters.

This overall analysis exposes the evident need for policy makers and practitioners to understand the humanitarian response system holistically and managerially, and as a pull of opportunities for sharing logistics capabilities and networking parties towards logistics partnership in the light of effectively alleviating the suffering of those in need. In addition, this analysis also exposes the need for the humanitarian actors to continue evolving towards switching to humanitarian logistics practices, which although differ significantly with commercial logistics, can support on supply chain analysis tools that are applicable to both commercial and humanitarian logistics as long as the appropriate dynamics are incorporated in the analysis.

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## References

- [1] Unidad de Víctimas. (2014, 11 24). Red Nacional de Información al Servicio de las Víctimas. Retrieved 11 24, 2014, from Unidad para la Atención y Reparación Integral de las Víctimas: <http://mi.unidadvictimas.gov.co/?q=v-reportes>
- [2] GDFRR. (2012, December 01). Fiscal Management of Natural Disasters in Colombia. Retrieved 11 20, 2014, from Global Facility for Disaster Reduction and Recovery: <https://www.gfdr.org/gfdr/DRFI>
- [3] Unidad Nacional de Gestión del Riesgo y Desastres. (2014, 11 23). Centro de Documentación e información de Gestión de Riesgo de Desastres. Retrieved 11 23, 2014, from Centro de Documentación e información de Gestión de Riesgo de Desastres: <http://cedir-catalogo.gestiondelriesgo.gov.co/>
- [4] Holguín-Veras, J., Jaller, M., Wassenhove, L., Pérez, N., & Wachtendorf, T. (2012). On the unique features of post-disaster humanitarian logistics. *Journal of Operations Management*, 494-506.
- [5] The Sphere Project. (2014, 11 11). Humanitarian Charter and Minimum Standards in Humanitarian Response. Retrieved 11 12, 2014, from The Sphere Project: <http://www.sphereproject.org/>