

Humanitarian supply chains during COVID-19: systems failures, recovery and emerging alternatives

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Executive summary: The impact of COVID-19 has been acutely felt in humanitarian aid supply chains, because of their globalised, complex, and interconnected nature. As government-enforced lockdowns were implemented and global transit routes froze, provision of humanitarian aid suffered. This paper investigates systemic failures to humanitarian supply chains, characterised by a) unavailability of items, b) price volatility, c) delays in delivery, and d) quality assurance issues. In this qualitative study, 17 humanitarian logisticians and programme staff, from UN agencies, IFRC, INGOs, and CSOs, were interviewed about their experiences from February to October 2020. Their experiences were collated and codified, to understand the systemic complexity, exacerbating factors, and internal controls which were experienced during this time. This study found that a number of internal systemic controls were utilised to mitigate impacts of supply chain failures. These include designed and operational ‘controls’ in the system of humanitarian supply chain management, and those dynamically redesigned during the case study period as COVID-19 presented new stresses and constraints to humanitarian supply chains. The results offer humanitarian organisations, donors, and academic researchers next steps in improving humanitarian supply chains and future avenues of research. This paper exercises *The York Framework* to understand systems complexity.

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Tags: humanitarian logistics, emergency logistics, COVID-19, supply chain management, disaster logistics, qualitative, atlas TI, humanitarian supply chains

Glossary

CBPF

Country Based Pooled Funds

CERF

Central Emergency Response Fund

CHAI

Clinton Health Access Initiative

CSCS

COVID-19 Supply Chain System

CSO

Civil Society Organisation

ESFT

Essential Supplies Forecast

ESM

Emergency Service Marketplace

IASC

Inter-Agency Standing Committee

ICAO

International Civil Aviation Organisation

IFRC

International Federation of Red Cross and Red Crescent Societies

INGO

International Non-Governmental Organisation

IOM

International Organisation for Migration

G-HRP

Global Humanitarian Response Plan

POE

Point Of Entry

SCTF

Supply Chain Task Force

UN

United Nations

UN MEDEVAC

United Nations Medical Evacuation

UN-DOS

United Nations Department of Operational Support

UNCMT

United Nations Crisis Management Team

UNCTAD

United Nations Conference on Trade and Development

UNDP

United Nations Development Programme

UNFPA

United Nations Population Fund

UN-Habitat

United Nations Human Settlement Programme

UNHCR

United Nations Commissioner for Refugees

UNICEF

United Nations Children's Fund

UNOCHA

United Nations Office for the Coordination of Humanitarian Affairs

WFP

World Food Programme

WHO

World Health Organisation

Section 1: Introduction

This case study is designed to capture, explain, and assess the systemic failures experienced in humanitarian supply during February to October 2020.

Humanitarian supply chains can be thought of as a complex system, with a purpose to deliver aid supplies and personnel to areas of need quickly, efficiently, and safely. Although the system is designed, it has been done so by many actors (often in silos), and with many linkages to commercial supply chain management and national-level infrastructure. In some respects, the system represents an ecosystem as opposed to a unified, designed machine.

During February to October 2020, COVID-19 affected global supply chains in several ways: closed ports of entry, grounded air traffic, government-enforced lockdowns, social distancing measures among other measures. Provision of humanitarian supplies and personnel was not immune from this. The system of humanitarian supply chains, however, has unique internal system controls to mitigate

impacts of failures in delivery. Furthermore, as a dynamic system, humanitarian supply chains also exercised peri-disaster redesigns to continue the vital flow of items and people during this time.

In this case study, the experiences of 20 humanitarian programme staff and logisticians from UN agencies, IFRC, INGOs, and CSOs were used as primary data collection and complemented by a desk review of peer-reviewed and grey literature, to capture the ways that systemic failures were experienced and mitigated between February and October 2020.

The case study will discuss the commonly reported categories of systemic failures in humanitarian supply: 1) items unavailable, 2) delays in delivery, 3) price changes, and 4) quality assurance issues. The case study will then outline the causes of these failures – describing them as either external to the system (exacerbating factors) or internal to the system (latent controls and redesign controls).

The findings suggest that future-proofing humanitarian supply chains must include an overhaul of latent controls that did not work during COVID-19, as well as an inclusion of novel redesigned controls tried during this period. Crucially, humanitarian supply chains must seriously consider: i) localising and diversifying supply chains, ii) including technology across supply chain management systems, iii) developing the capacity of local staff for national market awareness and supply chain management, and iv) donors must consider standardising the use of crisis modifiers and purchasing processes between them.

This case study includes a **timeline** of the research period, drawn from the **desk review** (Section 1). The **analysis of the interviews** uses a mixed methods deductive and

inductive coding, using *The York Framework* for Systemic Complexity specifically in the deductive approach to coding (see Section 2). The **findings** are discussed, and tentative **next steps** are suggested (Section 3 & 4).

Timeline of Systems Failures in Aid Supply February to October 2020

SARS-CoV-2, a novel coronavirus (2019-nCoV), was first detected in Wuhan Province, China, in December 2019. On **3 February 2020**, the World Health Organisation (WHO) issued a Strategic Preparedness and Response Plan (SPRP). Three weeks later, this virus was renamed and the COVID-19 pandemic was declared on **11 March 2020**. At that time there had been at least 118,000 cases in 114 countries, and 4,291 people had lost their lives (WHO 11/03/2020). Prior, in February, WHO provided early signals to markets, alerting to the market constraints for personal protective equipment (PPE), and publicly projected a need of 1.3 billion units for the coming nine months alone. Globally, governments began responding to the pandemic with social measures aimed at mitigating the spread of COVID-19, such as restricting movement of citizens, suspending the conducting of business, and closing borders, ports and points of entry.

On **13 February**, the Chinese Government issued an extension of order to shut down all nonessential companies, including manufacturing plants, in Hubei Province which remained in effect until 8 April impacting manufacturing and exportation of key goods. This shut down compounded many industries and supply routes throughout 2020, including pharmaceutical [1] [2], medical [3], manufacturing.

A rapid deployment of supplies by WHO and UNICEF in February and again March, meant that 84 countries received PPE and diagnostics equipment, and further

104 countries in March. WHO actioned a “no regrets” mechanism to reach a large number of countries early, using existing inventories, while UNICEF provided higher quantities to fewer countries. Early funding was deployed by WHO through the Immediate Response Account (IRA), which was complemented by The Global Fund (who reprogrammed funding to release early finance streams), the Gates Foundation (who provided bridge-funding to enable rapid deployment of supplies), and The Solidarity Fund (which launched in March).

On **13 March**, the European Commission Recommendation (EU 2020/403) on conformity assessment and market surveillance procedures within the context of the COVID-19 threat, included the requirements for the design, manufacturing, and placing on the market of PPE, including masks, gloves, and goggles for COVID-19.

Upon direction from the UNCMT, the SCTF was established on **26 March**. This Task Force had a mandate to establish a new emergency global CSCS to provide countries with essential supplies needed for their COVID-19 response. This included mapping suppliers, designing allocation mechanisms, establishing a global distribution system, and providing national delivery and distribution services. WHO called on experts (for example, CHAI) to negotiate and secure access terms with manufacturers of automated PCR diagnostics tests, and subsequently prepared a supplies forecast for biomedical supplies, including PPE [4] [5] [6].

On the **28 March**, the UN issued the first GLOBAL HUMANITARIAN RESPONSE PLAN (G-HRP) for COVID-19, and activated the Inter-Agency Standing Committee (IASC) scale-up protocol to mobilise the whole humanitarian system to support its implementation. This G-HRP was a joint effort by

members of the IASC, including UN, other international organisations, and NGOs with a humanitarian mandate, to analyse and respond to the direct public health and indirect immediate humanitarian consequences of the pandemic, particularly on people in countries already facing other crises. The G-HRP not only defined activity packets for COVID-19 response, but also mechanised the pooled appeals and inputs from WHO, WFP, IOM, UNDP, UNFPA, UN-Habitat, UNHCR, UNICEF, and international NGOs. Critically, it also allowed NGOs access to funding mobilised by G-HRP including through the CERF and CBPF. This G-HRP was updated regularly, including on the 29 April 2020, when an appeal for \$2.01 billion was requested for the period of nine months (April–December 2020). [7]

In early **April** the SCTF convened the CSCS. This system was designed with three components; 1) a control tower is erected in Geneva, dedicated to consolidating demands, allocating inventory and administrating the delivery of products; 2) three purchasing consortia for biomedical, PPE and diagnostic products respectively; and 3) a suite of planning tools which is launched on the WHO Partners Platform. These were designed to provide real-time tracking of goods to support the planning, implementation, and resourcing of nation states; to help governments access the ESFT; and the Supply Portal to consolidate demand per National Action Plans alongside the ESM. Delivery Hubs were erected in eight countries: Global Hubs in Guangzhou (China), Dubai (United Arab Emirates), and Liege (Belgium). Regional Hubs in Kuala Lumpur (Malaysia), Addis Ababa (Ethiopia), Panama City (Panama), Accra (Ghana) and Johannesburg (South Africa). The CSCS was expected to move a minimum of 100 million medical masks and gloves; up to 25 million N95 respirators, gowns and face-shields; and up to 2.5 million

diagnostic tests a month, on behalf of the humanitarian community. [8] [9]

Between **27-30 March 2020**, ACAPS ran the Quick Impact Survey which identified the immediate impact that government regulations had on humanitarian operations globally. The survey finds that the measures imposed had a significant impact on all operations, specifically on the movement of personnel internationally and within the country of operation, and on the limitation of import/export of products. The survey further suggested that 80% of respondents were mitigating the impact by refocusing activities, suggesting that there will be a halting, slowing, or suspension of non-COVID-19 activities. [10]

According to the ICAO the withdrawal of aircraft belly capacity usually made available for humanitarian goods because of decreased international commercial air traffic, led to a reduction in air cargo in **March** of 31% (compared to the same time the previous year). Although the international community attempted

to offset this with an increase in cargo freighters, cargo remained at nearly 20% reduction. In the first half of **April** the shortage of aircraft belly capacity continued to dwindle as international passenger capacity reduced by an unprecedented 89%. Combined, these challenges directly impacted humanitarian and health partners' ability to deliver assistance. Delays of two to three weeks or more were observed for the movement of food supplies. The cost to deliver planned programmes was reported by UNOCHA as 'significantly impacted' as the cost of goods and services increased, and partners faced access challenges in countries around the world [11] **(Figure 1)**.

On **6 April** UNOCHA issued guidance on the CBPF, which allowed for critical injections of finance into existing programmes. Importantly, temporary or time-limited flexibility protocols such as remote audit and financial monitoring were implemented, issuing a blanket no-cost extension (NCE) to existing programmes, authorising the use of e-signature on documentation, issuing a 15%

budget line flexibility, and removing the traditional caveat for 'triggers' for funds. This effectively freed up funds usually allocated to one type of emergency for use in COVID-19 response, including to logistics and supply chain management costs. All these mechanisms were previously tried with the CBPF. [12]

On **19 April** an update on the G-HRP was issued within which WFP made an urgent appeal for \$350 million to scale up transport and logistics services for humanitarian organisations' staff and supplies. In this G-HRP update, several pertinent supply chain issues are recorded. Specifically, the difficulty of moving humanitarian personnel into and between countries due to both tight restrictions of international flights and the temporary cessation of visa issuance, and the difficulty of delivering aid relief supplies due to the decrease of commercial air traffic, quarantine measures (which affected the staffing of ports, and points of entry and customs), and congestion at some sea points of entry. [13]

On **7 May**, an update to the G-HRP included a note on supply chains. In this note, it reported the

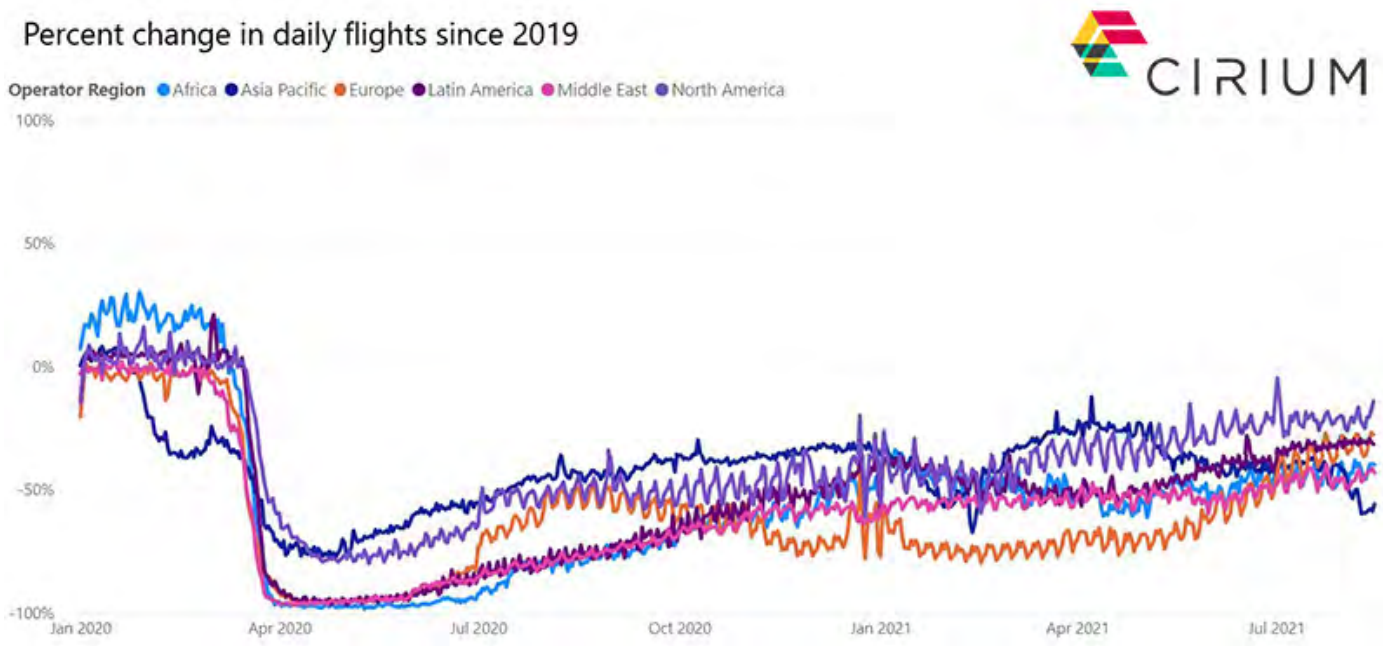


Figure 1: Percentage change in daily flights (Jan-Jul 2020) Source: The Cirium Core, data filed 16 August 2021

ongoing and increasing impact of lockdowns, curfews, and reduced manpower, at all stages of the supply chain: from production and manufacturing, to sea, road, and air transport. According to the UN Logistics Cluster, all countries reported that land, air, and sea points of entry were operating at reduced capacity, with some ports recording a decrease in throughput of 66% (for example, Mombasa port went from 5–6000mt/pd to 2000mt/d). By this point more than half of the 50 countries covered by the G-HRP had put transport restrictions in place: ranging from border closures on one or more land borders, limiting cargo movement (air/sea/overland) to a few entry points, restricting movement to only prioritised cargo, requiring trans-shipment at border, and/or requiring quarantine of incoming vessels/trucks. These disruptions affected the availability of key global health materials and ingredients, finished health products, logistics, shipping, water treatment, disinfection products, and more. Disruption to the air flight market had a recorded impact on vaccines shipments, with a decrease of 80% delivered to countries, and an increasing number of countries reporting depleting stock:

“Although by this point pharmaceutical-related production in China is recovering, and production in India has been assured, there is an anticipated capacity gap due to manpower and logistics constraints.” [14]

Alongside the CSCS, the UN also begins to address alternatives to global supply. On **12 May** the Tech Access Partnership was launched by the United Nations Technology Bank, together with the UNDP, UNCTAD and the WHO. The Tech Access Partnership was created to address critical shortages of essential health technologies and equipment by connecting manufacturers with critical expertise and emerging

manufacturers in developing countries, to share the information, technical advice, and resources necessary to scale up production of essential items. This represents the explicit inclusion of local production capacity to meet shortages and delays in key items, however the initiative is not heavily resourced and does not appear in the Supply Chain Task Force or the WHO COVID-19 SPRP. Over the coming months, the Tech Access Partnership would supply PPE in Lesotho, Turkey, and Costa Rica [15] [16].

On **22 May**, the WHO launches the COVID-19 Medical Evacuation (MEDEVAC) System and established a MEDEVAC cell leveraging assets from WFP, WHO and the UN Department of Operational Support to enable a coordinated and centralised approach to practitioner extraction, relying on local COVID-19 Coordinators at country level [17] [18].

As of **June 2020**, some sectors of global transport markets started to restabilise both in prices and capacity, including the aviation industry. Restrictions in certain regions and countries had been partially lifted and air freight rates began to return from the unprecedented range witnessed in **April**. However, congestion and delays were still reported via the UN Logistics Cluster, at border crossings due to implementation of COVID-19 containment measures such as: quarantine, testing, or extra sanitation measures and reductions in numbers of staff. Delays were witnessed particularly at border crossings throughout East Africa (east at the Kenya/Uganda Malaba border, Uganda/South Sudan border) and West Africa (Central African Republic/Cameroon border). Measures to contain the spread of the virus had also been put in place at major ports used by WFP: for example, mandatory quarantine periods for ships calling at some ports, including those in Nigeria and Yemen.

On **26 June** the G-HRP Progress Report included an update on the CSCS run by WFP/WHO. At that time, it had transported over 3,500 health and humanitarian personnel to 40 destinations over the course of 300 flights, and had dispatched over 11,300 m³ of critical COVID-19 health and humanitarian cargo to 75 destinations on behalf of 23 organisations by air, road, and sea. [18]

On **30 June** the IASC published a *Proposal for a Harmonized Approach to Funding Flexibility* in the context of COVID-19 to respond to a need to make funding agreements more flexible, so that frontline humanitarian actors could receive timely and adequate resources and pivot as appropriate to COVID-19-related activities. This proposal advised an increase in the budget flexibility to 20% (from 15% previously agreed), reviewed the cost classification and recovery practices of direct/indirect costs, and adopted simplified procedures for releasing funds. [19] Although logistics and supply chain management are not specifically mentioned, the above serve to allow for flexible financing of costs ascribed to these areas of operations.

By **July 2020**, the indirect impact of COVID-19, specifically limited mobility policies and port/border closures is evidenced in the in ACAPS Humanitarian Access Report, which found that COVID-19 had limited access to humanitarian services and aid by affected populations, and that “restriction of movement within the country” and “physical environment (obstacles related to terrain, climate, lack of infrastructure)” were the most common challenges identified. Relative to the last Humanitarian Access Report (Oct 2019), humanitarian access had deteriorated in 16 countries. [20]

On **19 July** the G-HRP update noted concerns that the supply disruption to date would cause many midterm indirect and unfavourable

outcomes. This update linked COVID-19 supply chain disruptions and labour shortages to food supply chains, including in Afghanistan, Eritrea, Zimbabwe, the Philippines, and Djibouti. It also noted the requirement for cross-border supply chains to be re-established to continue famine relief and the essential movement of agricultural inputs (such as seeds, pesticides, and livestock) to protect food security outcomes in many more countries. The updated G-HRP noted that food commodity prices had already increased by 10–20% in Afghanistan, 35–60% in Sudan, and in Mozambique food prices have been following an inflating trend since the onset of the pandemic in February (+6.1% as of 24 June). As such the protection of supply chains is formed as part of the response plan for Strategic Priority 2 (Decrease the deterioration of human assets and rights, social cohesion, food security, and livelihoods). The G-HRP update also recognised the impact that COVID-19 related disruption of global supply chains had on immunisation programmes in sub-Saharan Africa and in East and South Asia with 20 countries reporting a stock-out or informally indicating concerns about vaccine supply sufficiency for the period June to August. As such, protection of the supply chain is added to the response plan for Specific Objective 1.6 (Ensure essential health services and systems: secure the continuity of the essential health services and related supply chain for the direct public health response to the pandemic as well as other essential health services). In addition, this G-HRP update included a summary of macroeconomic impacts which cited contraction of global supply chains due to containment measures and spill overs from weaker external demand, as a contributing factor to a 11.9% decrease in global trade. Finally, the update noted the use of multipurpose cash assistance to

support local markets being used by multiple humanitarian actors. [21]

On the **20 July** ISAC publishes a complementary *Proposal to Address the Inconsistency in Unlocking and Disbursing Funds to NGOs in COVID-19 Response*. This proposal identified the need to strengthen coordination processes with national NGOs. The document also reported direct funding to NGOs of £5 million through Start Fund COVID-19 (since April). [22]

On **10 August** the CSCS was updated, listing all medical devices that may be requested through the COVID-19 Supply Portal. UNHCR has delivered some 250 metric tonnes of PPE and medical equipment to G-HRP countries. This includes 12 metric tonnes of hospital tents and the procurement of 2,000 oxygen concentrators and 1.4 million gowns.

By **27 August** WHO had shipped 57 million masks to 56 countries, approximately three million diagnostic sample kits had been delivered, along with increased supplies of biomedical items, such as oxygen concentrators, infrared thermometers, and adult and paediatric oxygen masks. IOM had also dispatched PPE, thermometers, hand sanitisers, surgical masks, sterile gloves, and other protective equipment to targeted countries.

On **31 August**, the second edition of the G-HRP is published, stating that PPE shortages and supply chain disruptions still hindered humanitarian response, in both COVID-19 and other humanitarian activities. 62 priority countries had international travel restrictions in place, and 54 had border closures. The report confidently praised the flexible funding arrangements of UNFPA (prioritised PPE needs and logistics management), WFP (through the IRA), and others to sustain underfunded operations and meet new, unforeseen needs, as well as the provision of global common services including critical transport and logistics services. The reported allocation for global

logistics is now \$42.1M, of which 100% had been allocated from CERF. By this date, WFP had transported 21,177 health and humanitarian personnel (97% of all requests), during 1,183 flights (44% from NGO partners) on behalf of 325 organisations. This update also reported the MEDEVAC system had carried out 39 evacuations worldwide, and IOM had entered an agreement with the UN-DOS to provide health support to UN personnel by setting up 20 Medical Health Assessment Clinics globally. The security of supply chains for essential commodities is reported against and includes not only health items, but also agricultural inputs, food, sexual and reproductive health, and non-food items as these have been affected by wider supply chain disruptions. [23]

In **September**, the World Health Organization commissioned an assessment of the CSCS focused on three main areas: strategy, implementation, and moving forward. When published (30 April 2021) this report found that the CSCS only accounted for approximately 50% of the essential supplies secured by partners during this time. The report suggests that including national and regional purchasers could increase access and ownership of a centralised supply chain system, and that a country-facing platform would be beneficial to connect to partner platforms and engage national government and regional institutions. [6]

On **31 October**, UNOCHA's Global Humanitarian Overview evidences the impact that COVID-19 has had on ordinary humanitarian response, with a significant increase in the funding requirements from \$28.8B (4 Dec 2019) to \$39.39B (31 Oct 2020), and a decrease in the percentage of needs covered from 53% (Oct 2019) to only 38% (Oct 2020). [24]

Section 2: Methodology

In this section, the search methodology for desk review

and data collection is explained. Data collection was conducted for this case study, through 20 semi-structured interviews of humanitarian programme and logistics staff from UN agencies, the IFRC, INGOs, and CSOs. The interviews were transcribed and anonymised and then analysed using *The York Framework*. As such this section also describes *The York Framework* and discusses the amendments made to it for the purposes of this analysis.

Desk review

The desk review included both **peer-reviewed** and **grey literature** relevant to the topic. This was used to describe the system complexity discussed below (Section 3), and to construct the timeline above (Section 1). The desk review was also used to inform the semi-structured interview guide which was used throughout the data collection stage.

To identify the peer-reviewed literature relevant to the topic, a set of keywords used for an initial search was developed. Searching for papers was done through a combination of keywords: where at least one from Set 1 and one from Set 2 was present. This search sourced papers from Google Scholar, Scopus, and the IEEE Xplore Library for Global Humanitarian Technology Conference. Specifically, the keywords in Set 1 were used to locate studies in the humanitarian logistics, or disaster management field, and those in Set 2 were used to identify subject specific papers.

Keywords (Set 1)	Keywords (Set 2)
Humanitarian supply chain Humanitarian logistics	COVID-19 covid19 nov-cov19

Grey literature was collected from primary sources including: UNOCHA, Relief Web, IASC, UN-DOS, WHO, WFP, and INGO policy statements and reports. To be relevant to this study, the grey literature was also

exposed to the same inclusion criteria: it had to be published during or about this time period and had to include a mention of 'supply chains' and/or 'logistics'.

Semi-structured interview development

The remit of this case study was to develop new data via a series of semi-structured interviews (SSI) with humanitarian sector professionals. Conducting SSIs supports an exploratory approach [25], in that it gives the opportunity to collect a rich quality of data. The objective of these interviews was **to capture experiences of aid sector professionals from February to October 2020**.

As such, the unit of analysis was the community of humanitarian practitioners, which were clustered into programmes and logistics staff.¹

Within the humanitarian sector the former and the latter areas of operations usually operate with different personnel, budget streams, and networks or clusters of coordination. To make an interview structure that would work for both types of personnel, an interview guide was developed with a total of six question (see Annex A for question set, justification, and coding).

This semi-structured interview guide was developed and piloted with three interviewees from different organisational samples. In doing so, another unit of analysis

¹ 'Logistics' is used here to describe professionals within the humanitarian sector engaged in any area of supply chain management, and the name for this position alters between organisations. For the purposes of these interviews, participants were asked to identify from the following options: Mid-management or coordinator in programmes or Mid-management or coordinator logistics, Senior Management in Programmes or Senior manager in Logistics, or Senior Leadership/Director.

was identified: Organisations. These were clustered into UN Agencies and IFRC; International NGOs; and National NGO or CSOs.²

Interviewee selection and interviews

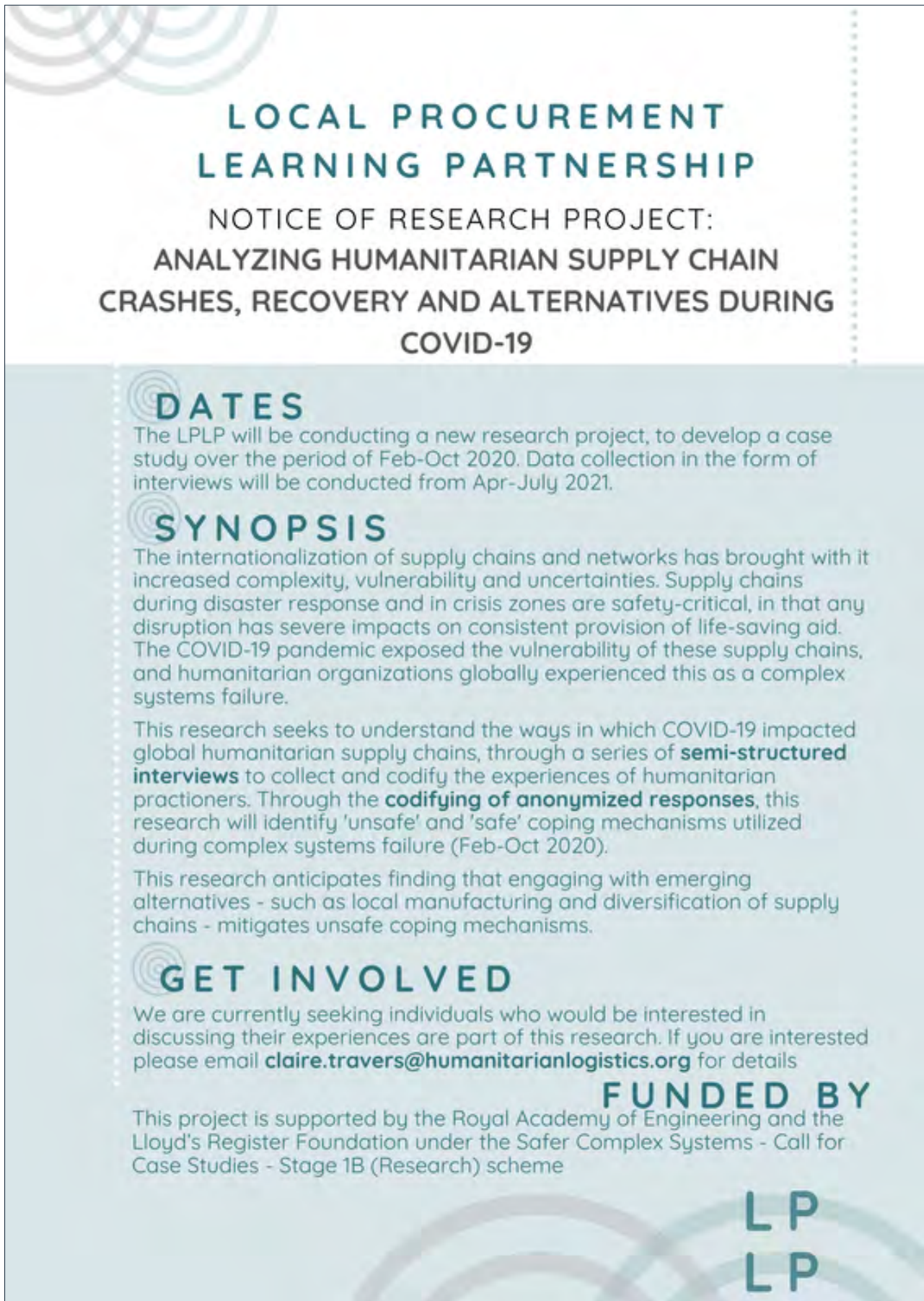
The interviewees were mostly selected through professional networks. A call for participation was developed (**Figure 2**) over and shared on LinkedIn humanitarian logistics groups, on the lead authors personal site, and distributed through email lists for the Local Procurement Learning Partnership (LPLP) and the Humanitarian Logistics Association (HLA). Furthermore, candidates were found over LinkedIn and cold-messaged. Those identified had to show employment over the research period (noncontinuous was allowable), within an identified organisation type. Finally, interviewees were asked to suggest individuals who would be suitable for participation in further interviews (snowball sampling) [26].

Initially, the project lead hoped to conduct 35 interviews with respondents. After further consultation with the team, this number was changed to 20 interviews. A total of 17 interviews have thus far been conducted.

The lead author participated in 100% of the interviews, for the purpose of replication logic, and a sample of the interviews were observed either live or after the fact by a second author, to reduce the possibility of interviewer bias [27].

Demographic data was collected during each interview and stored against interview codes for later analysis. Of the interviews, nine identified as female. Three were UN staff and four were from the IFRC. Six were from INGOs and two was

² The participants were asked to identify their organisation from a list of options: UN Agency /IFRC/ INGO/ National NGO or CSO/ Private Stakeholder.



LOCAL PROCUREMENT LEARNING PARTNERSHIP

NOTICE OF RESEARCH PROJECT: ANALYZING HUMANITARIAN SUPPLY CHAIN CRASHES, RECOVERY AND ALTERNATIVES DURING COVID-19

DATES

The LPLP will be conducting a new research project, to develop a case study over the period of Feb-Oct 2020. Data collection in the form of interviews will be conducted from Apr-July 2021.

SYNOPSIS

The internationalization of supply chains and networks has brought with it increased complexity, vulnerability and uncertainties. Supply chains during disaster response and in crisis zones are safety-critical, in that any disruption has severe impacts on consistent provision of life-saving aid. The COVID-19 pandemic exposed the vulnerability of these supply chains, and humanitarian organizations globally experienced this as a complex systems failure.

This research seeks to understand the ways in which COVID-19 impacted global humanitarian supply chains, through a series of **semi-structured interviews** to collect and codify the experiences of humanitarian practitioners. Through the **codifying of anonymized responses**, this research will identify 'unsafe' and 'safe' coping mechanisms utilized during complex systems failure (Feb-Oct 2020).

This research anticipates finding that engaging with emerging alternatives - such as local manufacturing and diversification of supply chains - mitigates unsafe coping mechanisms.

GET INVOLVED

We are currently seeking individuals who would be interested in discussing their experiences are part of this research. If you are interested please email claire.travers@humanitarianlogistics.org for details

FUNDED BY

This project is supported by the Royal Academy of Engineering and the Lloyd's Register Foundation under the Safer Complex Systems - Call for Case Studies - Stage 1B (Research) scheme

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Figure 2: Call for Participation developed to source interviewees

from a CSO/National organisation. A further two were from private partners. Of the interviews, 13 were logistics professionals, two were humanitarian programmes staff, and two were logistics consultants for a private partner. (See Annex B for demographic details.)

The interviews lasted between 70 and 90 mins, with a mean of 83 minutes.

Transcription

A total of 23.5 hours of recorded material was collected and transcribed. The HIAT method was utilised [28]. The transcription was done by a research assistant who was not present for the interviews. During this process, the data was stored as coded word files, and the names, organisational name, and identifying information was redacted.

SSI analysis

Atlas TI was used to analyse the transcribed interviews. A mixture of inductive and deductive coding was used for this study [29]. Using these strategies together allowed for flexibility in coding, and lead to the development of theoretical categories in line with what we can source in the data.

A deductive code manual for this study was developed, serving as a data management tool for organising segments of similar or related text to assist in interpretation [30]. The code manual was tested against a sample of three interview transcripts (each from different organisations), and these were coded independently by authors. Following the coding process of the transcripts, using the predefined codes, the results were compared and a few modifications to the predetermined code template were required.

Inductive analysis was also conducted by both authors of an additional three interviews, using in-vivo coding for line-by-

line descriptive coding [31]. The descriptive code fragments were discussed considering the existing code manual and, where required, modifications to code levels and concepts were made (see Limitations and scope below).

The remainder of the interviews were analysed in line with the revised code manual.

Limitations and scope

This case study is interested exclusively in the activities, experiences, and awareness of individual practitioners from February 2020 to October 2020. This window represents the acute onset of COVID-19 and the period of time when the supply chains were most critically affected (affected in the most unforeseen ways and in the most safety-critical ways). After 3 February there was policy on COVID-19 provided by the United Nations, and as such we would expect this to be a period of time within which humanitarian practitioners become aware of and able to prepare for COVID-19. Before this date, while there may well have been awareness, there would be no remit or expectation on sector professionals to be briefed. The aim of this case study is to glean learnings from the time of chaos, and to use such a period to understand the ways global humanitarian supply chain weaknesses were exposed and unveiled to us. By capturing these experiences, the case study aims to catalogue and codify the systems failures and coping mechanisms within this time period.

Section 3: Analysis and insights

This section discusses the analysis of both desk research and data collected to provide insights into the key research questions: What were the critical systems failures in humanitarian aid supply between February to October 2020? Why

did they come about? What are some coping mechanisms within the system during this time?

Systemic failures

COVID-19 caused many systems to fail. In healthcare systems COVID-19 compounded existing burdens of disease, impacted vaccine provision, and global health indicators evidenced a decreased access to healthcare for ordinary medical and public health initiatives. Areas of high risk of waterborne and communicable diseases, provision of safe water, sanitation, and hygiene messaging were impacted by the disruption in public health programmes and general access. In areas of significant poverty and informal economic engagement, COVID-19 impacted the poorest and most vulnerable, and resulted in loss of income, economic security, and livelihoods. These are associated with increased risk of gender-based violence, early and forced marriage, and domestic and child abuse for women and girls. COVID-19 impacted food and agricultural programmes; disrupted harvest and farm planning activities; and negatively impact food security indicators. The overall outcome of these systemic failures was loss of life and loss of services (existing in and outside the humanitarian and development communities), and it was disproportionately felt by the poorest, hardest to reach, and most vulnerable.

This case study used data collected from SSIs to define a particular system and the ways systemic failure occurred during the acute onset of COVID19: specifically, **the supply chain disruptions associated with humanitarian aid provision between February and October 2020.**

Within the context of this case study, the interview data was used to isolate the systemic failures of humanitarian supply chains. These are system failures in that they are

incidents when the disruption to the supply chain was so severe that it ceased to operate in the ways that would usually define itself. Within these findings we can categorise these systems failures in four ways – **1) unavailability of key goods, 2) delays in delivery of key goods, 3) price instability, and 4) quality issues of key goods.**

70.5% of those interviewed reported the **unavailability of key goods**, mentioned scarcity or an inability to source, purchase, or receive items. In local/national markets the scramble for items meant that individuals did not have the necessary items to safely continue to deliver aid. Some participants reported that this was a reason for halting programmes that required close interpersonal contact, including the medical and sanitation interventions, as well as protection activities such as conducting child-friendly spaces or gender-based violence activities. Other participants mentioned there were experiences of theft from their PPE inventory during times when items were not available in markets.

At a global level, manufacturing delays and a surge in demand for PPE, prompted suppliers to issue minimum order quantities (MOQ). Interviewees commonly reported the pooling of demands and purchase orders to qualify for these suppliers.

64.7% of interviews mentioned **delays** in delivery of key goods. Reported lead times increased by three months on average. Interviewees ascribed delays in delivery to a lack of capacity for transport at a national level; this was due to governmentally mandated lockdowns, and was obvious due to the unavailability of fleet, fuel, or diesel.

“At some point we launched three or four tenders in a row for vehicle rental because, between all of the NGOs in that in that area of the country, we seemed to have rented every

car that was available for rent. Market capacity was stretched for logistic support essentially, whereas other parts of the market were fine and still viable.” (07-0907)

At an international level, transportation was delayed due to decreased commercial flights, and bottlenecks at Point of Entry (POE) including government-mandated closures, staff shortages because of to social distancing and illness/death, or changes in importation requirements, and slow turnaround of pallets/containers at ports.

“There were very limited transport options, there were limited flight capacity because ... most of the planes were grounded” (09-2107)

Where organisations used WFP-operated flights, these delays were less acutely felt. These delays inevitably contributed to price instability.

70.5% of interviews indicated experiences of **price instability** which affected prices of PPE, non-COVID items, and transportation throughout the case study period and across all geographic regions. To an extent price instability was due to an initial surge in demand for both products and transportation handling outstripping capacity, classified as ‘price hikes’, and due to unpredictable and rapidly changing market factors (including, export/import regulations, spikes in demand due to fear, miscommunication), classified as ‘price volatility’.

Interviews were coded for **quality issues in key goods**, classified as ‘items not fit-for-purpose’, ‘damaged materials’, and ‘false promises or scams’. These concerns were reported in both the items procured locally or globally, but more frequently from deliveries from new suppliers. Participants reported PPE not fit-for-purpose as it did not include a complete set of items (for example, masks without strings to attach

them). A minority of interviewees spoke of their experience of ‘false promises’ – where a sample batch was of sufficient quality but on delivery, the full order was not of comparable quality. On the occasion that subquality goods were delivered, practitioners did not use them for activities involving affected populations including in programme activities.

System complexity

A supply chain is a network, encompassing procurement of materials, production, and delivery of products and services. [32]. Within the humanitarian sector these activities require the involvement of several types of stakeholders: donor and receiving governments, non-governmental organisations, private sector engagement (for transportation). These stakeholders are legally independent, far from each other geographically, or organisational entities that have the autonomy to make decisions regarding the information they share or do not share. As such, there are plenty of possibilities for bottlenecks: both administrative and logistical. [33] To further complicate this, the personnel and processes within each humanitarian organisation vary, with some organisations operating as a centralised highly structured unit while others prefer decentralisation with strong national networks. [34] Retention of lessons learned in one project are seldom integrated into the next disaster response, given time constraints [33] and capacity of the staff in logistics positions. [35] It is worth noting that the humanitarian supply chain takes on risks that would be unconscionable to the private sector, such as unsafe operating conditions, extreme, or changing physical and geographic environments, the role of the media, and politically volatile climates [36], and yet the risk management strategies have been taken from commercial sector supply chain management, often with a slower

rate of uptake, and without a formal trial and review.

During the interviews causes of system failures were identified and coded for in the following ways:

1. System inflexibility

Processes for humanitarian logistics are designed by or for donors, who fund the procurement of items for humanitarian response. The donor-focused processes of reporting limit the ability of humanitarian actors to be dynamic in the face of systems failures. These processes, even in the best of times, tend toward the arcane, are out-dated technologically, and no longer relevant to humanitarian access considerations or the nature of modern response. One interviewee explained it:

“The organisation I worked for lost a million dollars in an audit because we were unable to provide original copies of documentation from Northwest Syria, when it was impossible to remove documents from Northwest Syria. It wasn’t possible to cross the border and a donor audit failed and the money was lost. You know, that’s not something that should ever happen in a functional system and it’s not something that should ever happen with the kind of modern technology that we have.” (07-0907)

During COVID-19 these processes became an extra risk factor. One respondent explained how donor demands for physically signed papers meant logistics personnel had to break quarantine to illegally travel around the capital to get signatories and scans. Another explained that the lead time on donor approval was so long that they had to forego buying PPE that they needed and had to suspend programming.

“At the start of the pandemic, what we wanted to do was to get funding for prepositioning or prepurchase of PPE stocks to

then draw down into countries and, and replenish, but we couldn’t get funding for that” (04-0306)

2. Reliance on global supply chains

Preapproved suppliers are typically preferred, but these suppliers can only supply already known inventory and cannot pivot for new items. The process of vetting, approving, and listing suppliers is a lengthy and administratively difficult process, typically meaning that new suppliers cannot be dynamically added to these systems. Although the humanitarian sector has enjoyed a move to standardise programmes, the specifications for items vary between organisation and tend to be slightly different from those found in commercial markets. For example, tarps used in humanitarian response required in shelter response have subtly different requirements from commercial tarps; and non-food item kits vary in small ways between organisations. This has essentially led to siloed parts of the supply chain – including manufacturing and supplying these key goods.

During COVID-19, common standards for item specifications were issued in May 2021. However, organisations and programmes that would not usually handle PPE items did not have suitable preapproved standards, item specifications, or suppliers to make rapid purchase orders. Inventory codes, supplier approvals and market assessment (where done) were done rapidly, drawing on technical personnel which the sector should have easy access to.

“There wasn’t a lot of organisational guidelines on ... what to do with [procuring PPE] at that point [early March], ... it was mostly just to kind of almost like panic buying, panic buying but kind of codified into a process that changed over

the three or four months or so” (07-0907)

Global transport of humanitarian goods relies in part on the same supply routes as commercial shipping. During a humanitarian response, national governments may apply their own importation restrictions to prioritise supplies for humanitarian response or export bans/restrictions on items they require. During COVID-19, shutdowns of ports, air borders, and POEs was swift and establishing alternative routes was time consuming. In some cases, the interviewees noted that they set up their own supply chains, but without the necessary organisational knowledge or resourcing. Even when reopened, many POE were operating at a reduced capacity due to new health and safety measures (social distancing and quarantining goods) as well as staff shortages and illness. Delays are witnessed particularly at border crossings throughout East Africa (east at the Kenya/Uganda Malaba border, Uganda/South Sudan border) and West Africa (Central African Republic/Cameroon border).

In the initial lag in supplies, regional stockpiles of PPE and other humanitarian items ran out and local markets were subject to spikes and dips in pricing of essential items including PPE. The majority of those interviewed reported that they had to rapidly diversify suppliers to get the stocks required, and this is when reports of ‘false promises’ or poor-quality items were introduced. The skills and resources for rapidly diversifying, localising, or introducing new suppliers simply does not exist within a system that has been built inflexibly and with a reliance on a few suppliers, with inflexible elements.

3. Lack of local market awareness

The knowledge of market assessment, process, and compliance information was

markedly different between national and HQ level. This was particularly difficult during COVID-19 as many expatriate staff were given the option to repatriate, taking organisational knowledge with them and brain draining national offices. Although the desk review found good guidance has been issued since 2020, it also found a lack of market assessment methodology that was clear and tested for non-food items. At national level, the lack of market awareness hampered the ability of country programmes to quickly diversify supply chains or set up new suppliers, quality test items, and complete required compliance and custom paperwork. National-level interviewees noted the systemic separation between procurement and programmes staff and ‘siloeing’ of HQ and national knowledge, which contributes to this knowledge gap.

Market visibility and awareness was strongly represented with 30% of logistics personnel interviewed mentioning this as a recommendation.

“We went through competitive bidding processes, like trusting that our fellow log managers similar deals were given us or suggesting as good suppliers.” (17-0109)

4. A lack of pandemic planning

While epidemic response at a regional level is commonplace in humanitarian sector, participants reported their organisation had not previously prepared for a pandemic. This is not unsurprising. Even in 2018, the research on pandemics in humanitarian logistics was considered scant [37], and where it did present it was included as a “potential cascade of various events” as opposed to their source [38]. Of the interviewees, only 11% felt their organisation was prepared for the pandemic, but even those who felt this acknowledged that there had not been enough planning and could

not identify planning, preparedness documentation, or trainings or pandemic protocols before April 2020. Those interviews which mentioned the use of emergency procedures and business continuity documentation, noted they were out-of-date and/or hard to find.

“Yes, it was prepared for some sort of emergency but never to this scale and never to this duration. You know, at most it might have been prepared for you know a discrete time event that would cause people to have to hunker down for a couple of weeks or even a month. ...some sort of civil unrest or ...climatic event that required people to hunker down but not for months on end. So yes, I would say on reflection, under prepared, prepared yes but under prepared most certainly.” (14-1108)

While some respondents had emergency procurement and logistics procedures on hand, others did not. Interviewees from HQ and Regional level seemed to be more familiar with the procedures, indicating that where there was effort for contingency planning, the findings and lessons were not communicated to national offices:

“We had frameworks to look at ... but having to deal with it at regional level, at that sort of ‘first world admin office’ level was different. It was different to the sort of field level that one was used to” (12-1208)

“The logistics manual hasn’t been changed since, I think, 2011. They, they rely on short term waivers for a lot of deviations, it’s very, very hard to get a permanent change put through” (07-0907)

This element of system complexity is caused and compounded by the lack of general funding available for updating, maintaining and modernising logistics procedures in humanitarian organisations [36].

Currently, only 7–15% of budgets for humanitarian response can be allocated to the core costs, which includes logistics including fleet management, warehousing, but also communications, fixed costs, and so on. As such, very few participants felt their systems and procedures were equipped to handle the pandemic, even if the procedures were available. In organisations where injections of funds had recently been made to update systems, technology, or personnel, the experience of the systems failure was markedly different. Interviews with individuals from those organisations more frequently mentioned positive experiences during this time – feeling supported, confident in the decisions being made. Reactive funding also complicated the ability to procure items quickly. In interviews where crisis modifiers were mentioned, respondents felt this enabled them to more quickly procure emergency stock, allowing them to continue humanitarian response activities.

As per *The York Framework*, the above findings have been mapped onto the governance, management and task/technical levels in **Figure 3**.

Governance Level
<ul style="list-style-type: none"> • multiple stakeholders with overlapping jurisdictions • limited standardisation of specifications, processes, procedures • complex coordination mechanisms
Management Level
<ul style="list-style-type: none"> • shared dependency on supply routes and stockpile • lack of pre-financing available
Task and Technical Level
<ul style="list-style-type: none"> • limited evidence of systemic evaluation • low uptake of technology

Figure 3: Findings mapped onto *The York Framework*

System controls

Under *The York Framework*, design-time or operation-time controls can be thought of as coping mechanisms, strategies, or policies which have evolved or been designed to manage system complexity. This case study used by the desk review and the data collected during interviews to identify the controls

– or ‘coping mechanisms’ – latent in the system and used in the acute onset of COVID-19. As per *The York Framework*, these are disaggregated from design-time controls (those designed or built-in to the system) and those operation-time controls (those which are designed to use the system). These are differentiated from the controls which are apparent as dynamic redesigns of

the system due to the exacerbating factors presented by COVID-19 (**Table 1**).

Dynamic or redesign controls

The unique exacerbation of the system presented by COVID-19 meant that the system did not merely rely on existing controls – design or operation-time. Rather it allowed for the formulation

Design-time controls	Operation-time controls
<p>Prepositioning in the supply chain</p> <p>Critical to the functioning of the humanitarian supply chain is prepositioned inventories of stock at certain ‘strategic’ locations (warehouses, logistics hubs, distribution centres) that can be deployed quickly in case of a disaster. Often this prepositioning is shared by multiple supply chain partners, for example, vendor-managed inventory. [39] [40] [41]</p>	<p>Information sharing</p> <p>Critical to the operation of humanitarian supply chains is the ability to share information across different organisations, usually done through the logistics cluster, IASC, or other coordination mechanisms. This can be seen as an explicit risk mitigation strategy [41]</p> <p>During COVID-19, the CSCS was a key stakeholder in managing information flows. In addition, the interviews also evidenced a more informal sharing of information. Information sharing about suppliers, vendors, and manufacturers was done by national staff through informal channels, including WhatsApp, Facebook, and door-to-door networking. Some participants reported that this work was not compliant with donor requirements, leaving lingering concerns over their performance in an audit. On some occasion, a backdating of documents was confirmed as a common practice for mitigating this risk.</p>
<p>Using verified and certified suppliers is a designed control for humanitarian supply chain to mitigate risk by closely controlling the item specifics as well as cutting down on potential lead time by pre-vetting suppliers and vendors. [42]</p> <p>During COVID-19, however, the demand for PPE far outstripped the capacity of preselected suppliers, and those that could provide were faced with transportation issues: <i>“suppliers were very busy, handling all the requests but then also to find an adequate transport option and moving things into country”</i> (09-2107)</p>	<p>Pooling demand between organisations and between regions is a common operation-time control. This allows many stakeholders to draw on a common pool of supply, allowing for changes in demand between themselves, and leveraging flexible transportation and shared logistics assets (such as warehousing).</p> <p>During COVID-19 this was utilised, coupled with a redesign element. However, as the pool of supply was drastically lower than the demand, this control could not offset system failures.</p>
	<p>Standardising of item specifications is an operation-time control. While this is not novel to COVID-19, the European Commission Recommendation (EU 2020/403) on conformity assessment and market surveillance procedures within the context of the COVID-19 threat included the requirements for the design, manufacturing, and placing on the market of PPE for COVID-19. This made procurement of items easier as clear standards were the same across organisations and donor bodies.</p>
	<p>Over a third of interviews (36%) mentioned explicitly the use of emergency funding, procurement waivers, or emergency protocols to handle supply chain disruptions. This is an operation-time control that essentially temporarily lifted the thresholds required to undergo a lengthy bidding process. Instead of requiring sealed bids and a full tendering process, procurements of up to a certain value could be made by a senior logistics officer. The interviewees who mentioned this control confirmed that this enabled them to mitigate some of the supply failures. Where crisis modifiers were available respondents felt able to more quickly secure items already in the supply chain and build out stockpiles.</p>

Table 1

of dynamic controls: systemic redesign elements, dynamically changing their mechanisms and policies. During the interviews, several controls were identified that were new to the system.

Many interviewees noted, referenced, or nodded toward the **CSCS** set up by the SCTF in early April. This system was a massive and novel redesign of the system of humanitarian procurement, with three components³, designed to provide real-time tracking of goods to support the planning, implementation, and resourcing of nation states; to help governments access the ESFT; and the Supply Portal to consolidate demand per National Action Plans alongside the ESM.

"The larger humanitarian partners would typically pool together with WHO and go through their procurement portal." (14-1107)

The CSCS accounted for approximately 50% of the essential supplies secured by partners in 2020, according to The Yellow House & WFP, 2021 report.

The majority of interviewees (70.5%) mentioned novel ways **local markets were engaged** as a response to supply chain disruptions, as an alternative supplier for goods that would ordinarily be brought from global suppliers, as well as a livelihood

3 1) a control tower is erected in Geneva, dedicated to consolidating demands, allocating inventory and administrating the delivery of products, 2) three purchasing consortia for biomedical, PPE and diagnostic products respectively, and 3) a suite of planning tools which is launched on the WHO Partners Platform. Delivery Hubs were erected in eight countries: Global Hubs in Guangzhou (China), Dubai (United Arab Emirates), and Liege (Belgium). Regional Hubs in Kuala Lumpur (Malaysia), Addis Ababa (Ethiopia), Panama City (Panama), Accra (Ghana) and Johannesburg (South Africa).

programming activity for beneficiaries.

"We procured fake masks it created a lot of panic, amongst the members so we decided to switch to three layered reusable masks and that is when we procured reusable mask using local procurement." (02-2305)

Of the interviewees who mentioned the use of local procurement or production, the majority indicated this was a positive experience and wanted to see the engagement with local markets as strategy in the future:

"We learned a lot about the local supplier market, and of course we did a lot of market assessments in order to allow for that. So, I assume moving forward it will be a lot easier to use that local route and get authorisation for it because we know that we've done it previously." (09-2107)

"In the past, most of our PPE would have been ordered through global suppliers for our health programming. But when you're then expanding PPE to be done everywhere, and, you know, local supply markets are opening up." (04-0306)

A couple of interviews referenced quality control issues or potential scams. The bigger concern about future engagement with local makers, manufacturers, and producers were latent concerns about their ability to scale, as well as process barriers in the organisational operation and design controls which preclude the use of small vendors.

"So if you want to just to get the records, we have fifteen times bigger than we were three years ago, so I need to work with suppliers that they can scale up with me and scale down, okay? And these non-traditional small [mom and pop] suppliers, they don't have the cash flow and a geographical reach to scale with me. And we, for example,

have policies where we don't buy more than 30% of the turnover of our supplier to reduce the coupling of our operational needs with the financial cash flow of the supplier." (17-0109)

On 12 May the Tech Access Partnership was launched by the United Nations Technology Bank, together with the UNDP, UNCTAD, and WHO. The Tech Access Partnership was created to address critical shortages of essential health technologies and equipment by connecting manufacturers with critical expertise and emerging manufacturers in developing countries, to share the information, technical advice, and resources necessary to scale up production of essential items. This represents the explicit inclusion of local production capacity to meet shortages and delays in key items, however the initiative is not heavily resourced and does not appear in the SCTF or the WHO COVID-19 SPRP.

"We're talking about supporting local economies, building up countries and now we've seen that there can be a point where the supply chains are just cut, and we have no choice to use local. So, we're saying that we wanted to use local because we felt it was better for all these reasons, but we're also saying we've all just seen how local might be the only option. So can we add that into the mix as well and say, it could be the only option but it can also be the better option?" (10-1008)

"We started to depend more and more on local market because ... if you would like to purchase on national level not local level so that's needed a lot of time spent, a lot of money, [including] transportation between area[s]. So, this pushed us to depend on local market near of us sort of bring purchases from capital." (01-1405)

Interviewees mentioned the new **use of electronic**

signature/e-document technology for compliance purposes. During this time the CERF and CBPF issued special allowances for e-Signatures and digital documentation handling in certain countries. However, during the interviews, reports of physical copy/signatures were still occurring, on one occasion forcing staff to break national lockdown regulations to travel to offices and residences to obtain documentation in person. Some organisations were more adapt to this as a new control, specifically organisations that have recently invested in supply chain personnel and processes.

“Electronic signature wasn’t the thing we were using up until COVID routinely at all in any organisation I’ve worked for, and it should be.” (07-0907)

“So e-signing, e-document signing of contracts was not rolled out widely across the organisation. Certain pockets, certain teams had it so our legal team, for example, were completely geared up to be able to deal with DocuSign, they had had the training, they had had the software but our procurement team, for example, who deal with lower level POs which are also effectively contracts were not yet geared up to deal with DocuSign.” (14-1108)

The G-HRP July update noted the use of **multipurpose cash assistance** to support local markets being used by multiple humanitarian actors [21]. This research found this as well, with participants noting the rapid scale up on cash/voucher assistance (CVA). In the interviews this was a modality that allowed humanitarian activities to continue quicker than waiting for items would have. This was reported across sectors – in protection, medical, or health programmes, food security activities, and in sanitation projects.

“There was a significant scale up of cash and if I take just the Africa region, we, we had, I think 25 countries that decided to do cash.” (10-1008)

The use of cash assistance can be thought of as a pivot to cash and occurred either as an increase in number of registered recipients of an existing programmes, removing the conditional or work requirements for the cash programming, or setting up new cash programmes to complement or replace NFI and food programmes.

Section 4: Discussion and transferable learnings

The York Framework

As per the case study of the Safer Complex Systems Grant which funded this research, this section will discuss the usability of *The York Framework* as a model to understand and describe systems failure in humanitarian supply chains.

The York Framework is a theoretical structure to understand complex systems and systemic failure. The design is being iterated on currently (2021, but was initially designed in 2020, when

Engineering X commissioned the University of York to undertake a review of the safety in the design, management, and governance of complex systems following the fall of Grenfell Tower). The study included funding from stakeholder workshops, informal meetings, and an online questionnaire, which were used to develop a framework for the design, management, and governance of complex systems.

According to this model, causes of system complexity can be understood as having consequences, which are managed by design-time controls and operation-time controls, and which are subject to exacerbating factors (see **Figure 4**). The framework suggests that given failure in design-time or operation-time controls, systemic failures occur, and as such improving design-time or operation-time controls, may make complex systems safer. In preparation for this case study, grant awardees were given opportunities to test, discuss, and pick elements within these areas that suited their case study.

In this case study, *The York Framework* was used as the basis for the deductive code manual, and then tested against inductive

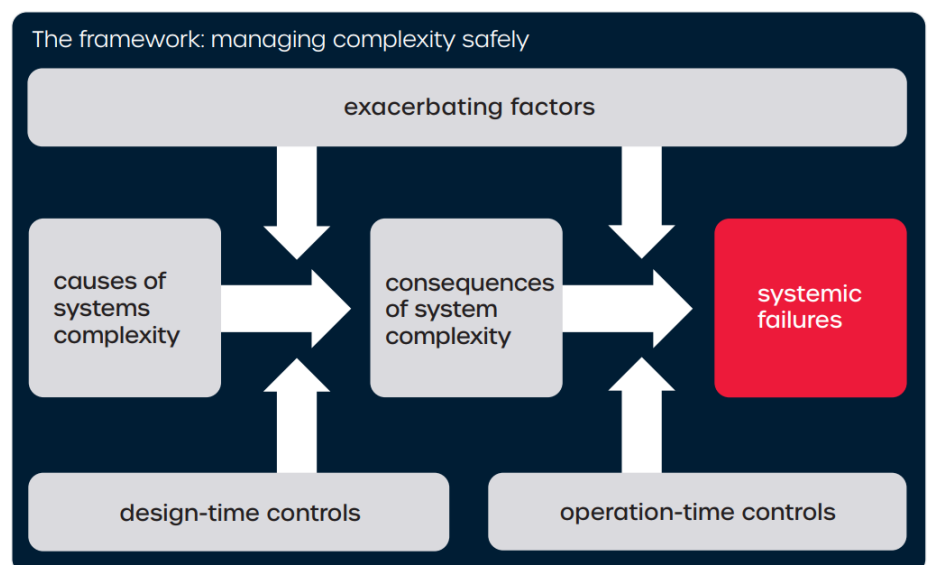


Figure 4: *The York Framework* (simplified) (Weaver, R) Source: Engineering X, 30 March 2021

coding. In doing so the theoretical concepts and distinctions were 'tested' against the phenomenon as described by the participants, and those that were not helpful for conceptual organisation, OR those that were not evidenced in the data were dispensed with.

Framework amendments

The use of the framework throughout this case study has suggested that the framework operates well in disaggregating the causes and consequences of systemic complexity. However, with protracted system failure, *The York Framework* was ill-equipped to capture all elements of the system controls in place. As such the following amendments are discussed and suggested.

When a system fails during a crisis, in an elongated, drawn out, complex, or otherwise extended manner, the system (if able) will modify its own controls during that time to minimise the systems failure until the systemic failure is no longer being experienced. These

must be meaningfully different from operation-time controls, as they are new controls introduced temporarily until the systems failure is no longer occurring, at which time these dynamic controls will also no longer occur.

In this case study, such dynamic or redesign-time controls were evidenced: organisations face systems failures (for example, price hikes) and made new controls to balance, eliminate, or mitigate the impact of the systems failure (for example, new supplier entry processes). These new controls are developed outside of the usual operation or use of the system.

A suggestion of how to represent this has been included, and a visual is represented (**Figure 5**).

Transferrable learnings from dynamic-time controls

The above redesign or dynamic controls were identified (Section 3). In addition to these, the interviewees were asked explicitly

to outline recommendations or desired changes they wanted to see⁴.

Many of the interviewees **noted how important research, data capture, or reflection is in the aftermath of COVID-19**:

"I think this time of reflection has been great. I think we've been able to look at the value in the way we work." (12-1202)

There was also a general impression that COVID-19 has pushed the **green** and **localisation** agendas by necessity.

The following policy areas can be confidently advised upon based on this research:

1. Donors to revise mandated processes

Organisations can only procure the ways that funding and finance permits, and, without a donor-level engagement in common processes, organisations will have to rely on emergency procurement measure such as waivers.

Where **crisis modifiers** already existed, practitioners interviewed said they were able to more quickly to pivot not only activities but also the procurement of key goods. Including a crisis modifier as standard could be considered as a first step in reassessing the donor-focused processes that have hampered logistics and humanitarian personnel in this new type of crises.

Standardising processes and procedures across donors

would also be impactful, allowing organisations to quickly pool procurement with others.

Finally, donors adopting a modern, accessible and realistic strategy for evidence handling (including, e-documents, e-signatory)

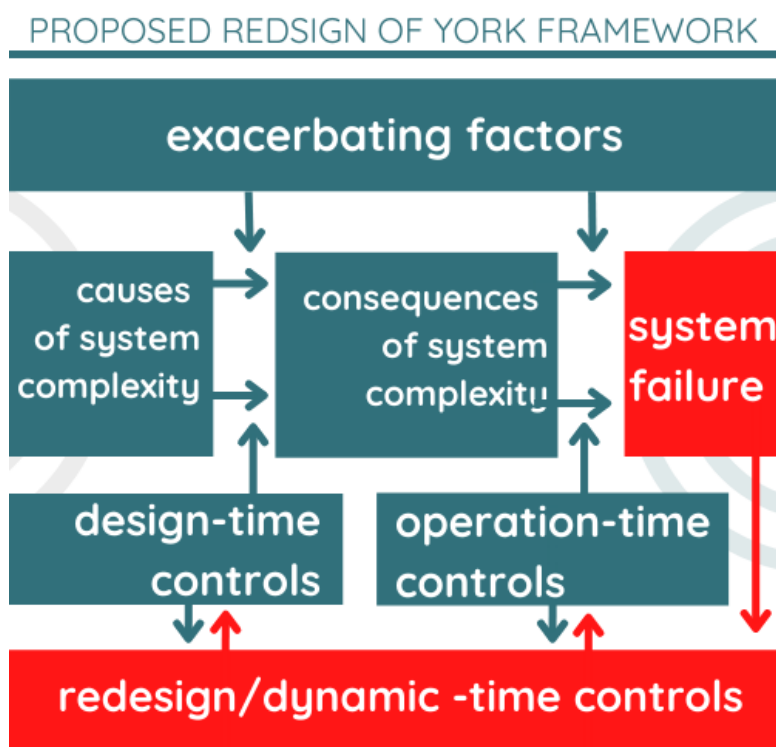


Figure 5: Revised *York Framework* including redesign or dynamic-time controls

⁴ Was there anything that you wanted to do but couldn't – and why not? OR What would you do differently if you could?

would also enable stakeholders to respond more dynamically, eliminating lengthy and potentially dangerous bureaucratic processes. The remote working conditions essentially forced upon the sector during COVID-19 could serve as a model for a **digitised compliance strategy** for donors, which would likely be most beneficial to country contexts where security risks are high for staff, where mailing services are not possible, or where there are lockdown, curfews and other restriction of movements.

2. Organisations to invest in supply chain resiliency

The reorganisation of **national capacity** has huge potential for improving supply chain resiliency. This case study found reports of expatriate staff repatriating, especially in countries where healthcare infrastructure was considered less developed. This essentially emptied fragile humanitarian contexts of crucial institutional capacity, leading to slowing or suspension of activities. The local and national staff were often left to step up to the plate and pick up the slack. More than developing staff capacity, a reorganisation of the position of local staff to roles and responsibilities in keeping with their activities during this time would not only support the localisation agenda in a meaningful way but would also make country offices resilient to future pandemics.

Integration of unconditional CASH across programmes, regardless of market functionality can offer a dynamic optionality in humanitarian programming, making its provision less vulnerable to supply chain disruptions and long-term serving to incentivise the local private sector to fill market roles currently colonised by aid organisations offering free items.

Finally, **localising and diversifying suppliers** to reduce a reliance on global supply chains, which contributed to price volatility

and delays in delivery. Long-term strategies to engage with regional or national supply chains – including manufacturers – could present more resilient supply chain solutions. An organisational policy that could support, and meaningfully engage with, networked supplier systems at a subregional level could present an extension of Grand Bargain commitments and National Action Plans, to build resilience in communities. Future pandemics would benefit from a diversified and localised supply chain, to help cope for breaks in global supply as well as flexible manufacturing process which can allow for adjustments in quantity and quality produced [39]. These efforts can include economic supply incentives to encourage additional suppliers to stay or enter into a certain market to avoid monopolistic situations, and to secure multiple sources should a disruption occur. [41] [43]

3. Sector to upskill on supply chain visibility

For rapid response, personnel and infrastructure must be able to see and understand inventory and markets. To conduct, access, and understand market assessments efficiently. Interviewees from organisations in which investment in technology and logistics infrastructure had been made recently were better positioned for response to system failures. Personnel with appropriate qualifications within the organisational structure are key [44], and technological enablers including digital inventory tracking and e-compliance products were mentioned as key to safe, swift, and ongoing operations. Investment in **inventory management tools**, including digitisation or the use of AI, for enhanced visibility of supply chain is crucial. Interviewees in all types of organisations were not able to answer basic questions about levels and state of stocks,

which inspired panic, fear, and stress in humanitarian personnel interviewed.

“We have very, very weak inventory system; it’s basically zero” (O2-2305)

Even in larger NGOs there is a desperate need to update their technological base to deal with supply chain disruptions on a global scale. There is much opportunity for cross-pollination from the private sector, where electronic ordering systems integrate stocking, logistics, materials acquisition, shipping, and other functions create a more proactive and effective style of business management and customer responsiveness. [41]

This could also look like sector-specific tools and capacity for rapid market assessment. The COVID-19 crisis has highlighted a need for organisations to be able to rapidly assess markets, both globally and locally, to access them dynamically in cases where new items are suddenly in demand. Prepositioned stocks were rapidly depleted during the early phase of the COVID-19 response, and without adequate awareness and understanding of markets, organisations were slow to be able to set up new supply routes. In this case the CSCS provided by WHO/WFP filled this capacity gap, but it may be advisable to ensure common tools for market assessment are known by organisations and capacity is protected within organisations for staff equipped to conduct them.

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Annexes

Annex A: SSI Structure and Code Manual

The below is the semi-structured interview guide developed for this case study, including code tree devised with a deductive method.

Set	Questions	Codes
1	Tell me about when you first remember learning about COVID19?	Source of first information Month of first information Reaction to first information Month of organisational communication Organisation preparedness plan
2	How did your organisation prepare for COVID19? What operational guidance?	Causes of Organisational changes <ul style="list-style-type: none"> • Donor changes • Finance Unavailable • Government Restrictions Examples of Organisational <ul style="list-style-type: none"> • Deployment changes • HR changes • HQ Policies • Meta policies Positive Organisational coping mechanisms Negative organisational changes
3	What were some significant changes you noticed on your programmes during Feb–Oct 2020? Why did these changes happen?	Changes to programmes <ul style="list-style-type: none"> • Programmes Halting • Programmes Slowing • Programmes Altered Causes of changes to programmes <ul style="list-style-type: none"> • Changing Need • Changes in Staffing • Donor changes • Finance unavailable • Supply chain disruption • Government Restrictions Impact of changes in programmes <ul style="list-style-type: none"> • Beneficiary: Lose of life • Beneficiary: Lose of services • Delays to services/ distribution Sectors of Programmes Effected

Set	Questions	Codes
4	What were some significant changes in your supply chains during Feb–Oct 2020?	Supply Chains System Failure <ul style="list-style-type: none"> • Items not available • Delays in delivery • Price Instability • Quality concerns of items Causes of Supply Chains disruptions <ul style="list-style-type: none"> • External to the system (exacerbates factors) • Internal to the System (design time/operation time controls) • Redesign Controls • Latent Controls Key Goods
5	During the period of Feb–Oct 2020, what would you say were the critical moments/ strain points for you?	Cause of Strain <ul style="list-style-type: none"> • External to the system • Internal to the system Impact of strain Month of strain
6	Was there anything that you wanted to do but couldn't – and why not? OR What would you do differently if you could?	<ul style="list-style-type: none"> • Prepositioning of goods • Enhanced SCM • Improved Market Awareness • Better coordination • Improved operational guidance

Annex B: Demographic Data

I-CODE	WHICH BEST DESCRIBES YOUR GENDER	WHICH BEST DESCRIBES THE ORGANISATION YOU WERE WITH DURING FEB-OCT 2020	WHICH BEST DESCRIBES YOUR EMPLOYMENT IN THE ORGANISATION YOU WERE WITH DURING FEB-OCT 2020	WHICH BEST DESCRIBES THE LEVEL YOU WERE STATIONED AT DURING FEB-OCT 2020	WHERE WERE YOU DEPLOYED/STATIONED/ BASED DURING FEB-OCT 2020?
01-1505	M	UN AGENCY	COORDINATOR IN LOGISTICS	NATIONAL	SYR
02-2305	F	UN AGENCY OR IFRC	MID-MANAGEMENT OR COORDINATOR IN PROGRAMMES	NATIONAL	LLW - MAL
03-2505	M	NATIONAL NGO	MID-MANAGEMENT OR COORDINATOR IN LOGISTICS	NATIONAL	CAL/KEOS
04-0306	M	INGO	SENIOR MANAGEMENT IN LOGISTIC	HQ	AMA
05-1606	M	PRIVATE PARTNER	SENIOR MANAGEMENT IN LOGISTIC	HQ	LDN
06-0507	F	PRIVATE PARTNER	SENIOR MANAGEMENT IN LOGISTIC	HQ	LDN
07-0907	M	INGO	SENIOR MANAGEMENT IN LOGISTIC	HQ/REGIONAL	AMN
08-1207	F	CSO/NATIONAL NGO	SENIOR MANAGEMENT IN LOGISTICS	REGIONAL/ NATIONAL	FIJI
09-2107	F	INGO	MID-MANAGEMENT OR COORDINATOR IN LOGISTICS	HQ	GENEVA
10-0908	F	IFRC	COORDINATOR IN LOGISTICS	HQ	GVN
11-0908	M	INGO	SENIOR MANAGEMENT IN LOGISTICS	HQ/NATIONAL	LDN/SAN
12-1208	M	IFRC	SENIOR MANAGEMENT IN LOGISTICS	REGIONAL	KYA
13-1208	F	IFRC	MID-MANAGEMENT OR COORDINATOR IN LOGISTICS	NATIONAL	DAMASCUS
14-1108	F	UN AGENCY	MID-MANAGEMENT OR COORDINATOR IN LOGISTICS	HQ/HQ/REG	ROM/ GVN/CHI
15-1908	M	IFRC	MID-MANAGEMENT OR COORDINATOR IN LOGISTICS	HQ	GENEVA
16-3008	F	INGO	SENIOR MANAGEMENT IN PROGRAMMES	REGIONAL	NAIROBI
17-0109	F	INGO	SENIOR MANAGEMENT IN LOGISTICS	NAT	BOGATA