Supply chain risks in humanitarian relief operations: a case of Cyclone Idai relief efforts in Zimbabwe

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Abstract

Purpose – The rising threat of tropical cyclones in Zimbabwe is of great importance in establishing the general sources of humanitarian supply chain risks and assessing their negative impact on relief operations. There is a scarcity of studies that collate such evidence toward enhanced humanitarian supply chains in Southern Africa. With this in mind, this study explored scattered evidence on supply chain risks in the delivery of humanitarian aid to victims of Cyclone Idai in Zimbabwe.

Design/methodology/approach – This reflective study evaluates supply chain risks associated with Cyclone Idai humanitarian relief operations through qualitative in-depth interviews with relevant actors in the field. The data were triangulated with secondary information from associated publications, blogs and newspapers to reflect the truth about the phenomena under investigation.

Findings – The results show that Cyclone Idai disaster response operations were adversely affected by social, economic and political/governmental risk factors. In the same breath, poor or inadequate infrastructure and environmental factors were also contributing factors toward the futility of humanitarian relief operations.

Practical implications – This study is significant as it endeavors to contribute toward humanitarian supply chain management, specifically in assisting humanitarian organizations with suggested strategies that would work toward making humanitarian relief supply chains more resilient. However, more research needs to be done toward optimized implementation strategies for the suggested framework.

Originality/value – It is to the best knowledge of these researchers that this is a unique study carried out to examine humanitarian supply chain risk factors in Cyclone Idai relief operations in Zimbabwe.

Keywords Cyclone, Cyclone Idai, Humanitarian, Relief, Disaster risk management, Supply chain management

Paper type Research paper

1. Introduction

Globally, there has been a rise in the number of disasters consequently escalating the demand for disaster relief operations. Among these disasters, tropical cyclones are increasing in frequency and severity with devastating effects on human lives and infrastructure and a surge in the demand for humanitarian relief response (Thomas and Kopczak, 2005; Gupt *et al.*, 2019). Governments and aid agencies are obliged to move in through humanitarian relief supply chains, to provide aid in the aftermath of these cyclones. Individuals and the corporate world also participate through philanthropy and as part of their corporate social responsibility (CSR) (Behl and Dutta, 2018; Banomyong and Julagasigom, 2017). However, effectiveness and efficiency of humanitarian supply chains largely depend on the economic, political and environmental situation in the affected countries (Balcik and Beamon, 2008). Social-cultural factors and the degree to which a country's infrastructure is developed are also pivotal to how expedient the humanitarian relief operations are (Badenhorst-Weiss and Waugh, 2015).

The Southern Africa region has its mark on the global list of cyclone-prone regions. Prior to Cyclone Idai, southern Africa had recorded three cyclones in two decades; cyclone Eline in

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year 2000, Cyclone Japhet in year 2002 and Cyclone Dineo in year 2017 (Mhlanga *et al.*, 2019). The increase in cyclones occurrences has consequently increased the demand for humanitarian relief response. Cyclone Idai was the worst tropical cyclone to hit the Southern Hemisphere in recorded history (Act Alliance, 2019). The cyclone struck four Southern African countries namely Madagascar, Malawi, Mozambique and Zimbabwe from the 14th to the 19th of March 2019, creating a humanitarian and ecological disaster. Human death toll rose above 1,000 people, and 100,000 more people were left in need of humanitarian aid in the four Southern African countries (Fitchett, 2019; France 24, March 24, 2019). In Zimbabwe, the cyclone primarily affected Chipinge and Chimanimani districts.

France 24 (March 24, 2019) notes that stakeholders stepped in to provide essentials through supply chains that spanned from Africa as well as from overseas countries such as China, United States of America, Britain and the United Arab Emirates. The United Nations World Food Programme (UNWFP), UN Refugee Agency, World Health Organisation, corporate companies, individuals, government and various other nongovernmental organisations (NGOs) availed food and other relief items required to support devastated communities in the aftermath of Cyclone Idai (Hart, 2019). Behl and Dutta (2018) pointed out that timely delivery of critical goods is a crucial element of an effective disaster response to reduce or mitigate the effects of the cyclone.

Previous studies by the likes of Natarajarathinam *et al.* (2009), Hapeman (2012); Masaba (2015); Juliana *et al.* (2017) concur that managing supply chain risks helps to mitigate further disruptions in relief operations. Studies evaluating the different country settings and associated impact on supply chain relief operations are needed. Most supply chain risk studies are located in the UK, USA, South America, India and Europe (Bak, 2018; Oloruntoba, 2010). Little or very scanty literature are available on developing countries, especially the southern parts of Africa, Zimbabwe in particular. This leaves a gap that necessitates the current study. Ultimately, the interrogation of the risk factors that militated against humanitarian supply chains during Cyclone Idai relief operations is the focus of the study. It is therefore in these researchers' interest to answer the following fundamental questions:

RQ1. What are the supply chain risk factors that were encountered during Cyclone Idai humanitarian relief efforts in Zimbabwe?

RQ2. How did supply chain risk factors influence Cyclone Idai humanitarian relief operations in Zimbabwe?

The rest of this article is organized as follows: after the introduction, section 2 provides a brief literature review, while section 3 focuses on outlining the methods and research design. Section 4 presents the results and discussion, while section 5 presents conclusions, from this study. Section 6 gives recommendations of the study, and section 7 presents practical implications of the results. The article concludes by looking at limitations of this study and recommendations proffered for further research.

2. Literature review

2.1 Theory of constraints

In today's globalized world, supply chains are at the core of improving the quality of most businesses' operational environment (Kovács and Spens, 2009). In an endeavor to deliver quality service, many supply chains encounter risks that seriously threaten the achievement of their objectives. The risks are, among others, equipment, people, policy, environmental, social or political. This study therefore adopts the theory of constraints (TOCs) in helping stakeholders to focus on improving the performance of supply chains. The TOCs was conceived by Tulasi and Rao (2012). It is a methodology used to identify the constraints that limit the achievement of organizational goals and developing plans to alleviate these

constraints (Tulasi and Rao, 2012). Lack of awareness about the existence of these constraints along the supply chain prevents the full realization of desired performance goals. To date, the TOC has been successfully applied in manufacturing, supply chain, project management, military, medical settings, management accounting and in services sectors (Coman and Ronen, 1994; Hodgdon, 1998). Little attention has been given, within reviewed literature, to the application of the TOC concept to the humanitarian supply chains, where the focus is to save lives and stop suffering. This is one of the first studies to adopt the TOC to overcome difficulties in realising the desired humanitarian supply chain performance.

2.2 Definition of concepts

A brief discussion of the key concepts used in this study is presented below, in order to understand and contextualize these terms.

2.2.1 Supply chain. Generally, a supply chain is a sequence of all the individuals, organizations, resources, activities and technology involved in the manufacture and sale of a product, stretching from the delivery of raw materials, right up to the end user (Wagner and Bode, 2008). A commercial supply chain includes manufacturers of products, the warehouses, its distribution centers and finally, the retailer where consumers purchase these products (Slack *et al.*, 2013).

2.2.2 Humanitarian supply chain. Humanitarian supply chain is the flow of relief aid and the related information between the beneficiaries affected by disaster and the donors (Barve and Yadav, 2014). The beneficiaries are the customers in a disaster supply chain as the chain stretches upstream to include governments, corporate companies, philanthropists, NGOs and intermediaries at local or global level. Humanitarian supply chain is more complicated, and it encompasses activities such as: preparedness, planning, design, procurement, transportation, inventory, warehousing, tracking and tracing, distribution, reporting and accountability and customs clearance (Thomas and Kopczak, 2005). It therefore includes activities stretching across the three phases of disaste – preparedness, response and recovery.

2.3 Supply chain risk factors

In today's competitive global world, risks have become more prevalent in disrupting the supply chain in organisations. Supply chain risks range from economic, social, environmental, infrastructural, to political risks (Hapeman, 2012). Identifying these supply chain risk factors helps in developing mitigation procedures to improve operational performance.

2.3.1 Infrastructure risk factors. Inadequate infrastructure is identified as a major challenge of disaster relief activities (Kovács and Spens, 2009). Humanitarian organisations struggle with aid distributions due to lack of adequate infrastructural facilities (Özdamar *et al.*, 2014). Under the main category of infrastructure, four sub-categories are identified: transport, communication, warehousing and power. Sudden onsets of disasters such as cyclones and floods have a strong negative impact on physical infrastructure, including the destruction of transport infrastructure such as roads, bridges and airfields, electricity networks and communication infrastructure (Kovács and Spens, 2009).

According to Costa *et al.* (2012), transport infrastructure is critical to delivering aid at the right time and to the right place to assist those in need. In general, humanitarian operations largely use road and air transport. However, transportation is dictated by road conditions, fuel availability,and airports capacity after disasters. Masaba (2015) found out that any slight disruption of transportation infrastructure can have a huge negative outcome to disaster victims, response teams and government. This corroborates with what Randrianalijaona (2018) postulates, that most rural areas in developing countries become inaccessible as the cyclones destroy weak transport infrastructures. The use of technology such as satellite

technologies and drones offers alternative transport facilities and reduce the total costs of the system and the time to respond to emergency (Delmonteil and Rancourt, 2017; Shavarani, 2019)

Good communication and information technology also play an important role in delivering the right information to support resource allocations by humanitarian organisations (Taniguchi *et al.*, 2012). In the same vein, Pettit and Beresford (2005) suggest that the communication during a crisis "is the single greatest determinant of success" as it assists in integrating activities and providing information to allow the supply chain to operate more effectively. Social media has also contributed to disaster response. Finau *et al.* (2018) noted how social media successfully assisted individuals before, during and after Cyclone Winston, to share information about the cyclone and to be informed about the cyclone. Consequently, breakdowns in information technology significantly affected communication between disaster relief agencies, thereby exacerbating the detrimental effects of a disaster (Juliana *et al.*, 2017; Chopra and Sodhi, 2004; Thomas and Kopczak, 2005). Diedrichs *et al.* (2016) highlight that communication deficiencies result in shortage of urgent supplies of aid.

Electricity plays an important role in humanitarian response. Unavailability of electricity can be devastating as it hampers the speed of delivery of life-saving interventions in post-disaster situations. When disasters such as cyclones strike, electricity infrastructure is damaged by heavy rains, flood and high winds, interrupting most humanitarian supply chains (Randrianalijaona, 2018). In the case of Hurricane Sandy, overhead electric distribution network was destroyed, resulting in power outages affecting over 500,000 consumers (Wanik *et al.*, 2018). This study sought to review energy factors that influenced humanitarian relief operations in Cyclone Idai relief efforts in Zimbabwe.

2.3.2 Environmental factors. Environmental risks represent one of the most significant risks in the global supply chain. These risks usually follow cyclones as the rains and flooding that come with cyclones can cause landslides damaging roads and bridges. Chan (2012) noted that bad weather and other environmental risks impact upon the people and bring negative effects on life, properties and infrastructure. After cyclone Gaja, emergency responders only managed to reach many victims ofremote villages in India, Tamil Nadu region a week later due to bad weather (Randrianalijaona, 2018). However, it should be noted that similar scales of hazards have different effects in different countries due to different environmental risks factors (Pathirage *et al.*, 2014). Therefore, an understanding of a country's environmental factors and their influence on humanitarian relief operations is important for policymakers, professionals and communities.

2.3.3 Political and government factors. Political and government factors play an important role in humanitarian supply chains. Humanitarian logistics and relief supply chain operations are faced with some unpredictable political constraints. Governments usually coordinate activities of relief organizations and support the relief efforts through the military or regulate NGOs in order to increase their professionalism (Balcik and Beamon, 2008). Consequently, humanitarian supply chains tend to be unstable and prone to politics and military influence (McLachlin and Larson, 2011). Kunz and Reiner (2016) and Wagner and Bode (2008) concur that government ineffectiveness and illegitimacy often lead to imposed restrictions on humanitarian supply chains leading to delays in delivery of aid. The responsible authority might impose that relief operation supplies must be sourced locally to balance between the social inequalities and the activities of the relief operations partners (Kanyoma *et al.*, 2013). Often some governments may dictate the purchasing policy for certain lines of humanitarian supplies; For instance, in Malawi, all medical supplies were sourced through Central Medical Stores Trust resulting in serious supplies shortages (Kanyoma *et al.*, 2013). Pathirage *et al.* (2014) posit that some laws have become ineffective as they failed to address the humanitarian aspect of disaster management. For example, Cheng *et al.* (2010) found that

market regulations imposed by governments on supplies needed for reconstruction activities create disincentives for companies to engage in such tasks. Moreover, there is no comprehensive law that covers every aspect of disasters as communities face new circumstances each time a disaster strikes (Pathirage *et al.*, 2014). Pathirage *et al.* (2014) therefore recommend that disaster-related laws be updated regularly. There is need therefore to establish the political factors that were in play during Cyclone Idai relief operations in Zimbabwe.

2.3.4 Social factors. Social issues are also a major challenge in supply chains. These social issues vary from labour, cultural, to human rights issues. It is not uncommon in humanitarian operations that some staff members engage in violations like sexual abuses of the victims or among themselves at the detriment of the operations. This humanitarian supply chain risk is reported in a number of operations across the world (Thomson Reuters Foundation, 2019). On another note, Pathirage *et al.* (2014) posit that education and training enhance the level of preparedness. They further note that while technology can provide information it requires human expertise to react to disasters. This corroborates with that scarcity of trained and experienced logisticians in South Asia impacted negatively on humanitarian organizations in delivering relief to Tsunami victims. Human behavior risks may also jeopardize relief operations due to misbehaviours, bad human decisions or poor judgments. Sandwell (2011) describes corruption as one human behavior humanitarian organisations face whereby there is a high degree of dishonesty among individuals appointed in the distribution of supplies. Altay *et al.* (2018) also posit that organisational culture plays a significant role in disaster relief operations. Humanitarian firms therefore need to consider differing social and cultural conditions of affected regions during humanitarian response (Oloruntoba, 2005). It is therefore the intention of these researchers to link social issues with supply chain performance outcomes in the delivery of aid in Cyclone Idai.

2.3.5 Economic factors. Economic supply chain risks may emanate from unexpected or unfavorable changes in financial matters like exchange rates, supplier bankruptcy and missed milestones with subsequent further funding requirements. These types of risks are common with most relief operations as it is quite difficult to be accurate with the actual cost of the operation. This is rare in developed countries, where most basic supplies are purchased from local suppliers and staff can be hired locally for logistical activities. However, in developing countries,the majority of supplies are imported, and most leading tasks must be managed by expatriate staff (Kunz and Reiner, 2012). Hence, many developing countries lack explicit policies on financing predisaster and postdisaster response. Instead they heavily rely on international funds from donors to manage disaster response programs. This study links economic factors with Cyclone Idai humanitarian relief operations.

2.4 Humanitarian supply chain performance

Humanitarian supply performance measures are critical for building excellent humanitarian supply chain network (Kovacs and Spens, 2007). The most widely used performance measurement dimensions are: output performance, supply chain flexibility and resource performance (Balcik and Beamon, 2008; Abidi *et al.*, 2014). Output performance is the primary purpose of any relief supply chain and measures the effectiveness with which supply chains are able to supply the required aid. Output metrics include the percentage of on-time deliveries, quantity and quality of the donations delivered as well as the time between a disaster striking and the time the supplies are delivered (Abidi *et al.*, 2014). To achieve these performance metrics, humanitarian actors have to live with humanitarian supply chain risk factors from the source of aid to the beneficiary.

While the main objective of humanitarian actors is to provide aid to victims (output performance), resource performance metrics are equally important to control the cost of

providing aid (Behl and Dutta, 2018). Improving the operational cost effectiveness ratio becomes apparent in order to help more vulnerable people per dollar spent. Adoption of best management practices such as pooling logistics resources in the supply chain through sharing of infrastructure, vehicles, generators, technical resources and skills allows last mile logistics to be optimised and avoid the duplication of costs (OCHA, 2019). It is therefore important to measure the total supply chain costs including labour, transport, warehousing, purchase of goods and expediting costs (Fritz Institute, 2017). However, the performance in humanitarian supply chain measured in terms of efficiency is dependent on supply chain risk factors available in the location of disaster.

Flexibility has also been identified as one of the key metrics of performance applicable in humanitarian supply chains. This is defined as the ability of an organization to cope and remain successful in an unpredictable and ever-changing market environment (Ismail and Sharrif, 2005). The flexibility of humanitarian supply chain management (HSCM) comes in the form of volume flexibility, delivery time flexibility, delivery mode flexibility and variety flexibility (Obrecht and Bourne, 2018). Flexible supply chains allow organizations to rapidly respond to a changing and dynamic environment with high uncertainty by being context-specific. Humanitarian supply chains need to be agile and able to respond quickly to unpredictable events effectively and efficiently (Kunz and Reiner, 2012). Relief supplies must flow from donors through the supply chain to the final consumers at the right time, at the right cost, in the right quantities and to the right place. Responding flexibly to humanitarian needs is conditional on political, social, infrastructural and environmental factors in the location of a disaster (Azmat *et al.*, 2019).

2.4.1 Research gap and objectives. The problems that arise during disaster relief operations may differ depending on various factors, such as the type, impact and location of the disaster and local conditions in the affected regions (Balcik and Beamon, 2008). Risks evolve over time and may evolve differently from one region to another. In a turbulent environment, understanding the main global supply chain risks can work to reduce their impact. While scholars have researched on cyclones in developed countries, such studies are scarce in developing Southern African countries. To date, no study has comprehensively assessed the prevalence of supply chain risk factors in Cyclone Idai in Zimbabwe and their effects on humanitarian supply chain performance. These researchers sought to bridge this gap and fill the dearth of literature by addressing the following objectives: (1) To establish the supply chain risk factors that were prevalent in Cyclone Idai relief operations in Zimbabwe. (2) To assess how supply chain risks affected the responsiveness of humanitarian agencies, government of Zimbabwe and corporate firms in helping the victims of Cyclone Idai.

3. Methodology

Following an interpretivist paradigm, data were collected through several qualitative sources and triangulated to enhance reliability and validity (Yin, 1994; Eisenhardt, 1989). Interpretivists assume that knowledge and meaning are acts of interpretation; hence there is no objective knowledge which is independent of thinking and reasoning (Roh *et al.*, 2011). This study relies on qualitative methodology given that empirical studies on risks and vulnerabilities on Cyclone Idai humanitarian logistics are scarce. This corroborates with Behl and Dutta (2018) who recommended the inclusion of qualitative research methods in humanitarian operations and supply chain management studies. Therefore, a qualitative study of the risk factors in Cyclone Idai humanitarian operations was imperative. The primary source of data was in-depth semi-structured interviews with key informants (supply chain managers, government officers and officers in humanitarian aid organizations). A pilot study was carried out to identify potential problems and adjusted to ensure content validity (Maxwell, 2013). The actual interviews were held with 15 participants who were purposively

selected from 27 humanitarian agencies and relevant government departments that participated in the 2019 Cyclone Idai relief responses. Furthermore, secondary data were obtained from available publications, blogs and newspapers to triangulate with interviews alleviating the biases of a single source (Pagell and Wu, 2009). Document analysis provided detailed and rich descriptions of the humanitarian supply chain risk factors and complimented other qualitative research methods as it suggested some questions that needed to be asked in interviews (Bowen, 2009). The researchers relied on documents on Zimbabwe Tropical Cyclone Idai (2019), reposted on Global Shelter Cluster website that included minutes and other publications by member organizations. These researchers assured respondents of confidentiality and anonymity (Easterby-Smith *et al.*, 2015). The participants were requested to volunteer information freely without any exertion of pressure on them, and no monetary or other compensation was offered for participation (Coldwell and Herbst, 2004). Using thematic analysis, in NVivo version 12, the researchers identified themes emerging from the data and consequently identified relationships between these themes (Taylor-Powell and Renner, 2003). The results were presented in vignettes.

4. Results and discussion

One of the objectives of this study was to establish the sources of supply chain risks within Cyclone Idai humanitarian relief operations in Zimbabwe. The study further sought to explain how these risk factors influenced the performance of humanitarian actors in delivering aid to the victims. Interviews were held with 15 respondents from humanitarian agencies and some government departments. Findings from this study indicate several risk factors in Cyclone Idai humanitarian supply chains. Common themes were identified to include infrastructure, environmental, political and social supply chain risk factors. These factors are presented in detail and described in the subheadings below.

4.1 Infrastructure risk factors

4.1.1 Communication networks. Lack of communications infrastructure greatly affected the humanitarian relief operations after Cyclone Idai. All interviewed participants working for NGOs and government concurred that both telephone and Internet communications were disrupted, depriving affected people and humanitarian organisations of efficient flow of information. District Civil Protection Units confirmed that they had no advanced communication tools like Internet to quickly link or communicate with other actors in the affected districts. There was very slow data movement between affected districts and national command centers. Supply chain teams for this operation thus worked with unreliable data, and resultantly, there was flawed execution of the relief operations. In one case, a government employee describes the challenges of accessing the victims in Chimanimani and Chipinge districts thus:

> Yes it is true, due to poor communication network, there was delay in assessing the needs and gathering the necessary data to ensure our responses were effective and addressed people's needs. There was risk of illnesses like dysentery and cholera following the cyclone in the affected areas and help took long to come due to lack of means to communicate. (Government employee, 28 April 2019)

Interview findings were confirmed by a report from a daily newspaper, The Herald:

> No one had enough information on the extent of the damage since all communication with Chimanimani had been cut off. (The Herald 14 March, 2020a)

These results supports the findings of Juliana *et al.* (2017) who found that disturbed communication networks significantly affect the flow of information between disaster relief agencies.

4.1.2 Transport network. Most respondents agreed that destruction of logistics infrastructures especially roads and bridges across all Cyclone Idai affected areas left many communities inaccessible thereby disrupting supply chain routes. This hampered the delivery of food and medicine and made safety sites inaccessible. Vehicles were stuck in muddy roads thereby delaying disaster response. In some areas, there was need for 4×4 off-road trucks and air rescue assets which were not available. Participant 11 noted:

> Transport was a major problem in assessing the victims' needs as well as delivering the much needed aid. The road network was severely damaged by the cyclone and the floods such that evacuations of endangered villagers and organized distributions of urgently needed relief items were delayed by several days. A bridge between the emergency response and chronic care center collapsed. Most patients with injuries and chronic diseases such as HIV, diabetes, hypertension and asthma had to walk many kilometers on foot in search of medication. A high school was closed for almost a month after the cyclone marooned the Biriri Bridge that links it to the main road. Participant 11

The interview results are supported by an OCHA report.

> The road network remains a challenge in Chimanimani. . .. wet conditions make driving hazardous. . . .28 schools remain inaccessible. . .. information gaps remain for the schools that are currently inaccessible. (OCHA, 17April 2019)

The results corroborate with the findings of Masaba (2015) who found that any slight disruption of transportation infrastructure can have a huge negative outcome to disaster victims, response teams and government.

4.1.3 Warehousing facilities. From interviews with majority key informants these researchers established challenges faced with warehousing facilities during Zimbabwe's Cyclone Idai relief operations. There was serious destruction to most possible storage facilities within the affected districts. There was also shortage of mobile storage units to cater for the rescue teams as they moved around both districts of Chimanimani and Chipinge. When interviewed, one officer from a humanitarian organization responded as follows:

> There was massive destruction of storage facilities. Food items worth thousands of dollars donated to victims were contaminated and some rot in the warehouses due to poor storage and distribution facilities. As a consequence, there was a shortage of essential goods. (Humanitarian Officer, 12 May 2019)

This status confirms what Özdamar *et al.* (2014) posited, that humanitarian organisations struggle with aid distributions due to lack of adequate infrastructural facilities.

4.1.4 Electrical power. Results from all the interviews agree that electric power was a significant challenge during and after the cyclone as the districts of Chimanimani and Chipinge were hit by electricity supply disruptions. Electricity consumers could not even rely on generators since there was an acute shortage of both petrol and diesel due to shortage of foreign currency in the country. One of the NGO officials had this to say:

> Electricity disruption affected routine vaccination services. Electricity disruptions also lead to communication network problems such as Internet connectivity; social media platforms such as whatsapp were down due to poor Internet connectivity. (NGO Officer, 28 April, 2029)

These findings are validated by a report from a local daily newspaper:

> The loss of electricity has affected the cold chain vaccines safety, water reticulation and other essential social services. (The Herald, 11 April, 2020b)

They also support the findings of Randrianalijaona (2018) who noted that destruction of electricity infrastructure by the cyclone in Madagascar left the country in darkness for several days disrupting humanitarian supply chains.

4.2 Environmental risk factors

Results from the bulk of interviews with the respondents show that the time during and after the cyclone was characterized by bad weather disrupting supply chain efforts to deliver aid to affected victims. Due to the incessant rains and fog, aid delivery vehicles were stuck, even air crafts were grounded. In interviews with respondents, they cited bad weather as one major risk that disrupted the delivery of humanitarian aid to Cyclone Idai victims in Chimanimani and Chipinge districts. One government official explained how bad weather disrupted the flow of relief aid to the victims:

> It was difficult in the incessant rains to assess the humanitarian situation in the affected areas and deliver aid. Hence some families spent six days marooned in water without any food until they were rescued. They gathered in pools of water, with little or no access to clean drinking water or sanitation services, increasing the risk of water-borne diseases. Even Zimbabwe Air Force's helicopters could not assist the victims because of the inaccessibility of the area due to bad weather. (Government Officer, 14 March 2019)

The interviews concur with an OCHA (2019) report: "*One month after cyclone Idai. . .. rainfall makes the dirt roads impassable again. Bad weather, ... thunderstorms and up to 3cm of rain. . .. grounding the WFP helicopter, and threatened the temporary road repairs. Poor weather in Chimanimani continues to hamper delivery of available medical supplies to the affected areas.*" (OCHA, 12 April 2019)

The results also agree with Chan (2012), who found that bad weather and other environmental risks impact upon the people and bring negative effects on life, properties and infrastructure.

4.3 Politics and government factors

During interviews, a majority of the participants criticized the government for stalling relief efforts. Most interviewed respondents revealed that cases of politicisation of aid were rampant in the distribution process. The ruling party, ZANU PF, took over the distribution of aid to victims along political lines, thereby discriminating against some opposition supporters. Storage and distribution facilities were in some incidences looted and the whole exercise politicized. The government at times issued directives for the release of a commodity to specific locations affecting the planned delivery schedules and interfered with the type of food distributed resulting in poor implementation of delivery and subsequent expiry of certain food stuffs before they reached the intended beneficiaries. Excerpts from one daily newspaper revealed how some aid failed to reach the intended beneficiaries.

> The distribution of aid to the cyclone-ravaged communities in Chimanimani and Chipinge has been fraught with controversy, with some ZANU PF officials accused of hijacking the process and doling out handouts along partisan lines. Some public officials have also been accused of looting the donations. . .. (Newsday, April 12, 2019)

A report by The Zimbabwe Human Rights Commission (ZHRC) (2019) also noted that the political situation had: "*. . .opened up the process of aid distribution to manipulation by some local leaders including politicians, and other influential individuals, resulting in the intended beneficiaries losing out along partisan, nepotistic and other affiliation grounds*". (ZHRC, 2019)

Another online publication adds that aid distribution to Cyclone Idai victims presented an opportunity to resolve unfinished political grudges: "*The disaster has presented an opportunity to members of the ruling ZANU-PF party to settle scores with those who oppose it . . .ruling ZANU-PF party had simply turned their internal party voter registers into beneficiaries' lists.*" (Fair Planet, 20 May 2019).

The results concurred with Hapeman (2012) who revealed that politics influences a natural disaster's impact and consequently the distribution of humanitarian relief aid. Government

policies determine who can participate in the assistance of victims, to what extent and who the beneficiaries should be.

4.4 Economic risks

Results from interviews with key informants revealed that financial deficit for the whole operation was the biggest single supply chain risk faced by Zimbabwe during Cyclone Idai relief operation. This funding gap affected a number of activities including the overall planning and response execution. IOM Shelter and NFI Cluster Team (2019) confirmed how the economic situation affected the availability of information to humanitarian players.

> There was a gap on the capacity for Civil Protection Unit (CPU) to provide accurate and up to date information, as CPU could not afford laptops and airtime to make necessary communications and record data (IOM Shelter and NFI Cluster Team, 2019).

The above findings are consistent with earlier research by Balcik and Beamon (2018) who noted the lack of resources such as inadequate supply of food, technology, transportation capacity, money and volunteers as one of the major problem factors in disaster relief.

4.5 Social risk factors

During interviews, most participants stated that there was sexual harassment of cyclone victims by some supply chain relief operations staff, police and military officers.

> Some women and girls have been forced into exchanging sex for food. Food is not enough for everyone. They are so desperate for food to the extent of sleeping with men in charge of the food distribution. (Respondent 15)

In concurrence, a local online newspaper, New Zimbabwe, reported:

> Villagers have complained of an increase in sexual abuse cases on girls and women by soldiers and aid workers. 131 complaints of sexual-related offences have been recorded in Chipinge and Chimanimani. (New Zimbabwe, 30 May 2019)

Furthermore, there was agreement among interview participants that Cyclone Idai relief operations were hampered by cases of theft of relief items by humanitarian employees, police and military officers. This was confirmed by one online newspaper ZimLive.com that reported theft of donated items by the police: "*A police officer was hauled off a Harare-bound bus after he was found with several items donated to victims of Cyclone Idai in Manicaland. Constable [. . .]was arrested on April 3 and found with several items of clothing, food and medicines which were destined to help survivors of a deadly cyclone . . ..*". ZIMLive.com April 07 2019

The finding confirms Save the Children (2008) and Thomson Reuters Foundation (2019) who pointed out that some staff members engaged in violations of human rights like sexual abuses of disaster victims. This study further confirms Sandwell's (2011) findings that corruption is a challenge faced by humanitarian firms where individuals appointed in the distribution of supplies are dishonest.

5. Conclusions

This study discusses supply chain risk factors that were encountered during humanitarian relief efforts in Cyclone Idai in Zimbabwe. It further examined how supply chain risk factors influenced Cyclone Idai humanitarian relief operations in Zimbabwe. The study concludes that Cyclone Idai humanitarian relief operations were disturbed by social, political, economic and infrastructural factors. The study notes that alternative transport and communication systems like drone technology were not considered in efforts to mitigate the risk of environmental and

infrastructure risks. Humanitarian relief supplies were inadequate, deteriorated or delayed to reach the victims. There were no robust strategies to prevent or mitigate the risks of shortage, theft and deterioration of aid items in the humanitarian supply chain.

6. Recommendations

Based on the results of the current study, it is suggested that the government of Zimbabwe should invest in strengthening the quality of road, telecommunication, warehouse and electrical infrastructure which are important to relief logistics. The study also recommends the use of technology to swiftly implement disaster relief efforts. Drones and other aerial technologies can be useful in identifying areas that need aid, establish clear routes and restore power and communications networks. For instance, drones and robots can be used to locate survivors and transmit information to emergency teams. Drones can be used to drop humanitarian aid such as blood, medical supplies and equipment to locations where communication and power networks have been affected by a cyclone.

The study also recommends proactive response to cyclones. Although cyclones are rapid onset disasters, they arrive with a few days warning so that preparations can be made for their arrival and improve responsiveness, which is critical to saving lives and alleviating suffering. Prepositioning of food, medicines, healthcare supplies, shelter and human resources will increase preparedness for cyclones. If supplies are located closer to the disaster, it can allow for faster delivery of supplies after the disaster. The government should partner with the local communities, private companies and nongovernmental agencies to raise the much needed financial resources to overcome the challenge of poor economic strength. In the absence of public financial resources, the private sector plays a huge role in saving lives and alleviation of suffering.

The study also recommends governments to prepare contingency financing plans to fund disaster relief and recovery such as self-insurance (contingency reserves and funds) and risk transfer arrangements using insurance. African countries can capitalize on African Risk Capacity (ARC) Disaster Risk Financing and Insurance initiatives to deal effectively with disasters. These researchers further recommend government to develop a disaster resiliency management policy among the humanitarian aids logistics and relief supply chain teams.

The study recommends both government and nongovernmental organizations to provide training to their employees on corruption and human rights to promote, protect and realize the rights of victims of a disaster.

7. Research implications

This study advances theoretical knowledge on disaster relief operations and humanitarian supply chain management in Zimbabwe by exploring supply chain risks factors. The study identified the contemporary supply chain risks experienced by humanitarian organizations that participated in Cyclone Idai relief operations in the country. Academics, practitioners, government, philanthropists and private companies gained insight into the Zimbabwe-specific sources of humanitarian supply chain disruptions. From a practical perspective, the findings of this study can assist Zimbabwe's humanitarian practitioners to formulate appropriate supply chain strategies to reduce the force of supply chain risks and vulnerabilities to cyclones.

8. Limitations and recommendation for further studies

The study used a cross-sectional study design where humanitarian organizations that participated in Cyclone Idai relief operations in Zimbabwe were investigated. Operations of

humanitarian organisations in Malawi, Madagascar, Mozambique and other countries that were hit by Cyclone Idai were not in the sampling frame. Consequently, generalizability to other countries and to other disasters should be done with caution. To address the limitation, the same study can be extended to other southern African countries that were hit by the same cyclone. A study comparing Zimbabwe's experience with other countries such as Malawi, Madagascar or Mozambique on prevalent supply chain risks during and after cyclone occurrences can provide evidence on the similarities or differences among different countries. Further research is also needed on the effectiveness of humanitarian supply chain risks management strategies in limiting the risks that Cyclone Idai presented.

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Appendix

Interview guide

Describe supply chain risks that humanitarian organisations were exposed to in their relief operations before/during/after Cyclone Idai in Zimbabwe. How did these risks affect effectiveness of their operations?

PROBE

(1) Infrastructure
- IT Breakdown
- Transport
- Warehouse

(2) Social factors
- Sexual and human right abuse
- Theft and pilferage
- Skills shortage

(3) Politics and Government
- Laws and regulations
- Policies
- Politics

(4) Environmental
- Natural Disasters
- Bad weather

(5) Economic
- Insurance
- Availability of items
- Budget availability

THE END

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