

HUMANITARIAN SUPPLY CHAINS: A PROCESS-ORIENTED APPROACH

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Purpose: The aim of the research was to identify and evaluate logistics processes undertaken in humanitarian supply chains in Poland.

Design/methodology/approach: The research method was CATI (ang. computer-assisted telephone interviewing). The research was conducted throughout Poland in 40 Crisis Management Centers at the provincial and district level.

Findings: It turns out that the surveyed organizations positively assess the procurement process and the recovery process in humanitarian supply chains. The distribution process in the context of its effectiveness is difficult to assess for the surveyed Crisis Management Centers. A small percentage of respondents believe that transport means are ready to quickly and safely deliver aid. There are opinions indicating inappropriate prioritization of transport means and resources, which leads to poor satisfaction of the real needs of the victims. A large percentage of neutral opinions in assessment of warehousing, distribution and location of operational centers, may indicate the occurrence of problems in these processes.

Originality/value: The results of research can be addressed to those involved in public crisis management, both local authorities and public entities as well as blue light organizations and non-governmental organizations involved in humanitarian aid.

Keywords: humanitarian logistics, humanitarian supply chain, crisis situations, crisis management, logistics processes, process management.

Category of the paper: research paper.

1. Introduction

Humanitarian logistics is fundamentally different from the traditional logistics process, as it aims to save lives, provide humanitarian support in the form of medicine, water, food and shelter, and restore society to self-sufficiency (Liu, Xie, 2017). The humanitarian supply chain is the flow of humanitarian aid and information between those affected by a disaster and those providing aid so that as few people as possible die or suffer (Mittal, Obaid, 2023, p. 317). As reported by Daud et al. (2016) the following processes occur in humanitarian supply chains: evacuation of people, delivery of appropriate relief supplies according to the needs of the

affected people, coordination, and prioritization of the use of limited transport resources, and storage and movement of relief goods and equipment. The aforementioned operations are always hampered by logistical problems, inadequate crisis management and sometimes overdonations (Thevenaz, Resodihardjo, 2010). According to Lima, Dávalos Campos and Trierweiler (2022), decision-making and crisis situation control can be supported by process management, which is understood as all the work done to deliver products/services to beneficiaries, its application starts at the strategic level and ends at the operational level. In process management, processes are divided into sub-processes, which must be performed by one or more activities, in turn activities can be broken down into tasks consisting of individual steps (Drejewicz, 2017).

A process map, i.e. a graphical representation of the identified processes (Olkiewicz, 2018, p. 381), can be prepared for all activities undertaken in humanitarian supply chains. Process management assumes that there are always 'opportunities for process improvement, which implies the need for systematic, structured, process analysis, improvement, monitoring, and performance management' (Olkiewicz, 2018, p. 372). Process management is expected to improve emergency planning and response and improve the actions taken in humanitarian supply chains.

Therefore, there is a need to identify and assess the logistics processes undertaken in humanitarian supply chains in Poland. This objective will be achieved by seeking answers to the following research questions:

1. Is the procurement and warehousing process in humanitarian supply chains well-organized?
2. Are the distribution processes implemented in humanitarian supply chains fair and efficient?
3. Are vehicles sufficient and appropriate to deliver aid quickly and safely and appropriately prioritized according to the needs of those affected?
4. Is the reconstruction of infrastructure after a crisis situation being carried out in such a way that the infrastructure is more resilient to future events?

The answer to the above research questions is based on research conducted in 2024 using the CATI method in the Crisis Management Centres in Poland. For clarity of research descriptions, abbreviations have been used throughout the article: for Crisis Management Centres - CMC; for the humanitarian supply chain - HSC.

2. Logistics Processes in Humanitarian Supply Chains

In the case of humanitarian supply chains, often referred to as 'supply chains for life', researchers primarily emphasize the specific and difficult conditions in which these chains are configured and their purpose of saving human life and health (Lupicka, 2011). Many NGOs involved in humanitarian operations, point out that logistics and humanitarian supply chain management are at the core of all humanitarian operations (Lupicka, 2011). Marcinkowski (2019) states that the importance of logistics in emergencies is increasing as the provision of aid to those in need is taking place within international and national streams of material, financial, human and information flows.

The Pan American Health Organization together with the Department of Emergency and Humanitarian Action Sustainable Development and Healthy Environments (2001, pp. 13-14) indicate that the following logistics processes are primarily considered in the humanitarian supply chain:

1. "Procurement - the purpose of the process is to make sure that the organizations involved in the relief effort have the resources necessary to meet the identified needs. This, in turn, requires identifying the sources of supply of these goods and services and how to acquire them.
2. Transport - by which supplies get to where they are needed. The transport strategy must consider not only the means of transport, but also the actual possibilities of getting supplies from A to B, as well as alternative transport for the rapid and safe delivery of relief supplies.
3. Warehousing - an organized, systematic way of storing resources until they are delivered to the final recipients, i.e. the affected persons. Stocks should also be included for unforeseen needs.
4. Distribution - the main objective of the humanitarian supply chain is to deliver aid to affected people. Aid resources should be distributed in a way that is proportionate to existing needs, fair and properly controlled to prevent abuse or waste".

Thus, a humanitarian supply chain can be depicted as a set of processes that are intertwined, and their identification allows for streamlining and increasing their efficiency (Nowosielski, 2009).

Pokusa (2004) points out that the basic premise of process management is to identify processes in terms of the following criteria:

- process time reduction,
- increasing the quality of processes,
- reducing the number of routes along which decision-making and implementation processes take place,
- a reduction in the number of people involved in handling processes,

- process rationalization,
- a reduction in the financial and material resources involved in the processes.

The implementation of the process management concept requires a continuous and structured influence on the processes taking place in the organization, through the use of appropriate concepts, methods, and tools for improving, designing new or reducing processes to fully realize the organization's objectives (Nowosielski, 2009).

Humanitarian supply chain management, in process terms, consists of the creation of organizational and information systems to support the conduct and coordination of preparedness and emergency response activities within the resources available and in an efficient and effective manner (Sienkiewicz-Małyjurek, 2010). Humanitarian supply chain processes are both physical and intangible in nature. They include the objectives and how they are implemented, the preparation of activities, securing infrastructure, knowledge, experience, information, transport and storage, information and communication systems, reporting, as well as activities that enable continuous improvement (Sienkiewicz-Małyjurek, 2010). The aim of the activities carried out in the humanitarian supply chain is to organize the flows of the resources held (necessary at a specific location) in the shortest possible time to minimize the possibility of threats or their consequences (Sienkiewicz-Małyjurek, 2010).

The humanitarian supply chain relies on logistical flows, which are crucial in streamlining and optimizing them. Sienkiewicz-Małyjurek (2014, p. 430) points to three main types of flows in humanitarian supply chains:

- "the flow of people - lifeguards, patrols, intervention groups, rescue formations, social workers, etc.,
- the flow of material resources - rescue equipment, firefighting equipment, preventive measures, portable security, energy equipment and media, heavy rescue equipment, social and humanitarian aid resources (e.g. food, water, clothing, personal hygiene products, cleaning products and substitute light sources, publicly available medicines and dressing materials), etc,
- the flow of information - between command authorities, executive units, security teams and the public; reliable communication of information enables the proper allocation of resources and prevents panic and disruption of ongoing operations".

The success of logistics operations lies in ensuring the synchronization of material flows through the coordination of processes and the appropriate use of resources, and consequently ensuring the availability of relief supplies at the place and time expected by the affected person. Figure 1 shows the logistics processes in the humanitarian supply chain in the context of the phases of crisis management.

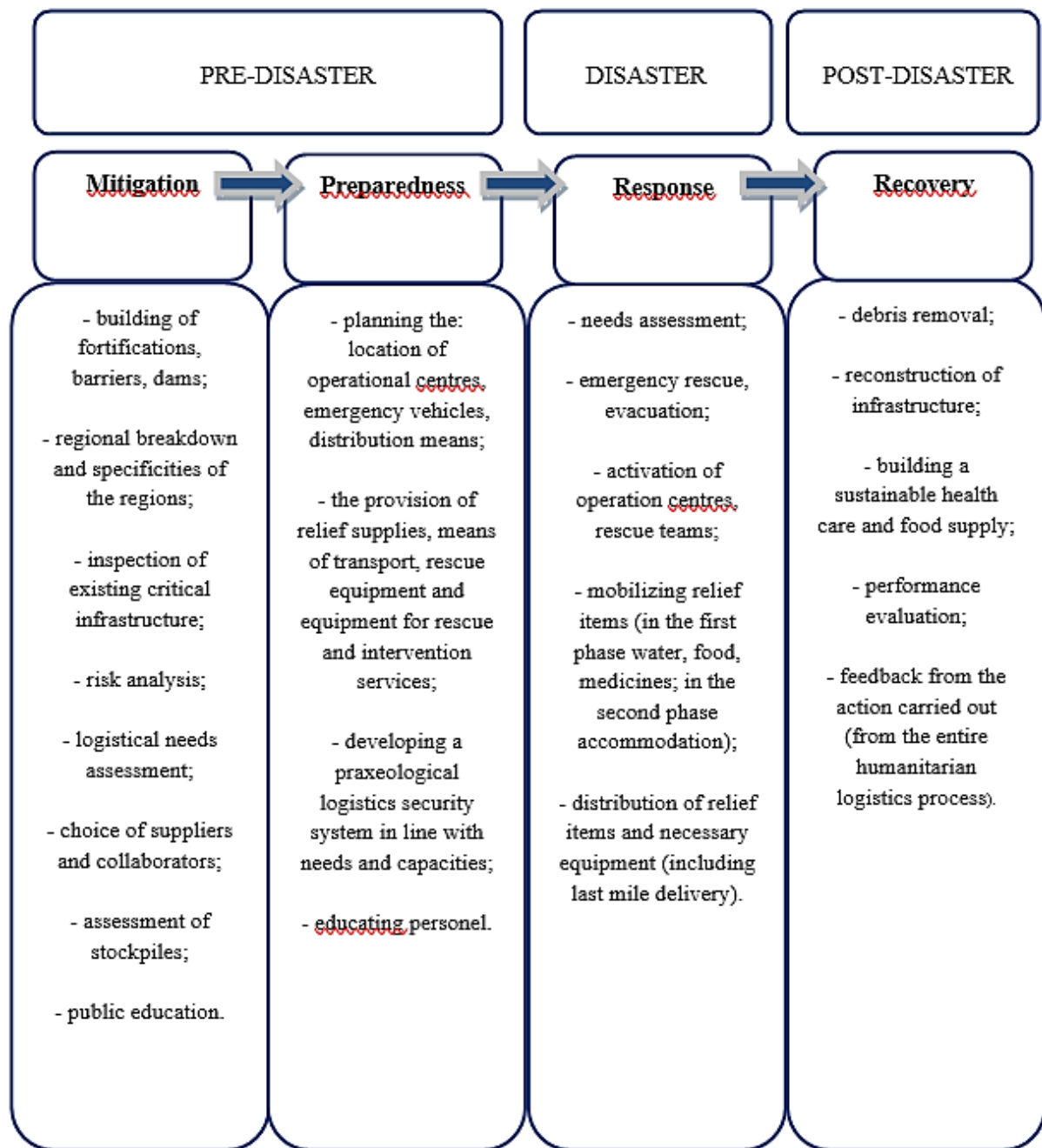


Figure 1. Logistics processes in humanitarian supply chains by phase of emergency management.

Source: adapted from: Duran, Ergun, Keskinocak, Swan, 2013, p. 4.

Managing the humanitarian supply chain requires decision-making at different levels of emergency development. Thus, the humanitarian supply chain is not only about taking action in the face of an emergency, but also before and after an event. The response phase is the most dynamic and characterized by many logistics processes. However, the state of preparedness of an organization before an emergency is equally important, as it defines the quality of operations during an incident. The recovery phase, on the other hand, is needed to restore the standard of living of the affected community; at the same time, the recovery should be implemented in such a way that the affected region is less vulnerable to another disaster after recovery (Piwowarski and Rozwadowski, 2016).

3. Methodology

The aim of the research was to identify and evaluate the logistics processes undertaken in humanitarian supply chains in Poland. An interview was used as the research method. An interview involves obtaining information from the respondent through direct contact with the researcher, which may be in the form of personal contact (personal interview), contact by telephone (telephone interview) or indirect contact (correspondence interview, controlled self-report) (Szreder, 2010, pp. 158-159).

In this paper, telephone interviews were used. The quality of data obtained by the telephone interview technique is as high as during a face-to-face interview, respondents are even more willing to share their opinions over the phone (Szreder, 2010, pp. 161-162). In many cases, a face-to-face interview is difficult or impossible, e.g. due to geographical distance or other specific conditions (Czakon, Glinka, 2021, p. 102).

The research was conducted throughout Poland in 40 Crisis Management Centres at provincial (7 CMC) and district (33 CMC) levels. The respondents were people holding senior positions in their organizations or delegated by their superiors as competent for the research. The sampling technique used is non-probabilistic. This technique is used when the structure of the population is well known and the aim is to gain an initial insight into the issue under study (Miszczak, Walasek, 2013, pp. 101-102). Non-probabilistic techniques are divided into random selection, quota selection, snowball selection and purposive selection (Jablonska, Sobieraj, 2013, p. 34). In this paper, the technique used is judgmental sampling or purposive sampling (Szreder, 2010, p. 56). Purposive selection involves the researcher indicating the population units that should be included in the sample. The sample elements are selected in terms of predetermined criteria. Purposive selection is based on knowledge, experience, or recommendations (Miszczak, Walasek, 2013, pp. 102-103). When building a purposive sample, the researcher selects 'those elements that represent the population well [...] samples are selected so that the study includes individuals who exhibit certain attributes' (Fratczak, Mynarska, 2007, p. 7).

The survey used a 5-point Likert scale, where 1 means 'strongly disagree' and 5 means 'strongly agree'. The Likert scale is used as one of the most commonly used psychometric tools in pedagogical and social research (Joshi, Kale, Chandel and Pal, 2015). The data obtained in the study were subjected to descriptive statistics. The measures used for analysis were the dominant, median, first quartile (Q1), third quartile (Q3) and mean. These measures allowed an objective assessment of the information obtained.

4. Results

Descriptive statistics formed the basis for the interpretation of the research results obtained. Statistical analysis was carried out individually for each issue studied. The results obtained are presented in Tables 1-7. Table 1 presents data of procurement process assessment.

Table 1.
Procurement process in HSC

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
1. Do you think that the procurement process in humanitarian supply chains (HSCs, so-called supply chains for life organised during emergencies and humanitarian aid) is well organised?										
0,00%	2,50%	10,00%	75,00%	10,00%	4	4	4	4	0,55	3,95

Source: own research.

From the data in Table 1, it can be seen that 85% of CMC (total positive responses: 'yes' and 'definitely yes') believe that the procurement process in HSC is well-organized. This is confirmed by the dominant value, which is 4, i.e. a 'yes' response. The standard deviation is low at 0.55, with a mean of 3.95. The 2.5% of CMC rated the HSC procurement process negatively, and 10% had no opinion.

Respondents then referred to the warehousing process at HSC (Table 2).

Table 2.
Warehousing process in HSC

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
2. Do you think that the warehousing process for humanitarian supply chain activities is well organised?										
0,00%	2,50%	47,50%	47,50%	2,50%	3	3,50	4	4	0,59	3,50

Source: own research.

Based on the data in Table 2, it can be concluded that half of the surveyed CMC believe that the warehousing process at HSC is organized correctly. However, almost half of the CMC (47.5%) abstained from giving an opinion in this area and 2.5% of the CMC stated that the warehousing process at HSC is inadequately organized. The dominant value is 4, indicating that 'yes' is the most common answer. The high percentage of undecided respondents and emerging negative opinions may indicate that the warehousing process in HSC is challenging for these units.

This was followed by a consideration of whether the distribution processes in HSC are fair and efficient (Table 3). In organizational and management science, the term efficiency is used, which is sometimes given the meaning of praxeological efficiency (Jashapara, 2006). Efficiency is the relationship between the results achieved, and the resources used (King, 2014). Efficiency means achieving the objectives of an activity in an optimal way, using resources in a rational way (Drucker, 2017).

Table 3.
Distribution process in HSC

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
3. Do you think that distribution processes in humanitarian supply chains are fair and efficient?										
0,00%	0,00%	67,50%	32,50%	0,00%	3	3	4	3	0,47	3,32

Source: own research.

The data presented in Table 3 shows that only one third of the surveyed CMC believe that the distribution process in HSC is fair and efficient, as many as 67.5% abstained from expressing an opinion on this issue.

Next issue examined was the transport means used for humanitarian supply chain operations (Table 4).

Table 4.
Transport means in HSC

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
4. Do you think that vehicles used for humanitarian supply chain activities are sufficient to deliver aid quickly and safely?										
0,00%	5,00%	67,50%	27,50%	0,00%	3	3	4	3	0,53	3,22

Source: own research.

The data in Table 4 shows that the majority of the surveyed CMC are unable to determine whether the transport means used for humanitarian supply chain operations are sufficient to deliver aid quickly and safely. Therefore, 67.5% abstained from giving an opinion in this regard. In contrast, 27.5% believe that the vehicles are adequate for the rapid delivery of aid and 5% of respondents hold the opposite opinion.

Continuing with the analysis of the transport process in HSC, respondents were asked whether transport means and resources are appropriately prioritized according to the needs of the victims (Table 5).

Table 5.
Prioritization of means of transport

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
5. In your opinion, vehicles being appropriately prioritized according to the needs of those affected?										
0,00%	5,00%	52,50%	35,00%	7,50%	3	3	4	3	0,71	3,45

Source: own research.

According to the information presented in Table 5, more than half of the CMC (52.5%) were neutral in indicating whether transport vehicles are appropriately prioritized according to the needs of the victims. In contrast, 42.5% of the CMC identified that vehicles are appropriately prioritized and respond to the needs of the affected, 5% of the CMC believe that vehicles are not appropriately prioritized. The standard deviation is significant at 0.71 with a mean of 3.45.

The recovery process is considered next (Table 6).

Table 6.
Recovery process in HSC

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
6. In your opinion, is the recovery of infrastructure after the crisis being carried out in such a way as to make it more resistant to the future events?										
0,00%	5,00%	22,50%	65,00%	7,50%	3	4	4	4	0,66	3,75

Source: own research.

The data presented in Table 6 shows that the majority of CMC (72.5%) indicate that the reconstruction of infrastructure after a crisis situation is carried out, in such a way that the infrastructure is more resilient to future events. Undecided in the assessment of recovery process was expressed by 22.5% of the CMC, and 5% of the CMC believe that this process is inadequately implemented. The dominant response is 4, i.e. a 'yes' response; and the standard deviation is moderate at 0.66 with a mean of 3.75.

The last question asked for an assessment of the location of operational centres for HSC activities. The results obtained are presented in Table 7.

Table 7.
Location of operational centres for HSC activities

Multiple choice questions [%]					Position measures					
definitely not (1)	not (2)	Neutral/undecided (3)	yes (4)	definitely yes (5)	Q1	Median	Q3	Mode	Standard deviation	Mean
7. Do you think that the location of operational centres for humanitarian supply chain activities is well planned?										
0,00%	2,50%	75,00%	22,50%	0,00%	3	3	3	3	0,46	3,20

Source: own research.

The data in Table 7 shows that 75% of the CMC are unable to assess the appropriateness of the location of operational centres for HSC activities. This high percentage of undecided respondents may be indicative of the problems that exist in these processes, as only 1/5 of the CMC indicate that the location is well planned. In contrast, 2.5% rate the location of the operational centres negatively.

5. Summary

Process management leads to increasing the efficiency of entities through standardization and improving or enhancing access to relevant resources that influence organizational processes (Olkiewicz, 2018). Crisis situations in the 21st century confirm the need for faster resource mobilization. Resource mobilization is an important aspect of response. Resource preparedness ensures a faster and better response (Pramanik, 2021).

Analysing processes in humanitarian supply chains enables their standardization (Saiah, Vega, Kovacs, 2023, p. 241). Process management approaches for emergency response operations carry benefits, i.e. increased transparency, improved collaboration and

communication, promotion of best practices and the use of more efficient and effective processes (Saiah et al., 2023, p. 241).

The surveyed CMC gave a positive assessment of the HSC procurement process. According to Stęplewski (2017, p. 186), the resources for emergency supply are as follows (example municipality, county):

- “material resources of state reserves - food, agricultural products, medicines, medical, sanitary materials;
- material resources from superior authorities - drinking water, medicines and medical, sanitary materials, blankets, clothing;
- material resources from field infrastructure - fuels, food, agricultural products;
- material resources in humanitarian and charitable aid - clothing, blankets, tents, sanitary materials)”.

In the practice of crisis management organisations, scarcity, insufficient availability or poor quality of resources are perceived as a threat, while the certainty of having these resources at the right level and of the right quality is perceived as a manifestation of security (Zawila-Niedźwiecki, 2014, pp. 66-67). Crisis situation creates an urgent need for resources, with the requirements for such resources being diverse and heterogeneous (Yang, Yao, Tian, Jiang, Xing, Yang, Liu, 2023, p. 2). During emergencies, there is a scarcity of resources, such as data and information, inventory, people, technology and transportation, and, in combination with inadequate infrastructure, storage and funding are examples of operational constraints (Maghsoudi, Moshtari, 2021, p. 110; Doan, Shaw, 2019, p. 687).

The warehousing process in HSC divided respondents, with half having a positive view of the process and half having no opinion, and there were also negative views. The warehousing process in HSC includes warehouse location planning, inventory management and distribution, order picking (Mittal, Obaid, 2023, p. 318). The prepositioning of warehouses at the local and regional level should consider location, logistics, costs, government cooperation and aspects of national stability (Mittal, Obaid, 2023, p. 320). Stockpile management, on the other hand, aims to minimize the risk of shortage and to provide the necessary resources to support emergency operations, health care and to maintain essential state functions (Cankaya, Ekici, Özener, 2019). Stockpiles can significantly affect the availability of resources, especially in the initial stages of an emergency response, when there is a high probability of destructions.

The distribution process in the HSC was difficult to evaluate for CMC respondents, with only one-third of CMC respondents believing that the distribution process in the HSC is fair and efficient, with the rest refrained from giving an opinion in this area. Computational optimization, using genetic algorithms, can be used to design socially just resource distribution (Kim, Sutley, 2021, p. 1; Cui, Liu, Tang, Zhu, 2019, pp. 290-294). Optimization is a logical analytical tool to use in this case, as the goal is to strive for fair outcomes (Kim, Sutley, 2021, p. 8). Distribution must respect the principles of norming and limiting, conditional rationing and follow the principle of economy (Kmiecik, 2015; Marjanski, 2015).

During any emergency, chaos ensues, so it is necessary to plan the distribution, as well as to prepare a transport plan for all required emergency and response teams (eGyanKosh, 2007). Establishing optimal distribution routes and identifying damaged distribution networks aims to reduce the suffering of affected communities (Maghfiroh, Hanaoka, 2020, p. 1). The distribution network for responding to hazards and emergencies consists of permanent facilities, temporary facilities and unpredictable disaster areas. The distribution network has more than one channel, and considers multiple available modes of transport, such as air, road, and rail (Zhang, Zhang, Li, Li, Chen, 2023, p. 2). Lee, Ettl and Ghosh (2010) list the following distribution problems when managing HSC:

- "a giant increase in demand at short notice;
- damaged/congested carriageways;
- chaotic demand behaviour (victims);
- failures of infrastructure, such as communication networks;
- short lead times".

Kumar, Keshav and Zeeshan (2022), in response to the challenges of aid distribution in the smart city, proposed a model that not only dynamically incorporates the details of available resources, but also introduces the priorities of the affected regions with updates of transport route information. Such an integrated optimized model provides an efficient initial distribution schedule and updates it for each subsequent time interval (Kumar et al., 2022). When new demand and resource information becomes available, it may be necessary to redistribute previously delivered relief supplies due to severe shortages in some locations and excess stocks in other areas (Reza, Abbas, Reza, 2021). To send relief items immediately to the site of need after a disaster, an emergency supply site must be selected quickly and a reasonable plan for distribution (Cui et al., 2019).

If resources such as transport means are inappropriately used and sent to the wrong place, then there can be no fair distribution of aid. Only a small percentage of the interviewed CMC believe that transport means are ready to deliver aid quickly and safely, the rest abstained from giving an opinion, and there were some individual voices that openly indicated that vehicles are not suitable to deliver aid efficiently. In the case of the question on prioritizing transport means and resources according to the needs of the affected, it appeared that half of the CMC evaded answering. However, the remaining CMC believe that transport means and resources are properly prioritized, with only 5% of CMC responding negatively, indicating errors in this process.

The recovery process of infrastructure have been assessed positively by most of the CZK. During the reconstruction phase, damage assessment, assistance to the population (health care, rehabilitation, accommodation, psychological support, compensation), restocking and the development of lessons learned take place (Kaak, 2017). Reconstruction is divided into short-term and long-term. Short-term involves restoring vital systems to minimum operational standards. Long-term reconstruction can take many years until the entire affected area is

completely restored (Piwowarski, Rozwadowski, 2016). Recovery aims to restore the previous state of affairs by restoring damaged facilities and areas in such a way that the infrastructure is less vulnerable to another disaster (Krynojewski, 2018).

An example of the mismanaged recovery phase is the 2015 Nepal earthquake. The government delayed the establishment of the National Recovery Authority; due to legal obstacles, the body was only officially established after eight months after earthquake. The delays forced many communities to live in temporary shelters for more than three years. In addition, the landslides damaged the existing transport network, thus making it difficult not only to mobilize the resources needed for recovery, but also to transfer waste (Pradhananga, ElZomor, 2021, p. 15). This example shows that critical transport systems, networks and routes need to be strengthened, and critical infrastructure resilience needs to be pursued.

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