The role of humanitarian logistics benchmarking in aiding disaster stricken areas

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Abstract: Humanitarian logistics needs an adequate strategy to be able to perform effectively and efficiently. In order to facilitate the creation of a suitable disaster response strategy it is of paramount importance to investigate the alternative strategies already in use. The technique required to do so is called benchmarking. Also, for constant improvement some kind of benchmarking should be present. The aim of analysis within this paper is to investigate the role of humanitarian logistics benchmarking as a strategic tool for aiding within disaster stricken areas. Secondary data sources are used for this purpose, as well as for drawing concluding remarks. Not only the strategies from same disaster type but also strategies from different disaster types are taken into consideration. That is a kind of disaster cross-type benchmarking. The reason lies in a few factors. Firstly, the topography and surface structure of the area play the main role. Same types of catastrophes can have different course of events in different regions which are conditioned by the land. Secondly, the urbanism and architecture of the populated areas at the endangered location. Thirdly, the people. This means that people's age, habits, literacy level, awareness towards disasters, and material status define response behavior when a disaster occurs. Paper analysis findings indicate that humanitarian logistics benchmarking is an important factor of disaster response activities and that consequently the whole value chain of humanitarian assistance can be highly dependent on the adequate humanitarian logistics strategy research.

Keywords: humanitarian logistics, disaster response, benchmarking, humanitarian organizations

1. Introduction

"Globally, there has been a rise in the number of disasters consequently escalating the demand for disaster relief operations" (Chari *et al*., 2021). Humanitarian logistics needs constant evaluation and benchmarking to be able to adequately respond when a disaster occurs. Across the globe many different strategies are in use because there is a plethora of different regions with its own characteristics. No identical situation is out there. Every region creates its own strategy and could be feasible in another to some extent. Despite that, benchmarking should be done if not constantly then periodically. Learning and improvement as a result of learning is the main reason why

benchmarking should be in use in humanitarian supply chains. Maximizing effectiveness and efficiency in human lives and belongings saving is of paramount importance so the benchmarking is a must.

Not only the strategies from same disaster type but also strategies from different disaster types are taken into consideration. That is a kind of disaster cross-type benchmarking. The reason lies in a few factors. Firstly, the topography and surface structure of the area play significant role (Guevara *et al*., 2022). Same types of catastrophes can have different course of events in different regions which are conditioned by the land. Secondly, the urbanism and architecture of the populated areas at the endangered location determine disaster relief approach (March & Leon, 2015; Dutta & Kumar, 2022). Thirdly, the people. This means that people's age, habits, literacy level, awareness towards disasters, and material status define response behavior when a disaster occurs (Shah *et al*., 2020).

2. Literature review

"Humanitarian operations constitute a wide range of situations, ranging from emergency operations, to long-term recovery, reconstruction and developmental processes that are more similar to commercial supply chains" (Gavidia, 2017). "A humanitarian relief operation involves several actors like donors, local government, local and international non-governmental organizations, military, suppliers, etc." (Maghsoudi *et al.* 2018; Costa *et al.* 2012; Kovács *et al.* 2007). Normally, humanitarian logistics supply chain management "deals with two types of operations: developmental humanitarian response operations and emergency response operations" (Shafiq & Soratana, 2019). "Developmental operations refer to the development of education, health, environment, socio and economy system of a particular region, country and community, while emergency or disaster management operations deal with the fulfillment of urgent needs created by disasters, including search and rescue, food, water, sanitation, medicine and shelter" (Bhimani & Song, 2016). "Sudden onset and offset disasters cause widespread disruptions, resulting in massive displacements of humans and collapsing socio-economic systems in affected countries" (Dasaklis and Pappis, 2018). Difference between emergency, normal and business logistics & supply chain is shown within Table 1.

Table 1. Difference between emergency, normal and business logistics & supply chain

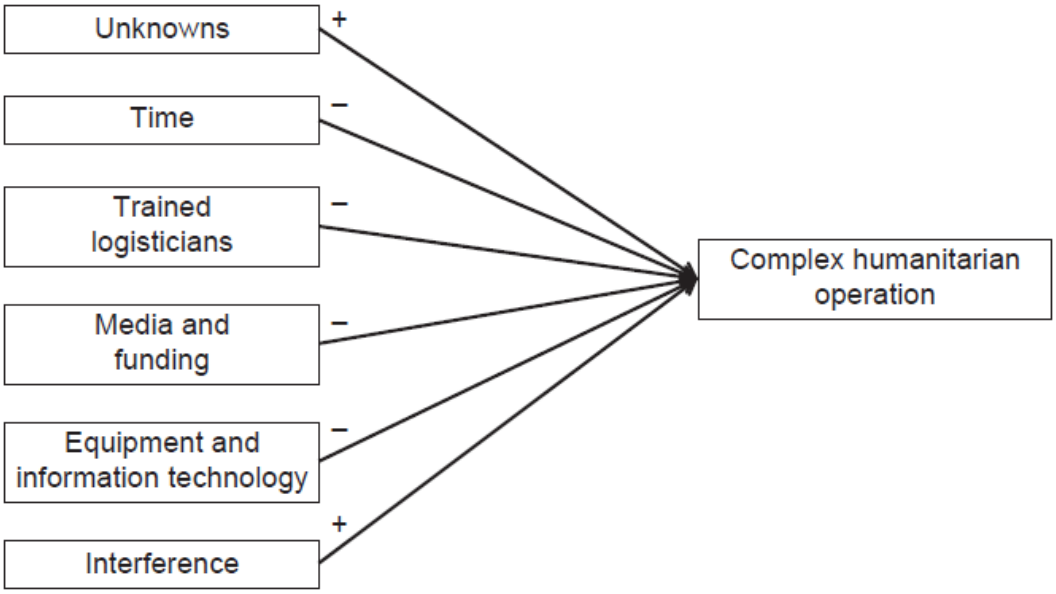
No.	Distinctive point	Emergency HL-SCM operations	Normal HL-SCM operations	Business logistics and supply chain operations
1	Objectives	To help people and save lives without the objective of profit-making	To help and develop the people, environment, and nature without profit	To maximize profit
2	Demand pattern	Unknown and irregular demand	Predictable with forecasting techniques	Predictable with forecasting techniques
3	Supply pattern	Non-predictable mixed patterns with cash or kind, and in-kind donations	Predictable mixed pattern of cash or kind and in-kind donations	Predictable pattern with a specific product
4	Flow type	Flow of fundamental resources, e.g. vehicles, peoples, food and shelter	Flow of fundamental and specific resources e.g. education, health and awareness	Flow of commercial products
5	Lead time	Immediate demand with no lead time	Predictable lead time	Predictable lead time
6	Delivery network structure	Dynamic structure, voluntary and ad hoc facilitator	Pre-established network with voluntary and ad-hoc facilitator	Pre-established network with location, warehouses and distribution centers
7	Inventory control	Challenging to maintain inventory level	Easy to manage, predetermined demand and supply	Easy to manage, have safety stock and demand patterns
8	Technology and Information	Comparatively low technology, less use of software	Comparatively low technology, less use of software	Highly developed technology with software utilization
9	Performance evaluation	Time of response and number of lives saved	Time of response and number of people helped	Based on standard supply chain matrices, profitability
10	Equipment and vehicles	Robust equipment required	Both robust and ordinary equipment's are required	Ordinary equipment required
11	Human resources	High-employee turn-over	Project-based high-employee turn-over	Stable, permanent respected career paths
12	Stakeholders	Donors, governments, military, community and partner NGOs	Donors, governments, military, community and partner NGOs	Shareholders, customers and suppliers

Source: Lean and Agile Paradigms in Humanitarian Organizations' Logistics and Supply Chain Management (2019)

"However, the main objective of the humanitarian supply chain in action is to provide the right supplies to the beneficiaries at the right time and location" (Azmat & Kummer, 2019). The importance of humanitarian logistics and supply chain lies in the fact that human lives are the main aim of all activities in the industry. The secondary goal is victims' material belongings, buildings and infrastructure. Like any other logistics and supply chain activity humanitarian organizations also require benchmarking. Also, benchmarking is required if other subjects are included in disaster response. Benchmarking is crucial not only for activity evaluation and strategy fulfillment but also for process improvements. In the humanitarian industry benchmarking could be very complex and sophisticated which is conditioned by the complexity of humanitarian logistics shown in Figure 1.

"The greatest unknowns in humanitarian logistics are the time, place, and severity of a disaster in terms of both people and property" (Overstreet, 2011).

Figure 2. Complexities of humanitarian logistics



Source: Research in Humanitarian Logistics (2011)

Also, the complexity of humanitarian logistics is defined by phases of disaster management and logistics activities in each of the phases, as well as by the number of participants involved in humanitarian logistics operations (Bealt & Mansouri, 2017; Le Cozannet *et al.,* 2020; Guo & Kapucu, 2020). Additionally, the cooperation among participants makes humanitarian supply chain more complex and consequently hard to compare (Beat *et al.,* 2016; Nurmala *et al.,* 2018). Also, the availability and usage of UAVs can be significant in disaster situations (Kyriakakis *et al.,* 2022), and make disaster relief efforts operate smoothly.

"The actions taken by organizations practicing humanitarian logistics can be considered in two distinct ways (Bhimani & Song, 2016):

1. Actions regarding potential and actual disasters may warrant humanitarian response, which we will call disaster management and which has been the major focus of past literature.
2. Actions with the goals of structural and sustainable development for an area/population, what we will call long-term development, which we go into more detail in the potential research directions section."

3. Humanitarian logistics and benchmarking

"Costa *et al.* (2012) explain that humanitarian supply chain resembles a lot to its commercial counterpart. For instance, they share similar activities like preparation, planning, procurement, transportation, storage tracking, and customs clearance. Despite a desire to help, many relief efforts

remain inadequate" (Fawcett & Fawcett, 2013). Hereof every activity in the humanitarian area needs constant improvement as business activities do. The improvement of all aspects of human lives saving activity is based on evaluation of humanitarian organizations, strategies, and activities. Primarily, the evaluation of internal processes of an organization or disaster strategy should be done. The reason is to have the basics for future comparisons. In that case, other strategies relevant to this field should be considered and compared to the existing ones. This is complex work and needs to be done thoroughly. The reason is the nature of humanitarian activism, where human well-being is the most important aim. The technique adequate for comparisons of any kind in business and humanitarian logistics is benchmarking (Piran *et al.,* 2021).

In order to properly see the effects of benchmarking, it must be stated that successful benchmarking is a continuous process of listening to the environment, as well as permanent adaptation to the environment. It is necessary to constantly research the practice of the best organizations and implement the best solutions in their own policy and manner of activities while respecting their own specifics. Benchmarking can be used in different areas for variety of situations (McIntosh & Zeitlin, 2022; Anuar *et al.,* 2022)

"Examples of benchmarks in logistics and supply chain management include (AmerTrans):

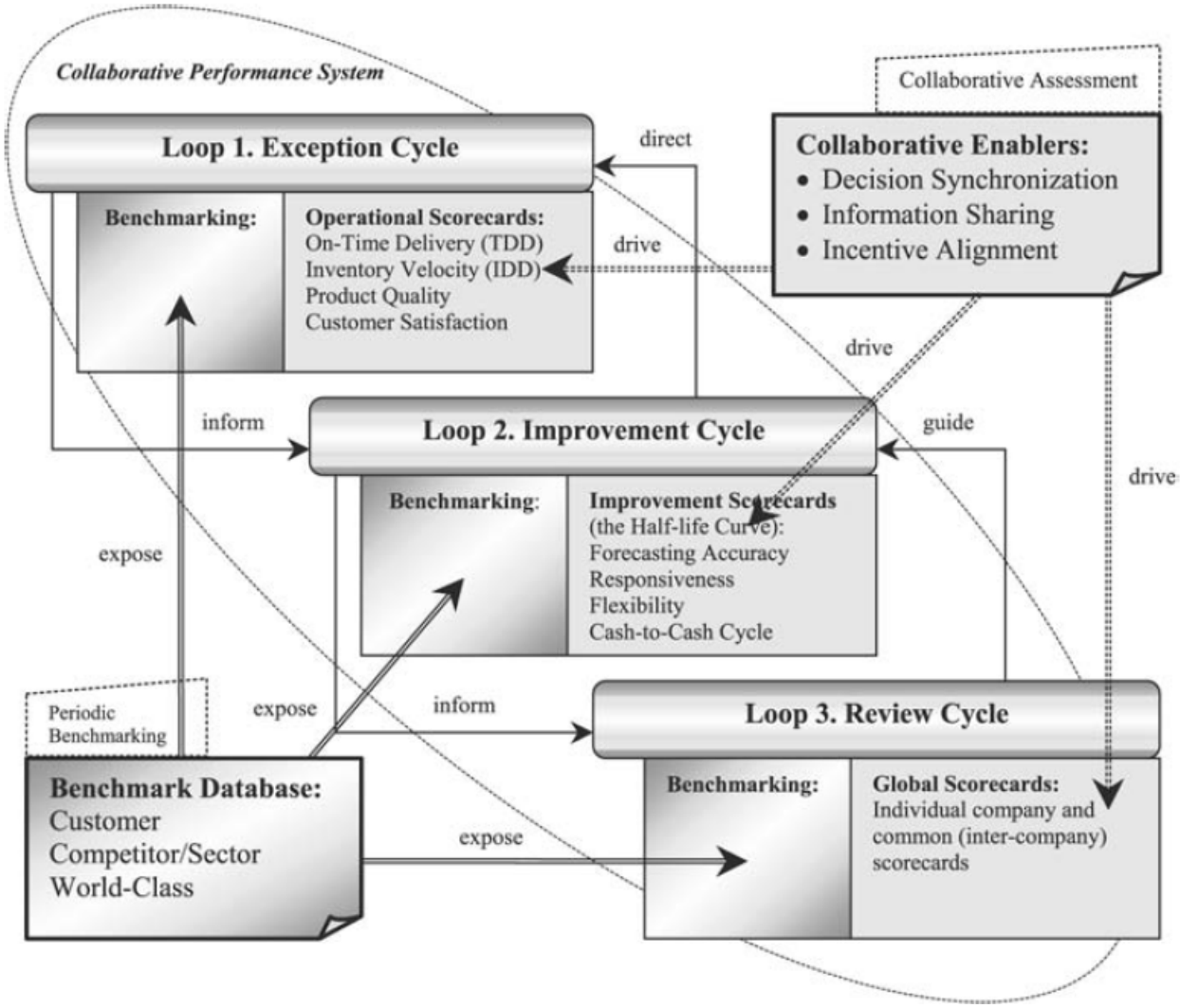
- Costs of storage
- Transportation times
- Product comparison
- Order or return processing times
- Inventory accuracy
- Storage density
- Warehouse or distribution center comparisons"

When it comes to supply chain collaboration participants they are interested in measuring the status of their collaboration and how it can be improved. Details on conceptual framework for collaborative benchmarking are shown within Figure 2. "Collaborative benchmarking contains three components: internal assessment report, collaborative performance system, and external benchmarking, and there are four steps that need to be taken to integrate the three components of collaborative benchmarking (Simatupang & Sridharan, 2004):

- First, the chain members need to conduct an internal assessment to obtain clear understanding about the current collaborative enablers used by the participating members to drive their shared supply chain processes.
- Second, the chain members need to monitor their collaborative performance system to assess the current level of collaborative performance.
- Third, the chain members need to conduct external benchmarking to identify and reveal the current level of best-in-class performance.

- Fourth, the chain members need to analyze any gap between current performance and best-in-class performance in order to monitor and control the exception process at the exception cycle, drive ongoing improvement at the improvement cycle, and achieve alignment with collaborative strategic objectives at the review cycle."

Figure 3. A conceptual framework for collaborative benchmarking



Source: A benchmarking scheme for supply chain collaboration (2004)

Table 2 shows the summary of maritime response to disasters of the U.S. Navy. This summary contains the response time (days), the cumulative capability (the peak range and day), and the mission that received the most and the least support. It can be concluded that different disasters require different response strategies. This is a good example of different catastrophes and the same way of responding to it. Also here to be said that these regions are in different countries and is a good lesson that has to be learned by those countries but also by countries with the same prone to catastrophes. This is a type of benchmarking that can be useful to everyone. Moreover, with

additional information available about the catastrophes and surroundings of the disaster areas new conclusions can be made. Thus, the information from Table 1 serves as a starting point for analysis.

Table 2. Maritime response to disasters

Disaster	Response		Peak of Cumulative Capability		Missions Receiving the Most Support	Missions Receiving the Least Support
	Range	Completion	Range	Occurred		
Indian Ocean Tsunami	81 Days	Day 41	Day 15 - Day 35	Day 24	Provision of Critical Supplies	Medical Care and Shelter
Hurricane Katrina	42 Days	Day 38	Day 10 - Day 23	Day 17	Provision of Critical Supplies	Medical Care and Shelter
Haiti Earthquake	72 Days	Day 41	Day 12 - Day 28	Day 19	Medical Care and Shelter	Provision of Critical Supplies

Source: Selecting Maritime Disaster Response Capabilities (2013).

Disaster response agility also depends on the country's preparedness. A country's social, cultural, and economic development determines future behavior even in the humanitarian field. Comparing approaches among countries is very important because other participants are highly influenced by governments' decisions. "In Japanese approach a public entity is always a coordinating body, while in USA the policy is more flexible where some communities and players do not participate in regional coordination teams" (Marcinkowski, 2017). Table 3 shows the differences between two countries' approaches. The Japanese approach seems more detailed, possibly because of the exposure of big cities to serious natural disasters. Japan takes into consideration even pessimism in disaster management while the USA doesn't. "The determinants that can make the difference are the complexity of disasters, the resistant market and humanitarian logistics players' relationships, and the utilization of every latest scientific knowledge in favor of Japan. The case of Great East Japan earthquake and tsunami depicts well the Japanese approach to disasters" (Koshimura & Shuto, 2015).

Table 4. Determinants of humanitarian logistics convergence from the Japanese and American public sectors' approach.

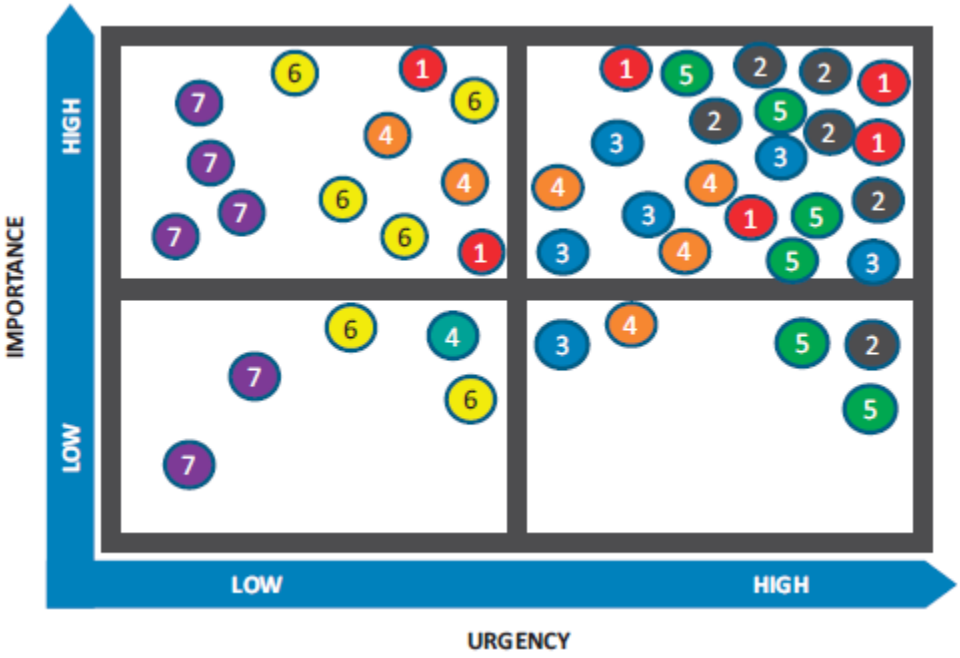
Approach	Japanese		American	
Determinants	Resulting factor	The type of humanitarian logistics convergence	Resulting factor	The type of humanitarian logistics convergence
Self-help and trust in the human abilities	Cooperation, synergy effect, consideration of societies needs and preferences	Informational, institutional	Cooperation, synergy effect, standardization of activities, scenarios preparation, human resources policies, rational behavior	Informational, institutional
Social functions and society integration	Structural and nonstructural activities	Institutional, informational	Preparedness, social functions	Institutional, infrastructural, informational
Decentralization of activities	Local plans integration, exploiting the potential, knowledge management	Informational, infrastructural	Scenarios and plans preparation, standardization, ICS, plans integration	Informational, infrastructural
The complexity of disasters	Preparedness, reaction, reconstruction, random factor inclusion, resources and damages estimation methods, life normalization, implementation of modern technologies, security, effects evaluation	Infrastructural, informational, institutional	Preparedness, reaction, reconstruction, life and livestock protection	Infrastructural, informational, institutional
The resistant market and humanitarian logistics players' relationships	Intersectoral supports platform, commercialization, supply chain management, business continuity planning, insurance system fortification	Institutional	Activities integration, federal subsidies, liaison to the JFO	Institutional
Utilization of every latest scientific knowledge	Interdisciplinary nature of science, forecasts and scenarios preparation, preparedness	Informational	Forecasts and scenarios preparation	Informational
The processes of planning and inspection of activities despite limited information	Preparedness, trainings, collecting information systems, communication systems	Infrastructural, informational, institutional	Preparedness, trainings, cooperation of neighboring administrative units, plans preparation, communication systems, volunteers' registry	Infrastructural, informational, institutional
Pessimism in disaster management	Preparedness, forecasts preparation, analysis	Informational	-	-

Source: Japanese and American approach to humanitarian logistics in natural disasters' prevention (2017).

A benchmarking can be done as an interview. "That kind of benchmarking has been done by Saleh & Karia, where six interviewed leaders are members of dual multi-mandate (humanitarian and development) international nongovernmental organizations (INGOs) operating in Jordan more than ten years of experience in the field. Seven benchmarks have emerged from the interviews with INGOs' leaders: Benchmark-1: Donors policies and regulations; Benchmark-2: Needs, expectations and relevancy; Benchmark-3: Coordination; Becnchmark-4: Staff management; Benchmark-5: Business continuation plans; Benchmark-6: Balanced short-term and long-term planning; Benchmark-7: Permanent adoption of successful modalities. The seven identified benchmarks have been sent to the interviewed leaders in the second round of data collection to triangulate them, to prioritize them in terms of urgency and importance (Saleh & Karia, 2020). Each interviewee has asked to place the emerged seven benchmarks on the quadrant, as shown in Figure 3. Thus, benchmarks 1, 2, 3 and 5 have been mostly ranked by the leaders as highly

important and highly urgent. Benchmarks 6 and 7 ranked mainly by the leaders as high prominent but low urgency and as low importance by one-third of the leaders."

Figure 3. Quadrant analysis of COVID-19 benchmarks for INGOs



Source: Benchmarks for INGOs' effective responses during COVID-19 pandemic (2020)

4. Conclusion

Humanitarian relief strategies should be made and developed either by the government or organization. Moreover, making and developing processes are ongoing processes and require adequate and accurate information about potential disasters. To be able to perform the developing process, one type of benchmarking should be done. Every aspect of the humanitarian supply chain can be evaluated and compared, from countries' approaches to transport mode response time. The process should be conducted and monitored by experts in the area so the accuracy is high.

The analysis within this article shows several comparisons. Every comparison presents useful data for decision-makers regarding performance abilities. All the data is useful for both practitioners and theoreticians. Thus, US Navy response time in different regions around the globe shows that there are no two identical situations even if operations are done by the same organization. But the analysis of operation duration serves as a starting point for evaluation and comparison of disaster response activity. Next, the comparison of approaches from two countries gives us information about whose approach is more adequate and why. Finally, through an interview of humanitarians can be seen how they prioritize benchmarks in terms of urgency and importance.

5. References

1. AmerTrans - https://amertranslogistics.com/supply-chain-management/logistics-benchmarking/ accessed on 10/06/2022
2. Anuar, W.K., Lee, L.S., Pickl, S. (2022). Benchmark dataset for multi depot vehicle routing problem with road capacity and damage road consideration for humanitarian operation in critical supply delivery. *Data in Brief*, Vol. 41., 107901.
3. Apte, A., Yoho, K. D., Greenfield, C. M., Ingram, C. A. (2013). Selecting Maritime Disaster Response Capabilities. *Journal of Operations and Supply Chain Management*, Vol. 6(2). pp. 40-58.
4. Azmat, M., Kummer, S. (2019). Importance of Key Success Factors for Local and International NGOs in Humanitarian Supply Chain. *Logforum*, Vol. 15(4). pp. 545-555.
5. Bealt, J., Barrera, J.C.F., Mansouri, S.A. (2016). Collaborative relationships between logistics service providers and humanitarian organizations during disaster relief operations. *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 6(2). pp. 118-144.
6. Bealt, J., Mansouri, S.A. (2017). From disaster to development: a systematic review of community-driven humanitarian logistics. *Disasters*, Vol. 42(1). pp. 124-148.
7. Bhimani S., Song J.S. (2016). Gaps between research and practice in humanitarian logistics. *The Journal of Applied Business and Economics*, Vol. 18(1). pp. 11-24.
8. Chari, F., Ngcamu, B.S., Novukela, C. (2021). Supply chain risks in humanitarian relief operations: a case of Cyclone Idai relief efforts in Zimbabwe. *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 11(1). pp. 29-45.
9. Costa, S.R.A., Campos, V.B.G., Bandeira, R.A.M. (2012). Supply Chains in Humanitarian Operations: Cases and Analysis. *Procedia - Social and Behavioral Sciences*, Vol. 54. pp. 598-607.
10. Dasaklis, T.K., Pappis, C.P. (2018). Critical success factors for implementing cholera vaccination campaigns in humanitarian emergencies: a DEMATEL-based approach. *EURO Journal on Decision Processes*, Vol. 6(1-2). pp. 1-20.
11. Dutta, A., Kumar, A. (2022). The Imperative Relationship between Architecture, Urban Design and Development and Disaster Management. *ECS Transactions*, Vol. 107(1).
12. Fawcett, A.M., Fawcett, S.E. (2013). Benchmarking the state of humanitarian aid and disaster relief: A systems design perspective and research agenda. *Benchmarking: An International Journal*, Vol. 20(5). pp. 661-692.
13. Gavidia, J. (2017). A model for enterprise resource planning in emergency humanitarian logistics. *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 7(8). pp. 246-265.
14. Guevara, H.J.P., Ortiz, M.E., Guevara, V.M.P., Barrientos, J.H., Guevara, J.A.P., Rodríguez, O.D., Cervantes, M.d.J.P., Morales, M.S. (2022). *Potential Flood Risk in the City of Guasave, Sinaloa, the Effects of Population Growth, and Modifications to the Topographic Relief. Sustainability*, Vol. 14(11).
15. Guo, X., Kapucu, N. (2020). Engaging Stakeholders for Collaborative Decision Making in Humanitarian Logistics Using System Dynamics. *Journal of Homeland Security and Emergency Management*, Vol. 17(1).
16. Koshimura, S., Shuto, N. (2015). Response to the 2011 Great East Japan Earthquake and Tsunami disaster. *Philosophical transactions of the royal society A*, Vol. 373(2053).
17. Kovács, G., Spens, K.M. (2007). Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*, Vol. 37(2). pp. 99-114.

18. Kyriakakis, N., A., Marinaki, M., Matsatsinis, N., Marinakis, Y. (2022). A cumulative unmanned aerial vehicle routing problem approach for humanitarian coverage path planning. *European Journal of Operational Research*, Vol. 300(3). pp. 992-1004.
19. Le Cozannet, G., Kervyn, M., Russo, S., Ifejika Speranza, C., Ferrier, P., Foumelis, M., Lopez, T., Modaressi, H. (2020). Space-Based Earth Observations for Disaster Risk Management. *Surveys in Geophysics*, Vol. 41. pp. 1209-1235.
20. Maghsoudi, A., Zailani, S., Ramayah, T., Arvidsson, A. (2018). Coordination of efforts in disaster relief supply chains: the moderating role of resource scarcity and redundancy. *International Journal of Logistics Research and Applications*, Vol. 21(4). pp. 407-430.
21. March, A., Leon, J. (2015). *Urban design: an underutilized tool for disaster risk reduction?* 7th State of Australian Cities Conference, Gold Coast, Australia.
22. Marcinkowski, J. (2017). Japanese and American approach to humanitarian logistics in natural disasters' prevention. *Logforum*, Vol. 13(2). pp. 171-182.
23. McIntosh, C., Zeitlin, A. (2022). Using household grants to benchmark the cost effectiveness of a USAID workforce readiness program. *Journal of Development Economics*, Vol. 157.
24. Nurmala, N., de Vries, J., de Leeuw, S. (2018). Cross-sector humanitarian–business partnerships in managing humanitarian logistics: an empirical verification. *International Journal of Production Research*, Vol. 56(21). pp. 6842-6858.
25. Overstreet, R.E., Hall, D., Hanna, J.B., Rainer, K.R. (2011). Research in humanitarian logistics. *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1(2). pp. 114-131.
26. Piran, F.S., Lacerda, D.P., Camanho, A.S., Silva, M.C.A. (2021). Internal benchmarking to assess the cost efficiency of a broiler production system combining data envelopment analysis and throughput accounting. *International Journal of Production Economics*, Vol. 238.
27. Saleh, F.I.M., Karia, N. (2020). Benchmarks for INGOs' effective responses during COVID-19 pandemic. *Benchmarking: An International Journal*, Vol. 27(10). pp. 2863-2886.
28. Shafiq, M., Soratana, K. (2019). Lean and Agile Paradigms in Humanitarian Organizations' Logistics and Supply Chain Management. *Logforum*, Vol. 15(1). pp. 139-153.
29. Shah, A.A., Ye, J., Shaw, R., Ullah, R., Ali, M. (2020). Factors affecting flood-induced household vulnerability and health risks in Pakistan: The case of Khyber Pakhtunkhwa (KP) Province. *International Journal of Disaster Risk Reduction*, Vol. 42. pp. 1-8.
30. Simatupang, T., Sridharan, R. (2004). A benchmarking scheme for supply chain collaboration. *Benchmarking: An International Journal*, Vol. 11. pp. 9-30.