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Review

A Systematic Literature Review on Logistics Information Needs for Sharing in Malaysian Disaster Management

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Abstract: This exploratory study uses systematic reviews of published journal papers from 2018 to 2022 to identify research trends and present a comprehensive overview of disaster management research within the context of humanitarian logistics. This review is guided by the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) review method. A systematic review of Scopus and the Web of Science turned up 23 related studies. Further review of these articles revealed nine main themes and produced a total of 42 sub-themes. Findings reveal that little attention has been devoted to the study of the information needs of humanitarian logistics during disaster response. The majority of previous research focused on disaster management before, during, and after disasters without comprehensively exploring the information required by humanitarian logistics providers for effective logistics support for disaster victims. The trends show that the information based on logistics needs presented is not significant. This study contributes to understanding past, present, and future research agendas and provides insight into current research status in information based on logistics needs in disaster management. Recommendations are highlighted related to using qualitative data analysis software, such as NVivo or Atlas.ti, as an analysis tool and practicing complementary searching techniques, such as citation tracking, reference searching, snowballing, and contacting experts.

Keywords: humanitarian logistics; information; logistics needs; disaster; Malaysia; review; systematic literature review

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1. Introduction

Over the past few years, natural disasters have caused more deaths and destruction. Worldwide natural disasters in 2021 was reported to have caused 10,000 deaths [1]. Among all the disaster types recorded throughout the year, flooding is the most dominant type of natural disaster [2]. Worldwide flood occurrences averaged 223 per year in 2021, up from an average of 163 per year from 2001 to 2020 [3]. However, delivering logistics support for victims during a disaster presents numerous challenges in ensuring the efficiency of material flows, such as food, water, medication, and shelter, towards disaster victims and necessitates a high level of planning. It has been reported that unnecessary emergency relief items provided by humanitarian logistics offered to disaster victims who have suffered a natural disaster have been a perpetual problem across the globe [4].

Humanitarian logistics fundamentally differ from typical logistics [5]. Logistics support plays a major role in humanitarian operations, which take about 80% of the time and resources [6]. Unfortunately, the high contribution of humanitarian logistics during humanitarian operations continues to affect how well the response works due to logistical problems. People have come to understand that information sharing is vital for humanitarian activities in disaster management. As a result, regional and global solidarity has also become stronger in an effort to minimize the risk of disaster management. In order to

prevent future disaster risks and reduce current disaster risks, the Sendai Framework for Disaster Risk Reduction 2015–2030 identifies seven main targets and four action priorities. Understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster reduction for resilience, improving disaster preparedness for effective response, and "Building Back Better" in recovery, rehabilitation, and reconstruction are among its priorities [7]. The Sendai Framework makes it abundantly obvious that a greater understanding of disaster risk is necessary to lessen the frequency and effect of disasters. The goal is to enhance risk governance in order to lessen current risks and prevent the emergence of future problems [8].

In Malaysia, there were problems and challenges faced by the local humanitarian logistics response in providing aid for victims. The performance of humanitarian aid distribution by logisticians has been impacted by insufficiency of information to implement a series of decision-making processes [9–11]. Over the past decade, humanitarian aid delivery by logisticians during disasters has faced the issue of the wrong type and quantity of supplies for affected disaster victims, damaged goods, expired goods, and improper supplies, which have stretched the world, including Malaysia. For instance, on 18 August, 2021, several locations around Yan District in Alor Setar were hit by flash floods due to heavy rain. Since the disaster, many humanitarian organizations have carried out relief missions, such as providing food items and kitchen necessities to affected people [12]. However, the relief items provided do not meet the requirements for some victims and cause dumping issues at donation centers. Thus, it clearly shows that information based on logistics needs plays an important role in determining the appropriate requirement for logistics support for disaster victims. In short, this study aims to analyze the existing literature between 2018 and 2022 on information based on logistics needs for disaster management in Malaysia. In the meantime, to gain a deeper understanding of the current condition and trend in humanitarian logistics research in disaster management.

The remainder of this study is structured as follows. In Section 2, the problem statement is thoroughly explained. Section 3 establishes the methods to be pursued, resulting in the development of a systematic literature review process. Section 4 contains an explanation of the result discovered through a systematic literature review. The result of the study is well discussed, along with theoretical and managerial implications, in Section 5. Limitations of the study are presented in Section 6. This paper concludes with recommendations and conclusions in Sections 7 and 8, respectively.

2. Problem Statement

A systematic review is an investigation into a clearly stated question that uses systematic methods to find, choose, and evaluate relevant research. It is also a method to collect and analyze data from studies that are included in the review. A systematic review lets the author back up their research claims and figure out where there are gaps and where more research is needed. Despite the abundance of studies on humanitarian logistics management in Malaysia, efforts to systematically close up these studies, especially on the information logistics needs for sharing during disaster response, are still lacking. This article attempts to fill the gap in understanding and identifies the elements of information needed for humanitarian logistics during disaster response in Malaysia. Reports in the peer-reviewed literature are referred to as a proxy for logistics needs to perform the humanitarian operation, indicating that this article offers a general and baseline overview of the information needed by humanitarian logistics to perform its activities. Besides that, there are multiple unsolved logistics issues, especially during disasters, which stem from inaccurate information gathered through communication [13–15].

Besides that, duplication of information sharing is one of the neglected issues by the government, which has caused the humanitarian logistics to not be capable of having smooth information gathering while facing a disaster [16]. The spread of false information about disasters has the potential to jeopardize humanitarian logistics efforts to provide aid to victims. Even if one agency has recorded the information, another agency officer

will manually record it rather than sharing it with other agencies. Due to the different terminologies used and delays in communicating essential information, this method is causing organizations to get inaccurate information. It has been seen that the information management implemented by humanitarian logistics is still ineffective during disaster response. More comprehensive supporting information and data structures are required for future studies to improve the accuracy of crowdsourced information [16]. This is supported by previous research [17,18], which stated that it is very important to get the information needed during a disaster. Even though extensive literature and research reports describe a variety of intentions towards humanitarian logistics operations, the information based on logistics needs during humanitarian disaster response is still not well established in current research. It is important to support an effective information-sharing process between organizations. Most of the researchers focus on minimizing travel costs and travel time, which include casualty transportation and evacuation [19].

The previous studies from Malaysia employed modeling, frameworks, and optimization methods to derive solutions to problems faced by local humanitarian logistics [20–23]. However, there is no recent management model that has been developed that focuses on information flow and logistics needs for humanitarian disaster response. Since information management has a significant relationship with logistics support performance [24], the development of a management model for information workflow based on logistics needs must be initiated to assist logisticians in performing humanitarian disaster response effectively. The work fills an important gap in the literature, with the most systematic review examining the study area of humanitarian logistics in Malaysia, which reflects on the performance level of humanitarian disaster response. This study is vital, as to date, there has been a lack of studies that focus on the information needed by humanitarian logistics during disaster response in Malaysia. International studies have also mentioned that communication of timely and reliable information is a very important element in disaster management to ensure that appropriate actions can be taken by disaster agencies [25]. International studies also agree that information searching and sharing during natural disasters receive increasing emphasis in order to survive the disasters [26].

The main research question was used to build a relevant systematic review in this article. What is the information on logistics needs during the humanitarian disaster response? It is because information on logistics needs very important, especially during disaster response [24,27]. A systematic literature review from Scopus and the Web of Science database is used to further identify and categorize the type of information required based on logistics needs in disaster management in order to answer the research questions.

3. Methodology

To investigate important topics and trends, literature mining from published literature is quite helpful [28]. In this section, the systematic review process and thematic analysis are described. Four stages were involved in the systematic review process: Identification, screening, eligibility, and inclusion. The review process was performed on 20 July 2022.

3.1. PRISMA

The review was guided by the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The term PRISMA is frequently used in the context of information science. In order to find the answers to a specific research question, a systematic review will thoroughly review all articles that have been published on the topic. To this end, it will use a variety of inclusion and exclusion criteria to identify the articles that should be included in the review, and it will then synthesize the results [29]. The identification, screening, eligibility, and inclusion standards for articles that fall under the purview of a review are described in Figure 1.

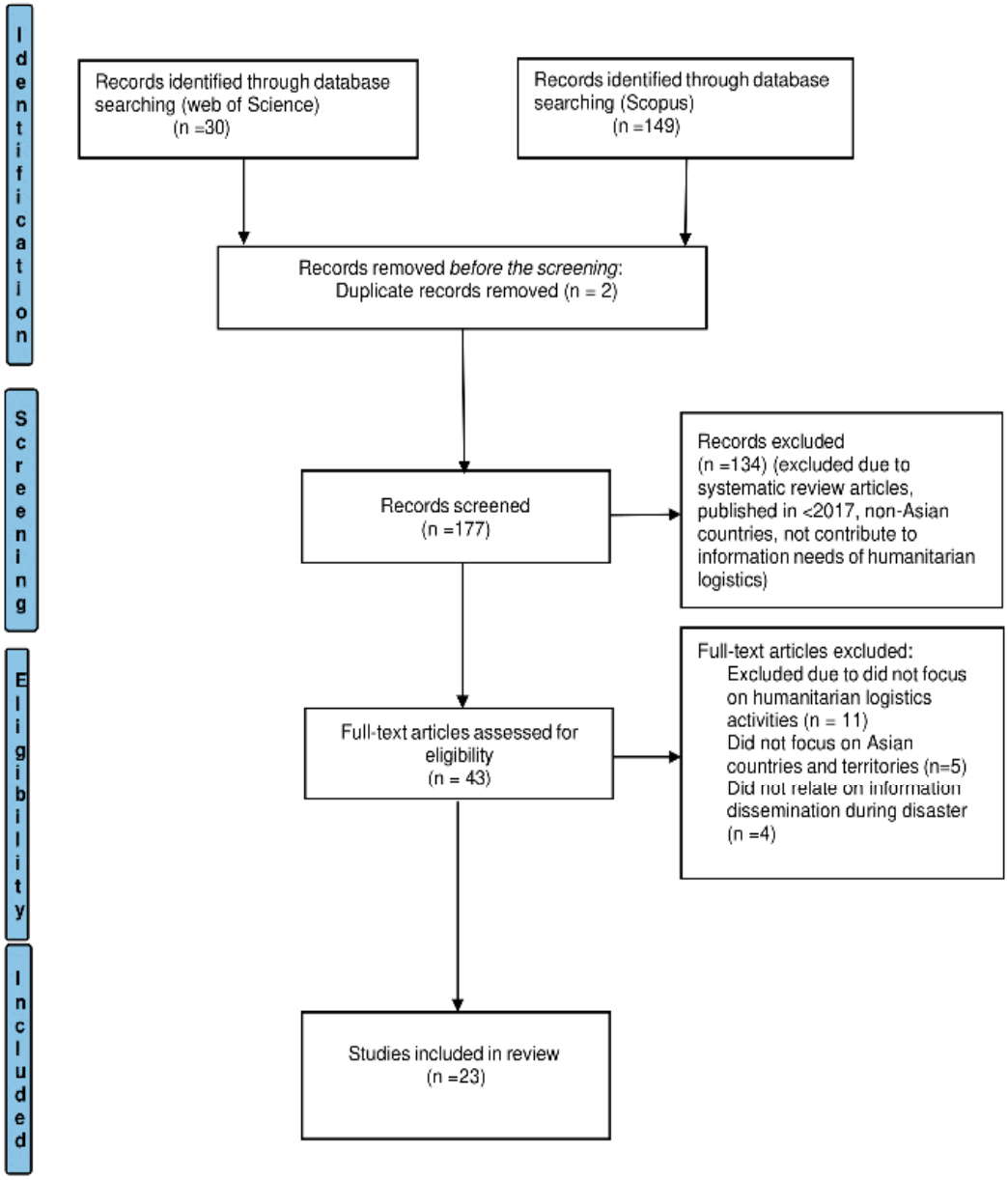

Figure 1. The flow diagram of the study. Source: Authors.

The remaining 23 articles were assessed and analyzed. Thematic analyses were conducted to identify an appropriate theme from the collected data. The data were extracted by first reading the abstract, then the full articles (in-depth) to identify relevant themes and sub-themes. To have quality control over the articles and data produced, themes that were formed from the data were validated by an expert with extensive experience in the humanitarian logistics field. The main objective of conducting this expert review was to ensure the clarity, relevance, and appropriateness of the findings stated in this systematic literature review.

3.2. Resources

This systematic review made use of two main databases, namely Scopus and Web of Science (WoS). Scopus is one of the largest abstract and citation databases of peer-reviewed literature. It offers more than 80,000 institutional profiles from 7000 publishers worldwide. Scopus consists of diverse subject areas such as business management, decision sciences, and social sciences. WoS, on the other hand, is a robust database that includes

24,764 journals and covers more than 250 fields of study. Among the research subjects covered are logistics and disaster management.

3.3. Systematic Review Process-Identification

The first phase identified the keywords used in the search process. Keywords related to humanitarian logistics, humanitarian relief operations, evacuation, and the humanitarian aid distribution process were used based on previous research and a thesaurus (see Table 1).

Table 1. The Search String.

Database	Keywords Used
Scopus	TITLE-ABS-KEY (“humanitarian logistics” AND “disaster” AND “Malaysia” OR “humanitarian aid” OR “evacuation”) TITLE-ABS-KEY (* relief * AND * good * AND * transportation *) TITLE-ABS-KEY (* emergency * AND * management * AND * disaster *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”)) TITLE-ABS-KEY (* disaster * AND *management * AND * logistics *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”)) TITLE-ABS-KEY (* humanitarian * AND * relief *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”))
Web of Science	TS = (“humanitarian logistics” AND “disaster” AND “Malaysia” OR “humanitarian aid” OR “evacuation”) TS = (* relief * AND * good * AND * transportation *) TS = (* emergency * AND * management * AND * disaster *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”)) TS = (* disaster * AND * management * AND * logistics *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”)) TS = (* humanitarian * AND * relief *) AND (LIMIT-TO (AFFILCOUNTRY, “Malaysia”))

Source: Authors.

3.4. Systematic Review Process-Identification

Several inclusion and exclusion criteria were determined. First, with regard to the timeline, a period of 5 years was selected between the years 2018 and 2022 as an adequate duration for examining the evolution of research and related publications that relate to climate change in Malaysia. The article review, which is based on empirical research conducted in Malaysia between the years 2013 and 2017, it focuses more on disaster topics than climate change topics in Malaysia [30–33]. Published research articles on disaster topics covered both small and large-scale hazards, such as earthquakes and landslides, which have little impact on the research gap of this study. Meanwhile, empirical research articles published between 2018 and 2022 contain extensive climate change-related information, emphasizing the need for effective logistics support during disasters. Thus, publications between 2018 and 2022 were selected to answer the research question of this study. Dealing with the uncertainties of climate change would help the process of distributing humanitarian aid by making it easier to share information based on logistics needs [34–37]. The systematic review focuses on empirical research in Malaysia to observe the trends of published information based on humanitarian logistics needs and reveal the current gap in this field. The purpose is to enhance the humanitarian aid distribution process in Malaysia since it has been debated recently. Malaysians have the highest percentage, at 67%, who are exposed and vulnerable to frequent climate change, especially flooding [38]. In relation to literature types, only article journals with empirical data, conference proceeding articles, and books are selected, which means review articles are excluded. Besides that, only empirical research from Malaysia was selected for review to answer the research question of this study. Table 2 below summarizes the inclusion and exclusion criteria for this study.

Table 2. Inclusion and Exclusion Criteria.

Criteria	Inclusion	Exclusion
Timeline	Between 2018 and 2022	<2017
Subject Area	Business Management, Decision Sciences, Social Sciences	Engineering, Computer Science, Economics, Econometrics and Finance, Earth and Planetary Sciences, Mathematics, Environmental Science, Energy, Agricultural and Biological Sciences
Document Type	Empirical data research Conference proceeding articles Book	Review articles such as systematic review, meta-analysis, and concept paper
Countries and Territories	Malaysia	Other than Malaysia

3.5. Systematic Review Process-Eligibility

The remaining articles from the screening process were then subjected to the third process, known as eligibility. At this point, all of the articles were carefully looked over to make sure they meet the standards set by the authors.

3.6. Data Analyses

At this stage, the remaining articles were assessed and analyzed. The analysis process concentrated on specific studies that were related to the posed questions. The data were collected and extracted by reading through the first part, which is abstract, and then reading the full content of articles in depth to identify appropriate themes and sub-themes. Qualitative analysis was implemented using inductive thematic analysis to determine themes related to the information needed by humanitarian logistics to perform humanitarian disaster response in Malaysia. The authors then organized sub-themes around the typology-established themes. Typology is defined as a classification based on types or categories.

4. Results

This section describes the results of the systematic review process through thematic analysis of the literature. A systematic review of the articles from Scopus and Web of Science databases between 2018 and 2022 turned up 23 related studies. Regarding the years published, five articles were published in 2018, five articles were published in 2019, five articles were published in 2020, four articles were published in 2021, and four articles were published in 2022. It reveals an extremely limited number of publications prior to the exclusion of empirical research that do not focus on humanitarian logistics activities related to the aim of the study.

As mentioned in the previous section, the aim of this study is to analyze the existing literature between 2018 and 2022 on information based on logistics needs for disaster management in Malaysia. Further review of these articles resulted in nine main themes, as shown in Figure 2. All nine themes were selected to be used in this study to represent the type of logistics information that is commonly needed in disaster management by humanitarian logistics, based on previous empirical studies conducted in Malaysia within the last five years (2018–2022). The themes developed for information based on logistics needs are disaster victims, evacuation centers, transportation, humanitarian aid, resources, assets, disasters, facilities, and search and rescue. The nine themes further produced a total of 42 sub-themes as follows: Disaster victims (six sub-themes), evacuation centers (seven sub-themes), transportation (five sub-themes), humanitarian aid (nine sub-themes), resources (two sub-themes), assets (two sub-themes), disasters (four sub-themes), facilities

(three sub-themes), and search and rescue (four sub-themes). All the sub-themes are summarized according to their explanation, which can be referred at Figure 3.

Authors/Theme	Disaster Victims						Evacuation Centre						Transportation					Humanitarian Aid								Resources		Assets		Disaster				Facilities			Search and Rescue			
Sub-themes	VI	EA	PC	AV	CN	PN	ER	LE	CE	DIS	NA	SN	FE	MN	TN	AP	VL	DT	QT	SD	PO	HM	RI	DF	PC	CS	MA	VN	MP	LA	AA	DI	LLN	DS	GL	SD	WL	RI	ES	HSU	TLA	EA
Soon, Kamaruddin & Anuar (2018)	√	√	√											√																											
Mohd, Fathi, Harun & Chong (2018)	√				√			√															√																		
Isahak, Rea, Siwar, Ismail, Sulaiman, Hanafi & Taha (2018)							√																																		
Zahari & Hashim (2018)									√			√	√			√	√												√					√							
Sidin, Abdan & Harith (2019)			√					√							√	√			√	√	√	√							√												
Tamyez, Gerth & Anuar (2019)				√													√						√	√												√	√				
Mohd, Fathi & Harun (2019)																							√	√				√				√									
Roslan, Abdullah & Omar (2019)																																	√								
Mohd, Fathi & Harun (2020)																									√							√									
Mabalwi, Nakamura & Bhattacharya (2020)																													√	√	√	√									
Akashah, Baaki, Anuar, Azmi & Yahya (2020)				√	√																											√							√	√		√
Mohd, Abdul Tharim, Mohamed Saraf, Sayed Abdul Khar, Yuserne, Abdul Munir & Hasbullah (2020).																								√																	
Mohd Zahari, Zulkifli, Mohamad, Kadir, Bachok (2020)																√																									
Hashim, Shariff & Deni (2021)				√		√		√	√	√	√				√	√								√																	
Zain, Ismail, Zainol, Yaacob & Ali (2021)				√														√						√		√	√		√		√					√	√				
Ng (2021)	√																						√																		
Valachamy, Sahibuddin, Ahmad & Bakar (2022)																																	√		√						
Gan, Tohir, Said, Tharima, Ong & Ramali (2022)											√							√																					√		
Safizadeh, Hedayati Marzbali, Abdullah & Maliki (2022)																√																									
Munir, Sundram & Adham (2022)																								√																	
Zakaria, Ahmad, Noor & Ahmad (2018)												√																													
Olanrewaju & Ahmad (2018).				√																																				
Samsudin, Ghazali, Ghani, Hussin, Kamaruzin & Kasri (2022)	√																																√								

Figure 2. Thematic analysis.

VI=Details Information about victims (location, type of injuries, age, gender)	**EA**=Focus Area to disseminate evacuation notice to flood victims	**PC**=Physical Condition of victims (visual, auditory, intellectual impairment, fragile, and mobility problem)	**AV**=Amount of disaster victims involved	**CN**=Contacts list of disaster victims	**PN**=Number of population of prone disaster areas
ER=Evaluation result of the efficiency and designation for the evacuation center	**LE**=List of potential evacuation center	**CE**=The capacity of evacuation centers	**DIS**= Distance between evacuation center and disaster areas	**NA**=Numbers of victims that need to be allocated at evacuation center	**SN**=Type of shelter needed(plastic sheeting, light weight emergency tents (LWET), prefabricated shelters
FE=Facilities needed in the evacuation center (sanitation, water availability, health facilities, food and non-food items, education and activities)	**MN**=Personnel and equipment mobilisation needed	**TN**=Type of transportation needed for search and rescue activities (air, water or ground)	**AP**=Access point for Search and Rescue (SAR) operation	**VL**=Availability type of vehicles (light and heavy) from logistics providers	**DT**=Distance travel from logistics provider location to disaster area
QT=Quantity and type of relief items needed by the disaster victim	**SD**=Suitability and durability of relief items	**PO**=Point of origin of the items needed to be delivered	**HM**=Humanitarian aid distribution mechanism	**RI**=Supply for relief items (timing, location, types and size)	**DF**=Demand forecasting for relief items (timing, location, types and size)
PC=Point of consumption for humanitarian aid	**CS**=Amount of contingency stock needed	**MA**=Requirement of medical assistance at disaster area	**VN**=List of volunteers teams to assist humanitarian aid distribution process	**MP**=Man power to drive humanitarian transport	**LA**=Number of logistics asset allocated for a state and district
AA=Availability of logistics assest for relief operation purpose	**DI**=Latest Disaster information (etc, flood level,weather reporting)	**LLN**=Identify location of disaster where logistics support critically need	**DS**=Extent damages and disaster scope	**GL**=Identifies the geographic location of disaster area	**SD**=Storage designation and space for particular relief items
WL=Warehouse location	**RI**=Details information of relief items to be received and stored in warehouse/depot/store	**ES**=Types of evacuation strategy used by high rise building (staircase evacuation strategy or lift evacuation strategy)	**HSU**=The height, size, and usage of building	**TLA**=Length of time logistical assistance required	**EA**=Number of exists available

Figure 3. Explanation of sub-themes.

Analysis of 23 related articles collected from Scopus and Web of Science databases shows that six articles published in 2018, 2020, 2021, and 2022 focused on evacuation decision making in Malaysia [39–44], one study published in 2018 focuses on disaster management strategies [45], one study published in 2018 focuses on determination of

locations for shelters and routes for disaster relief [46], one study published in 2019 focuses on mechanism of disaster management [47], two studies published in 2019 and 2020 focus on information management in disaster management [23,48], one study published in 2019 focused on communication mechanism in disaster management and success factor of humanitarian logistics [49], three studies published in 2020 and 2021 focused on humanitarian aid for disaster victims [50–52], two studies published in 2020 and 2021 focused on issue and challenges in disaster management [53,54], one study published in 2021 concentrated on logistics system in disaster management [54], one study published in 2022 focused on coordination in humanitarian supply chain [55], one study published in 2019 focused on issues in emergency operation and coordination center (EOCC) [56], and one study published in 2019 focused on disaster preparedness, response and recovery in disaster management [57]. Based on the observations gained from the analysis, multiple topics in disaster management are covered by previous research within the years 2018–2022. However, information based on logistics needs is less significantly discussed in previous published articles. The trend of study focus shows that the evacuation decision-making process is the most frequently discussed in previous studies. Since many issues of logistics support have been debated in disaster management, information based on logistics needs is found to be an influential factor in the decision-making process for the humanitarian aid distribution process. In light of the uncertain environment and the involvement of several stakeholders, decision-making during disaster management is a tough process. Thus, this study is very important to contribute towards improvements in the decision-making process for logistics support as needed by disaster victims, especially during the disaster.

Furthermore, 17 studies applied a qualitative approach, four studies applied a quantitative approach, and another two studies applied a mixed method (qualitative and quantitative). It is clear that the majority of researchers used the qualitative method to investigate the phenomenon of disaster management in depth in order to gain a better understanding of the crisis under study. The background information of the articles reviewed is summarized in Table 3.

Based on the results of the study obtained through a systematic literature review, most articles based on empirical studies in the field of disaster management do not clearly focus on the information required by humanitarian logistics in dealing with disasters. Table 3 below shows the findings of this study from the articles reviewed.

There are several articles that emphasize that information sharing during disaster management is very important. However, it has not been studied in more depth, especially as it relates to humanitarian logistics. This is because humanitarian logistics play a very important role during disaster management [58], especially in terms of procurement, transportation, and inventory management for humanitarian aid until the delivery of logistics support to disaster victims [59]. The need for effective humanitarian logistics operations in Malaysia is very significant, as natural disasters happen frequently. Most of the articles reviewed have implemented empirical studies based on flood cases caused by heavy, incessant tropical rains in a particular location in Malaysia rather than other types of natural disasters [60–62]. Research territories have focused on high-potential disaster locations such as Kelantan, Terengganu, Pahang, Perak, Selangor, Johore, and Kuala Lumpur. However, there is very little research conducted in Perlis, Pulau Pinang, and Kedah due to the low number of flood cases happening in those areas.

As a result of the systematic literature review that has been done, disaster management has become the main focus of previous researchers in different aspects. Among them are the policies and mechanisms of disaster and humanitarian aid management through the humanitarian supply chain and logistics, issues, and challenges in dealing with disasters, and decision-making in dealing with disasters. These are all studied in the different categories of disaster management, which are preparedness, mitigation, emergency response, and recovery. Each phase of disaster management has been studied by a previous researcher, with a few contributions towards information based on humanitarian logistics needs prior

to and after the emergency occurs. Table 4 below shows the role of humanitarian logistics in each phase of disaster management based on the article reviewed.

Table 3. Summary of background information of articles reviewed.

No.	Year	Author	Title	Territory	Research Approach	Research Focus
1	2018	Soon, Kamaruddin, Anuar,	Flood victims' evacuation decisions: A semi-nonparametric estimation	Kelantan Pahang	Qualitative	Evacuation decision making
2	2018	Isahak, Reza, Siwar, Ismail, Sulaiman, Hanafi, Zainuddin, Taha	Delineating risk zones and evaluation of shelter centers for flood disaster management along the Pahang River Basin, Malaysia	Pahang	Qualitative	Disaster management strategies
3	2018	Ramli, Alias, Taib	Evaluating transportation modes and routes for disaster relief in Kelantan using geographical information system	Kelantan	Quantitative	Determination of locations for shelters and routes for disaster relief
4	2018	Zahari, Hashim	Adequacy of flood relief shelters: A case study in Perak, Malaysia	Perak	Quantitative	Evacuation Center Decision Making
5	2018	Zakaria, Ahmad, Noor, Ahmad	Knowledge integration among flood disaster management team: Lessons from the Kemaman District	Terengganu	Qualitative	The interaction of flood knowledge showed during the preliminary, actual, and post-flood event phases.
6	2019	Sidin, Abdan, Harith	A data integration model for multi-agency assets in disaster logistic management	Pahang Kelantan	Mixed method (quantitative and qualitative)	Mechanism of disaster management
7	2019	Mohd, Fathi, Harun	Information management for humanitarian aid distribution system in Malaysia	Kelantan, Terengganu, Pahang	Qualitative	Information management system in disaster management
8	2019	Tamyez, Gerth, Anuar	Flood-related disaster communication and humanitarian logistics	Kuantan Pahang	Mixed method (quantitative and qualitative)	Communication mechanism in disaster management and success factor of humanitarian logistics
9	2019	Roslan, Abdullah, Omar	Emergency Operation and Coordination Center (EOCC) for disaster response management	Kuala Lumpur	Qualitative	Issues in emergency operation and coordination center (EOCC)
10	2019	Radi, Hashim, Jaafar, Hod, Ahmad, Nawi, Baloch, Ismail, Ayub	Lessons on environmental health and disaster preparedness, response, and recovery from the severe Kelantan flooding in 2014	Kelantan	Qualitative	Disaster preparedness, response and recovery in disaster management

Table 3. *Cont.*

No.	Year	Author	Title	Territory	Research Approach	Research Focus
11	2020	Mohd, Fathi, Harun	Improving humanitarian aid information management workflow for disaster relief team	Kelantan Terengganu Pahang	Qualitative	Information management in disaster management
12	2020	Mohd, Abdul Tharim, Mohamed Saraf, Sayed Abdul Khair, Yuserrie, Abdul Munir, Hasbullah	The essential items needed in a grab bag by flood victims in Kuala Krai, Kelantan	Kelantan	Quantitative	Humanitarian aid for disaster victims
13	2021	Zain, Ismail, Zainol, Yaacob, Ali	Humanitarian logistics support challenges during a flood in the five states of Malaysia	Johore, Pahang, Kelantan	Qualitative	Issues and challenges in disaster management
14	2021	Halizahari, Zain, Ismail, Zainol, Yaacob, Ali	Accessing Malaysia's armed forces logistics system in providing humanitarian logistics support	Kuala Lumpur	Qualitative	Logistics system in disaster management
15	2021	M.Y. Ng	Flood disaster in Malaysia: Gender-sensitive humanitarian aid?	Selangor, Perak, Pulau Pinang, Kedah, Perlis.	Qualitative	Humanitarian aid for disaster victims
16	2021	Hashim, Shariff, Deni	Allocation of relief center for flood victims using Location Set Covering Problem (LSCP)	Pahang	Qualitative	Humanitarian aid for disaster victims
17	2022	Munir, Sundram, Adham	Inter-organization practices for humanitarian supply chain: A case study of flood disaster in Malaysia	Kelantan	Qualitative	Inter-organizational coordination in humanitarian supply chain
18	2022	Gian, Tohir, Said, Tharima, Ong, Ramali	Effectiveness of travel time during evacuation in high-rise residential buildings: A case study in Selangor, Malaysia	Selangor	Quantitative	Evacuation center decision making
19	2022	Safizadeh, Hedayati Marzbali, Abdullah, Maliki	Proposed flood evacuation routes for heritage areas based on spatial configuration analysis: A case study of Penang, Malaysia	Pulau Pinang	Qualitative	Evacuation center decision making

This explains that many studies related to Malaysian humanitarian logistics functions are not discussed comprehensively regarding the integration of humanitarian logistics through information sharing, especially during disasters. Thus, there are research gaps that must be filled in order to improve the performance of humanitarian logistics in responding to disasters. In this article, the researcher has conducted a detailed thematic analysis to explore the current empirical study of information needed by humanitarian logistics in Malaysia (see Figure 2).

Based on Figure 2, each type of logistics information needed for disaster management is taken from articles that have been read and cited to show the pattern of humanitarian

logistics information from previous research. Based on the pattern of information-based logistics needs presented in each article from 2018 to 2022, it shows that a comprehensive study on information-based logistics needs during disaster response in Malaysia is required due to the low number of research focus in this field.

Table 4. Role of Humanitarian Logistics in Disaster Management.

Phase of Disaster Management	Actions Conducted by Humanitarian Logistics
Preparedness	Determine facilities location, goods pre-positioning, resource allocation (capacity and inventory), plan for transportation, manage humanitarian aid distribution prior to emergency.
Mitigation	Design accessible evacuation routes, allocation and critical supply routing, location of early warning systems and aid facilities, as well as implementation of facilities protection systems.
Response	Notify early warning system, decision-making in logistics activities include supply allocation (flow, routing and vehicle scheduling, temporary facility location), transportation of people and/or evacuation, inventory management (allocation and availability of stock), network recovery (roads, bridges, information systems and energy, etc.) among others.
Recover	Remove debris and garbage, network restoration, aid distribution for reconstruction and recovery of households, safety, functioning of markets and community operations in general

Source: Authors.

5. Discussion

This study has attempted to systematically analyze the existing literature on logistics information needed for disaster management in Malaysia. Certain inferences are made based on the reviews and data in the publications that have been published. More specific directions for future research are described.

First, disaster management in Malaysia at the level of before, during, and after a disaster is operated through different processes guided by Directive No. 20 under the auspices of the National Disaster Management Agency (NADMA) to mitigate the disaster impact [38]. Thus, humanitarian logistics under government agencies also have to act according to what is written in Directive No. 20. Previous research has found that disaster management agencies handle all disaster-related matters under Directive No. 20 [61]. However, humanitarian logistics that are involved in disaster management have faced serious coordination problems, especially during evacuation and aid distribution activities [62]. At this phase, high-quality information sharing between participants in humanitarian response is critical as it helps deliver an effective humanitarian aid distribution process for disaster victims. The different roles played by each group during disaster response have given the role of humanitarian logistics in the humanitarian operation significant support.

Meanwhile, research [49] found that regular communication and honest, clear, and accurate information were the most suggested improvements from their respondents, which consisted of government organizations and non-government organizations, to ensure better coordination in logistics relief operations. Without communication with the information needed, planned coordination in logistic operations will not be successful [49]. Hierarchical command is a concept of communication used by government organizations to communicate information related to the disaster with the purpose of providing humanitarian assistance, including logistics support for affected victims. According to the study [56], an emergency operation and coordination center (EOCC) needs to be set up by a military officer based on a set of command structures from top to bottom to deal with the disaster. In the meantime, data collected from public and media tools such as Facebook and WhatsApp play an important role in identifying disaster victims' needs for logistics support. Therefore, it clearly shows that determinants of specific information based on logistics needs at the

ground level are very important to be gathered before they can be delivered to disaster management agencies for action.

However, the information needed by humanitarian logistics is not well established by the research since it states that information needs to be shared along the chain of command. Some evidence suggests that sharing information and resources as necessary during a disaster is able to improve disaster response management, although further work identifying logistics information needed for sharing is required to confirm this finding. Even though a lot of research has been done on disaster management in Malaysia, there is not a single study that tells us what logistical information Malaysia's disaster management agencies need for their chain of command. According to each action taken by humanitarian logistics in every phase of disaster management (see Table 3), information sharing plays a key role in completing all the logistics operations under controlled coordination between government agencies [63]. There are the National Disaster Management Agency (NADMA), the Fire Rescue Department (FRDM), the Royal Malaysian Police (RMP), and Malaysia Civil Defense Force (CDF) [47]. Again, information is a valuable asset, especially during disaster response, that is produced, retrieved, processed, enriched, validated, consumed, and distributed intra- and inter-agency [64]. Thus, every kind of information that humanitarian logistics needs must go through the process of sharing information so that decisions can be made. According to the study [65], one of the shortcomings discovered in previous flood disasters was a lack of information sharing among agencies. Consequently, it has a negative influence on the effectiveness of emergency response by humanitarian logistics.

Based on an article that, through a rigorous review sourced from the Scopus database, has mentioned multiple times the importance of information sharing in disaster logistics management [23,38,48,54–56,65]. However, comprehensive empirical studies on the sharing of logistics-related information during disasters in Malaysia are woefully inadequate and flawed. The determination of logistics information needs during a disaster could contribute to better performance during humanitarian disaster response. The current information on logistics needs found in the reviewed article is still unable to provide a clear figure in the context of logistics needs information provided by Malaysian government agencies during disasters. Stand-alone logistics needs information from previous research articles that is not sufficient to figure out the whole humanitarian logistics operation workflow during a disaster, together with the logistics information needed to provide logistics support to disaster victims. Finally, theoretical and managerial implications are drawn to figure out the study contribution related to information based on logistics needs in disaster management and its impact on the effectiveness of the humanitarian aid distribution process.

5.1. Theoretical Implications

This study provides significant theoretical contributions to the literature by conducting a systematic literature review on information based on humanitarian logistics needs in disaster management by utilizing Scopus and the Web of Science databases. A systematic literature review is required for efficiently analyzing a wide range of academic data while avoiding researcher bias. In order to comprehend research trends and create an academic identity, the researchers first looked at earlier studies and examined journal articles on disaster management.

Finally, with the recent rise in the popularity of humanitarian logistics across disaster management areas, this study provides a significant contribution by presenting the general trend of existing research topics in disaster management. Because the role of humanitarian logistics is heavily reliant on high-quality information, disaster management practitioners are looking for ways to develop a model of information flow for logistics needs management in order to provide effective humanitarian logistics support, particularly during disasters. This study is meant to encourage all Malaysian disaster management committees to be more careful about getting logistics information and planning logistics activities during the response phase so that goals and objectives can be reached. This is because information management plays a significant role in humanitarian aid logistics support [23]. Effective

information during humanitarian logistics response is able to reduce the high rate of flood losses faced by Malaysia, which have reached a billion ringgit in Malaysia [66,67]. It is also able to improve inter-agency relationships through the sharing of necessary information during disaster management. It also contributes to a clear understanding of the logistics information based on the needs and requirements that each government agency involved in disaster management must have to provide logistics support for disaster victims.

Research on information based on logistics needs in disaster management, including this study, can benefit disaster management agencies in providing humanitarian aid through logistics support for disaster victims. Indirectly, sufficient information based on logistics needs would improve the effectiveness of information sharing between agencies. All the information required based on logistics needs is very important to establish as it contributes towards an effective humanitarian aid distribution process [23]. The use of known types of information required by humanitarian logistics reduces the risk of inadvertent delivery of logistics support at the disaster site. Compared with the lack of readiness by logisticians in identifying the information required, this will expose the ineffectiveness of logistics support for disaster victims. In the meantime, it would engage teams from humanitarian logistics in disaster preparation and strengthen disaster management resilience to potential disaster events [68]. Thus, research based on logistics needs information has great theoretical implications for the effectiveness of the humanitarian aid distribution process before, during, and after disasters.

5.2. Managerial Implications

This study would be useful for policymakers in making decisions based on logistics-related information needed in disaster management. By presenting the results of a systematic analysis, this study can provide useful insights through its overall findings and come up with the structured types of information required by humanitarian logistics to perform their roles. It can be used as a key source for logistics providers to identify the type of information required from other parties in order to provide logistics support to disaster victims. For example, during a disaster, the logistics provider needs to know the current condition of the disaster location and the number of trapped victims to deliver the appropriate type of transport to evacuate disaster victims to temporary shelters. Given that these types of information based on logistics needs are used in each phase of disaster management, namely before, during, and after the disaster, this study can be used to generate new ideas for improving the level of information sharing for intra-organizational coordination of humanitarian logistics and with other parties. Considering the fact that this type of information based on logistics needs is applied in each phase of disaster management, which is before, during, and after the disaster, this study can be utilized for developing new ideas in strengthening the level of information sharing for intra-organizational coordination of humanitarian logistics and with other parties. Additionally, accurate information, as necessary, is also useful for leaders in disaster management to communicate effectively and make decisions that take into account the needs of logistics support [69]. This can lead to better morale, increased cooperation, and improved teamwork, all of which can contribute to a successful disaster rescue operation. In order to achieve the goal of humanitarian logistics, relevant information is needed for effective decision-making [21]. It is because, without others' cooperation to gather necessary information, they would have insufficient information to utilize for decision-making [70].

Today, as the climate change crisis in Malaysia has accelerated and presents a serious risk for potential disaster victims, the humanitarian logistics response should be more prepared to overcome any uncertainties, especially during the disaster. It is because humanitarian organizations require immediate information in order to distribute humanitarian aid. The ability to gather information based on logistics needs is very important, as it helps logisticians get an accurate understanding of the situation and make better decisions can be made for better logistics support to disaster victims. This matter has been agreed upon by previous researchers [71] that the responsibility of humanitarian logistics is very

challenging as it involves multiple critical tasks in every phase of disaster management, such as preparedness, planning, procurement, transport, warehousing, tracking, tracing, and customs clearance from the point of origin to the point of consumption. Effective logistics response by humanitarian logistics in Malaysia could increase victims' satisfaction during disasters.

6. Limitations

This review has several limitations. Firstly, the focus of the study was to identify research trends and present a comprehensive overview of research conducted in disaster management within the scope of humanitarian logistics. The study only focuses on identifying information based on logistics needs that have been presented in previous articles between 2018 and 2022. Moreover, the articles reviewed were limited to empirical research that related to humanitarian logistics functions in disaster management conducted in Malaysia.

7. Recommendations

The results of this research provide some insight into the effective information sharing by humanitarian logistics pertaining to humanitarian disaster response in Malaysia in terms of the type of logistics information needed through a chain of command in Malaysian disaster management. Hence, this is a significant contribution to promoting an effective humanitarian logistics response during flood disasters in Malaysia. It is because floods are the most common type of disaster in Malaysia, and the performance of humanitarian logistics in delivering logistics support for disaster victims has been criticized. More qualitative studies are needed, as they offer in-depth analysis and detailed explanations of the flow of information sharing in humanitarian logistics based on the logistics information needed.

8. Conclusions

The result gained from the systematic review of this study has highlighted the type of logistics information needed for sharing in disaster management either before, during, or after the disaster in Malaysia. It can be concluded that a systematic review of previous research has proven more study is required to obtain information based on logistics needs as there is very limited study focus in this field. Even though research in the scope of humanitarian logistics has been widely discussed in previous research, studies on information based on logistics needs should have a comprehensive focus to come up with clear information structures that are applicable in disaster management practices.

Rather than the study's limitations, the rate of disaster occurrences in Malaysia, particularly flood disasters, is alarming. The number of fatalities and affected people has been reported to have increased, especially during a heavy flood in Malaysia. This situation tends to make logistics providers require all information based on logistics needs for a fast and effective response. It shows that humanitarian logistics support is in high demand to meet disaster victims' needs for goods and supplies at the right quantity, the right location, the right person, and at the right time. In order to achieve these four goals, logistics providers need to have clear information based on logistics needs. A comprehensive study of information based on logistics needs would also enhance the information sharing process between practitioners in disaster management. Thus, future studies should consider providing some insight into the effective information sharing by humanitarian logistics pertaining to humanitarian disaster response in Malaysia in terms of the type of logistics information needed through a chain of command in Malaysian disaster management.

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