

Revisiting the definition of humanitarian logistics

Joakim Kembro¹  | Nathan Kunz^{2,3}  | Lina Frennesson¹  | Diego Vega⁴ 

¹Division of Engineering Logistics,
Lund University, Lund, Sweden

²Institute for Sustainable Business,
Berne University of Applied Sciences,
Bern, Switzerland

³Coggin College of Business, University
of North Florida, Jacksonville, Florida,
USA

⁴HUMLOG Institute, Hanken School of
Economics, Helsinki, Finland

Correspondence

Joakim Kembro, Division of
Engineering Logistics, Lund University,
Box 118, 221 00 Lund, Sweden.
Email: joakim.kembro@tlog.lth.se

Abstract

Humanitarian logistics (HL) is a relatively new research area that requires clear boundaries and a defined foundational perspective. Recent disasters have shown that the scope of HL is expanding, as in cases of cash-based interventions, outsourcing to commercial companies, and stronger involvement of local communities. These changes imply the importance of scrutinizing the old definitions of HL and determining whether they require adaptation. This step is important considering that inadequate definitions create (i) misconceptions about what HL is, (ii) a lack of unity and understanding of the field's research goals, (iii) confusion about what constitutes a contribution, and (iv) theoretical ambiguity, which masks promising research directions, fragments knowledge, and retards the progress of scientific research. Based on a structured review, we found that three definitions from around 2005 have predominated in the literature so far. We identified various issues with these definitions and then conducted an expert elicitation process to develop and validate an updated foundational perspective on HL. Finally, we analyzed the data collected from experts using the literature on what constitutes a “good definition.” This led us to propose a revised definition and accompanying properties for HL. We conclude the article by offering important avenues for future research.

KEYWORDS

definition, disaster, humanitarian logistics, logistics, operations, supply chain management

INTRODUCTION

Humanitarian logistics (HL) is a relatively new research area (Altay et al., 2021). Emerging from related areas, such as disaster management and operations management, the foundation for a core body of knowledge was built during the first decade of the 2000s (see, e.g., Altay & Green, 2006; Kovács & Spens, 2007; Van Wassenhove, 2006). Since then, the HL literature has grown steadily. Characterized by a high degree of complexity and uncertainty, HL balances rapid life-saving interventions in extreme conditions with operational efficiency similar to commercial logistics (Kovács & Spens, 2009). HL is further complicated by the

involvement of a large number of stakeholders, including international humanitarian organizations (IHOs), foreign and host governments, volunteer groups, and funding agencies with sometimes differing objectives (Toyasaki & Wakolbinger, 2019). Recent disasters (e.g., COVID-19 and migration during the Greece–Turkey border crisis) have shown that countries typically acting as donors and providers of humanitarian aid can also find themselves in the hotspot of managing a humanitarian crisis in their respective territories (van Oorschot et al., 2022).

While a collective understanding of HL exists, clear boundaries between what it is and what it is not remain lacking. The predominantly used HL definitions were

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first formulated around 2005. Since then, the scope of HL activities has expanded, with recent developments including an increased emphasis on preparedness (Jahre et al., 2016) and the use of cash-based interventions (Heaslip et al., 2018). IHOs have also begun to offer logistics services to other IHOs (Abidi et al., 2015; Vega & Roussat, 2019) and have increasingly outsourced logistics to the commercial sector (Falagara Sigala & Wakolbinger, 2019; Kovács et al., 2012; Swanson & Smith, 2013). In parallel, the scope of objectives is also expanding, such that environmental sustainability and life cycle assessment (e.g., waste management, power generation, CO₂ emissions) now play a more important role (Besiou & Van Wassenhove, 2020; Corbett et al., 2022). Localization initiatives also call for the stronger involvement of communities, local humanitarian organizations, and companies, with IHOs playing a much more limited role on the ground (Frennesson et al., 2021; Matopoulos et al., 2014).

These changes imply that it is wise to scrutinize the old definitions and see if and where they need adaptation. This is an important step considering that inadequate conceptual definitions create multiple issues (Podsakoff et al., 2016). First, unclear definitions make it difficult to differentiate one discipline from others, which could lead to misconceptions about what it is and what it is not (Stock & Boyer, 2009; Suddaby, 2010; Yaniv, 2011). Along with an increased research interest and the adoption of HL by tangential researchers, these misconceptions may lead to a lack of unity and understanding of the field's research goals as well as increasing confusion about what makes a contribution (Richey et al., 2022). Such confusion also leads to a "Tower of Babel" effect, whereby the ability of a research community's members to communicate with one another and accumulate knowledge is impeded (Suddaby, 2010). In turn, the absence of a consensus definition leads to theoretical ambiguity (Stock & Boyer, 2009), which masks promising research directions (Richey et al., 2022), fragments knowledge (Suddaby, 2010), and retards the progress of scientific research (Locke, 2003). As Stock and Boyer (2009) pointed out, it becomes difficult for researchers to develop a theory, define and test relationships between constructs, and develop a consistent stream of research. Ultimately, the lack of a defined foundational perspective prevents HL from becoming a mature logistics discipline in its own right (Richey et al., 2022).

Consultations with several eminent academics, both within and outside the field, confirmed the need to redefine HL. For example, one academic stated that "times are changing rapidly; the definition of HL needs reconceptualization," and another noted that "the time has

come when the definition of HL should be reconsidered, as we have witnessed several changes in the past decade, which provide strong motivation to revisit the operational definition." Practitioners have also confirmed the importance of revising the definition of HL. Some of the most prominent logisticians in the sector agreed about the "need for a review of this term" and that "HL does need a fresh approach and thinking." Practitioners likewise considered the redefinition as "timely" and shared that it is "very necessary to work on this," as it is "a significant step in the right direction." Appendix A: Data S1 provides a full list of the (unsolicited) supporting statements we received from academics and practitioners during the data collection process. This need was further confirmed by a group of practitioners during the United Nations Logistics Cluster Global Meeting in October 2021—the most important practitioner event for humanitarian logisticians. In this meeting, we presented our work, and many practitioners shared their views regarding issues they had with the current definition. For example, one insisted on the need for a "headline that falls in line with a global logistics definition, but contextualized" to highlight what is unique about the humanitarian sector.

In light of this need and strong support from academics and practitioners, we revisited and revised the HL definition following a multistep research approach. First, we conducted a structured literature review to identify the HL definition(s) most frequently used in the academic literature. Then, we identified five dimensions that are useful for distinguishing between what is within or outside HL boundaries and discussed how previous definitions have generally failed to propose clear boundaries. Next, we conducted an empirical study with an expert panel of practitioners and top academics—ones who have laid down the HL knowledge base over the past 20 years—to develop and validate an updated foundational perspective of HL. Finally, we analyzed the data collected from experts using the literature on what comprises a good definition. This led us to propose a revised definition of HL and its accompanying properties.

Our article contributes to theory and practice in several ways. First, a clear definition facilitates the development of the HL discipline and guides future research. It provides a starting point for future research that is built upon consensus among academics and practitioners. Second, it clarifies the unique and accompanying properties of HL and helps to differentiate the field of HL from other fields. Third, it contributes to practice by clarifying the roles and functions of HL departments in IHOs. Finally, it brings clarity to the stakeholders who carry out HL.

HL DEFINITIONS: A STRUCTURED LITERATURE REVIEW

Background to HL and the humanitarian context

HL is carried out within the international humanitarian system, which represents “the network of interconnected institutional and operational entities through which humanitarian action is undertaken when local and national resources are, on their own, insufficient to meet the needs of a population in crisis” (ALNAP, 2022, p. 22). A cornerstone of this system, shaped from the mid-19th century onward (Barnett, 2013; Davey et al., 2013), is *humanitarian action*, the objective of which is “to save lives, alleviate suffering and maintain human dignity during and in the aftermath of crises, as well as to prevent and strengthen preparedness for the occurrence of such situations” (GHD, 2024, Principle 1).

The term *humanitarian logistics* originates from humanitarian organizations. In particular, it was mentioned in a news release after a workshop hosted by the World Health Organization in 2001 (WHO, 2001). However, the activities involved date back to World War I and the years that followed when newly formed humanitarian organizations worked to help civil populations (e.g., the American Relief Administration providing relief during the Russian famine from 1921 to 1922). Toward the end of the 1900s, the terms used included “logistics in relief operations” (Kemball-Cook & Stephenson, 1984), “relief supply operations” (Knott, 1987), and “relief logistics” (United Nations Development Programme [UNDP], 1993). The first article published in an academic logistics outlet (*Journal of Business Logistics*) was Long and Wood's (1995) “The Logistics of Famine Relief,” though they did not use the term “humanitarian logistics” in that article.

HL emerged as an academic field in 2005, with some of the most seminal papers written by authors, such as Altay and Green (2006), Van Wassenhove (2006), and Kovács and Spens (2007). This period coincided with the

development of the first definitions of HL. Our article does not describe the evolution of the HL literature stream; instead, we refer the interested reader to a number of review papers that focus on the early development of the field (see, e.g., Kunz & Reiner, 2012; Leiras et al., 2014; Overstreet et al., 2011). Since then, several reviews have focused on the subareas of HL, including performance management, sustainability, inventory management, and standards (see, e.g., Anjomshoae et al., 2022, 2023; Balcik et al., 2016; Banomyong et al., 2019; Paciarotti et al., 2021).

Identifying the most commonly used HL definitions

To identify the most commonly used definitions of HL and collect important attributes of HL from currently available definitions (Podsakoff et al., 2016), we began our research by conducting a structured literature review of published papers. First, we created a set of well-defined keywords and Boolean operators developed by two researchers after an initial analysis of the relevant papers (Table 1). To account for the fact that some authors have used the term *humanitarian supply chain* (HSC) as equivalent to HL, we included keywords relevant to both terms. The two researchers refined these keywords through an iterative process to ensure the inclusion of all relevant combinations of words and to identify a large sample of papers citing a definition.

We used these keywords to identify papers of interest from a broad selection of reputable journals. Given our focus on keywords occurring within the text, we selected databases that allowed us to search the full text of the article (i.e., not only the title, keywords, and abstract). We used the ABI/INFORM database and all other major publisher databases (Science Direct, Emerald, Springer, Wiley, and Taylor and Francis). After removing duplicate papers found in multiple databases, our process resulted in 54 papers (51 citing definitions of HL and three citing definitions of HSC) published in 31 journals between

TABLE 1 Keywords for the identification of papers that mention a definition of HL or HSC.

Definition	Keyword combinations
Humanitarian logistics (HL)	“humanitarian logistics is defined” OR “define humanitarian logistics” OR “defines humanitarian logistics” OR “defined humanitarian logistics” OR “defining humanitarian logistics” OR “definition of humanitarian logistics”
Humanitarian supply chains (HSC)	“humanitarian supply chain management is defined” OR “define humanitarian supply chain” OR “defines humanitarian supply chain” OR “defined humanitarian supply chain” OR “defining humanitarian supply chain” OR “definition of humanitarian supply chain” OR “define humanitarian relief supply chain” OR “defines humanitarian relief supply chain” OR “defined humanitarian relief supply chain” OR “defining humanitarian relief supply chain” OR “definition of humanitarian relief supply chain”

TABLE 2 The most commonly cited definitions of HL^a in the literature.

References	Definition	# refs (%)
Thomas and Kopczak (2005)	“Humanitarian logistics is defined as the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people. The function encompasses a range of activities, including preparedness, planning, procurement, transport, warehousing, tracking and tracing, and customs clearance.” (p. 2)	26 (47%)
Thomas and Mizushima (2005)	“Humanitarian logistics is defined as the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary’s requirements.” (p. 60)	16 (29%)
Van Wassenhove (2006)	“Essentially for humanitarians, logistics is the processes and systems involved in mobilizing people, resources, skills and knowledge to help vulnerable people affected by disaster.” (p. 476)	8 (15%)
	Various other (authors’ own) definitions	5 (9%)

Note: While there were 51 papers citing definitions of HL; # references add up to more than 51 because some papers cited multiple definitions.

^aIn addition to these papers, three papers used definitions of HSC. Of these, two used their authors’ own definitions and one paraphrased Thomas and Mizushima (2005).

2009 and 2020.¹ The size of this selection was consistent with Ketchen and Craighead’s (2023) suggestion.

After downloading the full texts of these 54 papers, we used the content analysis software NVivo to automatically code the definitions in each paper, following the process described in Kunz (2019). NVivo is a content analysis tool that facilitates the extraction of qualitative and quantitative information for unstructured texts. To ensure that NVivo recognized all sentences citing definitions, we added several typographical variations of the keywords presented in Table 1 (e.g., the ligature for “fi”). We also added a proximity search criterion to include all instances in which keywords related to “definition” were found within six words of the keywords “humanitarian” or “logistics.” Table A.2 in Appendix B: Data S1 shows the exact search terms used for the NVivo coding process.

The automated coding assigned the codes “Define HL” and “Define HSC” to all instances of definitions in the 54 papers selected. This step allowed us to identify and quickly retrieve each instance of an HL or HSC definition in all papers. After coding, we conducted a manual analysis of each coded sentence in each paper to verify that it was indeed a definition of HL or HSC. Next, we compiled the definitions used in each paper in an Excel file. While most papers used only one definition, a few used two definitions; in these cases, we collected both definitions. We conducted manual verification of all definitions cited,

and whenever we found a new definition, we searched for it in the source document and added it to our list of commonly used definitions. In some instances, we did not find the definition in the cited source document; thus, we classified these cases as “authors’ own definitions.” In other cases, the definition was paraphrased from an existing definition (without quoting it); we also classified these cases as “authors’ own definition.” We followed the same process for the definitions of HSC.

Through this structured literature review process, we identified three commonly used HL definitions. These definitions are found in Thomas and Mizushima (2005), Thomas and Kopczak (2005), and Van Wassenhove (2006), as shown in Table 2 (the list of all papers using each definition is provided in Appendix C, Table A.3: Data S1). Together, these definitions accounted for 91% of all definitions cited in our selection of papers, thereby indicating the predominance of three 18-year-old definitions in the literature. Five papers used their own definitions of HL.

The definitions provided by Thomas and Kopczak (2005) and Thomas and Mizushima (2005) originate from the same source: the Fritz Institute, a non-profit organization that aims to facilitate the adoption of best practices from logistics and supply chain management (SCM) for disaster response and recovery. The Fritz Institute developed this definition based on discussions with academics and practitioners from the private and humanitarian sectors (Thomas & Mizushima, 2005), as well as on a survey of humanitarian logisticians (Thomas & Kopczak, 2005). The two definitions differ in their wording of the purpose of HL. In particular, Thomas and Kopczak (2005, p. 2) defined the purpose of HL as

¹We did not restrict the time horizon of our literature search. This short time frame was consistent with the fact that humanitarian logistics developed as an academic discipline that used this term starting in 2006.

“alleviating the suffering of vulnerable people” (p. 2), whereas Thomas and Mizushima (2005, p. 60) viewed the purpose of HL as “meeting the end beneficiary’s requirements” (p. 60). Thomas and Kopczak (2005) also provided a list of typical activities included in HL functions.

The other commonly cited definition was proposed by Van Wassenhove (2006). This seminal piece is the most cited paper in the HL academic literature and has inspired many scholars to embrace this field. Van Wassenhove (2006) cited Thomas and Mizushima’s (2005) definition and then added his own interpretation of HL by adding the term “systems.” Van Wassenhove (2006, p. 476) also described the purpose of HL as “helping vulnerable people affected by disasters.” The five remaining definitions were developed by the respective authors of these papers, but were not cited by others.

REVISITING THE HL DEFINITION

Thomas and Kopczak (2005), Thomas and Mizushima (2005), and Van Wassenhove (2006) proposed the most commonly used HL definitions nearly 20 years ago. Since then, the scope of HL activities and objectives has expanded, thus justifying the need to revisit and potentially revise the definition of HL.

To further clarify the term, we analyzed it in three steps. First, we investigated different views on what lies within versus outside HL boundaries vis-à-vis its related areas of business logistics and disaster management. Second, we examined various interpretations and definitions of the term “humanitarian.” Third, we reviewed examples of trends that have changed the nature of activities, stakeholders, and objectives and thereby have the potential to supersede previous definitions.

Different views on what is within versus outside the boundaries of HL

At present, HL has become the overarching label for this research discipline and is widely used and accepted in the research community. Numerous papers have highlighted the difference between HL and business logistics, often focusing on the context of disasters involving complex operating conditions and destabilized infrastructure, lack of resources, budget uncertainty, ill-defined problems, and large and disconnected supply networks (see, e.g., Gralla et al., 2016; Van Wassenhove, 2006). In addition, the HL literature often discusses the disaster management cycle, which consists of mitigation, preparedness, response, and recovery activities (Carter, 1991). HL papers also highlight the diversity of stakeholders engaged in humanitarian

operations, including IHOs,² national and local nongovernmental organizations (NGOs), civil society organizations, donors, the private sector, the local community, foreign and host governments, and the military (e.g., Gabler et al., 2017; Kovács & Spens, 2007; Kovács & Tatham, 2009; Swanson & Smith, 2013). Nevertheless, there is an implicit assumption that, beyond context-specific characteristics and stakeholders, logistics in the humanitarian context is still logistics. Hence, the different activities that comprise logistics as a function (Lambert et al., 1998) are found in the humanitarian sector. Humanitarian organizations procure, transport, store, handle, and distribute goods as any commercial company would, but within a context characterized by specific constraints.

HL can also be compared to other areas of logistics, such as the logistics of assisting people in the aftermath of a disaster (henceforth referred to as “disaster logistics”³; e.g., Kelly, 1995). Examples include disasters in which the national/local authorities and other national/local stakeholders (e.g., local firms and local NGOs) are the sole providers of relief aid. Some papers mix the terms *humanitarian logistics* and *disaster logistics*, implying that they may be the same (e.g., Das, 2018; Manopiniwes & Irohara, 2017). Other papers suggest that there is a difference—albeit one that is rarely explicitly stated. For example, Holguín-Veras et al. (2016) proposed that disaster logistics is a broader concept that includes HL, stating that “DRL [disaster response logistics] includes all logistical activities, humanitarian or not, dealing with disaster response” (p. 35). Wilson et al. (2018) pointed to a distinction that concerns the country in which the disaster occurs, arguing that “Humanitarian logistics is usually examined from a low/middle-income country perspective, yet an efficient and effective disaster response is no less important for developed economies” (p. 107). Another possible distinction lies with the involvement of donors (Toyasaki & Wakolbinger, 2019). HL literature emphasizes their importance and the fact that they “provide the bulk of funding for major relief activities” (Kovács & Spens, 2007, p. 107). Moreover, HL research, while highlighting the range of stakeholders involved in disaster

²In the term IHO, we include international multilateral organizations (e.g., UN agencies), international NGOs, and organizations that are part of the Red Cross movement (i.e., International Committee of the Red Cross and International Federation of the Red Cross and Red Crescent Societies).

³We decided to use the word *disaster*, though it may be considered a close synonym of other related terms such as *emergency* and *crisis*. There is confusion in the literature concerning the definition and use of these terms, and no commonly accepted distinctions are available (Staupe-Delgado & Kruke, 2018).

relief operations, mostly uses (donation-driven) IHOs as the unit of analysis (Vega, 2018). This stands in contrast to disaster logistics papers that often focus on postdisaster logistics activities performed by national/local governments in their own territories, or those that occur in countries that are often large donors themselves. Similar terms, such as *emergency logistics* or *response logistics*, are sometimes used instead of disaster logistics (e.g., Caunhye et al., 2012; Tatham et al., 2012).

Various interpretations and definitions of the term *humanitarian*

To shed further light on the matter, we reviewed the term *humanitarian*, which has various interpretations and definitions. The concept of “humanitarianism” has been present throughout human history and has evolved following historical events. Barnett (2013) identified three eras of humanitarianism: imperial (early 19th century–World War II), neo-humanitarianism (World War II–end of the Cold War), and liberal (end of the Cold War–present). However, the beliefs and philosophies behind this concept can be traced back hundreds of years, from the laws and acceptable conduct of war stated in Sun Tzu’s *The Art of War* to Christian ideas of charity and the Islamic duty of *Zakat* (Davey et al., 2013).

The breadth of the term *humanitarian*, which is largely based on a Western-centric interpretation of humanitarianism (Caballero-Anthony et al., 2021; Frennesson et al., 2022), is highlighted in a report by Bennett et al. (2016), which stated that “the terminology and concepts of humanitarianism have always had a number of meanings, requiring a range of terms applied to a spectrum of different agendas” (p. 46). Bennett et al. (2016) classified these into three interpretations. First, *humanitarianism* can be seen as a broad concept referring to the desire to make aid available to those in need. For example, the Independent Bureau for Humanitarian Issues (IBHI) defined humanitarianism as “a basic orientation towards the interests and welfare of people” (IBHI, 2022). Second, the term *humanitarian* can be defined by emphasizing the difference between humanitarian and development aid. This interpretation is narrower than the first, as it limits humanitarian work to short-term disaster response rather than the long-term mitigation activities typically pursued in development aid. The third interpretation of *humanitarian* concerns the necessity of complying with humanitarian principles (i.e., humanity, impartiality, neutrality, and independence). Based on this interpretation, any form of aid, assistance, or action not aligned with these principles cannot be called “humanitarian,” but is merely “relief aid.”

Examples of trends that changed the nature of HL activities, stakeholders, and objectives

In this subsection, we reviewed literature that highlighted trends that have changed the nature of HL activities, stakeholders, and objectives and thereby have the potential to supersede previous definitions. Some of these trends first appeared in the context of development programs and were gradually implemented in HL.

First, the increased use of cash and voucher programs requires organizing, managing, and supporting cash deliveries to people in need (Heaslip et al., 2018; Kovács, 2014). In contrast to the traditional supply-driven approach, in which supplies are transported to an area in need and then distributed to locally identified recipients, this approach follows a pull philosophy in which affected populations become stakeholders who decide which products they want to buy with the received cash or vouchers. Thus, rather than delivering goods to affected populations, humanitarian organizations handle financial flows and ensure that the local supply chains are reliable and robust to avoid disruptions (CALP, 2020; Development Initiatives, 2022). New technologies, such as blockchains, have been used to manage these flows (Treiblmaier & Rejeb, 2023).

Second, HL has increasingly involved commercial logistics service providers (LSPs) that offer traditional logistics services, value-added services (e.g., fleet management, customs clearance, kitting, labeling, and reporting), and specialized activities (e.g., managing prepositioned stock, needs assessment, aircraft scheduling, and training) to match the needs of HL (Gil & McNeil, 2015; Vega & Roussat, 2015). Furthermore, LSPs provide support for local capacity building, in line with the idea of shifting from a product-based paradigm (i.e., delivering tangible relief items) to a service perspective in the humanitarian sector (Heaslip, 2013; Kovács, 2014). Related national and local stakeholders receive more attention, as IHOs and donors have committed to several initiatives for localization (i.e., the empowerment of national and local actors in humanitarian assistance). As discussed by Frennesson et al. (2021), localization initiatives require the stronger involvement of communities, local humanitarian organizations, and companies, with IHOs playing a much more limited role on the ground.

Finally, humanitarian organizations have been pushed to develop sustainable solutions to reduce their environmental impact (Besiou & Van Wassenhove, 2020; Haavisto & Kovács, 2014). The transportation of goods, which (still) represents a major component of HL, consumes fossil fuels and generates carbon emissions and waste (Kunz & Gold, 2017). To reduce these impacts, HL research suggests an increased emphasis on preparedness, such as

the repositioning of inventories and reduced use of air freight (Jahre et al., 2016) and the use of life-cycle assessment tools (van Kempen et al., 2017).

The need for an updated definition of HL

To summarize the analysis, we structured it into five dimensions that are useful for distinguishing between what is within versus outside HL boundaries. In this case, HL boundaries could be set by defining (i) what activities are within/outside of HL (activity-based view), (ii) the characteristics of the event to which these activities respond (context/event-based view), (iii) the stage of the disaster management cycle in which these activities fall (temporal view), (iv) the stakeholders that perform these activities (stakeholder-based view), and (v) the intentions with which these activities are performed (intention-based view).

While at this point we did not claim which dimensions should/should not be covered by the HL definition, we only observed that previous definitions generally failed to propose clear boundaries. First, they did not reflect that HL activities and stakeholders have changed over the years. This leads to a follow-up question as to whether specific activities and stakeholders should really be part of the definition (because they will likely change over time). Second, previous definitions have not outlined the specific disaster context that characterizes the uniqueness of HL. Third, they neither addressed the temporal view nor the stakeholder-based view. Furthermore, they failed to specify the meaning of the term “humanitarian.” This created ambiguity that may have led researchers to misuse the term (Komatsu, 1992). We also noted that certain terms were questioned. For example, while “vulnerable people” was acknowledged as a concept, it was criticized for its use as a label that tended to emphasize perceived weakness, passivity, and dependency rather than strength, capacity, and autonomy (Fawcett, 2009; Kelman, 2020; Le Dé & Gaillard, 2022). This term may also point to a gap between rich donor countries and poor, vulnerable countries in need of assistance (Bankoff, 2001; Gaillard, 2010).

Our review also indicated that the old definitions were not optimal from the beginning, regardless of how context has changed over the last 15 years. A good conceptual definition should, according to Podsakoff et al. (2016), “identify the set of fundamental characteristics or key attributes that are common (and potentially unique) to the phenomenon of interest” (p. 165). A good definition should also avoid contradictions (Gerring, 1999), be parsimonious (Suddaby, 2010), and place boundaries that clearly define what is included and what is not (Yaniv, 2011).

METHODOLOGY

To identify the HL attributes (henceforth referred to as “properties”; see Gerring, 1999) to be considered for a revised definition, we conducted an expert elicitation study. According to Podsakoff et al. (2016), expert elicitation is particularly effective for identifying the key properties of a concept. It also involves “successive questioning of the individual experts, without face-to-face confrontation” (Helmer, 1964, p. 3) to achieve convergence of opinions. As such, it is a consensus method that mirrors the key steps of the Delphi technique (Hasson et al., 2000). Expert elicitation has been used to reach consensus on definitions in various disciplines, such as climate change or cyber security (e.g., Cains et al., 2022; de Franca Doria et al., 2009). A typical setup includes an initial question or questionnaire and multiple rounds between the facilitator(s) and the experts (Hemming et al., 2018). Consensus is achieved after two to four rounds, and it is suggested that the level of consensus should lie between 51% and 80% (Hasson et al., 2000).

In our case, expert elicitation was more appropriate (compared to a purely historical literature review) because it allowed us to collect the opinions of the most relevant experts regarding the research on and practice of HL and combine their views to extract a consensus from the community. As a result, our definition was not only strongly grounded in theory, but also in the actual practice of HL. This unique approach of gathering feedback directly from the experts who have shaped the discipline over the last 20 years also limited the risk of our own biases in reading and interpreting scattered literature influencing the revised definition.

Expert panel selection

First, we established an expert panel. In particular, we used purposive sampling (Patton, 2002) to identify and select individuals who were notably knowledgeable about the phenomenon under study (Creswell & Plano Clark, 2017). Cooke and Goossens (2004) suggested collecting information from as many experts as possible, with the minimum number set at four. Following the criteria suggested by Cooke and Goossens (2004), we selected academic experts based on their overall publication impact (i.e., number of citations in Google Scholar, overall, and in the field of HL), the number of HL papers published, and their overall contribution to the field of HL in recent years (see detailed selection process in Appendix D: Data S1). This process led to the development of a list of 19 of the world's top scholars, who have made substantial contributions to and formed the knowledge base of the field of HL as we know it today.

Although conceptualizing a definition is primarily the responsibility of academics, we also included practitioners in our elicitation process to allow us to “make connections to current and future challenges in practice” (Ketchen & Craighead, 2023, p. 167) and ensure that the new HL definition is relevant for practice. Doing so allowed for extending academic knowledge to practitioners (Suddaby, 2010) and helped them claim authority and responsibility over the right functions and processes (Stock & Boyer, 2009). For these reasons, previous definitions presented in past papers also relied on experts from academia and practitioners to conceptualize definitions (e.g., the definition of SCM by Stock & Boyer, 2009).

As it was not possible to use quantitative criteria to identify practitioners, we used a set of qualitative criteria to ensure the proper representativeness of the expert panel. Specifically, we selected a variety of major humanitarian organizations spanning different mandates, geographic areas, and types to ensure a balanced mix of representative organizations (e.g., the UN, NGOs, and Red Cross). This purposeful sampling (Patton, 2002) ensured that a variety of perspectives on HL were considered. We also focused on organizations that carry out or oversee the distribution of supplies in humanitarian crises (as evidenced by their websites). Within these organizations, we selected the highest level staff who were active in HL work with at least 5 years of experience in this field (see detailed selection criteria in Appendix E: Data S1). To ensure that we collected a comprehensive view of HL, our selection process included practitioners with a strong managerial understanding and technical expertise on the topic (Durach et al., 2021). We invited these individuals to participate in our study, which led to a list of 23 experts in HL practice.

Initial revision of the HL definition

In their expert elicitation process, de Franca Doria et al. (2009) found that experts needed an initial definition to start the process. For this study, the authors met several times to develop an initial revision of the definition of HL through conceptual reasoning based on the predominantly used definition (Thomas & Kopczak, 2005) and different views on what is within versus outside the boundaries of HL (See Definition 1, Appendix F: Data S1).

First round of elicitation: Email consultation

Members of the expert panel were contacted by email, which provided a short introduction explaining the purpose, methods, and rationale for our new definition (Appendix G:

TABLE 3 Most common recommendations of expert panels after email consultation.

Recommendations	% Academics	% Practitioners
1. Add more activities	31	62
2. Less focus on nonprofit organizations	38	46
3. More emphasis on affected populations	44	31
4. Less focus on donations	25	46
5. Add SCM	19	54
6. Add phases of disasters	50	8
7. Add development aid	38	23
8. Add actors (less focus on NGOs)	31	31
9. Add volunteers	13	0

Note: $N_{\text{academics}} = 16$, $N_{\text{practitioners}} = 13$.

Data S1). In the email, we asked a limited number of clear questions (Cooke & Goossens, 2004): (1) Do you agree with the revised definition? (2) Is there anything in the definition that you disagree with? and (3) Is there anything missing in the revised definition? These questions were purposely formulated to encourage open feedback from experts. We received feedback from 16 academic and 13 practitioner experts out of the 42 experts we contacted. This number is consistent with other studies using expert elicitation (de Franca Doria et al., 2009) and is above the threshold recommended by Cooke and Goossens (2004).

We saved the answers and analyzed them using Atlas.ti, a qualitative content analysis tool. We followed an inductive coding process (Mayring, 2000), in which one author created codes while reading through the material. After this first coding round, the author refined the codes until we obtained a set of nine unique codes representing the most common suggestions for changes to the definition. During the coding, the relevance of each comment was assessed based on the proportion of experts who mentioned it and the level of agreement among the experts (de Franca Doria et al., 2009). The other authors then read all the answers and validated the coding. The codes are listed in Tables 3 and 4, respectively (See Results section). From these, we analyzed the inputs and the most common recommendations from experts and developed a revised definition (Definition 2, see Appendix H: Data S1).

Second round elicitation: Validation questionnaire

For the second step, we used a questionnaire to validate our changes (see Online Appendix I: Data S1). The format

TABLE 4 Validation from the expert panel as to how well the final version of the definition addressed the issues identified in the first round.

How well did we address the following issues identified in the first round?	Agree (%)	Somewhat agree (%)	Somewhat disagree (%)	Disagree (%)	N/A (%)
Q0.1 Definition too long	89	5	5	0	0
Q0.2 Contextual description exhaustive enough	68	26	5	0	0
Q1. Add more activities	84	11	0	0	5
Q2. Less focus on nonprofit organizations	63	32	5	0	0
Q3. More emphasis on affected populations	74	21	5	0	0
Q4. Less focus on donations	63	26	5	0	5
Q5. Add SCM	53	32	5	5	5
Q6. Add phases of disasters	68	21	5	0	5
Q7. Add development aid	63	21	5	5	5
Q8. Add governments as actors	79	0	5	11	5
Q9. Add volunteers	68	21	5	0	5
Average over all questions	90		7		3

Note: $N_{\text{academics}} = 12$, $N_{\text{practitioners}} = 7$.

was ideal because it allowed us to present the changes in writing and then measure the level of agreement using a 4-point Likert scale (agree, somewhat agree, somewhat disagree, and disagree), where the neutral response was purposely omitted (Ilic et al., 2017). We also provided the respondents with the opportunity to add open comments or suggestions for each question.

RESULTS

First round of elicitation

Table 3 presents the most common recommendations we received from our expert panel after the initial email consultation.

A large proportion of academics (50% of academics and 8% of practitioners) recommended including more phases of disasters (in particular, preparedness and recovery). Meanwhile, more practitioners suggested including more activities in the definition (62% of practitioners and 31% of academics) and extending it to SCM (54% of practitioners and 19% of academics). The nuances in the responses from both groups suggest that academics emphasize the theoretical framing of the definition, while practitioners are more focused on the operational perspective and actual activities involved in HL. Similarly, a large proportion of practitioners (46%) suggested removing the focus on donations that we incorporated into the definition, while only 25% of academics recommended this change. This difference may be explained by the fact that practitioners, more than academics, see the need for funding HL through sources

other than donations (e.g., government operations and private sector collaborations). We observed similar nuances in opinions, sometimes even contradictions, within each group. It was obviously not possible to implement all the suggestions in the definition. Although we tried to incorporate as many as possible (Table 3), integrating all recommendations would have led to a revised definition that would have become too lengthy to be deemed useful. Thus, to address this issue, we split the definition into a short generic definition and a longer contextual description that details the accompanying properties of HL.

Second round of elicitation

In the second-round questionnaire, the first two questions (Q0.1 and Q0.2) tested whether splitting the definition achieved our intended goals of shortening the definition while providing an exhaustive contextual description that detailed the accompanying properties of HL. The remaining questions tested whether the changes made in the previous round addressed the respondents' concerns. Table 4 shows the experts' responses to how well our final definition addressed the initial issues identified by the panel in the first round.

These results show that the experts' (academics and practitioners) agreement with our modifications generally increased compared with the previous round. Overall, we reached 90% agreement on the changes we suggested, providing us with a foundational perspective and a final set of properties to be considered for the revised definition of HL (proportion of "Agree" and "Somewhat agree," measured

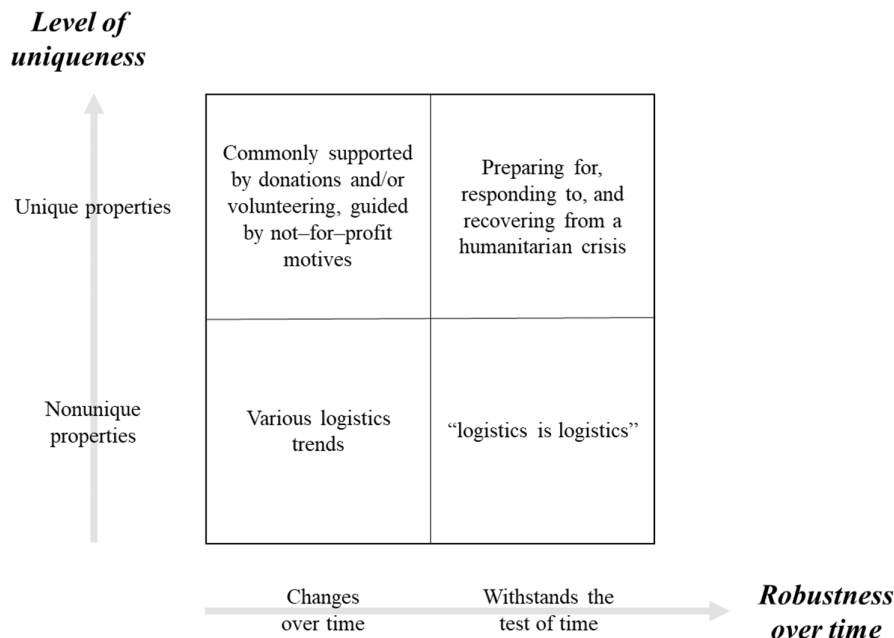


FIGURE 1 Categorization of properties to be considered for the definition of humanitarian logistics (HL).

as the average over all questions). We considered this to be a strong validation, as it was above the minimum levels of consensus (51% and 80%) recommended by Hasson et al. (2000).

TOWARD A NEW DEFINITION OF HL

Next, we analyzed the set of HL properties gathered from the expert panel based on what constitutes a good definition (Podsakoff et al., 2016). This led us to divide the properties into four categories (Figure 1): (1) properties that are unique, set the boundaries for HL (compared with other related areas) and are not likely to change over time (these should be included in the revised definition); (2) properties that are unique for HL but will change over time (“accompanying properties”; Gerring, 1999); (3) properties that will not change over time, but are not unique for HL; and (4) properties that are neither unique nor robust over time. Next, we reviewed and discussed each of these categories.

The new definition: Unique properties not likely to change over time

Based on our analysis, we defined HL as follows:

The logistics and supply chain management focusing on the preparation for, response to, and recovery from a humanitarian crisis, with

the aim of saving lives and alleviating the suffering of affected populations.

This short definition meets the well-recognized criteria for a good definition (Gerring, 1999; Podsakoff et al., 2016; Suddaby, 2010; Yaniv, 2011). In particular, it avoids tautology, circularity, and contradictions while parsimoniously capturing the essential properties and providing the boundaries of HL (i.e., what is included and what is excluded). This short definition also updates key terms, such as affected populations, to reflect current terminology about the recipients of aid (Alexander, 2022). There are several important aspects that deserve to be highlighted.

First, several respondents from the groups of academics and practitioners suggested that HL exceeded logistics. One example is the inclusion of sourcing and supplier management, which is widely recognized as an SCM construct. As one panel expert commented:

[I] still think this is an issue as logistics does not cover procurement, and whilst I understand the comments on a well-established term, we also refer to it as “humanitarian procurement” and “logistics” to ensure all factors are included. For example, the Global Logs Cluster does logistics not procurement.

Another respondent added, “In my terminology, ‘logistics’ is being superseded by ‘supply chain,’ with the latter potentially covering a broader spectrum of tasks as outlined in the longer contextualized version.” A third said, “I understand that ‘logistics’ is the older terminology and that it will take time to change common vocabulary, but we have to start somewhere.”

This is a decades-old debate among logistics and SCM scholars (Larson et al., 2007), which is now also drawing the attention of HL researchers and practitioners. The common understanding is that SCM is a broader concept than logistics, and that it includes processes (e.g., procurement and flow management), management components (e.g., leadership, values, and philosophies), and supply chain structure (e.g., length, number of suppliers, and number of customers; e.g., Cooper et al., 1997). Meanwhile, for several important stakeholders, HL is an established and widely used term that represents both logistics and SCM (e.g., Hanken's HUMLOG Institute, KLU, HELP Joint Center for Humanitarian Logistics and Regional Development [CHORD], and European Civil Protection and Humanitarian Aid Operations [ECHO]'s Humanitarian Logistics Policy). We resolved this by providing a new HL definition that incorporates SCM while recognizing that HL is a subarea of humanitarian SCM (HSCM), thus offering a future pathway for switching the terminology from HL to HSCM.

Second, and in full agreement with the expert panel, we defined HL using the boundary term *humanitarian crisis*. To ensure the broad acceptance of this term, we referred to the United Nation's Inter-Agency Standing Committee (UNIASC), which defines a humanitarian crisis as follows:

A singular event or a series of events in a country or region that cause serious disruption to the functioning of a society, resulting in human, material, or environmental losses, which exceed the ability of affected people to cope using their own resources. (UNIASC, 2015, p. 2)

None of the panel experts raised any issues with the use of this definition.

Third, 50% of the academic panel experts (and 8% of the practitioners) suggested that the focus on the response phase in the previous definitions was too narrow. As one panel expert commented, "The definitions are fairly concentrated on the early stages after a disaster." Another one stated, "I also wonder if HL should include response and preparedness or also, for example, rehabilitation. I feel that most organizations stay for longer, and they also help with rehabilitation." Therefore, in the revised definition, we adopted a disaster cycle perspective by recognizing the preparedness and recovery phases. One respondent reflected on whether *mitigation* should be added to the definition: "I wonder whether the mitigation of future disasters should be mentioned explicitly. Lots of the work that humanitarian organizations do relate to ... help communities mitigate future disasters. Some of these activities are agricultural projects, water

management, etc." We opted not to include mitigation in the definition because it focuses on the likelihood that something will happen and its potential impact (Bullock et al., 2021). In other words, it focuses on the crisis or disaster itself and how to avoid it or reduce its negative effect, rather than how to organize HL in preparing for, responding to, and recovering from the crisis. In the second elicitation round, 90% of the experts agreed with the way we addressed this issue.

Fourth, most second-round respondents (84%) agreed that HL is typically conducted in the context of disaster relief or development assistance. The development versus humanitarian discussion emerged in the first round, in which 38% of the academics and 23% of the practitioners suggested including *development assistance* in the definition. The panel acknowledged that there is a strong connection between development and humanitarian assistance. One respondent stated, "There is significant discussion in the sector that we need to bridge the humanitarian–development gap," and another added, "especially with more protracted crises⁴ in place which are humanitarian but long term." To some extent, such protracted crises, as well as a greater focus on preparedness, blur the lines between development and humanitarian aid. Meanwhile, many respondents argued that development was not part of HL. One respondent said, "Humanitarian crises are not always understood as development," while another added, "Development is on a longer time horizon and often done by other actors, although they should adhere to similar principles for their supply chain."

The discourse on the humanitarian–development nexus is a decades old discussion (Mena & Hilhorst, 2022). We agreed that humanitarian and development activities are being increasingly linked, and this is reflected by our adoption of a disaster cycle perspective (i.e., short- and long-term perspectives) in the definition. However, considering the wider recognition that development aid does not fall under humanitarian aid (cf. Bennett et al., 2016), we refrained from explicitly including the term "development" in the definition. Indeed, while HL focuses primarily on saving lives after a crisis, development places a stronger emphasis on improving people's well-being. According to Mena and Hilhorst (2022, p. 1051), "Traditionally, whereas humanitarian aid is concerned with saving lives and alleviating the suffering of crisis-affected populations [...], development focuses more on medium- to long-term systemic change, seeking improvements in quality of life and well-being" (see Mena & Hilhorst, 2022, table 1, p. 1052, for an elaborated comparison). Although well-being has

⁴A "protracted crisis" refers to a large-scale crisis affecting a significant portion of the population over a prolonged period of time.

been used by some authors in the HL community (e.g., Holguín-Veras et al., 2013; Shaheen et al., 2021), it is not the typical objective of HL.

Accompanying properties of HL

Next, we highlighted properties that are unique to HL but may change over time; we call these *accompanying properties* (Gerring, 1999). Although they are highly relevant to HL, including these properties in the definition would result in endless future revisions. Therefore, we propose the following accompanying properties of HL:

HL is commonly supported by donations and/or volunteering, guided by nonprofit motives, and carried out by various types of national and international organizations, such as communities, volunteer groups, companies, and governments, acting in the spirit of humanitarian principles.

One key property concerns the role of donations, which may come in various forms, including services, goods (often referred to as in-kind), or money. One panel expert commented:

With our current private sector collaboration, we try to move away from philanthropic engagements to more sustainable “shared value” engagements. So, donations have a more traditional ring to it, and [it is] not so forward looking, but of course, humanitarian work is linked closely still to donations.

A related aspect concerns not-for-profit motives. One expert noted that “important actors can have a for-profit motive,” while another suggested, “As it is not always driven by not-for-profit motives, maybe add ‘mainly driven by.’”

The roles and motives of HL stakeholders also deserve attention. One key aspect is the role of affected populations. One panel expert argued, “Affected people are not only stakeholders because they [i.e., affected people] need to receive help. They are also important stakeholders in helping [supporting] the response.” This notion points to a stronger focus on the active role of affected populations. Another critical aspect is the role of governments. Several panel experts suggested including governments as important stakeholders in HL. However, another respondent stated, “The reason why the humanitarian community has to be involved in the first place is often because governments have NOT acted in the spirit of humanitarian principles, so I don’t think these two should be in the same sentence.” Governments indeed create wars, but they still need to consider humanitarian principles in assisting populations. Thus, adding governments as stakeholders in HL

could also lead to a heightened focus on the responsibility of duty bearers to care for their citizens. This discussion also points to the question of how humanitarianism is interpreted. Going beyond the desire to provide aid to those in need (Bennett et al., 2016), our interpretation, which is supported by the empirical data collected from our expert panel, aligns with that of UNOCHA (2008), which emphasizes that HL is carried out in compliance with basic humanitarian principles. We reflected this in our accompanying properties by including the wording “acting in the spirit of humanitarian principles.”

Nonunique properties of HL

Finally, we highlighted properties that are not unique to HL. These properties were compiled based on input provided by the expert panel and were primarily related to specific systems, processes, and activities of HL:

HL includes the sourcing, planning, implementation, and management of flows of products, services, cash, information, staff, and associated resources between the points of origin and points of delivery. Conducted at the strategic, tactical, and operational levels, HL involves a range of systems, processes, and activities, such as procurement, supplier management, transportation, warehousing, inventory management, facility management, asset management, customs clearance, distribution, waste management, and reverse logistics, as well as coordination, forecasting, risk management, market and data analysis, performance measurement, information management, tracking and tracing, reporting, compliance, and quality assurance.

These properties are not unique to HL. In fact, there are multiple overlaps with the definitions of logistics and SCM used by the Council of Supply Chain Management Professionals (CSCMP, 2022). As the panel agreed, the distinction between HL and related areas does not lie in the various activities involved. According to one respondent, “logistics is logistics.” Many of these activities also change over time, along with trends such as localization and the provision of aid using cash and vouchers. Thus, including them in our definition would blur the boundaries of HL and call for frequent revisions. It would also make the definition unbearably long, breaking most of the guidelines for what constitutes a good definition (Gerring, 1999; Podsakoff et al., 2016; Suddaby, 2010; Yaniv, 2011).

Humanitarian Logistics (HL)

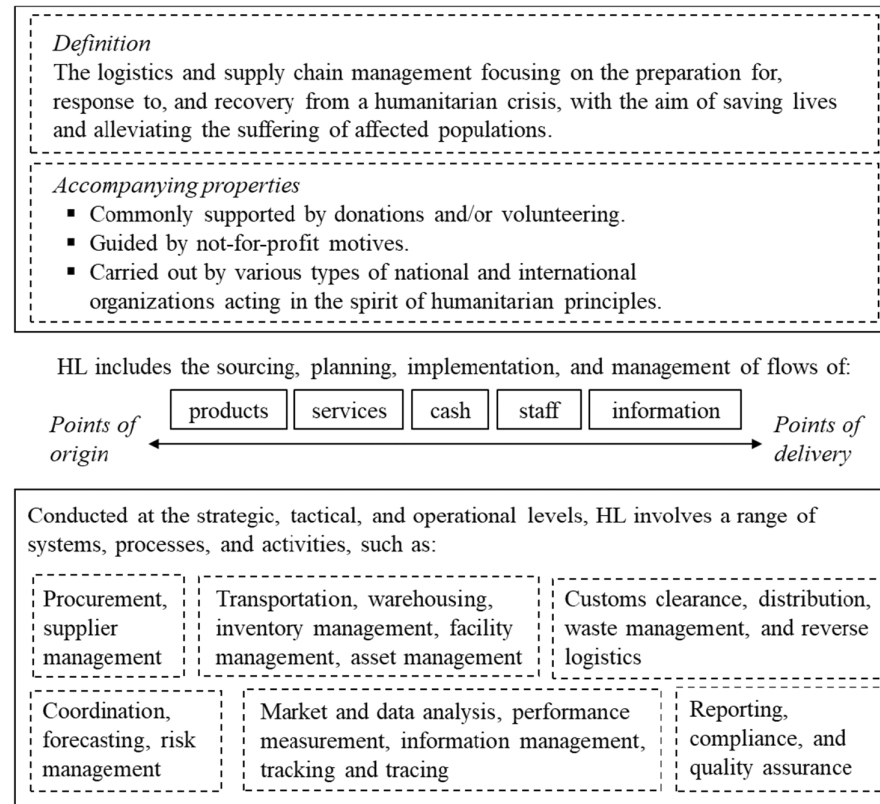


FIGURE 2 Overview of humanitarian logistics (HL) definition and its properties.

CONCLUSION

The purpose of this study was to revisit and revise the definition of HL. We followed a systematic process that combined insights from a structured review of the academic literature and an expert elicitation process with leading researchers and practitioners. Then, we revisited and revised the current definition of HL through an iterative process. This process led to a revised HL definition and the subsequent recognition that HL is a subarea of HSCM that is complemented by accompanying properties (Gerring, 1999), as shown in Figure 2. Following well-recognized criteria for a good definition (Gerring, 1999; Podsakoff et al., 2016; Suddaby, 2010; Yaniv, 2011), the revised definition sets boundaries (necessary and jointly sufficient attributes) that can stand the test of time.

Contributions

The importance of reaching consensus over a revised definition of HL cannot be understated. Given the increased research interest in HL, a clearly defined foundational perspective is of paramount importance for the development of a coherent discipline (Richey et al., 2022). This helps

avoid fragmented knowledge (Podsakoff et al., 2016), increases the understanding of the field's research goals, and clarifies what makes a contribution (Richey et al., 2022). An updated definition also creates a common language for researchers and practitioners to communicate, thereby avoiding the “Tower of Babel” effect (Suddaby, 2010). As such, it unites the field and creates an important foundation for supporting theory building and guiding future research (Stock & Boyer, 2009). Our consensus-based definition provides an agreed-upon starting point for the further development of a sound discipline (Richey et al., 2022) and “energizes” HL as a research stream (Ketchen & Craighead, 2023). Finally, the new definition helps differentiate HL from other disciplines, thereby avoiding misconceptions about what it is and what it is not (Richey et al., 2022; Yaniv, 2011). This is an important clarification and contribution for the logistics and SCM communities.

An updated definition contributes to practice in several ways. First, involving practitioners in the development of the definition makes it relevant for practice (Suddaby, 2010) and bridges the gap between academia and the practitioner community (Hawkins et al., 2022; Kunz et al., 2017; Rynes, 2007). Second, a more structured understanding of the discipline makes it possible

for humanitarian organization executives to claim ownership of a wide range of functions, processes, and activities (Stock & Boyer, 2009). In discussions with practitioners, we found that many humanitarian organizations struggle to determine the role and scope of their logistics and supply chain departments. Thus, our study helps humanitarian organizations structure these departments based on the activities carried out by the HL function (Figure 2). Third, the study provides practitioners with opportunities to develop and implement more effective practices and allows them to benchmark other organizations that view HL in the same way, thus enabling them to compare “apples to apples” (Stock & Boyer, 2009). Finally, our accompanying properties provide clarity about the stakeholders who carry out HL. The increasing role of volunteers, companies, and governments is widely recognized in the community and by most of our experts. However, this role has never been mentioned explicitly in previous definitions. These stakeholders’ contributions can only be considered HL if they act in the spirit of humanitarian principles, and our accompanying properties clarify this notion.

Future research

Our proposed definition should be challenged and tested. Western values and approaches have formed the international humanitarian aid system, as well as current narratives related to it (Davey et al., 2013; Rose et al., 2013). This potential bias represents a possible limitation of this study; thus, future research should account for other perspectives, particularly those of the Global South and emerging Asian countries. Furthermore, with regard to the convergence between humanitarian aid and development assistance, the inclusivity approach is gaining traction. For instance, Bennett et al. (2016) stated that “the vast majority of humanitarian organizations accept a wider interpretation of their life-saving remit that includes addressing the causes of crises (chronic poverty, increased vulnerability, loss of livelihoods) as well as their effects (war, disease, hunger, displacement)” (p. 49). However, the humanitarian sector still debates the humanitarian–development nexus, with some arguing for the importance of separating humanitarian and development work (e.g., DuBois, 2018). Critical voices argue that humanitarian work and tools are not fit to handle protracted crises and that applying emergency response approaches in protracted crises risks undermining institutional recovery (Hilhorst, 2018).

This lack of consensus points to important directions for future research. One is that the accompanying properties of HL, over time, may need to be revisited and revised to mirror current policies and account for new trends concerning the humanitarian–development nexus, such as

including a focus on the well-being of affected populations. On a related note, we call upon researchers to propose a separate term (and corresponding definition) for the logistics and SCM of development aid. This definition would likely have much in common with the definition of HL, but using a separate term helps define clear boundaries. There is a similar need for more research on the nexus itself. As Hinds (2015, p. 4) stated:

A central challenge in conceptualizing the humanitarian-development nexus is a lack of clarity in concepts and definitions ... There is often a lack of clarity in what the humanitarian-development problem is, which can have practical implications for connecting the two approaches.

Our definition of HL is the first step in this endeavor.

Aside from the above, our article opens up several other avenues for future research. First, the role of affected populations in HL could be further studied, along with the related trend of localization, to empower national and local stakeholders in providing humanitarian aid (Frennesson et al., 2022). Although donors push for more localization in humanitarian aid, there is still limited evidence of its successful implementation in practice and research. Second, sustainability and circularity are gaining traction, and several studies have focused on these topics in recent years. However, there remains a lack of specific metrics and tools for HL, and humanitarian organizations need more guidance in these areas. Third, the increasing role of commercial companies in HL also calls for a new research stream. While some work has been done in this area, there is a need for further research to identify opportunities for these companies to learn from and become fully involved in HL. This goes both ways, as HL can also learn from pioneering businesses on the frontline of implementing new practices and technologies. On a related note, with an increasingly uncertain environment (e.g., the COVID-19 pandemic, climate change, raw material shortages, and tensions/conflicts within and between countries) and the rising number of supply chain disruptions, companies can draw on many of the insights from HL theory and humanitarian organizations’ experiences and insights. This points to important research avenues in terms of further exploring how HL and related areas, such as business logistics and disaster management, can learn from each other to better tackle the challenges of tomorrow.

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ORCID

Joakim Kembro  <https://orcid.org/0000-0002-0705-3987>

Nathan Kunz  <https://orcid.org/0000-0003-2631-6401>

Lina Frennsson  <https://orcid.org/0000-0002-4983-7878>

[org/0000-0002-4983-7878](https://orcid.org/0000-0002-4983-7878)

Diego Vega  <https://orcid.org/0000-0002-5273-2460>

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AUTHOR BIOGRAPHIES

Joakim Kembro is an Associate Professor, awarded the distinction of Excellent Teaching Practitioner at Lund University, Sweden. Prior to joining academia, he worked as a logistician in various positions with the United Nations. His research interests include humanitarian logistics, retail logistics, warehouse operations, information sharing and circular economy. Joakim has received multiple Emerald Awards as well as the Bernard J. LaLonde best paper runner-up award. His research has appeared in *Journal of Business Logistics*, *Journal of Operations Management*, *Production and Operations Management*, *Journal of Supply Chain Management*, and others. He serves as Senior Associate Editor at *International Journal of Physical Distribution and Logistics Management* and supports *Journal of Business Logistics* in the role as Senior Editor.

Nathan Kunz is a Professor at the Bern University of Applied Sciences, Switzerland and Faculty Fellow at the Crowley Center for Transportation and Logistics, University of North Florida. He holds a Ph.D. in Operations Management from the University of Neuchâtel (Switzerland) and a Master of Science in International Business Development from the

same university. His undergraduate degree was in Engineering (Automotive Technology). Previously, he worked at the University of North Florida (USA), the INSEAD Humanitarian Research Group (France) and the Digger Foundation (Switzerland). Nathan's research focuses on humanitarian operations and sustainability in global supply chains. His research has been published in leading OM journals.

Lina Frennesson is a Ph.D. student at Lund University, specializing in humanitarian logistics. Her research focuses on the area of localization, with a particular emphasis on logistics preparedness and strategies for empowering local actors in humanitarian aid. This research has so far been published in two papers. In addition to her research, Lina is responsible for teaching a master's course in humanitarian logistics at Lund University.

Diego Vega is Associate Professor of Supply Chain Management and Social Responsibility, especially Humanitarian Logistics at Hanken School of Economics, Finland and Director of the HUMLOG Institute. He has over 13 years of experience in conducting research in humanitarian logistics with and for international humanitarian organizations, and is the recipient of the American Logistics Aid Network's (ALAN) research and academic contribution award. Some of Diego's recent research projects include the analysis of Swedish and Danish Red Cross supply chains, sustainable closed loop supply chains in the shelter sector, MSF's inter-sectional response to COVID-19 during ongoing operations, and the creation of a common data standard for humanitarian organizations. He is also Associate Editor of the *Journal of Humanitarian Logistics and Supply Chain Management* and the creator of the first humanitarian logistics Massive Open Online Course (MOOC). Diego's research interests include logistics services in humanitarian operations, modularity, sensemaking, and supply chain resilience.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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