Journal of Economics and Administrative Sciences, 24(4): 583-594, 2023
DOI: 10.37880/cumuiibf.1249842

Journal of Economics and Administrative Sciences

| esjournal.cumhuriyet.edu.tr | Founded: 2000 Available online, ISSN: 1303-1279 Publisher: Sivas Cumhuriyet Üniversitesi

Reverse Logistics Practices In Humanitarian Supply Chain Management: A Content Analysis

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Research Article

History

Received: 10/02/2023
Accepted: 18/03/2023

ABSTRACT

In recent years, natural disasters associated with human-induced factors and climate changes have increased. The humanitarian supply chain (HSC) provides a practical and rapid response to these disasters and deals with the destruction that may occur due to disasters. The use of reverse logistics, one of the key supply chain processes for successful supply chain management, is becoming widespread in the supply chain. Its use in HSC is limited. Considering the aim of HSC to create positive effects on the population affected by disasters, it is essential for the sustainability of resources and processes that they adopt reverse logistics practices. In this context, the study aims to analyze the usage area of reverse logistics in HSC operations and show where it can be applied in the future. In line with the purpose of the study, the annual reports and publications of aid organizations operating in Türkiye were analyzed using the content analysis method, and semi-structured interviews were conducted with experts in humanitarian aid organizations. It has been concluded that humanitarian aid organizations know reverse logistics processes, and their application areas are limited, and it is possible to apply them in the future. Adopting reverse logistics processes in humanitarian supply chain management by disaster relief organizations can ensure efficient and cost-effective reuse and recycling of disaster relief supplies.

Keywords: Content Analysis; Humanitarian Supply Chain; Reverse Logistics

İnsani Tedarik Zincirinde Tersine Lojistik Uygulamalari: İçerik Analizi

ÖZ

Son yıllarda insan kaynaklı faktörler ve iklim değişiklikleri ile ilişkilendirilen doğal afetler artış göstermiştir. İnsani tedarik zinciri bu afetlere etkili ve hızlı yanıt verilmesini sağlamakta ve afetlerin sonucunda oluşabilecek tahribatlarla ilgilenmektir. Başarılı bir tedarik zinciri yönetimi için anahtar tedarik zinciri süreçleri içerisinde yer alan tersine lojistik, ürünlerin bir dağıtım kanalında tüketiciden üreticiye doğru hareketi olarak tanımlanabilmektedir. Tersine lojistiğin, ticari tedarik zincirinde kullanımı yaygınlaşmakta ve uygulama alanları artış göstermektedir, insani tedarik zincirinde ise kullanımı kısıtlıdır. İnsani tedarik zincirinin, afetlerden etkilenen nüfusun üzerinde olumlu sosyal, çevresel ve ekonomik etkiler yaratma amacı göz önünde bulundurulduğunda afet yönetim sürecinde tersine lojistik uygulamalarını benimsemeleri kaynakların ve sürecin sürdürülebilirliği açısından önemlidir. Bu kapsamda çalışmanın amacı tersine lojistiğin, insani tedarik zinciri operasyonlarında kullanım alanını analiz etmek ve gelecekte uygulanabileceği alanların varlığını göstermektir. Çalışmanın amacı doğrultusunda literatür taraması yapılmış ve Türkiye'de faaliyet gösteren yardım kuruluşlarının yıllık raporları ve yayınları içerik analizi yöntemiyle incelenmiş ve insani yardım kuruluşlarında yer alan deneyimli ve uzman kişilerle yarı yapılandırılmış görüşme gerçekleştirilmiştir. Çalışmada insani yardım kuruluşlarının tersine lojistik süreçleri hakkında bilgi sahibi olduğu ve uygulamalarında kullanım alanlarının sınırlı düzeyde olduğu gelecekte bunların uygulanabilmesinin mümkün olduğu sonucu elde edilmiştir. Afet yardım kuruluşlarının insani tedarik zinciri yönetiminde tersine lojistik süreçlerini benimsemeleri, afet yardım malzemelerinin verimli ve uygun maliyetli olarak yeniden kullanımını ve geri dönüştürülmesini sağlayabilir.

Süreç

Geliş: 10/02/2023
Kabul: 18/03/2023

Anahtar Kelimeler: İçerik Analizi, İnsani Tedarik Zinciri, Tersine Lojistik

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How to Cite: Merdivenci, F. vd. (2023). Reverse Logistics Practices In Humanitarian Supply Chain Management: A Content Analysis, Journal of Economics and Administrative Sciences, 24(4), 583-594. DOI: 10.37880/cumuiibf.1249842

Introduction

The humanitarian supply chain, which has an important place in aid organizations and disaster operations, aims to provide maximum benefits in terms of medical aid, food, shelter, and drinking water to victims of emergencies and disasters. It also aims to allocate and quickly distribute the right amount of material needed to the right demand points (Tomasini and Wassenhove, 2009; Dubey and Gunasekaran, 2015; Özdemir et al.2021). Actors in the humanitarian supply chain who share a common value system based on alleviating the suffering of those affected by disasters and emergencies are donors, charities, NGOs, governments, the military, and logistics service providers (Thomas and Kopczak 2005). In humanitarian aid operations, the humanitarian supply chain is vital in delivering food, shelter, medicine, and first aid needs to disaster victims (Thomas and Kopczak, 2005). Supply chain and logistics constitute 80% of the costs incurred in these operations (Van Wassenhove, 2006). With the increase in natural disasters, aid organizations' importance is increasing daily (Behl and Dutta, 2019). The humanitarian aid provided by aid organizations is expected to be cost-effective and sustainable (Laguna-Salvado et al.,2019).

Dubey and Gunasekaran (2015) stated that the humanitarian supply chain will be driven by sustainable development and ecological balance in the future. On the other hand, aid organizations are expected to cause less environmental damage and use resources ethically and efficiently in aid operations in the humanitarian supply chain (Haavisto and Kovacs, 2014). In particular, an effectively and efficiently managed humanitarian supply chain enables humanitarian organizations to make the best use of their resources, allocating the right amount of material needed to the appropriate demand points as soon as possible, under limited financial constraints. Making the best use of donated funds, using the least amount of resources within the scope of the activities carried out, and reducing the urgent needs of a population sustainably, are associated with the success of humanitarian supply chain operations (Wassenhove, 2006).

There are key supply chain processes in thriving supply chain management. Systematic handling of reverse logistics, one of the key processes in the supply chain, is becoming an ecological, economic and legal obligation (Nakıboğlu, 2007). Reverse logistics can be defined as the movement of products from the consumer to the producer in a distribution channel. This process includes product acceptance, renewal, remanufacturing, recycling, and disposal. Reverse logistics, the recovery, and reuse of products, mainly reduce waste disposal, extraction of raw materials, and emissions from transport and distribution (Turrisi et al.,2012), reducing negative impacts on the environment and saving landfill space, fuel and costs (Sarkis et al.,2010).

It is expected that reverse logistics reduce or prevent environmental damage and that the activities involved in the process will be carried out at the "least cost" to the environment. (Sarkis et al.,2010). This situation reflects the desire of humanitarian aid organizations to "do not harm" to the environment and the individual (Peretti et al.,2015). In addition, considering the purpose of the humanitarian supply chain to create positive social, environmental, and economic effects on the population affected by disasters, it is essential for the sustainability of resources and the process that they adopt reverse logistics practices in the disaster management process.

First of all, humanitarian supply chain management is discussed in the study. Later, reverse logistics in the humanitarian supply chain was included, and the studies and applications made in this context were discussed in the literature review section. In the research method part of the study, information about the analysis used is given. In the findings part, organizations operating in Türkiye and having annual reports and publications on their corporate websites were subjected to content analysis, and semi-structured interviews were conducted with experienced and experts in humanitarian aid organizations. Finally, in the conclusion part, the findings of the research are discussed, and evaluations and suggestions are given.

Humanitarian Supply Chain Management

While disaster relief efforts have been practiced throughout history, humanism often dates back to the efforts of Henri Dunant (founder of the Red Cross Agency) to help wounded soldiers at the Battle of Solferino (Kovacs and Spens, 2011). After the Indian Ocean earthquake and tsunami in 2004, humanitarian logistics played a central role in disaster relief efforts, and its importance was recognized by the public and emerged as a new research area (Kovacs and Spens, 2007; Kunz and Reiner, 2012).

The International Federation of Red Cross and Red Crescent Societies defines a disaster as "*an event that seriously disrupts the functioning of a community or society and causes human, material, economic or environmental losses that exceed the community's ability to cope using its resources*." (IFRC, 2022). Disasters are increasing year by year all over the world. The growth rate of natural disasters (drought, hurricanes, floods, famine, earthquake, etc.) and man-made disasters (international conflicts, refugee crises, wars, etc.) affects the social existence of humanity (Behl and Dutta, 2019). It is stated that this situation will increase over the years and will continue.

Thomas and Kopczak (2005) stated that deaths due to disasters will increase in the next 50 years. Recent major crises in the world (fire, earthquake, epidemic, etc.) give rise to this situation. In addition, the number of deaths due to Covid-19, which affected the whole world as of 2019 and was declared an emergency by the World Health Organization in 2020, is 4,200,412, according to WHO reports (WHO, 2021). The importance of humanitarian logistics and supply chain management, which constitutes an essential part of disaster relief operations and disaster relief operations (Ye and Yan, 2020), has been understood more and has been among the research subjects in the Covid-19 process, which is characterized as a period of uncertainty and danger (Karabag, 2020).

Efficient and effective logistics operations and supply chain management are required to perform disaster relief operations effectively (John, 2017). Humanitarian supply chain management encompasses the system and processes involved in mobilizing people, resources, skills, and knowledge to assist vulnerable people affected by disasters and embraces (Wassenhove, 2006; John, 2017) the understanding of providing the proper assistance to the right beneficiaries at the right time.

The humanitarian supply chain deals with disasters ranging from earthquakes, tsunamis, hurricanes, epidemics, droughts, famines, terrorist attacks, and wars with a combination of various disasters that can occur simultaneously (Van Wassenhove ,2006). Thomas and Kopczak (2005:2) defined humanitarian logistics management as follows; "*The process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials and related information from the point of origin to the point of consumption, to alleviate the suffering of the vulnerable*." Humanitarian logistics and supply chain focus on efficiently managing goods, information, and service flows to respond to the urgent needs of the population affected by emergencies. This is a critical element of a successful relief operation (Sheu, 2007).

Supply chain and logistics activities constitute 80% of humanitarian aid operations (Van Wassenhove, 2006) and are an essential factor in humanitarian aid operations. Van Wassenhove (2006) states that logistics is "*the costliest part of any relief operation and the part that can tell the difference between a successful and a failed operation*." Research led by the Fritz Institute suggests that logistics is at the center of aid for several reasons. These reasons (Thomas, 2003):

- ✓ Act as a bridge between disaster preparedness and response through logistics, effective purchasing procedures, supplier relationships, knowledge of pre-positioned stock and local shipping conditions,
- ✓ The speed of response to major humanitarian programs, including health, food, shelter, water, and sanitation interventions, depends on the ability of logisticians to procure, transport, and receive supplies at the site of a humanitarian effort,
- ✓ Because the logistics department is often involved in every phase of a relief effort, it has a rich repository of data that can analyze to enable post-event learning.
- ✓ Balcık and Beamon (2008) summarized the essential features and differences of humanitarian logistics (different from business logistics) as follows.
- ✓ Unpredictability of demand in terms of timing, location, type, and size,
- ✓ Sudden demand for vast quantities and short lead times for a wide variety of supplies,
- ✓ High risks associated with adequate and timely delivery,
- ✓ Lack of resources (supply, people, technology, transport capacity, and money).

Van Wassenhove (2006) stated that the difference of the humanitarian logistics sector from the commercial supply chain and the private sector is not only factors such as working conditions, demand uncertainty, and lack of resources, but also several other factors (invisibility, uncertainty, new phenomena, factor diversity, interaction between factors, and gradual change) in the physical or geographical environments where disasters occur, causing complexity in humanitarian logistics (Richardson, 1994; Van Wassenhove, 2006).

In this process where saving human life is in question and no profit motive is pursued, aid organizations focus only on forward flow. Reverse logistics is often ignored and not positioned in the process. Reverse logistics in the commercial supply chain is "*The process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements*." (Rogers and Lembke, 1999).

It is expected that reverse logistics reduce or prevent environmental damage and that the activities involved in the process will carry out at the "least cost" to the environment (Sarkis et al.,2010). This situation reflects the desire of humanitarian aid organizations to "do not harm" the environment and the individual (Peretti et al.,2015). In addition, considering the purpose of the humanitarian supply chain to create positive social, environmental, and economic effects on the population affected by disasters, it is essential for the sustainability of resources and the process that they adopt reverse logistics practices in the disaster management process.

Reverse Logistics in The Humanitarian Supply Chain

In 2019, humanitarian reports showed that more than 100 million people worldwide needed assistance, increasing to nearly 120 million in 2020 (GHA, 2020). The recent increase in disasters and their consequences causing significant damage requires effective management of humanitarian operations and humanitarian supply chains and appropriate response methods (Sahay et al..2016).

While humanitarian aid provides essential assistance to people affected by crisis and offers opportunities for longer-term development gains, countries or communities receiving aid often lack adequate infrastructure or management systems to handle the aid-related waste. Solid waste management is one of the most pressing global development problems, and the waste problem is expected to grow as time passes, especially for countries receiving humanitarian aid. Therefore, waste can accumulate in countries receiving humanitarian aid and remain in communities indefinitely or lead to inappropriate disposal measures. This situation causes adverse effects on the environment (USAİD, 2020).

Humanitarian aid is based on the Hippocratic tenet of "Help or do no harm," which is included in the Hippocratic Oath in medicine. This principle can be interpreted as

"supporting or not hindering development" or "not harming the natural environment" within the scope of humanitarian aid (Haavisto ve Kovacs, 2014). Humanitarian organizations need to consider and implement the concept of reverse logistics and operations in the management of disaster relief supplies and in the humanitarian supply chain to protect the natural environment and in line with the objectives of "no harm" to the environment and the individual (Peretti et al.,2015).

Disaster relief materials are used throughout the process to respond to damage caused by disasters and crises; The vital needs and safety items needed (such as food, drink, clothing, and shelter), medical supplies and tools, and equipment used for first aid interventions have a critical role in saving lives and restructuring communities at all stages of disaster management (Ye and Yan, 2020).

Disaster relief supplies include food waste, packaging waste, medical supplies, waste from tools and equipment used for first aid interventions (medical supplies and shelters), and all kinds of waste generated in rescue and aid operations (like building debris). “The purpose of reverse logistics in humanitarian aid operations is related to green marketing strategies and the recovery management of all kinds of aid materials sent to reverse flows to ensure efficient and cost-effective reuse and recycling of disaster relief materials used in disasters and emergencies” (Ye and Yan, 2020; Peretti et al.,2015). Successful recovery management and proper disposal of relief supplies can significantly reduce waste from disaster relief supplies.

Because of the uncertainty of disaster events and their urgent response, the humanitarian supply chain has reactive management and is designed as temporary (Pettit and Beresford, 2009). For this reason, the procurement, management, inventory, and storage of the needed materials are not as easy as in the traditional supply chain. Ye and Yan (2020), the problems experienced in disaster management.

- ✓ Persons involved in the management of materials stocked in warehouses for disaster relief do not have adequate training,
- ✓ Problems in coordination and information sharing between stakeholders and managers,
- ✓ He stated that there might be inspection and classification problems in the inventory management of the donated materials.

Due to these problems in management, the proper demand cannot be determined, inventory and cost increases are experienced due to a lack of coordination, and scarce resources that need to be used and distributed effectively can be wasted and deteriorate, causing environmental waste.

What will happen to the waste such as tents, water drums, and tarpaulins left in the aid area after the completion of the disaster relief process is still a big problem that needs to be answered. Similarly, waste such as detergents and plastic containers created by volunteers and people working in disaster areas is a problem. Ye and Yan (2020) stated that several years after the 2008 earthquake in the Sichuan province of China, due to the lack of regular monitoring and management, tons of rice and flour sacks expired and deteriorated in the warehouses of some towns affected by the earthquake. Each item given to the needy is a production resource and must be returned to its source if these items are no longer used (Monica, 2011:66). In this case, the application of reverse logistics can be a solution to these waste and waste problems. Using reverse logistics will result in less waste due to recycling used products.

During the 1980s, reverse logistics was limited to the movement of products from the customer to the manufacturer instead of the primary flow. In this direction, since most product shipments are sent in one order, Lambert and Stock first defined reverse logistics in 1981 as "proceeding in the wrong direction on a one-way road." (Rogers and Lembke, 2001). The Logistics Management Council, on the other hand, published the first known definition of reverse logistics in the early 90s. This definition is defined by Stock (1992) as "waste recycling, disposal, and management of hazardous materials; More broadly, it is defined as "a role of logistics used to break down, recycle, repair, reuse and destroy resources." (Brito ve Dekker, 2002).

Reverse logistics covers the reverse distribution, recycling of products, reduction, management, and disposal of wastes related to packaging and use of products. It can also be seen as a holistic approach, including reducing the amount of material in the advanced system (Dowlatshahi, 2000; Gardas et al., 2018). Reverse logistics aims to maximize product values by focusing on the reverse flow of products in the supply chain and is interested in how the returns and recoveries will be experienced in the process in terms of efficiency and economy (Han and Trimi, 2018; Senthil et al., 2018).

The humanitarian supply chain differs from the commercial supply chain due to physical, financial, and information flows. While in a corporate supply chain, there are shareholders and customers, in a humanitarian supply chain, there are donors and beneficiaries (Aslanzadeh, et al., 2009: 228). In this respect, reverse logistics processes will differ in the humanitarian supply chain due to the actors and processes that differ from the commercial supply chain. Reverse logistics processes in the humanitarian supply chain start with product collection, as seen in Figure 2. Distributors and charities can reuse in-kind donations in good condition used by the beneficiary by taking back the surplus and unnecessary ones. Finally, suppliers can recycle donations so that the materials of used products and components can be reused.

Considering the humanitarian supply chain's aim to create positive social, environmental, and economic effects on the population affected by disasters, it is essential for the sustainability of resources and processes to adopt reverse logistics practices in the disaster management process. In addition, the environmental impact of reuse and recycling benefits organizations by saving landfill space, energy, and costs (Sarkis et al.,2010).

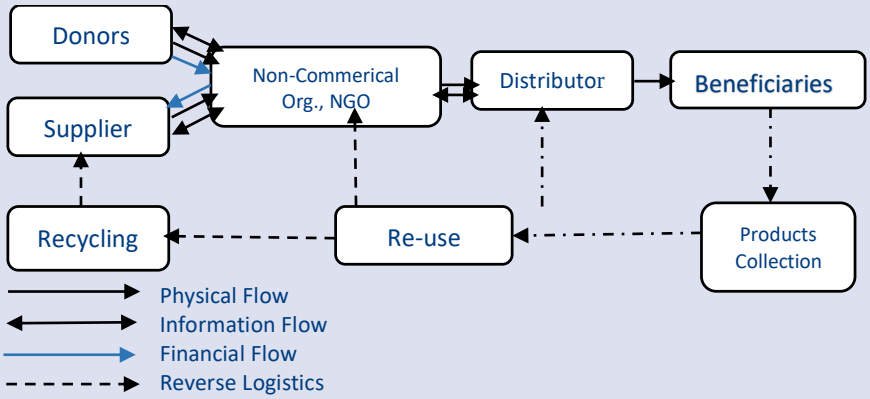

Figure 1. Reverse Logistics in the Humanitarian Supply Chain
Source: Adapted from the study of Aslanzadeh, et al. (2009).

Literature Review

Reverse logistics applications in the commercial supply chain reduce the negative environmental impact and provide economic savings for organizations (Peretti et al.2015). In addition, reverse logistics in the commercial supply chain has attracted significant attention from practitioners and academics as a strategic resource that can help companies gain a competitive advantage through the efficient recovery of products (Garcia-Sanchez et al., 2019). Humanitarian supply chains, on the other hand, aim to provide maximum benefits in terms of medical aid, food, shelter, and drinking water to victims of emergencies and disasters, without profit. In this direction, in theory, and practice, reverse logistics applications are not discussed much.

In the literature, firstly, reverse logistics in the humanitarian supply chain discussed in terms of green logistics and environmental approaches. Kovacs (2011) emphasized the environmental impacts of humanitarian aid activities during their implementation and the lack of reverse logistics in this process. Sarkis et al. (2012) stated the importance of environmental approaches to meet the ecological pressures and expectations of organizations, society, and governments in the humanitarian supply chain. Monica and Andreas (2011) analyzed whether there are reverse logistics stages of products made by donors in humanitarian aid operations. Peretti et al. (2015) looked at the application areas of reverse logistics in aid operations of 14 top aid organizations worldwide (CARE, CRS, IFRC-RCS, MSF, OCHA, Oxfam, Save the Children, UNDP, UNFPA, UNHCR, UNICEF, WHO, WFP, World Vision). They discussed the challenges and opportunities of reverse logistics for humanitarian organizations. Hu and Sheu (2013) proposed a new reverse logistics system for post-disaster debris, and aimed to minimize logistics costs, risk-related costs and psychological costs. Similarly, Aydın (2020) has developed a reverse logistics network design for debris management of end-of-life buildings for disaster preparedness.

The importance of humanitarian aid has increased in the last ten years, and the number of people in need of humanitarian assistance has tripled. According to the 2020 Global Humanitarian Outlook report prepared by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), it been stated that in 2020, approximately one in 45 people worldwide will need humanitarian assistance, but this number will double due to COVID-19. Because of these increases, the United Nations (UN) highlights areas for improvement in global humanitarian assistance, including supply systems and supply chains. In addition, it has created "The New Way of Working" to reduce people's needs, risks, and vulnerabilities, increase their resilience, ensure environmental sustainability, and include the 2030 Sustainable Development Goals (UN, 2022).

USAID (U.S. Agency for International Development) has conducted a study titled "Sustainability in Humanitarian Supply Chains: Determining the Preliminary Scope of Improvements in Packaging," in which organizations such as the UN World Food Program, the United Nations Refugee Agency, the International Committee of the Red Cross, the International Federation of the Red Cross, the Global Logistics Cluster, and the United Nations Environment Program members. The study investigated the attitudes and effects of humanitarian aid stakeholders towards packaging waste. It has been stated that packaging wastes differ according to the disaster situations experienced. While it can give immediate priority to non-food aid (for example, shelter) in sudden disasters, it can prioritize food aid in slow-developing emergencies. Each situation reveals a different set of supply chains and operations and differences in packaging and waste used. For example, emergencies and crises that often require ready-to-use food may involve multi-layered plastic packaging products (carrier bags) that are difficult to manage at the end of their life due to metalized or multi-material components. Emergencies and crises that require higher levels of non-food assistance can present different challenges due to the diversity of goods and the resulting packaging diversity. It was noted that these differences in packaging and packaging waste management are essential to consider in interventions designed for packaging waste management for emergencies and crises with the most significant waste problems (USAID, 2022).

With a focus on sustainability and recycling, the IFRC will consider how it can reduce packaging size, use "greener" materials, collaborate with vendors to standardize packaging, promote and adopt returnable packaging methods, and promote recycling and reuse. He is developing the project "Greening the Supply Chain." (USAID, 2022).

The UNHRD (UN Humanitarian Response Depot) Laboratory is working on an initiative called "give the packaging a second chance," which seeks to find ways to reuse items shipped in disaster relief operations. UNHRD has developed a "Crib Tent" specially designed for babies most vulnerable in crises. This cradle tent comprises storage boxes containing geodesic tents sent to the aid area. The cradle tent can also be reused as a chair (UNHRD, 2022).

Studies and practices on reverse logistics in the literature and throughout the humanitarian aid sector have been recently explored to ensure sustainable relief efforts due to increasing disasters and their long-term effects.

Methodology

This study aims to learn the current situation and attitude towards the future of reverse logistics in the humanitarian supply chain. In this direction, content analysis and semi-structured interviews, among the qualitative analysis methods, were used. Content analysis is defined as "a technique that provides a methodical, systematic, objective and, if possible, quantitative examination of the content of various texts to classify and interpret their basic elements that do not lend itself directly to naive reading." (Bilgin, N.2006). The most prominent data sources suitable for content analysis; are texts traditionally ascribed meaning, such as oral discourse, written documents, and visual representations (Krippendorff, 1989).

Tasdogan (2018) T.C. stated that from the list of associations registered to the Department of Associations of the Ministry of Interior, there are 144 domestic and foreign humanitarian organizations operating in Türkiye's field of humanitarian assistance. Among the aid organizations that carry out disaster and emergency planning studies and provide services in Türkiye, there are AFAD and service groups affiliated to AFAD and Logistics Warehouses, Turkish Red Crescent, TAF(Turkish Armed Forces), Metropolitan Municipality AKOM, Private Sector, and National Medical Rescue Team (UMKE) (Ulugergerli, 2021). Among the national NGOs and Volunteers and Volunteer Associations that are in the field of humanitarian aid, emergency and rescue, IHH Humanitarian Aid Foundation (IHH), Support to Life Humanitarian Aid Association, Search and Rescue Association (AKUT), Emergency Humanitarian Aid and Education Association, Istanbul University Search and Rescue Association and Associations such as Nilüfer Search and Rescue can be counted.

Peretti et al. (2015) defined annual corporate reports as public documents used to show not only what the organization has done in the past year but also how the organization will follow in the coming years. In this context, the research sample consists of humanitarian aid organizations AFAD, Turkish Red Crescent, IHH Humanitarian Relief Foundation, and Support to Life Humanitarian Aid Association, which have annual institutional reports on their website. Institutional reports of UMKE, AKOM, and TAF are not available on their official websites. In the study, the annual reports of these organizations involved in disaster and emergency planning studies in Türkiye between the years 2017-2021 were first examined using the keywords determined in Table 1 with the content analysis method. The results obtained from the keywords in these reports are shown in Table 2.

Due to the insufficient reverse logistics processes in the annual corporate reports, the articles, books, brochures, and magazine publications on the websites of the organizations, which include the realized applications and projects, were included in the content analysis using keywords, and the results were reflected in Table 3.

After the reviewed reports and publications, a semi-structured questionnaire was directed to experienced and expert people working in humanitarian organizations and associations. Researchers frequently prefer a semi-structured interview as it has a certain level of standardization and flexibility, eliminates limitations in tests and questionnaires based on writing and filling and helps to gain in-depth information on a particular subject (Yıldırım and Şimşek, 2003). Semi-structured interviews are not as rigid as structured interviews and not as flexible as unstructured interviews; located between the two (Karasar, 1995).

The study used the snowball sampling method to determine the aid organizations from which data will be obtained. Snowball is a method used when the universe is large or lacking in information or when it is difficult to reach the units formed by the universe (Patton, 2005). The data of the current research was collected via Google Docs. While demographic information was requested in the first part of the research questionnaire, in the second part, five questions were directed to the experts using the study of Pretti et al. (2015). The answers to the questionnaire were collected online between 12.10.2022 and 01.11.2022

Results

Content Analysis

Agrawal et al. (2015) and Thierry et al. (1995), based on a comprehensive literature review, the activities involved in reverse logistics processes were formed in 9 stages. The activities involved in these processes are shown in Table 1. The reverse logistics activities used in Table 1 were used as keywords for the study. Reverse logistics practices of AFAD, Turkish Red Crescent, IHH, and Support to Life Humanitarian Aid Association, which are among the humanitarian organizations in Türkiye, in the management of the humanitarian supply chain were created by making content analysis in Table 2. A total of 65 corporate reports published by these organizations from their official sites between 2017-2021 were scanned by content analysis method using keywords.

Table 1: Reverse Logistics Processes

Product Development
Rework
Product Renewal
Renovation
Disposal
Repair
Reuse
Reproduction
Recycling

Sources: Thıerry et al.,1995; Agrawal et al., 2015.

Table 2: Reverse Logistics Applications in Humanitarian Supply Chain Management (2017-2021 annual corporate reports)

Reverse Logistics Processes	AFAD	Turkish Red Crescent	IHH	Support to Life Humanitarian Aid Association
Product Development	1			
Rework				
Product Renewal				
Renovation	77	2	5	
Disposal				
Repair	3	5	6	
Reuse				
Reproduction				
Recycling	1	5	1	

Sources: (URL 1), (URL2), (URL 3), (URL 4)

Table 3: Reverse Logistics Applications in Humanitarian Supply Chain Management (Publications)

Reverse Logistics Processes	AFAD	Turkish Red Crescent	IHH	Support to Life Humanitarian Aid Association
Product Development		2		
Rework	5			
Product Renewal				
Renovation	15	56	3	6
Disposal	11			
Repair	93	55	5	17
Reuse	1	8		
Reproduction	1			
Recycling	3	34	1	

Sources: (URL 1), (URL2), (URL 3), (URL 4)

According to the research results in Table 2, only renovation, repair, and recycling activities were carried out as reverse logistics applications. Due to the insufficient results, a total of 79 publications (books, articles, magazines, and brochures) in which the organizations' projects, practices, and activities between the years 2017-2021 were discussed and subjected to content analysis.

According to the analysis results;

- ✓ AFAD mainly included renewal, disposal, and repair activities in its corporate report and publications within reverse logistics processes. The report dealt with the renewal of the regions at risk of disaster in cities, experiencing infrastructure bottlenecks, losing their old value and function, and low quality of space, taking into account the social, economic, environmental, and aesthetic dimensions. It also discussed the replacement rates of disaster relief materials and equipment within the scope of performance indicators.
- ✓ The Red Crescent stated its repair, renovation, and recycling activities within the scope of its projects and aids in places damaged by disasters.
- ✓ IHH Humanitarian Relief Foundation included repair and renewal activities among the projects carried out for the disaster victims.
- ✓ Support to Life Association has included repair and renewal activities in the projects and corporate reports it has handled similarly.

Semi-Structured Interview

To learn the current situation and attitude toward the future of reverse logistics in the humanitarian supply chain, a semi-structured interview questionnaire was directed to 6 experienced and expert people in humanitarian aid organizations. The questions directed to the experts within the scope of this interview are as follows (Pretti et al.2015:262).

1. What does the concept of "Reverse Logistics" mean to you?
2. What is your organization's approach to reverse logistics perspective and practices?

3. What are your thoughts on how reverse logistics processes and practices can be applied to humanitarian aid operations in the context of sudden-onset (earthquake, fire, flood, and landslides) and slow-onset disasters (drought and famine)?
4. Can reverse logistics be applied to disaster relief supplies (needed vital needs and safety items, medical supplies, and tools and equipment used for first aid responses) in humanitarian aid operations?
5. Does your organization carry out any recycling activities? If so, which goods does this apply to, and how is it carried out?

These questions, taken from the study of Pretti et al. (2015), were directed to experienced and expert people working in humanitarian organizations in Türkiye. The answers given to the semi-structured interview questionnaire were reflected in the tables.

Table 4. Company Information and Titles of Humanitarian Supply Chain Managers Interviewed

Code	Company Information	Titles
1	Logistics Association	vice president
2	AFAD	Expert
3	Turkish Red Crescent	Support Services Director
4	Turkish Red Crescent	Logistics Operations Specialist
5	Turkish Red Crescent	System Integration Specialist
6	AFAD	Expert

Table 5. Explanations of the participants for the concept of "Reverse Logistics."

1	Product and empty container returns
2	Recycling, recycling of inert and used raw materials.
3	In our organization, the concept of reverse logistics is divided into two classes commercial products and humanitarian aid materials. There may be a balance movement of the materials in the disaster area, sometimes in different regions. In addition, surpluses are withdrawn to central warehouses. In our commercial activities (for example, mineral water), there is a return or returnable product from the customer to the factories.
4	Return the final product from the point of consumption to the end of origin.
5	Recycling of waste materials into production.
6	Recycling - Re-evaluation.

Table 6. Approaches of the participants to the reverse logistics perspective and practices of their organizations

1	It should be encouraged.
2	Positive. We always support the reverse logistics.
3	When viewed within the framework of humanitarian aid operations, the material delivery to the disaster area is usually done with the emergency code. Similarly, balance movements between disaster centers are made with the emergency code. For the distribution of the materials remaining in the region after the disaster, their transfer to the different areas is carried out at the standard rate.
4	The use of reverse logistics is available within our company. We are of the approach that we should do the cost calculation well. Reverse logistics can incur considerable costs in some cases.
5	With the second-hand textile operation, waste textile products are recycled, contributing to charity activities.
6	We have container cities within the scope of the shelter. Although I am not sure, I think that expired containers are re-evaluated.

Table 7. Opinions on how to implement reverse logistics processes and practices in humanitarian aid organizations.

1	Materials such as tents, container houses, and beds must be collected after use.
2	With a planned and follow-up method.
3	Inventory tracking and traceability, as well as mapping those in need, are essential. As a result, the fact that reverse logistics operations or balancing movements are triggered based on the demands of those in need is experienced in the field.
4	The concept of reverse logistics is an essential issue in humanitarian aid applications. During the application, I think the products that will return to the origin point should be stored in the disaster area or nearby collection centers and then delivered to the first point.
5	Prefabricated houses, tents, blankets, and kitchen utensils can be used for quick solutions in humanitarian aid operations in disaster situations.
6	Tents, kitchen sets, etc., given to disaster victims materials can be re-evaluated and repaired after the end of their intended use and can be made ready for use.

Table 8. Opinions on the application of reverse logistics to disaster relief materials in humanitarian aid operations

1	Yes, the containers in which the materials are carried can be reused.
2	Yes.
3	All materials that will meet the demand of the needy are included in this scope.
4	Reverse logistics can actually be used in every field. I think that reverse logistics can be applied in many aid materials in humanitarian aid activities.
5	Yes, many vital needs and shelter materials can be used in humanitarian aid operations as they are produced in a reusable form.
6	It's a costly industry. It can be applied for effective resource management.

Table 9. Opinions on the situation of the organization performing any recycling activities

1	There is no reverse logistics in the activities of the association.
2	It supports recycling.
3	Secondhand textile operation is carried out (A value chain is operated for the reuse of used clothing).
4	There is a reverse logistics process in our Afyonkarahisar mineral water factory. We have returnable (with deposit) mineral waters that we send to dealers. These mineral waters are sent to the dealers in the safe. Then, the empty bottles are collected in the crate and returned to the factory.
5	Along with the second-hand textile operation, recycling activities are carried out for textile products.
6	I do not know the subject in the context of the department I work for.

First, the question was posed, *"What does the concept of "Reverse Logistics" mean to you?"* The results of the answers regarding this issue are shown in Table 5.

Second, the question was posed, "What is your organization's approach to reverse logistics perspective and practices?". The results of the answers regarding this issue are shown in Table 6.

Third, the question was posed, "What are your thoughts on how reverse logistics processes and practices can be applied to humanitarian aid operations in the context of sudden-onset (earthquake, fire floods, and landslides) and slow-onset disasters (drought and famine)?". The results of the answers regarding this issue are shown in Table 7.

Fourth, the question was posed, "*Can reverse logistics be applied to disaster relief supplies (vital necessities and safety items needed, medical supplies and tools and equipment used for first aid interventions) in humanitarian aid operations?".* The results of the answers regarding this issue are shown in Table 8.

Finally, "Does your organization carry out any recycling activities? If so, for which goods does this apply, and how is it carried out?" question was posed. The results of the answers regarding this issue are shown in Table 9.

Conclusion

The humanitarian supply chain that disaster relief agencies manage throughout the operation plays a vital role in saving lives and healing the devastation caused by disasters and crises. In line with the humanitarian supply chain purpose, it provides maximum benefit in terms of medical aid, food, shelter, and drinking water to victims of emergencies and disasters. It delivers the right amount of disaster relief materials needed to the right demand points in a short time. Management of disaster relief supplies delivered to victims is a critical issue in the humanitarian supply chain. It is essential for the success of the humanitarian supply chain that the donated funds and resources are limited and that social, economic, and environmental factors are not ignored during the operation.

Natural disasters can be caused by entirely natural causes as well as by people harming nature. The deterioration of the ecosystem, the overuse of natural resources, and the pollution of the earth pave the way for natural disasters. In this respect, humanitarian aid organizations attach particular importance to the understanding of "not harming the environment and individuals" (Peretti et al.,2015) during disaster operations due to natural disasters that have increased recently.

Although reverse logistics, one of the essential key processes in ensuring the sustainability and success of the supply chain, has become widespread in the traditional commercial supply chain, and its application areas have increased, this situation is insufficient in the humanitarian supply chain. In addition, it is vital for disaster relief organizations to adopt reverse logistics practices in humanitarian supply chain management and operations in terms of the sustainability of scarce resources and the process. In this direction, the study aims to analyze the usage area of reverse logistics in humanitarian supply chain management and show where it can be applied.

A total of 65 institutional annual reports and 79 publications of AFAD, Turkish Red Crescent, IHH Humanitarian Relief Foundation, and Support to Life Association, which are among the disaster relief organizations in Türkiye, were handled, and the application and usage areas of reverse logistics were investigated by content analysis method. As a result of the study, it is seen that among the reverse logistics processes of disaster relief organizations, only repair, renewal, and recycling are generally included. Peretti et al. (2015) stated that it is not surprising that aid organizations prioritize a forward flow rather than a reverse flow in the supply chain due to the aim of maximizing donated funds and resources to victims and the increasing number of

victims. Studies in the literature, in which the humanitarian supply chain and reverse logistics are handled together, stated that reverse logistics in the humanitarian supply chain is insufficient and incomplete, similar to the research results (see Ye and Yan (2020), Peretti et al. (2015) and Kovacs (2011)).

According to the findings obtained as a result of semi-structured interviews, experts in humanitarian aid organizations stated that they also have knowledge about reverse logistics, their organizations' approach to reverse logistics is positive, and they include some reverse logistics applications. This contributes to corporate sustainability by reducing costs and recycling processes in humanitarian supply chains.

It was stated that reverse logistics processes should be applied, and it has been noted that it is used for beverage materials such as textile products, shelter materials, and glass bottles, among the aid materials. The fact that aid organizations carry out such activities shows that they act in line with the understanding of not harming the environment and the individual. They consider reverse logistics, which is among the successful supply chain processes.

In line with experts' opinions in aid organizations, it has been stated that reverse logistics processes will provide cost-effectiveness in the future. This is important for the efficient and effective use of resources and donated funds in terms of financial performance. It also supports the aim of creating positive social, environmental, and economic impacts on the population affected by disasters.

Adopting reverse logistics processes in humanitarian supply chain management by disaster relief organizations can ensure efficient and cost-effective reuse and recycling of disaster relief supplies. Also, through reverse logistics, successful management of disaster relief supplies can be achieved, and wastes that need to be disposed of appropriately can be significantly reduced.

Extended Abstract

The humanitarian supply chain, which has an important place in aid organizations and disaster operations, aims to provide maximum benefits in terms of medical aid, food, shelter, and drinking water to victims of emergencies and disasters. It also aims to allocate and quickly distribute the right amount of material needed to the right demand points (Tomasini and Wassenhove, 2009; Dubey and Gunasekaran, 2015; Özdemir et al.2021). In humanitarian aid operations, the humanitarian supply chain is vital in delivering food, shelter, medicine, and first aid needs to disaster victims (Thomas and Kopczak, 2005). Supply chain and logistics constitute 80% of the costs incurred in these operations (Van Wassenhove, 2006).

In particular, an effectively and efficiently managed humanitarian supply chain enables humanitarian organizations to make the best use of their resources, allocating the right amount of material needed to the appropriate demand points as soon as possible, under limited financial constraints. Making the best use of donated funds, using the least amount of resources within the scope of the activities carried out, and reducing the urgent needs of a population sustainably, are associated with the success of humanitarian supply chain operations (Wassenhove, 2006).

There are key supply chain processes in thriving supply chain management. Systematic handling of reverse logistics, one of the key processes in the supply chain, is becoming an ecological, economic and legal obligation (Nakıboğlu, 2007). Reverse logistics can be defined as the movement of products from the consumer to the producer in a distribution channel. This process includes product acceptance, renewal, remanufacturing, recycling, and disposal. Reverse logistics, the recovery, and reuse of products, mainly reduce waste disposal, extraction of raw materials and emissions from transport and distribution (Turrisi et al.,2012), reducing negative impacts on the environment and saving landfill space, fuel and costs (Sarkis et al.,2010).

In this process where saving human life is in question and no profit motive is pursued, aid organizations focus only on forward flow. Reverse logistics is often ignored and not positioned in the process. Reverse logistics in the commercial supply chain is "*The process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements*." (Rogers and Lembke, 1999).

It is expected that reverse logistics reduce or prevent environmental damage and that the activities involved in the process will be carried out at the "least cost" to the environment. (Sarkis et al.,2010). This situation reflects the desire of humanitarian aid organizations to "do not harm" to the environment and the individual (Peretti et al.,2015). In addition, considering the purpose of the humanitarian supply chain to create positive social, environmental, and economic effects on the population affected by disasters, it is essential for the sustainability of resources and the process that they adopt reverse logistics practices in the disaster management process.

In this direction, content analysis and semi-structured interviews, among the qualitative analysis methods, were used. Content analysis is defined as "a technique that provides a methodical, systematic, objective and, if possible, quantitative examination of the content of various texts to classify and interpret their basic elements that do not lend itself directly to naive reading." (Bilgin, N.2006). The most prominent data sources suitable for content analysis; are texts traditionally ascribed meaning, such as oral discourse, written documents, and visual representations (Krippendorff, 1989).

The research sample consists of humanitarian aid organizations AFAD, Turkish Red Crescent, IHH Humanitarian Relief Foundation, and Support to Life Humanitarian Aid Association, which have annual institutional reports on their website. Institutional reports of UMKE, AKOM, and TAF are not available on their official websites. In the study, the annual reports of these organizations involved in disaster and emergency planning studies in Türkiye between the years

2017-2021 were first examined using the keywords determined in Table 1 with the content analysis method.

According to the analysis results.

- ✓ AFAD mainly included renewal, disposal, and repair activities in its corporate report and publications within reverse logistics processes. The report dealt with the renewal of the regions at risk of disaster in cities, experiencing infrastructure bottlenecks, losing their old value and function, and low quality of space, taking into account the social, economic, environmental, and aesthetic dimensions. It also discussed the replacement rates of disaster relief materials and equipment within the scope of performance indicators.
- ✓ The Red Crescent stated its repair, renovation, and recycling activities within the scope of its projects and aids in places damaged by disasters.
- ✓ IHH Humanitarian Relief Foundation included repair and renewal activities among the projects carried out for the disaster victims.
- ✓ Support to Life Association has included repair and renewal activities in the projects and corporate reports it has handled similarly.

After the reviewed reports and publications, a semi-structured questionnaire was directed to experienced and expert people working in humanitarian organizations and associations. Researchers frequently prefer a semi-structured interview as it has a certain level of standardization and flexibility, eliminates limitations in tests and questionnaires based on writing and filling and helps to gain in-depth information on a particular subject (Yıldırım and Şimşek, 2003). Semi-structured interviews are not as rigid as structured interviews and not as flexible as unstructured interviews; located between the two (Karasar, 1995).

The questions in the interview forms directed to six experts were adapted from the study of Pretti et al. (2015). In line with the answers to these questions, it has been tried to learn the current situation regarding the experts' reverse logistics processes, the institutions' approach to reverse logistics, and whether reverse logistics processes are included in the practices. According to the results obtained, it has been seen that experts and institutions have knowledge about reverse logistics and that the institutional approaches are positive, but there need to be more applications. The results of the study show parallelism with the literature. Studies in the literature stated that reverse logistics in the humanitarian supply chain needs to be more complete and complete (see Ye and Yan (2020), Peretti et al. (2015) and Kovacs (2011)).

In line with experts' opinions in aid organizations, it has been stated that reverse logistics processes will provide cost-effectiveness in the future. This is important for the efficient and effective use of resources and donated funds in terms of financial performance. It also supports the aim of creating positive social, environmental, and economic impacts on the population affected by disasters.

Adopting reverse logistics processes in humanitarian supply chain management by disaster relief organizations can ensure efficient and cost-effective reuse and recycling of disaster relief supplies. Also, through reverse logistics, successful management of disaster relief supplies can be achieved, and wastes that need to be disposed of appropriately can be significantly reduced. This can make a significant contribution to the sustainability of the process and the success of the human supply chain.

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