

PANAMA CLUSTERING MODEL FOR DISASTER PREPARATION AND HUMANITARIAN ASSISTANCE IN LATIN AMERICA

MODELO DE AGRUPAMENTO DO PANAMÁ PARA PREPARAÇÃO PARA DESASTRE E ASSISTÊNCIA HUMANITÁRIA NA AMÉRICA LATINA

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Abstract

The January 2010 Haiti earthquake was a gamechanger in the humanitarian assistance management mechanisms. This event boosted a massive response of international collaboration, but limited capacity for organizing humanitarian aid collapsed the effective delivery of this cooperation. Faced by this case and the growing number of disasters, the Government of Panama proposed the establishment of the Regional Logistics Center for Humanitarian Assistance (CLRAH). The purpose of this study is to describe the operational structure, activation mechanisms, and impact of CLRAH as a clustering model of shared-use facilities driven by the country's logistics capacity that promotes strategic alliances for an effective and timely response of humanitarian aid in Latin America. This study adopted an exploratory descriptive approach. Through the CLRAH, Panama has fostered a humanitarian ecosystem with a defined number of facilities supporting humanitarian logistics. IFRC, UNHRD, SINAPROC, and strategic partners strengthen this clustering model by centralizing common activities, sharing best practices, supporting each other's operations, and taking advantage of economies of scale through their organic operating synergies. The pandemic and recent natural events have demonstrated the effectiveness of CLRAH, but

Resumo

O terremoto no Haiti em janeiro de 2010 revolucionou os mecanismos de gestão da assistência humanitária. Esse evento impulsionou uma resposta massiva de colaboração internacional, mas a capacidade limitada para organizar a ajuda humanitária prejudicou a eficácia dessa cooperação. Diante desse caso e do número crescente de desastres, o governo do Panamá propôs a criação do Centro Logístico Regional para Assistência Humanitária (CLRAH). O objetivo deste estudo é descrever a estrutura operacional, os mecanismos de ativação e o impacto do CLRAH como um modelo de agrupamento de instalações de uso compartilhado que promove alianças estratégicas para uma resposta eficaz e oportuna da ajuda humanitária na América Latina. Este estudo adotou uma abordagem descritiva exploratória. Por meio do CLRAH, o Panamá promoveu um ecossistema humanitário com um número definido de instalações de apoio à logística humanitária. A IFRC, o UNHRD, o SINAPROC e parceiros estratégicos fortalecem esse modelo de agrupamento centralizando atividades comuns, compartilhando melhores práticas, apoiando as operações uns dos outros e aproveitando as economias de escala por meio de suas sinergias operacionais orgânicas. A pandemia e os recentes eventos naturais



new challenges question the need for expansion and more capacity.

Keywords: Disaster. Risk Reduction. Humanitarian Logistics. Relief. Emergency Response.

demonstraram a eficácia do CLRAH, mas novos desafios questionam a necessidade de expansão e maior capacidade.

Palavras-chave: Desastre. Redução de Riscos. Logística Humanitária. Socorro. Resposta a Emergências.

1 INTRODUCTION

The January 2010 Haiti earthquake changed the vision of the world humanitarian community on how to face and deal with critical events that require humanitarian assistance. The disaster further evidenced the need to establish better disaster management mechanisms for adequate response in terms of capacities and resources. Port-au-Prince, the capital city, experienced widespread destruction, with three million people affected, including 222,570 recorded deaths, 300,572 injuries, and 1.5 million people left homeless. In Léogane and Gessier, 70% of homes were destroyed or damaged (IFRC, 2011). The impact of such an event motivated a massive response to international collaboration, including nontraditional agencies and individuals, which complicated the quality of the response. Owing to the limited capacity to organize the reception, storage, and distribution of humanitarian aid, along with fragmented information flow, the effective delivery of international cooperation has collapsed (Nezih & Labonte, 2014; Kirsch *et al.*, 2012).

This earthquake revealed a clear gap in terms of how humanitarian efforts were coordinated among different actors (Salam & Khan, 2020). After the earthquake, stakeholders' collaborative strategies were more reactive than other events, such as Hurricane Matthew, where the strategies were more planned and anticipated (Moreira *et al.*, 2022). This 2016 hurricane impacted Haiti, among other countries, and official reports indicate over 540 deaths, 175,000 displaced, and 2.1 million people affected (Marcelin & Cela, 2017) with damage estimated at 2 billion US dollars (CRED, 2022).

Haiti's experience is similar to many Latin American countries with low- and middle-income vulnerable populations that are prone to natural disasters (Bird *et al.*, 2023). The overall context suggests the need to locate a facility acting as a distribution center to support humanitarian relief chains in response to quick-onset disasters (Balcik

& Beamon, 2008). A strategic location closer to the disaster (Campbell & Jones, 2011) will allow the concentration of humanitarian relief organizations to improve their capacities to stock and deliver the amount of relief supplies to meet the needs of people affected by the disasters within a relatively short timeframe (Roh *et al.*, 2015).

Given the significant gap between the interest in supporting the international community against natural hazards or other human-caused events, and the need for building capacities, resilience, and strengthening disaster preparedness, the Government of Panama has taken the initiative to propose, design, and build a set of logistics facilities focused on the management of humanitarian assistance with own-national funds, with the objective to provide a more expedite and accurate aid with local and regional outreach. This is called the Regional Logistics Center for Humanitarian Assistance (CLRAH, Spanish acronym), that along with a set of favorable conditions crucial for establishing these types of facilities and providing effective and timely response to the rest of the countries in Latin America.

The purpose of this study is to describe the operational structure, activation mechanisms, and impact of CLRAH as a clustering model of shared-use facilities that promote strategic alliances for disaster preparation and an effective and timely response of humanitarian assistance in Latin America.

2 METHODOLOGY

This study adopted an exploratory descriptive approach. Since publications on this topic are limited, an additional review of gray literature was conducted, including technical reports from government and international organizations, legal frameworks, and non-scientific publications, to build a baseline for a better understanding of this public initiative by describing their main characteristics, operational structure, and outreach.

3 RESULTS

3.1 Characterizing the humanitarian hub of Panama

Panama is considered an ideal location for international activities because of its geographical location, overall connectivity, and numerous opportunities for value-added logistics services to become a strategic hub for regional and global flows (Castillo *et al.*, 2018). It has a unique platform of logistics assets and world-class specialized services such as the canal, a network of seaports to handle a variety of cargo and passengers connected by expressways and railroad, five active international airports, free trade zones and special investment regimes, logistics parks, and a platform of logistics, financial, communication, and technology services with an international scope (Georgia Tech Panama, 2024).

Panama has one of the highest liner shipping connectivity indices (UNCTAD, 2024) and one of the fastest growing markets and air connectivity relative to the population in Latin America and the Caribbean (IATA, 2021), providing convenient transport infrastructure within the country in terms of air and seaports. Other criteria enhance the location of the CLRAH such as a low criminality rate, no armed conflict groups, a stable political and economic environment, qualified human resources, proximity to disaster-prone areas, and less vulnerability to natural events and geo-environmental conditions (UNOPS, 2012).

The implementation of the CLRAH by the Government of Panama promotes humanitarian assistance offered by the governments of other countries, non-governmental organizations (NGOs), private companies, donors, and other actors through the consolidation of a cluster of integrated logistics facilities. This allows time reduction and efficiency in the delivery of aid, standardization of processes, consolidation of the required services and optimization of costs, and promotes innovation in logistics operations, thus forming the Humanitarian Hub of Panama (UNOPS, 2012).

The establishment of this dedicated logistics complex began in 2014. Before the CLRAH, Panama was not an active participant in the humanitarian context; however, humanitarian logistics capacities already existed. The International Federation of Red Cross and Red Crescent Societies (IFRC) was one of the first organizations to provide

strategic support and relief items throughout the region, with their own local offices, warehouses, and inventory. As an NGO, their operations were independent, without the direct participation or responsibility of Panama, only supporting the local Red Cross upon request.

A legal framework was designed and approved for the official creation of CLRAH as a special government agency under the Ministry of Government (Law 80, 2017). The CLRAH was inaugurated on November 19, 2018, with the delivery of the first facilities to the IFRC and SINAPROC, the occupation of the Administration Building, and the signing of the Executive Decree regulating Law 80 of 2017 (CLRAH, 2024a). The establishment of CLRAH develops four strategic objectives:

- Become a logistics center of excellence by providing reception, storage, handling, and facility management of logistics operations and humanitarian assistance to the countries of the region.
- Ensuring a system for managing and facilitating synergies among Users, Strategic Partners, and Beneficiaries.
- Strengthen the capacities and collaboration of national civil protection systems in Latin America.
- Professionalization and capacity building of regional human resources in humanitarian logistics operations, risk management, and other related fields (CLRAH, 2024b).

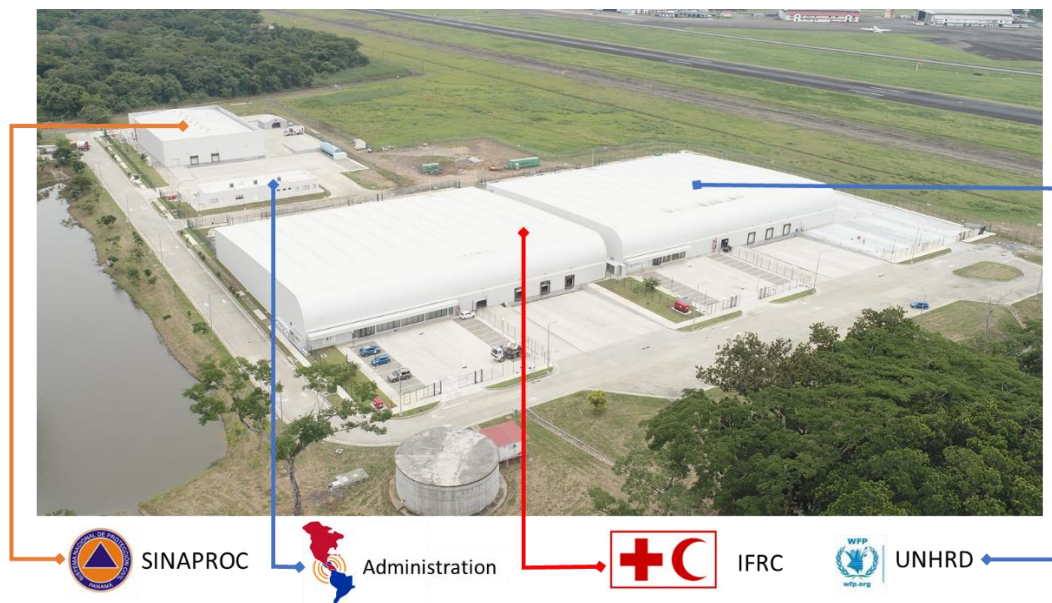
CLRAH is a logistics and resilient platform with the purpose of facilitating the activities of reception, handling, storage, and redistribution of supplies and equipment, as well as the mobilization of human resources for the efficient management of humanitarian assistance toward national and international emergencies (Law 80, Article 2). The center is located within the Panama Pacifico Special Economic Area, next to the runway of Panama Pacifico International Airport, and is directly connected to the most important containerized seaports located in Panama City and Colón (CLRAH, 2025).

Among other favorable conditions for highly efficient logistics operations, the logistics complex has a total area of 6.12 hectares and three storage warehouses of approximately 12,000 m². The facilities include the Administration Building of the complex, control and security area, road access for internal traffic, cargo handling area,

parking lots, heavy equipment, and operations area, approximately 10,000 m² of open space for storage of oversized cargo, containers, mobile equipment, and a water reserve tank. Storage facilities are enhanced by the availability of cold rooms for handling perishable products, medicines, vaccines, and other items requiring handling at controlled temperatures (Figure 1).

Figure 1

Regional Logistics Center for Humanitarian Assistance



Source: CLRAH (2025)

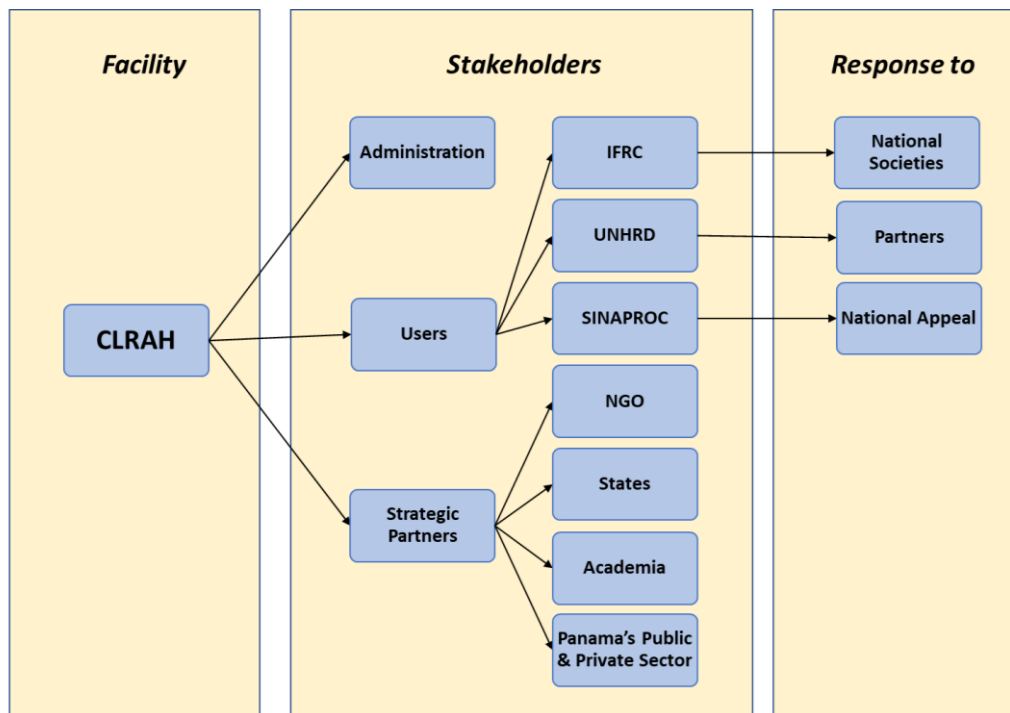
The activities in the CLRAH are carried out by three groups of members: Administration, Users, and the Strategic Partners, forming the Humanitarian Hub of Panama ecosystem (Figure 2). The Administration is responsible for guaranteeing the efficient execution, management, and maintenance of logistics center facilities. Under the leadership of its administrator, it offers logistics facilitation services for the effective performance of humanitarian operations carried out by Users, promotes knowledge and understanding of risk management, logistics, and humanitarian assistance, and promotes strategic alliances with other national and international stakeholders participating in the humanitarian ecosystem.

Users, either national or international, offer reception, handling, manufacturing, storage, dispatch, and redistribution of supplies or equipment for humanitarian purposes

or the provision of humanitarian services or assistance and are physically and operationally established within complex facilities in permanent terms (Law 80, Article 7). A total of three Users are operating in CLRAH: International Federation of Red Cross and Red Crescent Societies (IFRC), United Nations Humanitarian Response Depot (UNHRD) and National Civil Protection System (SINAPROC, Spanish acronym).

Figure 2

Humanitarian Hub of Panama Ecosystem



IFRC is the world's largest humanitarian network with more than 14 million volunteers and employed staff, supporting 192 national societies internationally (IFRC, 2023^a), and is the first international User installed within CLRAH. Through the Regional Logistics Unit of the Department of Logistics, Purchasing, and Supply Chain Management, the IFRC mandate is to provide support to all national societies requesting special aid and offers key supply chain coordination services, purchasing and supplier management, storage and transportation, fleet management, logistical support, and preparation for emergency response. In the Americas, the IFRC offers these services to 35 regional national societies at any time based on regular operations, projects, or in response to disasters (IFRC, 2023^b).

The IFRC has a commercial warehouse with a storage capacity in a closed room of 4,800 m² and a height of 8 m, in addition to an open room of 2,200 m² for storing containers, rolling equipment, and other resources oriented to humanitarian aid. Its response capacity is organized to deliver humanitarian assistance to 5,000 families in the first 48 hours of a disaster (CLRAH, 2025). Before CLRAH, IFRC operated at the commercial end of Panama Pacifico room in a reduced facility with an overall storage capacity of 4,765 m² under the former Pan American Disaster Response Unit (PADRU) (UNOPS, 2012).

UNHRD is an international user of the CLRAH and is managed by the United Nations (UN) World Food Program (WFP). The UNHRD is a valuable logistics commercial provider that manages a network of six worldwide depots and offers multiple supply chain solutions to its partners within the humanitarian commercial (Dufour *et al.*, 2018). The core services are focused on the warehousing, inspection, and handling of prepositioned relief items. Logistics is provided at no cost to commercial NA agencies and commercial and NGOs while other related services are provided for additional charges (UNHRD, 2023^a).

UNHRD offers services to 86 partners worldwide, of which 18 are located in Panama. A partner can be any organization with humanitarian purposes interested in prepositioning humanitarian assistance supplies in any of its global warehouses for later dispatch to any crisis or disaster situation (CLRAH, 2025).

The UNHRD is assigned a 5,200 m² closed storage capacity warehouse for racks capable of storing 3,200 pallets and 6,200 m² of additional open spaces. This facility has cold rooms with a total of 1,122 m² distributed in two temperature-controlled rooms (1,019 m²) with a range from 15°C to 25°C, and a frozen room with three sections: prechamber (22 m²), cold room (58 m²) and freezer (23 m²), with temperatures between 8°C to -23°C (CLRAH, 2025). The original facility was a warehouse in Panama City with an approximate capacity of 2,000 m², distributed among 1,600 m² for dry storage, 110 m² with controlled temperature, and the rest for offices, commercial room, and general access (UNOPS, 2012).

SINAPROC is the national user and institution responsible for the execution of integrated disaster risk management and providing humanitarian responses to the population of Panama impacted by adverse events in collaboration with national and local authorities (SINAPROC, 2024). The humanitarian warehouse of the commercial

Commercial located in the CLRAH under the administration of SINAPROC, with a total area of 1,800 m², additional 1,400 m² of open spaces for mobile warehouses, vehicles, and other resources. Its two-story facilities also have offices, common areas for operation staff, a press room, a presidential room, and the National Emergency Operations Center (COEN, Spanish acronym) to maintain close coordination between the commercial government representatives responsible for health, infrastructure, and public safety to facilitate care, protection, and assistance to those affected by any potential event (CLRAH, 2025). Before the CLRAH, SINAPROC had no warehousing facilities of their own.

Strategic Partners are organizations that directly or indirectly support humanitarian assistance actions that take place in CLRAH and offer operational, logistical, administrative, knowledge transfer, collaboration, and cooperation services without physically or permanently establishing their operations within the complex. These partners can be States, international organizations, foreign authorities, national government agencies, non-governmental and private organizations, and academic institutions. Strategic Partners who wish to act as Users must establish physical and commercial operations within the CLRAH and comply with the existing regulations (Law 80).

States, foreign authorities, and international organizations can provide technical support or donations that can be stored in any warehouse and redelivered upon further coordination. National government agencies support Users by prioritizing the transportation of relief items, emergency escorts, customs clearance, expediting port and airport entries, and other official formalities. NGOs mainly provide in-kind donations, technical advice, and volunteer participation, whereas private organizations become logistics service providers or commercial suppliers.

3.2 Activation mechanisms within the CLRAH

CLRAH Users respond to emergency calls and humanitarian assistance through different mechanisms (CLRAH, 2021). Each is in accordance with its principles and mandates, stakeholders, and effective capacity at the moment of appeal.

The IFRC has a mandate to support all National Society members if a crisis occurs and exceeds a National Society's local response capacity through the IFRC's global disaster response system. This includes mechanisms for strategic, operational, financial support, or other specific services tailored for an effective crisis management and strengthening local response capacities in a systematic and coordinated manner (IFRC, 2023a). Participation is not executed as a direct and independent response to emergencies or disasters that arise nationally or internationally unless it is attended by a National Society, and the support request to IFRC is owing to insufficient financial and technical resources, specialists, or humanitarian aid goods.

IFRC assistance is provided at different levels: i) Country Support with the direct involvement of the nearest Country Office or the Support Team, ii) Regional Support with the leadership of Regional Offices, iii) Global Support when the strategic direction of emergency operations is provided by IFRC Headquarters. The funding mechanisms for supporting crises include Country Plans, designed for each individual country, the Disaster Response Emergency Fund (DREF), as money available to National Societies for early action or rapid response against a disaster, and Emergency Appeals for large-scale and complex disasters. Their surge mechanisms are accountable and based on a global response system: i) Rapid Response, with specialized personnel for short-term support, ii) Emergency Response Units (ERUs) as specialized teams and equipment capable of being deployed to a selected location at short notice, iii) Head of Emergency Operations (HEOPs) when experienced staff provide overall leadership during complex events (IFRC, 2023a).

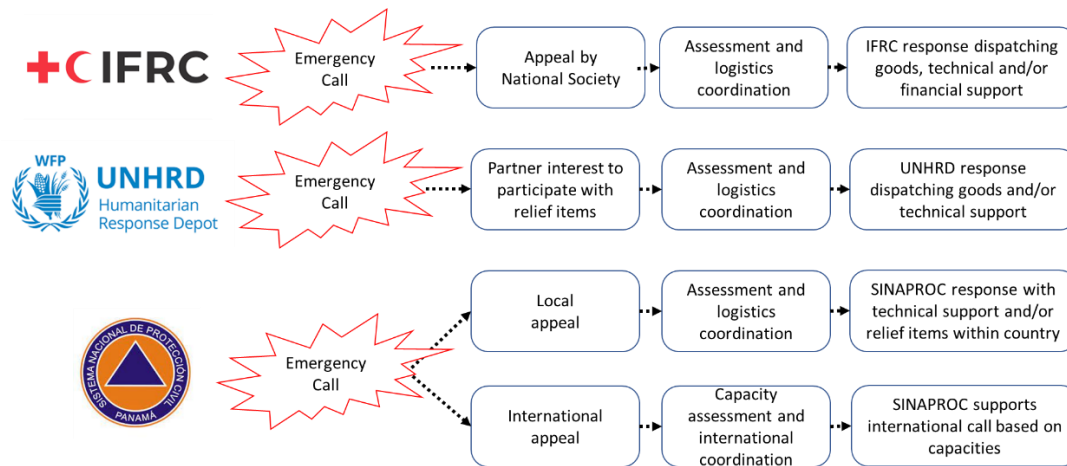
Given the existence of a specific event, the UNHRD responds with logistical support to calls made by any of its partners who previously had supplies in the humanitarian response depots (HRD) or needed to deliver resources to a specific destination when inventories are placed at other sites (Toyasaki *et al.*, 2016). Therefore, its responses are specific to the interests of its partners. To become a partner (Authorized User), organizations sign a Technical Agreement (TA) with the WFP to use the UNHRD network. Along with Standard Operating Procedures (SOPs), these documents represent the legal framework between the WFP and Authorized User for the provision of logistics services categorized as standard and specific (UNHRD, 2022).

The first group of services, which are free of charge, includes reception, warehousing, inventory management, routine storekeeping, documentation, customs management, and dispatch of relief goods. Specific services provided at an additional charge are the procurement of relief items and transport services, specific maintenance, dangerous goods handling, special handling, training, and technical assistance in the field (UNHRD, 2024). In addition, it offers optional technical assistance for specialized logistics services through Field Teams deployed on location to prevent potential bottlenecks in the receiving areas and other related assistance.

The number of relief items stored in the depot depends on the decision of each partner. As individual organizations, they decide where to store a number of items and when and where to ship them (Stienen *et al.*, 2021). Consequently, the UNHRD is the logistics executor of a partner's stock.

For the IFRC and UNHRD, their location within CLRAH allows them a faster response capacity to any request for humanitarian assistance from National Societies and partners within the Latin American and Caribbean regions. However, establishing itself as a regional distribution center allows the mobilization of staff, equipment, materials, and supplies among other global facilities for the internal collaborative support of organizations.

On the other hand, SINAPROC is a Panamanian government institution whose objective is to provide response and humanitarian assistance to the people of Panama and attend to those conditions that may affect their overall well-being. Their participation in the event of a natural hazard or disaster is through their own initiative, fulfilling the mandate to safeguard the lives of nationals and residents in the country (Alvarez and Serrato, 2013). Before any regional event, if an appeal for international aid arises, a collaboration request must be addressed to the Ministry of Foreign Affairs by its counterpart or the diplomatic mission of the requesting country. If the solicitation is within SINAPROC's response capacity and financial resources, participation is authorized (Figure 3).

Figure 3*CLRAH Users' mechanisms of response to emergency calls*

Source: CLRAH (2021)

During the Users activation process, the main role of the CLRAH Administration is to act as a facilitator of the installed capacities and provide strategic collaboration as required. In addition, it will be a focal point between Panamanian government agencies and Users for effective performance, as well as a mediator with diplomatic missions in humanitarian advocacy. This role is adopted by the Administrator and working team leaders to secure the best results of any humanitarian action and achieve the highest quality response to a crisis (CLRAH, 2021).

The Humanitarian Hub of the Panamanian ecosystem seeks mutual collaboration among all participants (Administration, Users, and Strategic Partners) to fulfill their objectives, mandates, and guarantee effective coordination and cost-efficient execution of the delivery of humanitarian technical support and relief aid to people in need. Although each User responds to their own stakeholders and mechanisms, CLRAH members are committed to assisting each other in a joint effort to enhance their response capacity and improve the overall results.

3.3 Impact for the establishment of CLRAH

Owing to their vast and diverse natural resources, Latin America and the Caribbean are among the richest and most unique regions in the world, but they are also

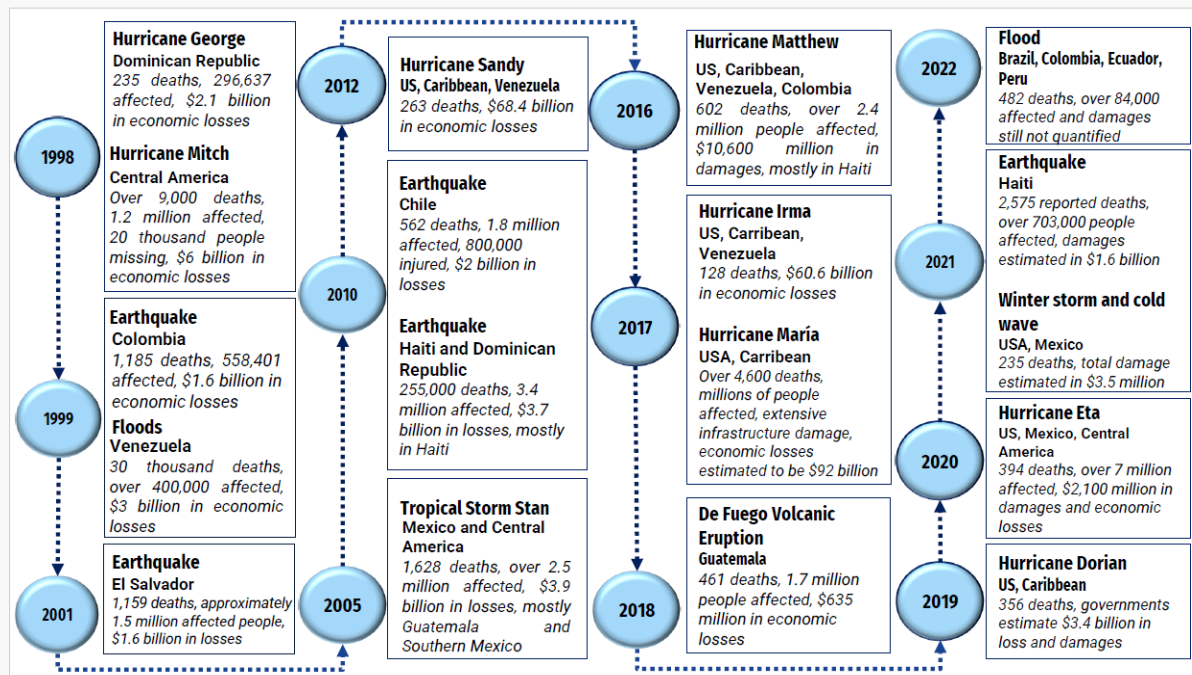
one of the most dangerous for human life, marked by major disasters with devastating consequences. Some disasters have become emblematic events and world references owing to the severity of their impact, extent of the damage, and extraordinary amounts of economic and human losses (UNDRR, 2021).

Between 1998 and 2017, disasters related to climatic and geological events claimed the lives of 312,000 people and affected 277 million in Latin America and the Caribbean. Most human losses were due to earthquakes, floods, storms, droughts, heatwaves, and other meteorological events, representing 93% of all disasters that occurred during this period (UNDRR/CRED, 2018). From 2018 to 2022, other major events caused the deaths of over 4,500 people and more than US\$12 billion in damages (CRED, 2022). The main events associated with disasters that occurred in Latin America and the Caribbean from 1998 to 2022 are illustrated in Figure 4.

The COVID-19 pandemic has been another game changer in humanitarian ecosystems. The social and economic effects that began with a health-related phenomenon continue to affect the health systems, economic growth, and well-being of the population (Rathnayaka *et al.* 2023). Latin America and the Caribbean can increase their resilience and recover their paths to sustainable development by consolidating impact-based regional value chains (Gonzalez-Perez *et al.*, 2021).

Figure 4

Main events associated with disasters that occurred in Latin America and the Caribbean



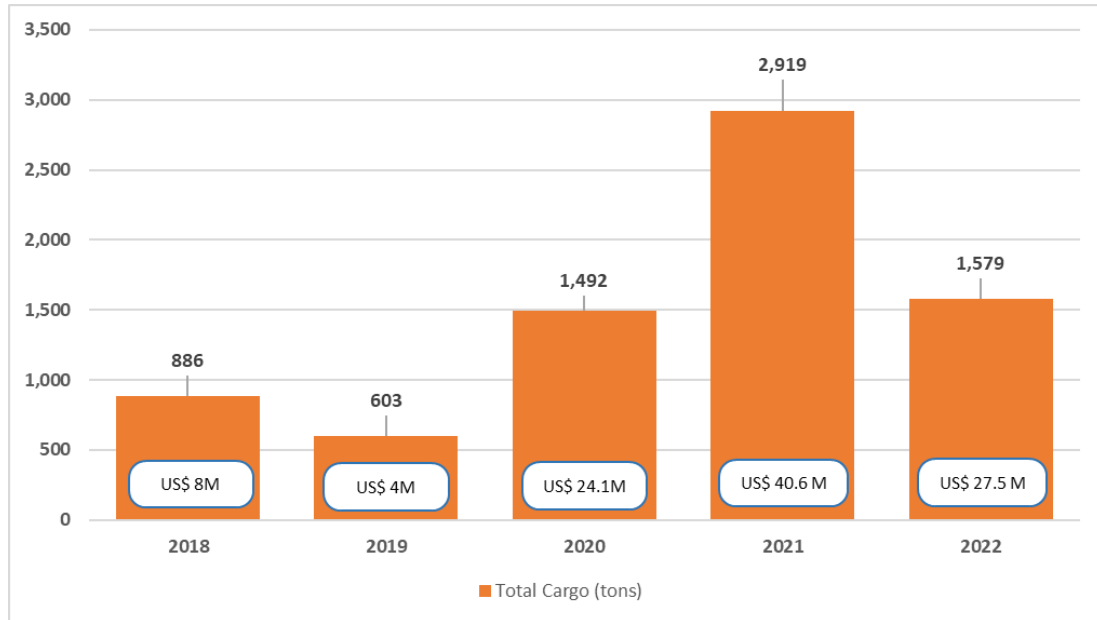
Source: UNDRR (2021); CRED (2022)

With advances in humanitarian logistics operations in CLRAH, Users have exhibited significant growth in the number of operations deployed and the volume of assistance. This fulfills the best interests of the Government of Panama and the international humanitarian community for supporting people in need at the regional level. The total weight and value of the international cargo mobilization from CLRAH is illustrated in Figure 5. The COVID-19 pandemic boosted the overall capacity of this logistics center, reaching its maximum in 2021, with the movement of 2,919 tons of relief goods valued at US\$40.6 million.

The main natural events attended through CLRAH since its inauguration in 2018 were the De Fuego volcanic eruption in Guatemala and hurricanes Irma and Maria recovery (2018), hurricane Dorian in the Bahamas (2019), tropical storm Eta and hurricane Iota and the recovery process (2020), La Soufriere Volcano eruption on St. Vincent and the Grenadines (2021), Haiti recovery support and immigrant collaboration from South America through the Darien jungle in Panama (2022), and COVID-19 pandemic response operations (2020-2022) (CLRAH, 2023).

Figure 5

International cargo mobilization from CLRAH (total weight and value in Millions of US\$).



Source: CLRAH (2023) from data provided by IFRC and UNHRD

During the first five years, the clustering model demonstrated its impact with a greater number of benefited people in terms of the amount of aid, with an increase from 886 tons (US\$8M) in 2018 to 1,579 tons (US\$ 27.5M) in 2022. From their facilities in the Humanitarian Hub of Panama, IFRC registered an outbound operation for preparation and response of 466.4 tons of aid items to 29 countries valued at US\$ 5.11M in 2022. The main relief goods were personal protection equipment (PPE), hygiene, kitchen and cleaning kits, mosquito nets, tarpaulins and jerrycans. On the other hand, UNHRD dispatched 1,112.8 tons of goods valued in US\$ 22.37 M to 34 countries including PPE, health-related items, shelter and tarpaulins, COVID-19 test and mobile storage units (MSU) (CLRAH, 2023).

Table 1

IFRC and UNHRD humanitarian operations during 2024 and mid-2025

Details	2023	2024	mid-2025
TOTAL			
Volume (tons)	779	1029.3	449.9
Value (US\$)	9.1	7.3	2.5

IFRC			
Volume (tons)	417	475	161.6
Value (US\$)	2.5	2.4	1.0
Beneficiary countries	22	25	12
Distribution	29.8%	32%	53% Maritime Air 38% Land 8% Mixed 1%
• Central America	39.7%	41%	
• Caribbean	19.7%	25%	
• South America	12.6%	2%	
• Others			
Type of goods	Personal protection equipment, hygiene kits, kitchen kits, cleaning kits, mosquito nets, tarpaulins, jerrycan		
UNHRD			
Volume (tons)	362	554.3	288.3
Value (US\$)	6.6	4.9	1.5
Beneficiary countries	33	22	14
Distribution	28.7%	6.9%	52% Maritime Air 20% Land 17% Mixed 11%
• Central America	43.3%	86.9%	
• Caribbean	22.5%	6.2%	
• South America	5.5%	0.02%	
• Others			
Type of goods	Personal protection equipment, health related items, shelter and tarpaulins, MSU		

Source: CLRAH (2025)

As reported in Table 1, the IFRC and UNHRD have similar coverage in terms of the response distribution in the Latin American region. Furthermore, with a non-food items strategy, their stock of goods has a more extended usage period since they are mostly oriented to PPE, hygiene, kitchen and cleaning kits, health-related items, water, and housing and shelter solutions.

UNHRD Panama recognized the strategic role of the enhanced new location from its original warehouse at the Panama Pacifico Airport. The new facilities were highlighted by a significant increase in operations, with nearly a doubling of the number of partners utilizing the hub's services and a threefold increase (65 to 278) in the number of consignments handled by the hub in 2021 compared to 2019 (WFP, 2022). During an interview, former UNHRD Panama Manager Francisco Quesada compared previous and current locations, and highlighted the benefits of receiving over 11,000 m² for storage, rooms for cold chain of 500 m² each one, and shared facilities with other Users. "The loading docks are placed at truck level reducing forklift movements from 4 hours before to just one hour now. This is a significant operational improvement just for having a

convenient design of the facility” Quesada (2023) mentioned. Since the number of shipments depends directly on the needs for humanitarian response, both international Users keep sufficient relief inventory in their warehouses to be prepared for any emergency call (CLRAH, 2025).

4 DISCUSSION

The Humanitarian Hub of Panama leverages from the logistics and service platform of the country and the establishment of a significant number of humanitarian-related organizations. CLRAH has become a clustering model for regional humanitarian logistics in Latin America and its main asset is its convenient location and closeness to the neighboring countries. As several authors mention, the location selection is fundamental for the design of a successful relief network (Boonmee *et al.*, 2017) and an emergency humanitarian logistics model (Timperio *et al.*, 2017), which makes it ideal for an effective distribution of relief aid and technical assistance in the event of a disaster to secure maximal coverage (Kovács & Spens, 2007; Shaw *et al.*, 2022; Balcik & Beamon, 2008).

The CLRAH response capacity is enhanced by sea and air transportation networks, where multiple shipping companies and airlines use Panama as a regional transshipment hub. Transport connectivity is crucial for the expedite reception and timely delivery of all resources. Furthermore, the planning process of transportation of goods is strengthened by the facility location (Sirbiladze *et al.*, 2021), which reduces transport vulnerability (Aslan & Çelik, 2019).

The expanded capacity of CLRAH provided by mutual collaboration allows Users to receive, store, handle and distribute relief items based on the natural event, type of disaster, potential affected population, and characteristics of the territory to assist. Besides, an adequate stock level for pre-stock and resources pre-allocated in territory and a stratified delivery aid plan are fundamental for an effective distribution of humanitarian aid (Di Pasquale *et al.*, 2020; Nawazish *et al.*, 2022).

Latin America records a significant number of events associated with disasters, and consequently people affected, deaths, and economic losses; therefore, the clustering model of the CLRAH secures physical and technical capacity with the joint effort and

partnership of its members to respond to the irregular demand patterns and complexities of emergency relief operations (Beamon & Kotleba, 2006).

Humanitarian assistance involves unexpected constraints and risks (Akgün *et al.*, 2015) and onsite activities indicate an unpredictable demand for relief items that represent new logistics challenges for agile supply chains (Kovács & Spens, 2009; Oloruntoba & Gray, 2006). To reduce the gaps from an adequate aid response and availability of resources, CLRAH members cooperate with each other not only by sharing facilities but also by creating alliances to improve preparedness, reduce logistical costs, and enhance task effectiveness (Tomasini & Van Wassenhove, 2009; Malmir & Zobel, 2021). These alliances between the government and NGOs in the Humanitarian Hub of Panama expanded with the participation of private organizations. Diehlmann *et al.* (2021), Mendel *et al.* (2020), and Nevraumont (2016) document that public-NGO-private collaboration achieves more effective solutions to humanitarian relief efforts and disaster risk reduction, preparation, response, recovery, and community resilience by sharing resources, experiences, and technical knowledge.

CLRAH is an initial step toward a similar model of how the direct involvement of a government and humanitarian community can reach a larger scope. This is the case for the Dubai International Humanitarian City (IHC), founded in 2003. Located in the United Arab Emirates, the IHC is the first and largest humanitarian hub in the world, with offices and warehouses of 135,000 m², covering Africa, Asia, the Middle East, and Western Europe (IHC, 2023), and hosting UN organizations, NGOs, and commercial firms (Ziadah, 2019).

The COVID-19 pandemic has demonstrated the valuable impact of CLRAH in supporting regional humanitarian assistance. However, as a cluster focused on disaster preparation, and immediate and precise responses to national and international appeals, the facilities of the Humanitarian Hub of Panama will soon face new challenges. The increasing number of natural events and the size and scale of disasters have led to the need for physical expansion and more installed capacities in terms of dedicated spaces, warehousing facilities, the involvement of new active members, and the upskilling of specialized human resources.

The main limitation of this study is the availability of official information and published literature on this topic; the process for documenting this kind of project will

demand more information from government authorities and stakeholders, which will become partially reserved.

Further studies are required to evaluate the new dynamics of natural hazards and other critical events, and how CLRAH will be capable of preparing and responding to the increasing number of events, the expanding needs of more facilities, and the attraction of new actors.

5 CONCLUSIONS

From an organic perspective, Panama has fostered a humanitarian ecosystem. It began with a defined number of facilities supporting humanitarian activities, which is the CLRAH, but the interaction and collaboration between its Administration Office, their Users (IFRC, UNHRD, SINAPROC), and the transversal participation of different Strategic Partners have developed a clustering model for regional humanitarian assistance for Latin America and the Caribbean, conforming to the Humanitarian Hub of Panama.

The collaborative effort among non-equals but with similar objectives strengthens the strategic alliance to have a greater impact on people in need. From a functional perspective, the Panamanian Government covers the overall maintenance costs of the complex at no charge to the Users for operating their assigned warehouses. Users are responsible only for their own running costs (staff, transportation, utilities, and equipment) but directly execute the aid response. The CLRAH Administration Office does not handle humanitarian inventory, which facilitates the efficient execution of User operations.

The CLRAH clustering model has demonstrated greater benefits by consolidating facilities into a shared-use concept and centralizing common activities. At the same time, stakeholders can easily share best practices, support each other's operations as required and/or permitted, and take advantage of economies of scale during the procurement, transportation, or delivery of relief items because natural synergies among Users may induce mutual benefits.

The unification of the IFRC, UNHRD, and SINAPROC as active actors in the international humanitarian community in a single location empowers the overall capacity

to prepare and respond to the increasing number of natural disasters and other events that affect people's lives.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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