Challenges and perspectives for humanitarian logistics: a comparative study between the Democratic Republic of Congo, the Central African Republic and the Republic of South Sudan

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Abstract

Purpose – This study aims to identify the main challenges to achieving humanitarian logistics in the context of United Nations peace missions in sub-Saharan Africa and to present suggestions for overcoming the logistical gaps encountered.

Design/methodology/approach – The methodological approach of the work focuses on the comparative case study of the United Nations Mission in South Sudan, the United Nations Multidimensional Integrated Stabilisation Mission in the Central African Republic and The United Nations Organisation Stabilisation Mission in the Democratic Republic of Congo from 2014 to 2021. The approach combined a systematic literature review with the authors' empirical experience as participant observers in each mission, combining theory and practice.

Findings – As a result, six common challenges were identified for carrying out humanitarian logistics in the three peace missions. Each challenge revealed a logistical gap for which an appropriate solution was suggested based on the best practices found in the case study of each mission.

Research limitations/implications – This paper presents limitations when addressing the logistical analysis based on only three countries under the UN mission as a case study, as well as conceiving that certain flaws in the system, in the observed period, are already in the process of correction with the adoption of the 2016–2021 strategy by the UN Global Logistic Cluster. The authors suggest that further studies can be carried out by expanding the number of cases or using countries where other bodies (AU, NATO or EU) work.

Originality/value – To the best of the authors' knowledge, this study is the first comparative case study of humanitarian logistics on the three principal missions of the UN conducted by academics and practitioners.

Keywords Humanitarian logistics, Peacekeeping missions, UN, CAR, DRC, RSS

Paper type Case study

1. Introduction

Humanitarian logistics is defined as the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the end of consumption to alleviate the suffering of vulnerable people (Mizushima and Thomas, 2005). Beamon and Kotleba (2006) characterise humanitarian logistics by large-scale activities, irregular demand and unusual constraints.

Humanitarian logistics as a field of study saw its growth from the mid-2000s with the publication of seminal works for the period in a disconnected way, as Altay *et al.* (2021) pointed out. The meta-analysis by Kunz and Reiner (2012) summarised the various systematic literature reviews produced in humanitarian logistics in that period. Undoubtedly, until the current period, studies on humanitarian logistics and improving its quality have been increasing; however, specialised publications such as JHLSCM, through its authors and reviewers, point to issues that still require more significant depth. The distance between the discussion and practice (Besiou and Van Wassenhove, 2020); the need for empirical studies on humanitarian logistics and humanitarian supply chain management highlighted in the current literature (Jahre *et al.*, 2016) despite contributions such as the chapter by Sohn (2018), the scarcity of publications with collaborative efforts between researchers and professionals or

The current issue and full text archive of this journal is available on Emerald Insight at: **https://www.emerald.com/insight/2042-6747.htm**

Journal of Humanitarian Logistics and Supply Chain Management
Emerald Publishing Limited [ISSN 2042-6747]
[DOI 10.1108/JHLSCM-07-2022-0087]

Received 29 July 2022
Revised 30 March 2023
12 October 2023
Accepted 10 February 2024

even practical experiences/*in situ* observations (Nurmala *et al.*, 2017; Agarwal *et al.*, 2019; Altay *et al.*, 2021).

Regarding the main themes, in the past 20 years, publications have been focused on specific major disasters/catastrophes, according to Holguin-Veras *et al.* (2012) or on natural disasters, as discussed by Rodríguez-Espíndola *et al.* (2023). Currently, the publication scenario is dominated by the theme of COVID-19 (Kovács and Falagara Sigala, 2021; Rahman *et al.*, 2022; Thompson and Anderson, 2021) and analyses linked to climate change and its impacts, such as discusses Yan (2023) in his literature review. The area of conflicts, wars and complex emergencies, although until recently they were responsible for most humanitarian deliveries, was practically unexplored, as Altay *et al.* (2021) pointed out.

The findings and observations surrounding scientific production in the field of humanitarian logistics have prompted the creation of this scientific article. The focus is on examining humanitarian logistics within three major crises resulting from wartime conflicts. Additionally, this article incorporates empirical insights gathered through the authors' firsthand experiences working in various capacities related to humanitarian logistics in the selected countries for this comparative case study. To ensure a comprehensive approach, it also emphasises collaboration and knowledge exchange between academics and practitioners, as the authors conduct academic research in this specific area.

According to Coleman (2014, p. 2), within the context of peacekeeping, logistics is "the science of planning and executing the movement and maintenance of staff and equipment in operations". In a peace operation, logistics takes on unique characteristics, causally related to the environment in which it develops and the actors that operate. This occurs because the multidimensionality of peace operations leads to the aggregation of military logistics and civil logistics, sometimes even business, in what we can name as humanitarian logistics, not only for its purpose but also for the unique characteristics it takes from each one of these branches.

The humanitarian logistics of peace operations in sub-Saharan Africa is one of the most challenging operations in the contemporary world. Faced with this reality, several scenarios challenge conventional logistical practices translated into humanitarian efforts on the African continent. Several events have led Africa to the current situation, whose conflicts have worsened the case in some countries. In this scenario, three countries stand out on the African continent: South Sudan (SS), the Central African Republic (CAR) and the Democratic Republic of Congo (DRC). The fragile state index of SS, CAR and DRC reveals the chaotic outlook for these countries, which are among the most delicate in the world. According to this measurement model, the higher the index, the worse the situation in the country. In 2014, the SS presented the worst index in the world, occupying the first position of the fragile state, while the CAR occupied the third and the DRC the fourth position. In 2023, it is observed that the situation has been changing. Now, these countries are occupying the third, eighth and fourth positions, respectively. Unfortunately, this change reflects not improvements in each country's situation but the presence of new areas in emergencies like Somalia, Yemen and Afghanistan. The number of people who need humanitarian assistance in the three selected countries has either remained or increased. The logistical demands to support these people need to be constantly optimised. For this, it is necessary to seek common aspects to maximise effectiveness, minimise costs and generate efficiency in regional humanitarian logistics.

This article will study the challenges of implementing humanitarian logistics in these three African countries. To this end, it is structured as follows: Section 2 briefly reviews the literature to identify the main challenges of humanitarian logistics in peace operations and the actual state of the humanitarian logistic concepts to allow empirical debate. Section 3 details the methodology used in the article. In Section 4, the research presents the main logistical challenges for each country based on the specific case study developed for each of the selected countries. The data were observed and collected by the authors who worked, respectively, in the United Nations Mission in South Sudan (UNMISS), in the United Nations Multidimensional Integrated Stabilisation Mission in the Central African Republic (MINUSCA) and in the United Nations Organisation Stabilisation Mission in the Democratic Republic of Congo (MONUSCO) and combined with the data contained in UN official documents. Section 5 dives into comparing cases through the listed variables, focusing on projecting the practical actions taken. At this point, the article returns to the theoretical frame and reanalyses the results against the literature. The last section presents suggestions for overcoming logistical gaps and improving humanitarian logistics.

2. Literature review

To acquire a profound picture of the investigated problem, this article followed a systematic literature review proposed by Hemingway and Brereton (2009), which consists of five steps from identifying all relevant published papers to the interpretation through the selection, evaluation and analysis.

For the first step, the databases chosen were Google Scholar, ProQuest and Scopus. The following keywords and Boolean operators were searched for in the fields "Title", "Abstract" or "Keywords": (UN logistics OR humanitarian logistics) AND (challenges OR trends) AND (Africa OR sub-Saharan). Previous literature reviews inspired these keywords. The search was limited to peer-reviewed publications only. With this process, we achieved 11,172 articles in the three platforms. Next, we cross-platformed to exclude articles that appeared duplicated or triplicated in academic journals, books, book chapters, theses and dissertations. After this review, we reached the total number of articles analysed according to Table 1.

The study started with an extensive review of academic literature on humanitarian logistics while also assembling data from UN mission logistics to identify the main challenges faced in logistic operations in the African continent. This literature review was subsequently narrowed down to challenges in sub-Saharan Africa.

To expand the literature review to cover the prominent publications on the subject, which might have yet to be viewed by the authors, the authors decided to use the Research Rabbit Artificial Intelligence platform to improve the results obtained. This tool consists of an artificial intelligence tool capable of searching big data for connections between articles and authors

Table 1 Results of the literature review process on the adopted platforms

Article search criteria	No of articles Google Scholar	ProQuest	Scopus
"UN logistics" AND challenges AND Africa	5	4	31
"UN logistics" AND challenges AND sub-Saharan	0	0	10
"UN logistics" AND trends AND Africa	2	2	16
"UN logistics" AND trends AND sub-Saharan	0	0	1
"United Nations logistics" AND challenges AND Africa	3	4	37
"United Nations logistics" AND challenges AND sub-Saharan	2	2	6
"United Nations logistics" AND trends AND Africa	0	2	9
"United Nations logistics" AND trends AND sub-Saharan	0	0	1
"Humanitarian logistics" AND challenges AND Africa	310	148	68
"Humanitarian logistics" AND challenges AND sub-Saharan	46	32	13
"Humanitarian logistics" AND trends AND Africa	240	106	15
"Humanitarian logistics" AND trends AND sub-Saharan	35	21	1

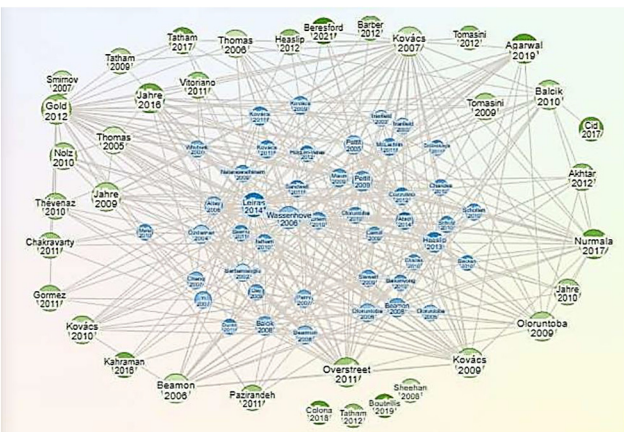
Source: Authors

that may have gone unnoticed during the initial literature review on the abovementioned platforms. The reports initially obtained through the literature review were inserted into the AI platform. A spatial model was produced based on connection criteria:

- cross-references; and
- the number of citations (relevance).

The obtained model is shown in Figure 1.

Figure 1 Spatial model obtained based on cross reference criteria using AI



Source: Figure created by authors

These documents led the existing literature to define fifteen challenges, which were reduced to six categories due to the similarity of some terms related to humanitarian logistics in the sub-Saharan Africa UN missions. These challenges can be summarised to consist of:

- Geographic location;
- Infrastructure;
- Environmental situation;
- Security;
- Coordination; and
- Financing.

Following and extending the approach taken by Beresford and Pettit (2021), Table 2 details the principal articles obtained in the early literature, confronting the main challenges and their incidence in articles, book chapters and reports with a higher quantity of citations in the platforms used in the research. A few additional relevant articles based on high citation frequency are also included as they are appropriate to the context of the discussion. This approach helped to refine the challenges to be analysed in the literature review, systematising the process of the theoretical scope.

The challenges can range from a lack of electricity supplies to limited transport infrastructure, including a "controlled" environment with minor variability (Kovács and Spens, 2009). The challenge of using the means available and getting the necessary support to its destination characterises one of the fundamental points for the success of a mission. Regarding humanitarian logistics, currently, several tools are available to help decision-makers in the first hours after a disaster. However, the rapid deployment of an adequate distribution network and the efficient distribution of humanitarian aid is still crucial to save human lives and alleviate suffering (Paquet, 2011, p. 1).

Regarding the challenge of geographic location, the literature points out that geographic context plays a crucial role in potential preparation for item pre-positioning measures and infrastructure (Kovács and Spens, 2009). The geographic characteristics of a region can also present challenges in accessing affected populations (Balcik *et al.*, 2010). Kunz and Reiner (2012) help better to understand the importance of geographic information in humanitarian contexts while also demonstrating that the literature, despite some exceptions such as Thomas and Fritz (2006), Smirnov *et al.* (2007), Gormez *et al.* (2011), Balcik *et al.* (2010), Nolz *et al.* (2010), Tatham (2009) and Thévenaz and Resodihardjo (2010), generally focuses on exogenous factors.

Infrastructure situational factors, such as the availability of a road network, railway, airports and power supply, play an essential role in the performance of humanitarian logistics (Chakravarty, 2011; Nolz *et al.*, 2010; Pazirandeh, 2011; Vitoriano *et al.*, 2011), not only factors but also all

Table 2 Key challenges and references

Reference/key challenges	Geographic location	Infrastructure	Environment situational	Security	Coordination	Financing	Output type	Citation Google Scholar	Citation Scopus	Citation ProQuest
Kovács and Spens, 2007	X	X	X		X		Journal	1,496	126	215
Sheehan, 2008						X	Journal	9	0	0
Kovács and Spens, 2009	X	X	X		X		Journal	690	805	22
Tomasini and Van Wassenhove, 2009				X			Journal	485	331	15
Nolz *et al.*, 2010		X					Journal	62	128	2
Balcik *et al.*, 2010	X						Journal	1,135	781	43
Beresford and Pettit, 2009				X			Journal	203	141	0
Jahre and Jensen, 2010		X					Journal	287	153	9
Chakravarty, 2011		X					Journal	58	26	2
Pazirandeh, 2011		X					Journal	63	28	2
Vitoriano *et al.*, 2011		X					Journal	341	65	19
Tomasini, 2011				X			Book chapter	10	19	0
Overstreet *et al.*, 2011					X		Journal	272	176	7
Kunz and Reiner, 2012	X		X				Journal	294	169	4
Akhtar *et al.*, 2012					X		Journal	220	95	12
Heaslip, 2012						X	Book chapter	29	17	1
Barber, 2013				X			Book chapter	38	14	3
Coleman, 2014		X				X	Report	58	0	0
Boltürk *et al.*, 2016	X			X			Journal	65	24	2
Boutellis, 2019						X	Journal	13	0	0

Source: Authors

infrastructure network play an essential role providing humanitarian aid to the nodal points (Rojas Trejos *et al.*, 2023), in this sense investments on infrastructure preparedness have been proved to be a good strategy to improve the effectiveness of the operation (Lewin *et al.*, 2018). However, it is necessary to remember that infrastructure is often damaged and transport capacity into an area is often restricted (Jahre *et al.*, 2009); infrastructure generates the most significant shares of operational requirements expenses in UN peacekeeping (Coleman, 2014). The current literature is focused on disasters and the results of a collapse of infrastructure. Few authors discuss the need for more infrastructure, which is the reality of several African countries when debating humanitarian logistics.

Security is another factor that directly affects humanitarian logistics. It is essential to consider that security is dependent on the local government and that the level of (in)security directly impacts the performance of the logistics response (Wood *et al.*, 1995; Kunz and Reiner, 2012; Tomasini and Van Wassenhove, 2009). Therefore, increasing security in places where there are armed conflicts is critical (Beresford and Pettit, 2009; Kovács and Spens, 2009). In extreme crises, the goods transported by logistics can become targets for thieves due to their high added value during emergencies, so the humanitarian operation in the country could be jeopardised if there is no longer a functioning or continuous supply corridor (Lewin *et al.*, 2018). One way to mitigate this problem is by planning the location of warehouses near safe places (Boltürk *et al.*, 2016) and, of course, ensuring a safer and neutral corridor (Schlein, 2015). Another way to minimise this problem is to involve military personnel in the logistics supply chain (Barber, 2013), facilitating the security of logistics convoys and local supply warehouses.

Usually, the most common obstacle discussed in academia for humanitarian logistics comes from natural disasters. Very little is said in the current literature about the existence of armed groups that hamper or obstruct these logistics, and even less is discussed on how to neutralise this threat to pave the way for humanitarian logistics. This scenario has been common in some parts of the African continent, and it is believed that this gap has left a vital knowledge vacuum, which will be addressed in this paper.

Humanitarian logistics is also directly affected by factors in the environmental situation, such as the frequency and intensity of rainfall, the topography of the terrain and the site's climatic conditions (Kunz and Reiner, 2012). Such conditions mainly affect transportation infrastructure, hindering the swift movement of relief supplies and personnel. Normally, road transport, which is the cheapest and most easily deployed, becomes the most affected slowing down response efforts and impacting the distribution of aid (Negi, 2022). Rainfall is most responsible for severely deteriorating the traffic conditions of roads by causing flooding, soil erosion and landslides (Kovács and Spens, 2009), especially in tropical climates, such as in African countries. These variants make it challenging to implement fast and efficient logistics (Cid and Goldoni, 2017), delaying the entire logistics chain and potentially leading to the loss of human lives.

Coordination among actors involved in humanitarian aid is one of the main challenges in responding effectively to disasters (Kovács and Spens, 2007). The coordination process is understood as activities among interdependent organisations to achieve the common goal of effectively improving the flow of information along the supply chain, controlling the production and delivery of goods and receiving donations, costs and quality of services (Akhtar *et al.*, 2012). For Overstreet *et al.* (2011), coordination in humanitarian logistics is complex as it involves many uncertainties, time constraints, shortage of trained people, funding, equipment difficulties and significant interference from various parties. Thus, coordination is the heart of any humanitarian logistics operation, for without it, any joint response is compromised.

The ability to distribute costs is at the heart of the UN's capacity to finance its peace operations (Coleman, 2014). While the humanitarian aid community must go through much longer processes to secure funding, the military has access to substantial discretionary funds, which often leads to the replacement of civilians by military personnel, whether out of necessity or will (Heaslip, 2012). However, Boutellis (2019) and Sheehan (2008) point out that the problem starts at the top of the UN funding system. The discredit in the UN's ability to resolve the conflicts in which it is involved causes distrust in rich countries classified as the most significant financial contributors. This factor, associated with the non-payment of quotas by several countries, implies the inability to reimburse troop-contributing nations, which leads them to reduce their interest in contributing to future missions (Boutellis, 2019; Sheehan, 2008). In the same direction, but from an administrative point of view, Coleman (2014) presents three problems related to peacekeeping finance: a – The methods of reimbursement of troop contributing countries and police contributing countries for staffing is flawed; b – The reimbursement mechanisms to the states for the implantation costs of the equipment of their contingents are deficient; c – The existence of structural obstacles that prevent the leverage of resources to deploy more qualified units.

3. Methodology

This study adopts a comparative case study approach to analyse humanitarian logistics in peace operations in sub-Saharan African countries. This method provides an understanding of the logistical nuances in different contexts, allowing for identifying patterns and singularities (Hollweck and Yin, 2015; Yin, 2018). By focusing on the countries of SS, the CAR and the DRC, the aim is to provide a comprehensive analysis of peace operations in these complex and challenging scenarios.

The research technique is based on a solid literature review covering official documents from UN peacekeeping missions, providing a robust theoretical framework. In addition, it incorporates practical descriptions obtained through the participant observation technique of the authors (Spradley, 2016), who worked for a year in each of the peacekeeping missions of the countries under study. Field activities included participating in meetings of the military component with the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), coordinating the use of armed convoys and military equipment for humanitarian benefit, meetings of logistics groups, involvement in the civil-military coordination process, distribution and receipt of supplies in the countries of the SS, CAR and DRC. This practical view gives an authentic character and a privileged perspective on the challenges faced

in the field, strengthening the validity and relevance of the results obtained.

Subsequently, a comparative study of peace operations in the three selected countries will be conducted. This process will seek to identify similarities and distinctions in the humanitarian logistics used to gain a comprehensive understanding of the factors that influence the effectiveness of the operations. The comparative analysis will then be structured into six predefined categories based on the literature review: Geographical location, Infrastructure, Security, Coordination, Financing and Environmental Situation. These six categories were selected after the initial literature review based on their critical relevance to the success of peace operations in complex humanitarian contexts.

The results will be compared with existing scientific literature, promoting rigorous validation of the study's findings. This step is crucial to ensure methodological consistency and a substantial contribution to humanitarian logistics in peace operations. At the end of the study, suggestions will be made to improve the efficiency of humanitarian logistics used by the UN in peace operations in sub-Saharan Africa. These recommendations will be based on the study's empirical findings and thoroughly examine the relevant scientific literature.

This methodological approach, anchored in a comparative case study, a thorough literature review, participant observations and a structured analysis of peace operations, will allow for an in-depth and informed investigation of humanitarian logistics in challenging contexts in sub-Saharan Africa. Figure 2 shows a flowchart resuming the steps adopted to simplify the understanding of the article methodology.

This article is limited in its approach to the logistics of peace operations based on just three African countries. In addition, it considers that certain system flaws during the observed period are already being corrected by adopting the 2016–2021 strategy by the UN Global Logistics Cluster (GLC). This is basic research in nature, which, in its expansion, can serve as a basis for new applied studies.

4. Analysis – The main logistical challenges in humanitarian operations

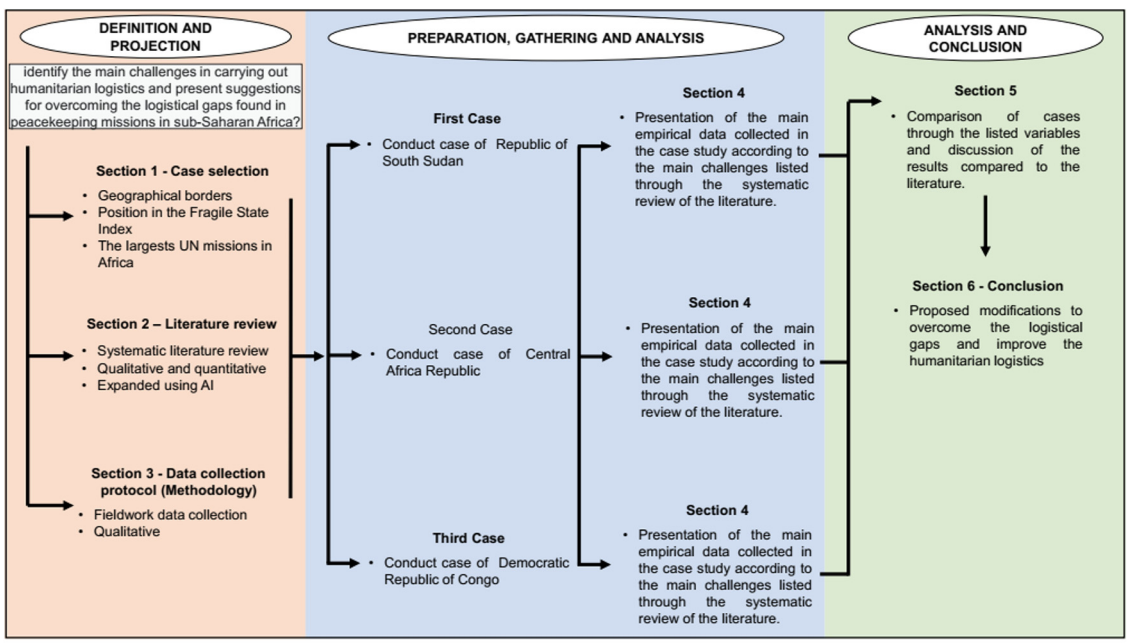
This section presents a case study of each country in focus, addressing the main logistics problems that can be identified in the local context, according to the challenges highlighted by the literature review. Although the three countries have essential similarities, the results and impact on the UN mission differ. Geographical conditions are fundamental to explaining the results and challenges the local logistics cluster (LC) faces. In the same direction, there is a historical component connected to the threat, capable of profoundly influencing the results, requiring new solutions to provide accurate results to humanitarian assistance.

4.1 Republic of South Sudan

The RSS has one of the world's most complex and challenging supply chains because of its geographic localisation. Its landlocked position in the heart of the sub-Saharan area, without access to national ports, increases the challenges to transport goods not only for regular markets but mainly for humanitarian purposes. The SS LC uses three corridors across nine countries to supply the main delivery points, with limited or non-existent road transport infrastructure and severe air operation restrictions (WFP, 2017, p. 14).

The lack of national structure, reflecting two significant wars still as part of Sudan, the conflict that started in 2013, two years after independence and the historical neglect in which SS was immersed for many decades impacted the development of local

Figure 2 Flowchart of the methodology adopted



Source: Figure created by authors

structures that could be harnessed by the SS LC, which led to the establishment of regional (Uganda, Kenya, etc.) and international system contracts[1], which naturally makes values more expensive (Oliveira and de Silva, 2011; UN, 2013)

The corridors for transporting supplies to SS are long and based on axes of low transitability and are subject to climatic seasonality. They are North Corridor – road transport from the Port of Sudan via Kosti (Sudan) to Upper Nile State (South Sudan); Eastern Corridor – land transport from the port of Djibouti (Djibouti), passing through Nazaré to Gambella/ Jimma all in Ethiopia, from this point, 90% of the cargo is launched in the northern states by aircraft, while the rest is transported by road and river and c) Southern Corridor – road transport from the ports of Mombasa (Kenya) Dar Es Salaam (Tanzania) and Tororo (Uganda) to Juba or the advanced centres in Bor, Rumbek, Wau, Aweil and Wunrok (WFP, 2017, p. 14).

Climatic conditions in SS are another question that needs to be addressed carefully. There are two main seasons: wet and dry. The wet season begins roughly about the end of April and ends about the future of November, followed by the dry season. Seasonal rainfall is heaviest in the upland areas of the south and diminishes to the north. During the rainy season, many roads become inaccessible. Up to 60% of the country is cut off during this period, meaning that humanitarian response by road is minimal or impossible from July until December (and sometimes longer).

SS has been facing security problems that directly impact humanitarian logistics. Operational interference, movement restrictions and bureaucratic impediments caused by the government of SS (OCHA, 2018, pp. 7–8) are the main reasons that hinder the movement of food and non-food items. Acting through delays in customs inspections, non-concession or hold of the mandatory document for air transportation "Flight Safety Assurance" (FSA[2]) and the non-authorisation of entry for specific items, mainly dual-use items.

Another challenge refers to the difficulty of adopting centralised management processes through a single component running the supply chain, as happened in Sudan (Tomasini, 2011, p. 21) when the United Nations Joint Logistics Centre[3] was established to fill logistics gaps and alleviate bottlenecks, prioritise logistics interventions and investments, collect/share information and assets, coordinate port and corridor movements to reduce congestion, provide details of transporters and rough indications of market rates, provide guidance on customs issues and provide information on equipment and/or relief items suppliers (Tatham *et al.*, 2010). This difficulty occurs due to other organisations' non-mandatory participation in this centralised logistical process (Jahre and Jensen, 2010, p. 662), resulting in competition for the few regional resources and structures to be contracted among the actors in SS.

Duplication of efforts, the inadequacy of items, the loss, either by a criminal act or by validity and the supply gap are common problems established in the logistics chains in conflict environments and operational restrictions. The poor governance of some NGOs, combined with the instability caused by high staff turnover and the employment of inexperienced humanitarian managers, is unable to understand the extent of the need for coordinated and broad logistical management (Adem *et al.*, 2018), which has a profound impact on the coordination process.

Another coordination problem regarding the micromanagement carried out by certain NGOs, refusing a centralised supply chain, has consequences not only for the organisations but also for the system that derives efforts from places already covered, has difficulties in hiring staff regionally and locally for higher demands and still fails to meet local requirements because it is not able to measure the actual needs.

Another point refers to the competition of humanitarian organisations for financial and material resources and the media's attention (Kovács and Spens, 2010; Oloruntoba and Gray, 2009), which directly impacts humanitarian provision. Small non-governmental organisations have few donors who make them operate under pressure to show short-term results. This environment of work associated with the difficulty of installing their operations leads them, several times, to place themselves close to the logistical access axes, which impacts the delivery of humanitarian provision in places of difficult access and high humanitarian insecurity. Another type of indirect effect is the collapse of local commercial relations once the indiscriminate presence of foreigners increases the local prices, making the few productions of agricultural items destined for these NGOs, not for the local market.

4.2 Central African Republic

CAR occupies the penultimate place in the 2018 HDI, with about 79% of a population of 4.7 million impoverished inhabitants. Almost three million residents need humanitarian assistance. Low productivity, weak markets and high gender inequality contribute to the problem and are further aggravated by the recurring political crisis and insecurity (WFP, 2020).

When CAR's LC was activated in August 2013, funding was scarce, security was critical and access was extremely challenging. In addition, the country's logistical infrastructure was insufficient, and the logistical capacity of humanitarian actors was lacking. To contribute effectively to the humanitarian response, the CAR's LC would need strong leadership to ensure an adequate configuration in terms of resources, skills, partnerships and global implementation support. However, this leadership did not materialise, leading to inadequate initial performance (LC CAR, 2016, p. 3).

Among the various challenges faced, it is possible to highlight some that directly interfere with logistics, such as internal violence, geographic aspects, roads, rains, storage capacity and air support. Each of these is treated now as a problem to be overcome by the international community, with different levels of priority for each agency.

Violence is one of the factors that devastates a country's ability to react to reverse its situation. Several efforts are directed to end this evil plague in CAR, and actions could be required to address issues related to the increase in people's social welfare. The security situation continues to deteriorate. Armed groups fuel intercommunity tensions, exacerbating sectarian violence. Over one million Central Africans have fled their homes, and 2.5 million people, more than half the population, need emergency humanitarian assistance. This situation has led to a deterioration in essential social services and economic infrastructure. In addition to violence protection, priority needs are food, health care, water, hygiene and sanitation, shelter and household items (OCHA, 2020).

CAR's geographical aspect is related to its interior continental position, such as its difficulties regarding integrated logistics aspects. CAR is a landlocked country dependent on land access from the transport means of neighbouring countries, such as Cameroon. According to the Logistics Capacity Assessment, Cameroon has four ports: Douala, Kribi, Limbe and Tiko. Douala, which comes to be the country's principal port, handles almost 95% of the goods entering the country. It is also the main foreign trade port for its neighbours, such as the CAR. A new Kribi Conteneurs Terminal has been open since March 2018 (GLC, 2019a). The distance to Bangui, the capital of CAR, is 1,421 km by road, which poses a challenge for road logistics flow.

Road and sea integration are essential for logistical support. Road conservation increases in importance as the country is more inland on the continent. The average flow time from Douala to Bangui is about two days via the only existing paved road. Access to the CAR population is complex, even without the additional restrictions. A World Bank study in 2019 noted that the country's road network coverage represents a critical challenge. The main factors are road network density is low at only 1.5 km per 100 km^2 with only a third of other fragile and low-income countries density; poor road network with only 62% (80% is the average in fragile states); low investment in strategic transit corridors with neighbouring countries like Cameroon and DRC and low public investment (except for main roads) (World Bank, 2019). In addition, the country's truck fleet consists mainly of low maintenance used trucks due to the regulatory structure of the country's transportation sector, which limits the use of trucks in terms of mileage and, therefore, incentives for investment in vehicles (LC CAR, 2016, p. 11).

Another factor that, combined with the road situation, can make logistics difficult by road is the rainy season (June to December). Heavy rains and dirt roads are muddy and almost impassable during this period, which is good news for agriculture but a real challenge for humanitarian organisations trying to bring relief items to people in need, severely affecting transport from Cameroon to the prefectures such as Ndele, Zemio, Obo and Rafai and making it inaccessible access to Birao and Tiringoulou (WFP, 2019a).

According to these aspects described above and actual country situation, time is the dominant factor that is confused with the mission. Almost three million people need humanitarian assistance across CAR, equivalent to Madrid's entire population or Nairobi. Relief items transport is a crucial but always challenging component of the humanitarian response in CAR. Reaching these people with assistance in remote places and keeping them in a continuous movement to escape conflicts has become a mystery (WFP, 2019a).

Some of the most affected sites are almost entirely isolated due to the lack of roads leading to them, or those that do, which are often not robust enough to support large trucks. Some of these locations can take three to week weeks to reach. The struggle to get there is further hampered by the prevailing insecurity, often making road travel very dangerous (WFP, 2019a). In this scenario, using air transport is often the only possible way to achieve efficient humanitarian logistics.

4.3 Democratic Republic of Congo

The DRC is the largest country in sub-Saharan Africa, possessing immeasurable natural wealth and the stage of one of the most complex humanitarian crises in the world. This fact is due to numerous concomitant factors, such as continuous armed conflict, demanding access to needy people, precarious infrastructure and high vulnerability of the population, associated with the limited capacity of the state to meet the needs of the people affected and a multitude of simultaneous emergencies that plague the country (LC DRC, 2016).

In general, the country's infrastructure could be improved and more secure. The government still needs to maintain or rebuild national roads after the deteriorating political, social and security situation in recent decades. The humanitarian community has identified weak infrastructure as one of the biggest obstacles to reaching beneficiaries in remote locations (LC DRC, 2016).

Another problem found as an obstacle to humanitarian logistics was the need for more transport services, as well as storage in remote areas. The most vulnerable communities live in isolated areas or places with severe limitations in land connections with major cities. There are either no road connections in these places or it is very precarious, so the lack of transport services persists. These characteristics are added to the lack of storage areas for goods and materials, which often makes storing materials necessary for humanitarian support unfeasible, causing a low impact on the most vulnerable communities (LC DRC, 2016, p. 7).

Such conditions are aggravated by the tropical climate, with abundant rains from July to December, which deteriorates or impedes the traffic conditions of the country's roads. The alternatives are the fluvial environment, mainly limited to the Congo River or the aerial environment, the ideal means to overcome the tropical jungles, but costly and dependent on the scarce airports in the country (WFP, 2019b).

Besides this, the policy of conducting the country is marked by cases of corruption and disputes for power, in addition to having armed forces with disabilities in personnel, material and preparation, resulting in the absence of the state in various situations in this country of continental proportions (Silva, 2012). In addition, the government is constantly plagued by Ebola epidemics, suffering in 2018, the second-largest outbreak globally. Over 3,400 people were infected, with approximately 2,200 dead (WHO, 2019).

In the area of coordination, the main existing bottlenecks were identified as the difficulty of logistics coordination in remote areas, the complexity of carrying out customs clearance at the borders, the high fees charged in the country for logistics services, the difficulty in telecommunications infrastructure and the fragility of the local government with several cases of corruption (LC DRC, 2016, p. 8).

Even more severe is the need for more communication and understanding between the parties in large cities, such as Kinshasa and Goma and the actors in the most isolated fields, which generates a lack of confidence and makes it challenging to implement strategies to support humanitarian crises. In addition, "Focal Points are generally responsible for various operations in the country and, in certain cases, due to the high workload, the support provided to the LC Coordinator is more reactive than proactive, preventing some problems from being

addressed in an appropriate and timely manner" (LC DRC, 2016, p. 15)

Funding for humanitarian responses was another bottleneck identified by the LC. In 2016, approximately 7.5 million people needed some form of humanitarian assistance. The budget requested to provide humanitarian support in this period was US$680m. For comparison purposes, in 2015, US$692m had been asked, of which only 65% was authorised, that is, US $448m, making the humanitarian response even more difficult in a troubled scenario (LC DRC, 2016, p. 7).

5. Discussions – Comparative case studies

The purpose of this section is to compare the measures that have already been implemented or are in the process of being implemented in the logistical context of the missions covered, according to the categories of challenges encountered. It also aims to discuss how each country's solution has allowed advances in the humanitarian provision and the functioning of the various organisations, as well as in the coordination of efforts and based on the main challenges pointed out by the systematic literature review.

5.1 Geographic location

As previously demonstrated, geographic location is one of the categories that presents itself as a challenge to be overcome for the practical realisation of humanitarian logistics. The long distances to be covered, added to the precariousness of ways of transport and adverse weather conditions, impose the difficulty of moving goods and services to isolated people and communities.

To overcome these challenges, RSS has been making use of community warehouses (LC RSS, 2019a, p. 1) in areas of difficult access or even inaccessible during the rainy season; these are considered strategic for the logistic manoeuvre (GLC, 2015, p. 40). These warehouses ensured the continuity of the logistical flow and, consequently, the humanitarian actions. At the same time, mobile storage units (MSUs) were provided on loan to organisations willing to manage them as shared storage in locations prioritised by the Inter-Cluster Working Group (GLC, 2019b).

To access these isolated places, it is necessary to use the various means of transport available, with air being essential for this purpose. In CAR, humanitarian groups have jointly identified five priority locations for air transport where needs are exceptionally high. Thus, since 2017, CAR's LC has coordinated access with three critical aircraft contracted by the WFP in different sizes and capacities, which allows flexibility for cargo transport and landing on available runways (LC CAR, 2019a). Despite their higher cost, helicopters are also feasible, allowing access to more remote areas without needing airstrips.

5.2 Infrastructure

The challenges of geographic location are closely linked with another category nfrastructure. Deficient infrastructure, especially transport, is a profound challenge to overcome for implementing humanitarian logistics in the countries studied. Roads are generally poor, airports and ports are scarce and railways need to be more present.

In SS, the diversification of transport modes and their coordination through UNMISS, together with the WFP, UNHAS and OCHA, demonstrates how the synergy of efforts has guaranteed the continuity of humanitarian operations (WFP, 2017, pp. 10–12). Maximising the use of roads during the dry season by increasing safety conditions, taking advantage of the navigability of rivers (mainly the Nile River) to move large volumes of cargo and improving air capillarity[4] through the positioning of strategic aerial (LC RSS, 2019a, p. 3) guarantee the delivery of essential items and the advance storage described above. River transport by barge is available to handle larger loads of non-food and food items for humanitarian aid. The objective is to allow organisations to establish a chain of uninterrupted supply to support delivering or pre-positioning relief items to affected populations and carry no charge at other points through small boats (LC RSS, 2019b, pp. 1–3).

In the CAR, the need to repair roads and bridges to maintain the flow of humanitarian support led to the implementation of relatively low recovery programmes from 2015 to 2017. However, the budget did not include personnel and resources and fundraising through donors needed to be increased (LC CAR, 2016, p. 23).

In the DRC, it was noted by the logistic cluster that the country's infrastructure is limited and in a deplorable state. The humanitarian community has identified poor infrastructure as one of the biggest obstacles to getting aid to beneficiaries in remote locations. Due to the importance of road rehabilitation, a specific subgroup could be created for this task so that problems in other areas also had room for discussion (LC DRC, 2016).

5.3 Security

As stated earlier, very little is said about the impact of violence perpetrated by armed groups on humanitarian logistics. In the case of the countries studied here, this violence is a constant reality that seeks to be addressed differently in each country.

In the DRC, the violence has reached such a high level that the UNSC decided to create in 2012, for the first time in UN history, a Force Intervention Brigade (FIB) to neutralise the armed groups existing in the country. This Brigade, the most prominent armed group, M-23, allowed the liberation of the areas controlled by this armed group and re-established humanitarian logistics activities under better security conditions (UNSC, 2013, 2014). The mandate of the FIB has been renewed ever since, demonstrating that the level of violence in the country remains critical.

The UNMISS, in response to requests from humanitarian workers, studies on a case-by-case basis, always keeping in mind the available resources, priorities, costs and capacities. The mission developed an incremental security strategy for the main transport axes to establish a temporary base through which patrols radiate and ensure safe movement on the road. This initiative has increased the number of convoys running and the alignment to the principle sought by most humanitarians about the military, the principle of coexistence and non-association (Colona, 2018, p. 128). Security issues have been a primary focus since the escalation of the conflict in 2016 and 2017 in the capital, Juba (where large stocks are located). Risk analysis has led WFP to drive improvements in warehousing security and supply chain planning, reducing inventory quantities in high-risk locations, acquiring dedicated storage space for its operation in Tororo, Uganda, to reduce the general stock levels previously maintained in Juba, increasing the security of the rest of the essential items (WFP, 2017, p. 17).

MINUSCA's military contingent has guaranteed security in several places in the country, but geography provides isolation in some parts of CAR where violence still proliferates. Blue helmets have managed to bring a feeling of hope to the most vulnerable, but much remains to be done. The Special Representative of the Secretary-General in CAR has warned the Security Council that the situation in the country remains severe and there are still armed groups in the process of negotiating peace. Actions such as the signing of a peace agreement between the CAR government and 14 armed groups under the "African Initiative for Peace and Reconciliation in the Central African Republic" led by the African Union (UN, 2019a) and the implementation of a rapid force intervention with Portuguese contingent, has shown the attention of leaders in combating and reducing violence (UN, 2019b).

5.4 Environmental situation

The difficulties imposed by the environmental situation in the countries studied usually occur due to the rainy season, which leaves the existing roads in deplorable traffic conditions. According to the Climate Centre (2021, 2023), weather and climate accounted for most displacement and caused severe problems for people in vulnerability, as in SS with the Nile floods. This condition is closely linked to the previous one.

In DRC, one of the primary logistical deficiencies listed by the humanitarian agencies was strengthening capacities to support road rehabilitation (LC DRC, 2019a), usually affected by the rainy season. Among the main recommendations is the reinforcement of the road access work team to recover the roads from the critical areas affected by the crisis, as well as to improve the geographic information systems and the road access mapping tools and products (LC DRC, 2019b)

In SS, to reach isolated communities in the rainy season whose terrain is inaccessible by land and impeding the landing of helicopters, WFP improved the capacity to launch specialised nutritious foods, which were previously delivered by helicopter, thus increasing the total volume of deliveries and reducing the cost of air delivery per ton of these foods by 85% (WFP, 2017, p. 15).

Droughts, erratic rains and dry spells affect the northern Sudan-Sahelian part of CAR, triggering periodic conflicts between farmers and transhumant pastoralists in the country's north-Western, northern, north-eastern, eastern and south-eastern parts. At the same time, climatic conditions immobilise access to inland regions, increasing humanitarian insecurity (WFP, 2021). The increase of the volume storage using shared warehouses, in an environment where the lack of security reaches alarming levels, has been adopted as a logistical solution to optimise the cost, space, time and labour required for humanitarian logistics. Without this, humanitarian organisations would be much more difficult and costly to ensure their logistics project runs smoothly (LC CAR, 2019a, 2019b).

5.5 Coordination

A humanitarian logistics operation is a large coordination operation by which the various actors seek efficiency. Therefore, coordination is the heart of this type of operation. A good coordination solution found by the WFP to reduce costs and develop the logistics in DRC was the creation of a logistics chain that combines the hiring of commercial carriers (road, air, river and rail) to complement the 106 trucks of the organisation itself. This combination was essential for timely and synergistic delivery to the various locations in the DRC, leaving WFP in areas not covered by commercial carriers (Kalinga and Jibidar, 2017).

Other critical future perspectives can be taken from the report of lessons learned in 2016 by the DRC LC. In the coordination area, three recommendations were made. The *first* concerns the creation of a new state strategy for the LC in a more participatory manner, engaging the main actors. The *second* recommendation is to strengthen the coordination approach to be more proactive and inclusive, reducing the weak communication between the actors of the LC in the capital, Kinshasa and those in the field, especially in the city of Goma, in the east of the country, which concentrates 60% of humanitarian actors in the most troubled area. The *third* recommendation is restructuring personnel to balance the coordination of the centre and the field, reinforcing the Goma LC with clear job descriptions that guarantee the optimal use of resources in the final activity (LC DRC, 2016, pp. 11–16).

In UNMISS, the OP LIFELINE operation shows one of the best examples of full civil and military coordination. UNMISS deployed riverine units, specialised and equipped to operate in rivers, thus creating the same context to patrol the roads. In 2018, 1,015 tons of emergency items were transported along the Nile River through seven barge movements from Bor to Malakal in close cooperation with the WFP (GLC, 2015, p. 40). The barge movement represents, for logistical transport, an example of the necessity to integrate transport models and the capability of increasing amounts of items, decreasing the value spent once many areas before are only covered by helicopter.

The need to facilitate a convoy with the UN Integrated Multidimensional Stabilisation Mission in CAR (MINUSCA) was raised at coordination meetings. Still, the main parties needed clarification about their roles and responsibilities. CAR's LC did not facilitate free transport services, but for periods, the cluster provided information on the options of using WFP transport under a bilateral cost recovery contract (LC CAR, 2016, p. 21). Until the end of 2014, due to attack risks on trucks and consequent difficulty in identifying transporters willing to do the job, transport support was mainly related to facilitating safe transport.

5.6 Financing

The big problem related to financing is verifying the actions/projects' effectiveness. One of the factors contributing to the difficulty in monitoring efficiency occurs because the LC coordinator at the country level is responsible for managing the cluster and reports directly to the country director, which limits GLC oversight and support.

One suggestion for solving this problem in DRC was the creation of key performance indicators (KPIs), quarterly summaries and financial management tools to enable more accurate support for the operations of the LC, to serve as a guide for national-level strategies and to strengthen project management. These KPIs must be agreed upon among the LC participants for a specific period, highlighting what the cluster aims to achieve shortly and what achievements are expected as a performance measure.

The CRUZ Report (Cruz *et al.*, 2017) also corroborates the idea that performance measurement of activities and operations on the ground is critical. According to this report, implementing change requires solid and committed leadership at all levels, and it is essential to establish a senior governance body to oversee the implementation of recommendations and proposals, including senior leadership from the Secretariat and one or two external experts. In addition, a sub-body of the governance structure needs to be established to evaluate the actual performance of implementing the recommendations and proposals. Also, according to this report, if governance and evaluation mechanisms are found and recommendations are implemented, the number of deaths and injuries will decrease. Otherwise, the trend in the number of fatalities will likely worsen (Cruz *et al.*, 2017).

UNMISS' approach of decentralising authority and financial resources to field offices has been described as an enabler, giving it greater flexibility and responsiveness at the local level. The result, with the reallocation of financial resources to the regional offices, increased the capabilities of the civil alert network at those offices – bringing dividends to the mission's early warning and protection work (EPON, 2019).

6. Conclusions

This paper sought to identify the main challenges in humanitarian logistics and present suggestions for overcoming the logistical gaps in peacekeeping missions in sub-Saharan Africa. At the end of this article, it was evidenced that although the supply chain in the African context has a particular context in DRC, CAR and SS, some common points can light the way to increase regional humanitarian logistics efficiency. After analysing the challenges of the humanitarian logistics of the RSS, CAR and DRC, it is possible to visualise some common factors that, when analysed together, can bring more efficient and synergistic solutions in the conduct of regional humanitarian logistics.

One of the points that deserves to have its debate expanded concerns the *regionalisation*, when possible, of the logistical response. The three countries analysed have common borders; however, there has yet to be a supply movement between these borders. The reaction of the LCs is still very much tied to the dynamics of each mission without GLC deepening its actions in the field in a more integrative way. In situations where territoriality allows, a regional approach will improve the logistical operation and consequently, humanitarian aid.

Creating a regional logistics chain, hiring specialised suppliers and knowledge of local characteristics can multiply logistics efficiency. The regional response can also strengthen the UN's position in the face of restrictions imposed by governments or rebel groups since it brings up the discussion of other actors with the political strength to help strengthen humanitarian actions. Despite the logistics, initially being designed to meet the population's vulnerability, it is essential to consider a joint response. In this case, it can favour the construction, in a second moment, of integration structures between the countries and consequently support the development of improving the connection between Central and East Africa.

Transport Infrastructures, in general, need to be improved and with significant limitations in the three countries. Dirt roads predominate in the region, and when they exist, their trafficability is significantly affected in the rainy season. Hence, they absorb most of the humanitarian logistics efforts in their recovery. The fluvial and aerial means are restricted to a few stretches, but they partially supply deficiencies of the other modes.

Thinking about integrating modes, internally and regionally, is one issue that deserves a more in-depth debate. Hence, the suggestion of the DRC LC to *create a subgroup to deal specifically with transport infrastructure* is a viable solution for other missions. Such a measure could serve the three countries, improving the coordination of efforts and their integration.

In places of difficult access, the *storage solution* is the best alternative found by the countries mentioned in the search to maintain a stock compatible with the demands of humanitarian organisations. These stores must be made based on previous statistical data that foresee future needs, in periods before the rains, under the coordination of the GLC, but with the participation of all humanitarian actors. In this sense, expanding the embryonic action of financing MSUs to organisations that operate them in a shared way can be extended to strategic points that serve regional employment.

A new perspective of solving the isolation issue allied with aircraft transportation is the *long endurance remotely piloted aircraft systems* (LE-RPAS). In summary, using LE-RPAS has significant potential to support the logistic response when access is restricted or forbidden due to security or political reasons. However, several essential hurdles remain before the concept can be operationalised. Key among these is the development of an air traffic control regime that supports (rather than constraints) the RPAS use and the mechanisms (both process and people-related) that translate the data from the RPAS into usable information to underpin timely and effective decision-making (Tatham *et al.*, 2017, p. 6). Not only the technical questions should be solved, but the political constraints must also be addressed to allow aircraft transportation effectively. The solution for launching essential items from aircraft is another good way to solve the isolation problem.

As for security, it is observed that the realities experienced in each country are presented in very different ways. However, it is believed that coordinating the actions of the military component and humanitarian actors can be done synergistically, respecting the particularities of each organisation/institution. Thus, the *synchronisation of road patrol actions, as well as the creation of warehouses close to military bases*, could maximise the existing security in places of difficult access without interference, considering, as already said, the principle of coexistence and non-association (Colona, 2018, p. 128).

The main lesson in information management was measuring what matters and making that information reach those with decision-making power. In addition, creating indicators that reflect familiar historical series from the three countries can serve as a tool for making political and administrative decisions that reflect real logistical gains for the region.

Finally, the coordination could be improved by the GLC by considering the material logistical needs and mainly by *observing the real needs and interests of the actors performing the field tasks.* This coordination should be done at three levels: with the local government, with humanitarian agencies and, not least,

Table 3 Proposed solutions and gaps to be improved

Proposed solution	Gap to be improved
Creation of a regional logistics chain	– Strengthens the UN's position in the face of constraints imposed by specific governments or rebel groups – favours the integration of logistical structures and improves the connection between East and Central Africa
Integration of the transport infrastructure	– Provides alternative routes for humanitarian logistics, whether by road, river or air, especially during rainy periods when traffic on dirt roads is impossible
Planning of supply storage points	– Avoids shortages by maintaining a compatible stock in the right place, based on the anticipated forecast of logistical problems, such as during rainy periods
Use of the alternative system for delivery of logistical goods	– Use remotely piloted aircraft systems or capacity to launch logistical goods to adequately support immediate logistical response when access is restricted or prohibited for security or political reasons
Creation of warehouses near military bases	– Maximises security in places of difficult access, respecting the principle of coexistence and non-association between civilian and military actors
Creation of common historical indicators of the three countries	– Assists in making political and administrative decisions that reflect real regional logistical gains
Increased coordination with frontline actors	– Increases synergy between the formulators of policy guidelines and frontline workers, thus increasing trust between the parties and the efficiency of actions

Source: The authors

with the workers at the end of the line. One of the great discoveries of the GLC was that the field actors at the three levels needed to see their needs reflected in the documents and guidelines of the policymakers and procedures, which generated parallel local coordination and the loss of trust between the parties.

The table below illustrates the summary of the main findings of this paper (Table 3).

Based on the above conclusions, it is observed that regional logistics monitoring allows the creation of a laboratory for testing and further analysis of various measures and procedures previously adopted in relatively similar contexts that have successfully validated them under a highly complex scenario and unorthodox solutions. Understanding the relationships that cross the balance between needs vs possibilities sheds light on how actors behave. It opens the field for further analysis of viable solutions to overly complex humanitarian logistics problems.

This paper has concluded that multidimensional missions always need to revisit the concepts of efficiency and effectiveness, as this is the only way to prepare for future scenarios, even if one cannot predict the nuances of that system. Based on flexibility, adaptability and sustainability, the integrated response must be constantly discussed again to ensure the functioning of peace operations and the necessary humanitarian provision.

In short, an integrated view of regional problems can shed light on shared solutions that will improve the efficiency of humanitarian logistics and contribute to achieving the UN's goals of promoting peace, regional cooperation and global development. In short, an integrated view of regional problems can shed light on shared solutions that will improve the efficiency of humanitarian logistics and contribute to achieving the UN objectives of promoting peace, regional cooperation and global development. However, this approach still requires further studies on its impacts, advantages, disadvantages and possibilities for adoption. Thus, within the conclusions, this research suggests that the regional approach is the result of additional studies in other scenarios, involving other levels of crisis, other countries, and, if possible, other conditions to ratify or rectify the perceptions brought in this study.

Notes

1 Contract linked to a release system in which items, normally available on the market, are identified and priced in advance of their use. It is the main purchase modality exercised by the logistics cluster.

2 Document created by Government of South Sudan that guarantees the safety of the flight, is signed by both parties to the conflict, in theory it should guarantee the safety of the aircraft, but it is used as an instrument to prevent or delay flights.

3 Created to optimise and complement the logistics capabilities of cooperation agencies within a well-defined crisis area for the benefit of the ongoing humanitarian operation (UN, 2003, p. 3).

4 Term that refers to the development of diversified air routes that interconnect and expand to form an air network.

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