

## Determinants of Humanitarian Logistics Performance to Effective Disaster Relief Operations in Addressing Pandemics in Tanzania

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### ABSTRACT

*The study assessed the key areas in humanitarian organizations to pave the way to effectiveness in disaster relief operations. The study employed a sequential explanatory research design; this design was used purposely by converging quantitative and qualitative data with a sample of 150 respondents from humanitarian organizations. Questionnaires and key informant interviews were used to collect data. The nature and strength of association between independent variables and dependent variables were tested using multiple regressions. The study found that the determinants of humanitarian logistics performance for effective disaster relief operations include having trained experts, a dedicated humanitarian organization, supportive policies, supportive financial resources, and dedicated logistics service providers. Therefore, it was concluded that the overall effectiveness of disaster relief operations depends on proper structures in humanitarian logistics that capture efficiency in logistics cooperation and involvement of logistics service in providing disaster relief operations. The study recommended that the government should recognize the importance of public-private partnerships in disaster relief operations and ensure proactive actions in having reliable infrastructure and empowering the operations of logistics service providers and humanitarian organizations and agencies in Tanzania. This study could aid policymakers to institute frameworks that could guide nations to undertake procedures that may enhance the movement of people and materials to the affected areas and cooperation between stakeholders. The study had theoretical implications that enrich the structuring of stakeholders in stakeholders theory and add knowledge on this undertaking and strengthening humanitarian logistics systems.*

**Keywords:** Humanitarian Logistics, Disaster Relief Operations, Pandemics, Humanitarian Organizations

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## I. INTRODUCTION

### 1.1 Background of the Study

The outbreak of manmade and natural pandemic has affected the logistics operations in the world which calls for humanitarian logistics to aid in the movements of goods and people which helps the affected areas and population to supply foods, medical equipment, and medicines (United Nations Coordinated Appeal, 2020). In China, there has been a big effect in all the big business cities on the logistics activities that demanded the government to instate measures to aid the movement of items but it lacked the strategies to readdress the logistics activities differently to carter in the disaster environment, this is due to unpreparedness (Wuhan Statistics Bureau, 2019).

Disaster Response Financial Report of Russia (2015), shows that the country also struggles to create a good environment or logistical environment to ensure the effectiveness of disaster operations. In Kenya, according to the paper done by Karanja, Muirura, and Ombui, (2015), they narrated that in the occurrence of a disaster like a pandemic, Disaster relief operations depend on the proper working of humanitarian logistics. They reported that several issues need improvement in practice, the issues include humanitarian Logistics coordination, which the Kenyan humanitarian organization and stakeholders are struggling with is humanitarian Logistics coordination, and the involvement of logistics service providers (Mweiga, 2013).

African governments suffer the inadequate coping capabilities due to little national resources to help the affected populations in disaster situations (Kassema, 2020). For example, in the Democratic Republic of Congo (DRC), they strived to form committees to control COVID 19 and Ebola with the hope this will help in the coordination of resources with other stakeholders but it was not a success (Nachege et al., 2020), this coupled with the failure of Kenya National Disaster Response Plan done by Office of the President Ministry of State for Special Programmes (MSSP), and Ministry of Provincial Administration and Internal Security -National Disaster Operation Centre (NDOC). This also has been the problem in Tanzania, there's a problem with the facilities and mechanisms in disaster management and responses to disasters (Stephano, 2018). To address these and ensure that countries have the best system to cope with the disasters, there are humanitarian relief organizations and the need to capture the importance of humanitarian logistics in the situation of pandemics and related disasters (Saleh & Noorliza, 2020).

Humanitarian organizations and government agencies with a vested interest in disaster relief operations are constrained by the issues relating to managing humanitarian logistics performance issues, capturing the contribution of

effective humanitarian logistics in disaster relief, and instituting the role that could be played by logistics service providers in addressing pandemics (Stephano, 2018; Mpanju, 2015). In practice, there is a need for practitioners to understand the immediate contribution of humanitarian logistics and how this can be linked to disaster relief operations in Tanzania and to recognize the need to cooperate with the logistics service providers in humanitarian relief operations. Logistics will likely improve the movement of goods, practitioners, and information that will aid in reducing the impact of the problem and instituting control measures for further spread, as humanitarian logistics may also aid in the supply of medical supplies, doctors, and related gears to stop further spread.

### 1.2 Statement of the Problem

Around the world has been a problem with a pandemic that necessitated the philosophy of humanitarian logistics, since a pandemic may cause disruption it is the contribution of HL to ensure continuity of supply to the affected population (Save the Children, 2015; Wolicki, Nuzzo, Blazes, Pitts, Iskander, & Tappero, 2016). Regarding the failure of the logistics to absolve the shocks in ensuring continuity of supply of the basic goods there is when humanitarian logistics comes into play (Eriksson & Karlsson, 2017). Most developing countries (like Tanzania) fail in humanitarian logistics due to the lack of understanding of effective management which entails its performance and also understanding of the importance of logistic cooperation and involvement of logistics service providers in disaster relief operations (Schiffling, Hannibal, Tickle, & Fan, 2020).

The published research (Kovács & Spens, 2009; Kassem, 2020; Saleh & Noorliza, 2020; Kessa, Sadiq, & Yeo, 2021) portrays that humanitarian logistics is with challenges that need close attention by stakeholders who may use the challenges to transform to key performance indicators. For example, the study done by Kovács and Spens (2009), narrated the constraints as lack of transport infrastructure, lack of funding, limits in the use of funding, and lack of vehicles as major factors facing the performance of humanitarian logistics. Kunz and Reiner (2012) provided four external issues affecting the performance of humanitarian logistics, including, socio-economic situational factors, environmental situational factors, governmental situational factors, and infrastructural situational factors.

Efforts have been in place to ensure the best humanitarian logistics practices in Tanzania but a lot more need to be done to ensure the effectiveness of humanitarian logistics in disaster relief operations, for example using specialized people for the specific disaster. The study by Mpanju (2015) in Tanzania demonstrates that more needs to be done to ensure effective disaster relief operations; one being proper coordination and proactive measures. Most of the literature focuses on providing an understanding of humanitarian logistics generally on disaster relief operations, but few stressed specifically pandemics (Vaillancourt, 2015). Humanitarian logistics in disaster relief operation need to be strategized to ensure better performed system and this may be stressed by determining the performance indicators, as demonstrated by UNICEF Tanzania Humanitarian Situation Report (2020), this could help in paving ways toward a better performing humanitarian logistics operations.

### 1.3 Justification of the Study

The decision-makers in humanitarian logistics and programs aimed at relief operation requires a precise overview of the systems to ensure that the rescue operation is well organized and that they are efficient (Wielgosz, 2006). It calls for efficient rescue teams and proper interconnection systems which define the proper functioning of humanitarian logistics and relief operations. Further to that, one of the purposes of the United Nations, as stated in its Charter, is "to achieve international cooperation in solving international problems of an economic, social, cultural, or humanitarian character." The Organization is now relied upon by the international community to coordinate humanitarian relief operations due to natural and man-made disasters in areas beyond the relief capacity of national authorities alone.

Four UN entities, the United Nations Development Programme (UNDP), the United Nations Refugee Agency (UNHCR), the United Nations Children's Fund (UNICEF), and the World Food Programme (WFP) have primary roles in the delivery of relief assistance. UNDP is the agency responsible for operational activities for natural disaster mitigation, prevention, and preparedness. When emergencies occur, UNDP Resident Coordinators coordinate relief and rehabilitation efforts at the national level.

According to the Disaster Assistance (OFDA) policy of 2015, this Policy for Humanitarian Action outlines the context in which USAID's Office of U.S. Foreign Disaster Assistance (OFDA) works, the basic principles, and the core values which underpin OFDA's humanitarian functions, and the method OFDA employs to address the critical humanitarian needs of the affected populations worldwide. The policy extracts from OFDA's mandate, which incorporates the fundamental goals of humanitarian action, which are protecting lives, alleviating the suffering of humans, and mitigating the economic and social impact of disasters. This is critically undertaken by ensuring effective humanitarian logistics and disaster relief operations.

## II. LITERATURE REVIEW

### 2.1 Underpinning Theory: Stakeholder Theory

A stakeholder can be defined as an individual or group of individuals in the environment or having a stake in the organization or operation of the business organization or charity organization – the people who could pose an influence or being influenced by its normal operations (Ademola, 2014). The stakeholder theory demonstrates that disasters impact all the stakeholders' activities and daily operations and affect the supplies of goods and also may include the fluctuation of prices (Freeman, 2010; Gunasekaran, Dubey, Fosso, Wamba, Papadopoulos, Hazen, and Ngai, 2018).

Supplies depend on companies that are may be established and positioned in the affected areas or different locations of the world. The companies depend on downstream logistics and the supply chain they are in, and disaster victims are depends on the supplies offered by relief organizations and agencies (Carter, 2015; Pfeffer and Salancik 1978, 2003). Coordination and behaviors and coordination between actors or stakeholders define the success of the operations. This calls for the creation of partnerships between the stakeholders in disaster relief operations and humanitarian logistics. This will help in the joining of resources and much on the joint effort in rescue operations and ensuring proper coordination of activities. For instance, Stakeholders from the private group and public bodies get involved in disaster and humanitarian operations in different forms; this can be enhanced through good communication and having joint plans in disaster relief operations.

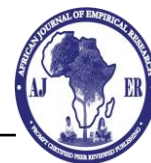
Stakeholders from the corporate sector must be aware of the implications for their operations and supply chains as a result of significant support for disaster and humanitarian relief efforts. Contractual engagements can help companies indirectly contribute to disaster and humanitarian relief efforts in a variety of ways. Organizations actively contribute to the employment of locally impacted populations and, as a result, economic development in conflict or post-disaster zones, taking into account support from the international aid network and, if necessary, local government (Bray and Crockett, 2012). Furthermore, by making their products and services available to the general public, they can facilitate long-term disaster and humanitarian response and recovery (Nkamnebe & Idemobi, 2011; Yates & Paquette, 2011).

### 2.2 Review of Empirical Studies

Logistics is closely linked to the process of planning and managing the flow of material and information. Logistics has the primary objective or mission in the form of arranging for goods to be delivered at the right time, in the right amount, and on the plan from the company to the customers (Casado-Vara et al., 2018; Ghiani, Laporte, & Musmanno, 2004). The number of logistical needs in Indonesia appears to be constant and predictable every year (BPS, 2019). There are two types of logistics businesses, included commercial logistics and specialized logistics, such as humanitarian logistics. Humanitarian logistics has some functions, such as an effort to deal with natural disasters or an outbreak of the pandemic disease in the form of shipping goods or materials to disaster victims who have an unforeseeable and sudden number of requests. Humanitarian logistics has supply chain networks that should be flexible and adaptable to the destination and the pace of environmental change through the use of existing resources (Li et al., 2008; Zhang et al., 2019).

There are some inhibiting factors for humanitarian logistics including the difficulty of accessing natural disaster sites due to volatile post-disaster situations and lack of adequate resources, in particular human resources (Balcik et al., 2010; Roh et al., 2018). Some other obstacles require service quality, or good quality of service provided by personnel (Anderson et al., 2015; Vega et al, 2015), quality of operation services (An et al., 2010; Nagurney et al., 2019), and technical service quality (Gunasekaran & Ngai, 2003; Lamb, 2018). These obstacles certainly make it difficult for logistics services to be carried out effectively and efficiently, as well as to determine the amount of storage of goods that are useful for helping victims of disasters.

According to Masudin and Fernanda (2019), humanitarian logistics has published a variety of articles covering earthquakes and post-disaster physical recovery. Economic recovery is the least discussed, while long-term recovery is the most widely considered. In 2016–2017, the bulk of the articles on recovery management and the most reviewed papers on long-term restoration were published in 2010–2012. This finding shows that there is still a need to develop an understanding and research the process of disaster management in humanitarian logistics. Humanitarian logistics operate in the humanitarian sector, in the context of managing natural disasters. Humanitarian logistics adapts to every situation. Humanitarian logistics must be able to adapt both to the destination and the timing of environmental changes using existing resources (Li et al., 2008; Zhang et al., 2019).



### III. METHODOLOGY

#### 3.1 Introduction

This study adopted a sequential explanatory research design. This design was used to develop the concept from the gathered data, interpretation, and explain as on the subject. Applying the design the quantitative data were first collected using a questionnaire and in the second phase, the qualitative data were collected using an interview guide, and then the quantitative and qualitative information were converged during the discussion of the results after analysis. The target population was the humanitarian organizations and other stakeholders taking part in the success of humanitarian logistics and disaster relief operations. The unit of observation includes five (5) organizations; it included respondents engaging in humanitarian logistics and disaster relief operations.

The study selected a sample of 150 respondents to participate in the study; this is as calculated from Cochran's Sample Size Formula. The study employed stratified random sampling, this was used by dividing the population into strata (groups) with homogenous characteristics and random samples were then selected from each stratum. The study employed Cochran's Sample Size Formula for calculating the sample of an unknown population:

$$n = \frac{Z^2}{4d^2}$$

n= sample size, z= the value on the z table at 95% confidence level = 1.96, d=sampling error at 8%

#### 3.2 Validity and Reliability

Validity is the extent to which a test measures what it wishes to measure. It is concerned with the accuracy and meaningfulness of inferences and the ability of the research instrument to measure what it claims to measure (Magigi, 2015). The content validity of the data collection instrument was determined by discussing the instrument with research experts at the university. The valuable comments, corrections, and suggestions given by research experts assisted in the validation of the research instrument.

To ensure validity, the questionnaire and interview guide were pre-tested through a pilot test study where 10 respondents were selected randomly and studied to check the accuracy of the instruments before being administered for full data collection. The researcher also consulted various experts in the field of humanitarian logistics and disaster relief operations. The experts went through the tools and commented on the questions and themes contained. Their inputs were incorporated into specific tools to enable the researcher to collect relevant and adequate data that helped in attaining study objectives.

To ensure the reliability of the research instrument, a pilot study was carried out for a different section of the questionnaire. The researcher also measured reliability using the reliability coefficient; the most commonly used reliability coefficient is Cronbach's alpha which estimates internal consistency by determining how all items on a test related to all other items to the total test – internal coherence of data. The Cronbach's alpha coefficient was used to test the reliability of the instruments. According to Cronbach, (1951), the rule of thumb for acceptable alpha is that 0.8 and above is highly acceptable for homogeneity of items while 0.7 is the limit for acceptance. Therefore in this study, all five variables had a Cronbach's Alpha above 0.7 and thus the questionnaires were reliable (Saunders *et al.*, 2007).

**Table 1: Data reliability: Cronbach's Alpha**

Construct/variable	Construct items	( $\alpha$ )
Determinants	B1,B2,B3,B4,B5,B6,B7,B8,B9,B10	0.719

These results show it is a good test as on Cronbach's Alpha since it is acceptable on  $0.8 > \alpha \geq 0.7$ , good on  $0.9 > \alpha \geq 0.8$ , and excellent on  $\alpha \geq 0.9$  ( internal consistency).

#### 3.3 Data Analysis

The data were analyzed using multiple linear regression analysis and descriptive analysis with the aid of the Statistical Package for the Social Sciences (SPSS).



**Table 2: Measurement of variables**

Variable	Definition	Measurement	Instrument
Determinants of logistics performance	Humanitarian Logistics experts, Humanitarian Logistics preparedness, Supportive humanitarian logistics policies, Effective humanitarian logistics planning	Typical Survey Response Scales ( Extent scales)	Questionnaires and interview guide

Source: Researcher’s construction (2021).

### 3.4 Test of Model Assumptions

#### 3.4.1 Multicollinearity

To test for multicollinearity, this study applied the Variance Inflation factor (VIF) which identifies the degree of correlation between predictor variables and multicollinearity is not considered a problem if VIF is between 1 and 10 (Mertler & Reihnhart, 2016). However, multicollinearity exists if VIF is less than 1 or greater than 10 (Mertler and Reihnhart, 2016). According to the results shown in Table 3, the study is completely free from multicollinearity problems since VIF are between 1 and 2.

**Table 3: Multicollinearity statistics**

Variables	Tolerance	VIF
Determinants of logistics performance	0.6447	1.551

#### 3.5.2 Heteroscedasticity

It is an assumption of linear regression generated using Ordinary Least Squares (OLS’) that the variance of the residuals from the model is constant and not related to the independent variables (homoscedasticity) (Mertler & Reinhart, 2016). Violation of this assumption leads to heteroscedasticity making coefficient estimates less precise increasing the probability that the estimates are not an accurate representation of the population. Levene’s Test was conducted to test for heteroscedasticity. The test assumes homoscedasticity when the p-value is greater than 0.05 ( $p > 0.05$ ) (Mertler & Reinhart, 2016). As shown in Table 4 below, the variables used indicated homogeneity with a p-value of 0.767 hence  $p > 0.05$ .

**Table 4: Heteroscedasticity test**

Levene’s Statistic	df1	df2	Sig.
0.089	0	150	0.767

#### 3.5.3 Normality

To understand whether the data collected were normally distributed or not, the study used Kolmogorov and Shapiro-Wilk to test the normality of variables and the results are presented in Table 6. The findings as seen in Table 5 show that p-values are greater than 0.05 both in Kolmogorov and Shapiro-Wilk, thus implying that the collected data were normally distributed.

**Table 5: Normality Test Results of Kolmogorov and Shapiro-Wilk test**

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Determinants of logistics performance	0.123	150	0.015	0.968	150	0.149

## IV. FINDINGS AND DISCUSSION

### 4.1 Level of education of the Respondents

The highest level of education of the respondents was categorized into five levels which include; secondary school level, basic certificate and ordinary diploma level, Bachelor’s degree level, Master’s degree level, and any other level of education. The findings from the field revealed that 5 (3.3%) of respondents were the holder of secondary

school education level, 20 (13.3%) were the holder of the certificate or ordinary diploma education level, 70 (46.7%) were respondents with first degree, and 55 (36.7%) were the holder of other education levels (primary school level) as indicated in Table 6.

**Table6: Education level of the Respondents**

Categories of education level	Frequency	Percentage
Secondary schools level	5	3.3
Basic Certificate/ diploma level	20	13.3
Bachelor degree level	70	46.7
Master degree level	55	36.7
Any other level (Primary)	0	0
<b>Total</b>	<b>150</b>	<b>100</b>

From the findings in Table 6, the study established from the analysis that the majority of respondents who constituted 83% were holders of at least a Bachelor's degree level and a Master's degree level. This implied that the majority of respondents had the necessary knowledge to respond to questions raised during the data collection process. The education level of the respondents portrays that they have sufficient skills and knowledge to respond to the questions asked and also the majority of them possess certificates that relate to humanitarian logistics and supply chain which means they have a solid understanding of the issue raised in humanitarian logistics. This shows that the respondents had the necessary professional and technical skills to effectively respond to the questions grounded on the ideas in disaster relief operations and humanitarian logistics and were able to suggest the necessary measures that need to be taken to make effective disaster relief operations as related to posed questions and responses.

#### 4.2 Working experience of the Respondents

The study was interested to understand the working experience of the respondents to help understand the background information of the respondents. This information was resourceful to establish a ground that the respondents are familiar with and aware of the relief operations procedures and how humanitarian organization works on making this a success. This also needed to establish a ground on their experiences as related to normal working procedures of logistics and the link that connect it to humanitarian operations. The duration of working experience was classified into three groups which include; the experience of less than one year, between 6 to 10 years, and above 10 years. The results of the findings were as presented in Table 10 below.

**Table 7: Working experience of the Respondents**

Categories of working experience	Frequency	Percentage
Less than 5 years	31	20.6
Between 6 to 10 years	55	36.7
Above 10 years	64	42.7
<b>Total</b>	<b>150</b>	<b>100</b>

From the findings presented in Table 7 above, it is clear that the majority of respondents 64 (42.7%) have substantive experience of at least 10 years in humanitarian operations and disaster relief operations. This implied that the respondents have sufficient information about their operations. The findings here show that the respondents had solid experience working with the humanitarian organization and experience in the supply chain and they have a solid understanding of the issues pertaining to disaster relief operations. Most of the respondents are familiar with the standard operations in disaster relief operations and understand how the system in relief operations works.

#### 4.3 The Determinants of Humanitarian Logistics Performance to Effective Disaster Relief Operations

This aimed to establish the Determinants of Humanitarian Logistics Performance to the effectiveness of disaster relief operations and the researcher provided a number of statements for the respondents to consider. Various statements were presented on a Typical Survey Response Scales (Extent scales) where respondents were asked to state their level of agreement or disagreement on a scale of 1 to 7 where '1' was to an Extremely Small Extent, '2' to a Very Small Extent, '3' to a Small Extent, '4' to a Moderate Extent, '5' to a Large Extent, '6' to a Very Large Extent and '7' to an Extremely Large Extent. The terms 'Extremely Small Extent', 'to a Very Small Extent', and 'to a Small Extent' were assigned a mean of 1.0 to 2.5, to represent not agreed. The term 'Moderate Extent' and 'to a Large Extent' was

assigned the mean of 2.6 to 3.4. While the assertion ‘Extremely and Very Large Extent’ was given the mean of 3.5 to 5.0 to represent agreed upon.

**Table8: The Determinants of Humanitarian logistics performance in Addressing Pandemics in Tanzania**

Statement	Mean	Std. Deviation
Financial Resource	4.50	0.988
Trained Experts	4.54	0.891
Dedicated Humanitarian Organization	4.37	0.987
Supportive Policies And Regulations	4.40	0.854
Border Crossing Flexibility	4.33	0.863
Reliable Government Support	3.86	0.456
Reliable Storage Facilities	4.33	0.863
Transport Infrastructure	4.33	0.823
Dedicated Logistics Service Providers	4.16	0.888
<b>Average</b>	<b>4.31</b>	<b>0.846</b>

From table 8 above, descriptively, the standard means are above 3.00 which defines neutrality, this means that for the given statements most of the respondents agreed that the statement amount to the determinants of humanitarian logistics to effective disaster relief operations in addressing pandemics. The standard deviations are below one which means that there is a minimum average distance between the values of the data set and the mean. The average mean and the average standard deviation indicate that the data points are spread out over a small range of values and the mean above 3.00 portrays agreement with the statement (far from neutral). From the mean of 4.33 to 4.54 (for the given Std. Deviation), this portrays that the performance in humanitarian logistics in addressing pandemics could be determined among other things, by having in place the financial resource, dedicated humanitarian organization, border crossing flexibility, supportive policies and regulations, trained experts, reliable government support, reliable storage facilities, reliable health facilities, transport infrastructure, and dedicated logistics service providers.

The findings show that most of the respondents suggested that determinants of humanitarian logistics performance in addressing pandemics in Tanzania includes dedicated humanitarian organization, reliable government support, supportive policies and regulations, trained experts, financial resource, reliable storage facilities, border crossing flexibility, transport infrastructure, dedicated logistics service providers, reliable health facilities. This implies that humanitarian logistics depends on having these indicators in place for it to perform well because this will ensure a conducive working environment for the humanitarian organization and the stakeholders in making effective disaster relief operations.

The findings are in line with the “Impact on the Ground” report by World Health Organization 2021; they show that in the case of COVID 19 disaster relief operations in countries that were mostly affected the needed system of dedicated humanitarian organizations, reliable government support, supportive policies and regulations, trained experts, financial resource, reliable storage facilities. This indicated that the government needed to associate with other stakeholders on improving the rescue operations and also ensure good coordination with humanitarian organizations.

These findings are in line with that of Karuppiah, Sankaranarayanan, Ali, and Paul (2021), in their study of Key Challenges to Sustainable Humanitarian Supply Chains: Lessons from the COVID-19 Pandemic, they narrated that the key to performing humanitarian logistics is to ensure there’s strong financial resources, trained experts, and continuous support and collaboration with the government. This means a well-performing humanitarian logistics needs strong financial resources, trained experts, and continuous support and collaboration with the government; this will help the organization to a good plan for the relief activities and also ensure effective facilitation of the actions necessary in relief operations. It is also in support of the findings by Santarelli *et al.* (2015), in which they narrated that these indicators are important for the sustainability of humanitarian logistics in disaster relief operations.

During the interview the researcher asked the expert in humanitarian logistics about the determinants, he responded that,

*“Humanitarian logistics in disaster relief operations need a lot to stand sustainable and it should be known that strong finances and funds are not the only solutions, there is a need to have more experts in the field and it is crucial to have the supportive infrastructure and reliable connection with the supplier and actor in other countries which calls for supportive policies in the country and import and export procedures...” (Field data interview 17/07/2021 Kigoma)*

This means that it is crucial to create an environment in disaster relief operations that attract improvements even if it means associating with international agencies. It calls for harmonizing the indicators that determine the performance of the whole system of humanitarian logistics.

#### 4.3.1 Model analysis of Determinants of Humanitarian Logistics Performance for Effectiveness of Disaster Relief Operations

The multiple linear regression models were used to measure the relationship between Determinants of humanitarian logistics as an independent variable and a dependent variable which is the Effectiveness of Disaster relief operations. The Determinants of humanitarian logistics were analyzed through main three variables which were; Humanitarian Logistics experts, Humanitarian Logistics preparedness, and Supportive humanitarian logistics policies to determine their influence on the Effectiveness of Disaster relief operations. Since the data were collected using the Likert scale, the study combined Likert-type items of the dependent variable into a single composite score/variable during the data analysis process to provide a quantitative measure of a character or a personality trait.

**Table 9: Model analysis on Determinants of Humanitarian Logistics Performance for Effectiveness of Disaster Relief Operations**

COEFFICIENTS					
Variables	Unstd. Coefficients		Stand. Coefficients		Sig.
	B	S.E	B	T	
(Constants)	1.060	0.322		3.294	0.001
Humanitarian Logistics Experts	0.145	0.035	0.087	4.143	0.038
Humanitarian Logistics preparedness	0.243	0.027	0.548	9.000	0.083
Supportive Humanitarian Logistics Policies	0.209	0.061	0.359	3.427	0.001

**$R^2=0.594$   $R=0.771$ , overall fit of the model  $F = 87.736$  at  $p = 0.000$**

In order to capture the effects of Determinants of humanitarian logistics on the Effectiveness of Disaster relief operations, the multiple linear regression model was adopted where preliminary results indicated that the model had  $R^2 = 0.594$ ; adjusted  $R^2 = 0.585$ , and standard error of estimate = 0.244 as detailed shown on Table 13. The coefficient of determination ( $R^2 = 0.594$ ) implies that the three predictor variables under the study in this objective, explain only 59.4% effects of on Effectiveness of Disaster relief operations, and the rest was contributed to other Determinants of humanitarian logistics factors that were not covered in this study.

The above figures, specific  $R=0.771$ , in relation to  $R^2$  demonstrated that the sub-variables or the predictor variables have remarkable effects on the effectiveness of disaster relief operations, and there is a positive relationship between the predictor variables and the effectiveness of disaster relief operations in addressing pandemics. On the above narrations and analysis, therefore the study argues that the study argued that Determinants of humanitarian logistics had effects on the Effectiveness of Disaster relief operations.

Likewise, with regard to the fitness of the model applied in the study, an analysis of variance (ANOVA) was done the overall fit of the model  $F = 87.736$  at  $p = 0.000$  was statistically significant. The statistically significant value ( $p = 0.000$ ) implies that the model had enough statistical significance in predicting the effects of Determinants of humanitarian logistics had effects on the Effectiveness of Disaster relief operations.

Similarly, the results from the analysis of variance revealed that three predictor variables; Humanitarian Logistics experts ( $p<0.05$ ), Humanitarian Logistics preparedness ( $p<0.05$ ), Supportive humanitarian logistics policies ( $p<0.05$ ) toward Determinants of humanitarian logistics had effects on the Effectiveness of Disaster relief operations.

However, among the significant variables, Humanitarian Logistics experts and Humanitarian Logistics preparedness had the highest standardized coefficients. This implies that they had the strongest effects on the dependent variable when other factors in the model are controlled.

The results from the model analysis on Determinants of humanitarian logistics performance for the Effectiveness of Disaster relief operations demonstrated that in measuring the performance of humanitarian logistics (based on the determined variables), having Humanitarian Logistics experts, Humanitarian Logistics preparedness, Supportive humanitarian logistics policies contribute significantly towards the effective disaster relief operations and the model perfect fit on this narrations. This indicated that to establish effective systems and operations in disaster relief operations, it is crucial to have effective systems that perfect in having trained and experienced manpower in



humanitarian logistics, and for the humanitarian organizations and the stakeholders to be more proactive and prepared to face a crisis and having supportive policies that established and strong recognize the importance of stakeholders coordination.

## V. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

The findings show that humanitarian logistics have the potential to improve disaster relief operations. The findings show that this may be contributed by having the proper set of determinants to assess the performance of humanitarian logistics, understanding the contribution of logistics cooperation, and the importance of logistics service providers' disaster relief operations in addressing the pandemic.

Humanitarian organizations need to recognize the necessity of having systems that ensure their collaboration and how to cooperate with other stakeholders in disaster relief operations. Considering the importance of humanitarian logistics in disaster relief operations, then all the stakeholders must work in a system that will maximize their participation and recognize how crucial collaborative relationships are. Disaster relief operations require systematic arrangements in humanitarian logistics.

### 5.2 Humanitarian Logistics Performance

The determinants of humanitarian logistics performance in effective disaster relief operations are attributed to having dedicated humanitarian organizations, having reliable support from the government (local government and central government), possessing reliable and supportive policies relating to this and regulations, having trained experts, and strong finance. This can also be attributed to having flexibility in border crossing from one country to the other, improving transport infrastructure, and having dedicated logistics service providers. The government (local and central) and other stakeholders need to collaborate to improve infrastructure and institute a mechanism for educating and training the personnel to be more conversant with disaster relief operations and humanitarian logistics. A well-performing system of humanitarian logistics plays a crucial role in making effective disaster relief operations, so there's a need to create an environment that will instill a culture of continuous learning on this aspect and connect all the key players.

### 5.3 Recommendations

The study calls for more efforts and concentration on the factors or indicators that improve humanitarian logistics performance. This will allow the stakeholder to witness the success of their efforts in the whole humanitarian supply chain and disaster relief operations. The government may use these findings to improve information sharing between the key players and track the efforts and the effectiveness of resources invested in humanitarian logistics and disaster relief operations.

### 5.4 Theoretical Implication

The results of the study contribute to strengthening the existing body of literature by confirming empirically that humanitarian logistics contribute to the effectiveness of disaster relief operations and hence focus needs to be given to structuring institutions that recognize humanitarian logistics as a strategy. The study contributes to the stakeholder's theory by establishing the specific contribution of cooperation and coordination between stakeholders in humanitarian logistics toward effective disaster relief operations, that in terms of quick and resilient services in disaster relief operations.

The study findings may be used also in improving legal issues relating to Public-Private Partnership by incorporating a section that recognizes the importance of Public-Private Partnership in humanitarian logistics and disaster relief operations in addressing pandemic since the crises and pandemics happens every day in our lives, be the natural pandemics or the man-made pandemics.

### 5.5 Implications of Policy

The findings of the study have policy implications for Tanzanian local and central government. Effective humanitarian logistics functioning for government agencies and organizations is essential for best practices and operations in disaster relief operations. Therefore decision-makers need to consider this as a strategic move and a hedge for future disasters as they may happen. The results from this study recommended an improvement in a private-public partnership to capture these important aspects to ensure effective cooperation and collaboration between stakeholders within and outside the national boundaries.

Therefore the results may be used by stakeholders and policymakers in improving the effectiveness of disaster relief operations and working of the humanitarian organization far as humanitarian logistics is concerned. This may be used to structure a framework that ensures sustainability in partnering and the creation of a risk management framework that specifically deals with pandemics and relief logistical operations.

Further, the results of the study indicated that the involvement of logistic service providers had a statistical significance contribution to the effectiveness of disaster relief operations and will eventually help to reduce transportation and movement complications in the relief operation. Therefore decision-makers should focus more on improving laws and regulations relating to this specific set and helping LSP in infrastructural development and treating them as important stakeholders.

Definitely, this study could aid the policy maker to institute frameworks that could guide nations to undertake procedures that may be smoothening the movement of people and materials to the affected areas and structure standards that may enhance these logistics without violating the normal operating procedures during pandemic periods. This study could be a good tool for humanitarian organizations as it will give these organizations the resourceful information for these organizations to initiate and build relationships and cooperation with other international disaster relief organizations and other humanitarian organizations to strengthen the logistics in the outbreak of pandemics.

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