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Effect of emergency management, humanitarian services and transport logistics on port operations in Nigeria: Empirical assessment

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ABSTRACT

This study examines the effect of emergency management, humanitarian services and transport logistics on port operations in Nigeria. Its focus is to determine the significance of both emergency management strategies and humanitarian aids during and after emergencies in Nigerian ports. The study adopts multiple regression models to analyze the primary data generated from the field using structured questionnaire. These data were validated using content and sampling validity techniques to ascertain its appropriateness for the study. It was confirmed that disasters or emergencies are retrogressive factors that can cause sudden and massive disruptions to operations in the ports leading to destruction of lives and properties, huge financial loss, destruction of infrastructure and closure of ports, either temporarily or permanently. However, it is proven that effective disaster preparedness/ awareness reduces the hardships experienced during emergencies and that humanitarian services/logistics cannot be done without in rescuing and recovery operations. The study concludes that effective disaster management strategies and efficient humanitarian services have positive and significant effects on port operations in Nigeria and recommends the following measures; every port should have a standard disaster management unit (SDMU) among others.

1. Introduction.

Disasters are acute threats to national security and economic activities because of their devastating consequences to lives, infrastructure and economy. Considering some peculiar disastrous instances; the 2022 flood disasters resulted to huge and unquantifiable destruction/loss and threat to lives, properties/ infrastructure and food security in Nigeria. Also, the Jesse fire outbreak which happened in 1998 engulfed over 1000 persons, destroyed oil installations and ravaged farms and the overall leakages or spills from rusty oil pipelines leading to environmental degradation of the Niger Delta region(Faghawari&Edih, 2023), incessant invasion against farmers and farmlands by Fulani herdsmen are samples of major threats to the Nigerian economy whose survival is largely dependent on proceeds from crude oil sale being a mono-product economy(Edih et al., 2022). In the global perspective, the September 11 (9/11) , 2001 attacks against the twin towers at World Trade Centre, caused the death of 2996 people in New York, US being orchestrated by Osama Bin Laden force(al-Qaeda) , the atomic bombings of Hiroshima and Nagasaki, Japan in August, 1945 during the Second World War and the ongoing Russia-Ukraine war were man-made disasters as well as major threats to national security and global economic survival. Similarly, the ravaging consequences of covid'19 pandemic led to the closure of international borders and shutdown of international transportation (including shipping logistics and other port operations).

As such, the direct or indirect tie/relationship between national security and economic growth has been settled in pre-

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vious studies (Edih et al, 2022). Based on such undeniable, intricate connection between the consequences of disasters, national security and economic investments, nations across the globe took gigantic measures towards addressing security issues, economy and prevent disasters, whether occasioned by natural and anthropogenic forces. Countries like US and China are spearheading security and economic related issues in the world. Chieh (2021) argues that issues on national security have been the centre-piece of China's economic policy and in Joe (2022), national security has been a major pillar to America's socio-economic vision. In fact, policies or programmes on security and economy seem to be inseparable. Disasters can happen any time and everywhere, that is why, they are regarded "inevitable circumstances" in society. Owing to the rampant occurrence of disasters or emergencies in the workplace, at sea, in the air, and on land, it is often said that life itself is a disaster (Iwele, 2022). However, this study does not intend to tow such perspective or line of thought because disaster is a serious discomfort, unexpected calamity or catastrophe beyond man's capacity and control but life ordinarily is not (Faghawari&Edih, 2023).

Figure 1: 2022 Flood Disaster, Anambra State.

Source: Authors.

Figure 2: 1998 Oil Pipeline Explosion, Jesse Delta State.

Source: vanguardngr.com.

It is observed that grade one disaster can metamorphose into a worse situation (ie becoming a grade 2 disaster supposing it can be calibrated to show the extent of damage to man and the environment) where relief and humanitarian operations are not carried out on time (DCDC, 2016). Therefore, response to disaster calls has to be prompt because any delays will double the consequences within the shortest notice. The Nigerian ports are not insulated against probable emergencies. Since ports are central to shipping transportation/maritime logistics and vulnerable to emergencies all over the world, maritime facilities ought to be manned by trained personnel with up-to-date knowledge on disaster management.

Humanitarian services are usually pursued during and after emergency to save lives and to reduce the sufferings of victims of disaster. In Holgiun-Veras et al., (2012), the purpose of humanitarian assistance is to distribute materials and financial help to people in need, to alleviate suffering and likewise, save lives. Operations of humanitarian logistics embrace distribution of medical supply to mitigate diseases and provide food to fight hunger and provision of critical relief items. As observed, efficiency of humanitarian response is affected by uncertainty, severity of disaster, level of infrastructure damage and available equipment for such response and recovery operations (Overstreet et al., 2011).

Also, human factor (which demonstrates the willingness and kindness, love and sacrifice as underlying principles in the delivery of humanitarian assistance) determines the efficacy of humanitarian attention to victims of emergencies. Humanitarian services or logistics has become global industry due to the unfortunate increase in the occurrence of disasters across global ports as well as other sectors of economy. The focus of humanitarian logistics is the delivery of humanitarian assistance to people affected by acute and complex emergencies (Margarita, 2021). In that case, logistics is key to the delivery or distribution of humanitarian services based on efficacy (Kovacs &Spens, 2007). And in this context, maritime transport logistics is a promising alternative for delivery of humanitarian items(Baskaya, et al., 2017) to road and air transportation modes, however, road transport can be used in response to any form of disaster (Ertem et al., 2017). Humanitarian logistics is often referred to as humanitarian supply chain, which bothers on "planning, implementing and controlling an efficient, cost-effective flow and storage of goods and materials" as well as related information from point of origin to point of consumption for the purpose of alleviating suffering of vulnerable people (Thomas &Kopezak, 2005 as cited in Margarita, 2021).

Maritime transportation is the mode of transporting goods and passengers via sea routes to ensure efficient delivery of humanitarian services (Margarita, 2021). During response/recovery operations, humanitarian service may encounter complex emergencies and IASC (Inter-Agency Standing Committee) defines complex emergency as " a humanitarian crisis which occurs in a country, region or society where there is a total or considerable breakdown of authority resulting from civil conflict and/or foreign aggression"(IASC, 1994 as cited in Margarita, 2021). Complex emergencies are instances of large displacement of human population, that results to eruption of communicable or contagious diseases, may be, due to hunger or malnutrition and

lack of clean drinking water (Harping et al., 2021; Rochat& Cookson, 2017, both cited in Margarita, 2021).

Figure 3: Severe damage to the Wharf, piles and topping of Ban Nam Kam Fishing port in Thailand. Tsunami's height is 9m.

Source: Turnbull & Hughes, 2017.

Figure 4: Scuor and collapsed reinforced concrete columns of the Wharf and associated building at the Yuriage, Miyagi Japan in the great East Japan Tsunami.

Source: Harspool et al., 2016.

According to Turnbull and Hughes (2017), ports facilitate trade between internal and external markets and countries like New Zealand (and Nigeria) majorly depend on exports and imports to sustain their economies. It has been observed that disasters like tsunamis and earthquakes can compromise or shutdown operations of port's and harbour navigability (Turnbull & Hughes, 2017; Admire et al., 2014). Ports are also vulnerable to inundating and non-inundating tsunamis occasioned by vehement current (Borrero et al., 2015). Depending on the degree of vehemence of such tsunamis, can result to huge damage to port operations and infrastructure; piles, wharves, quay and pier deck, cranes, mooring dolphins, bollards, pontoons and mooring lines. Also, the seawalls, breakwater, containers, timber logs, vessels, bouys, boat ramps and jetties, buildings and vehicles, pavements, seabed and shoreline, waterways as well as marine farms can be damaged by impulsive force from tsunamis and earthquakes (Horspool et al., 2016; Borrero et al., 2015; Cox et al., 2014).

The direct and indirect consequences from disasters on infrastructural lifelines, economy and society are massive as well as corrosive. Such vehement disruptions of lifelines; wastewater operations and telecommunications are based on tight connectivity between them. Furthermore, it has negative effects on related sectors; taxi transport, tourism and hospitality (Horspool et al., 2016 ; Bell et al., 2005). In Turnbull and Hughes (2017), the 2010 Chile earthquake and tsunami caused a dramatic lost of commercial power at San Antonio. And Kamaishi port, Japan suffered considerable damage to infrastructure and several casualties arising from three tsunamis; 1896 Meiji Sanriku Earthquake, 1933 Show Sanriku Earthquake and the 2010 Chilean Tsunami. Similarly, United States experienced about 80 major tsunamis in the past 230 years which resulted to USD 80 million lost in ports, vessels, and properties (Turnbull & Hughes, 2017; PIANC, 2010).

Figure 5: An example of a drifting ship causing damage during collision with a crane in Sendai Port, Japan during the 2011 Japan Tsunami.

Source: Turnbull & Hughes, 2017.

Figure 6: A vessel washed inland to a street in Talcahuano, Chile after the 2010 Chile Tsunami.

Source: archive.boston.com.

The foregoing instances of recurring disasters to port's infrastructure and operations portend the need for disaster management and administration of humanitarian services to victims of such emergencies. Emergencies have become recurring events in society as a result of the combined effects of natural and anthropogenic factors. Consequently, the negative effects of disasters on human lives, productive activities and the environment are very devastating. Therefore, the need to proffer succour through effective emergency management techniques and deployment of humanitarian logistics/or services during and after emergencies in ports have become paramount. Hence, this investigation into the effect of emergency management, humanitarian services and transport logistics on port operations in Nigeria is carried out. The study's objectives and research hypotheses are stated as follows;

Objectives.

1. To assess and/or affirm the impact of disasters on port operations in Nigeria.
2. To determine the significance of emergency management on port operations in Nigeria.
3. To evaluate the effect of humanitarian assistance on port operations in Nigeria.

Hypotheses.

H_{01}: Disasters have no positive and significant effect on port operations in Nigeria.

H_{02}: Emergency management techniques have no positive and significant effect on port operations in Nigeria.

H_{03}: Humanitarian services/logistics have no positive and significant effect on port operations in Nigeria.

2. Review of Literature.

This section considers two major sub-sections, namely, conceptual review and review of empirical studies.

2.1. Conceptual review.

This review tows the following sequence; emergency management plan/ techniques, humanitarian services/ logistics, port operations and brief description of selected ports.

Emergency management Plan/ techniques

"...there is much more to emergency management than just than response operations- Bob Fletcher".

Therefore, disaster management plan (DMP) is a broad mechanism for addressing emergencies and related hazards in ports with a commitment to mitigating the adverse effects on affected population and environment. DMP is thus, a sophisticated strategy that caters for or handles the worst emergencies such as plant failure, human error, earthquakes, cyclones, food, tsunamis, fire and explosion etc (Okha Port Report, n.d). Literature is advising that DMP should be widened to accommodate measures that can control on-site and off-site emergencies at all times. Basically, DMP is geared towards ensuring safety of lives, protection of installations, and environment, restoration of production, and salvaging operations. Industrial Disaster Management Plan (IDMP) is also put up to achieve the following similar goals but is not limited to; rescue and extend medical treatment of casualties, safe guard others, minimize damage to property and environment, contain and control the incidence, provide authoritative report to media houses, ensure proper rehabilitation of affected persons/area and preserve relevant documents/records (Okha Port Report, n.d).

Disaster management are usually carried out in four or five phases which are, mitigation, (or prevention), preparedness, response and recovery as demonstrated in the diagram below;

Figure 7: Disaster Management Cycle.

Source: Adapted from Hudson Trident, 2010.

Figure 8: Types of Crisis.

Source: Adapted from Hudson Trident, 2010.

The Mitigation Stage

In ISDR(2007 as cited in UN, 2008), mitigation process encompasses both structural and non structural measures undertaken to either limit or address the adverse effects of natural disasters, environmental pollution, and technological hazards. Such structural measures are engineering works, and hazards resistance construction and the non-structural measures include raising awareness, developing knowledge, land use policies, resource management and facilities operation procedures.

Munonye (2022) explains three aspects of the mitigation phase as :

a. any activity that prevents an emergency, reduces the chances of an emergency happening, or reduces the damaging effects of unavoidable circumstances.
b. buying flood and fire insurance for homes and other valuable assets.
c. it involves activities that takes place before and after emergency actually occurs.

Mitigation as a process also includes proactive strategies taken to prevent hazardous events from occurring. This is done by eliminating hazards, reduce severity, and potential impact of intending situations before their occurrence. The basic import of mitigation is to protect lives and properties, preserve cultural sites and the environment, reduce vulnerability to emergencies, economic and social disruptions (BC, 2022).

The Preparedness Stage

According to OCHA, (United Nations Office for Coordination of Humanitarian Affairs' quote in ISDR, 2007), "pre-disaster activities are undertaken within the context of disaster risk management and are based on sound risk analysis. This includes the development of a comprehensive preparedness strategy, policy, institutional structure, warning and forecasting capabilities and plans. These measures are geared towards helping at-risk communities, safeguard lives and assets by being alert to hazards and taken appropriate actions in the face of an imminent or actual disaster".

Munonye (2022) explains measures or activities implementable at the stage of preparedness as follows;

a. plans or preparations made to save lives and to help response and rescue operations.
b. evacuation plans, stocking food and water are examples of preparedness.
c. having emergency kit ready for quick flight and such kit may be small but strong enough to contain essentials for survival journey.

Preparedness as a phase of emergency management usually considers actions that ensure the readiness to undertake emergency response and recovery. This involves response actions to hazards, risks and vulnerability assessments, planning, resource planning, volunteer management, training, exercises, public / partner education and continuous improvement (British Columbia, BC, 2022).

The Prevention Stage.

This strategy entails actions or activities that provide total avoidance of the adverse effect of hazards and means to minimize related environmental, technological and biological disasters. Investments in disaster prevention measures depend on socio-technical feasibility and cost-effective factors which are justifiable in localities prone to disasters. Basically, in aspect of public sensitization/awareness and education, changing orientation, (attitude and behaviour) will contribute to the promotion of culture of preventing disaster.

The Response Stage.

This strategy provides assistance or quick intervention during or immediately after a disaster to preserve lives, basic subsistence needs and properties of those people affected. Response or relief operations can be short-term or long-term (ISDR 2007 as cited in UN, 2008). Munonye (2022) explains response to disaster as actions taken to save lives and prevent further damage to properties. This entails the act of putting preparedness plans or strategies into full actions. Such acts of seeking shelter from a tornado or turning off gas valves in an earthquake and certainly, all response activities takes place during the emergency.

The Recovery Stage.

It entails decisions and actions taken with a view to restoring and improving the pre-disaster living conditions of affected persons and communities. Thus, encouraging necessary adjustments in recovery plans will reduce risks during emergencies or disasters. Recovery strategy embodies rehabilitation and reconstruction processes as opportunity to develop risk reduction measures to address disastrous conditions (ISDR 2007 as cited in UN, 2008). It has been seen that actions of recovery take place after an emergency which include, activities embarked on to return victims to normal or safer living condition following emergency, and getting financial assistance for repairs and other meaningful life sustenance ventures (Munonye, 2022).

Humanitarian services and / or logistics.

Disaster has been explained as catastrophic disruptions of activities or the functioning of a body polity (organization, community, society, or the world), usually associated with devastating effects such as human, economic and environmental losses (UN/ISDR, 2009). Such aggravated effects from emergencies calls for swift disaster relief measures from both government and non-governmental agencies. Humanitarian activities like, preparedness, response and reconstruction are major part of disasters relief process. In other words, disaster relief is also known as emergency relief, humanitarian aid or assistance, which are implemented in phases, namely; preparation, planning, prevention/recovery, restoration and rehabilitation. These processes may not operate sequentially but, can be done simultaneously as well as in a cyclical order (Kovacs &Spens, 2012). The process of planning, implementing and controlling an efficient cost effective flow and storage of goods and materials for the benefit of victims of disasters is known as humanitarian transport logistics (Thomas &Mizushima, 2005 cited in Kovacs &Spens, 2012). Humanitarian services are carried out by recognized organizations. These humanitarian organizations manage the delivery or distribution of relief materials to persons affected by disasters in accordance with humanitarian principles. There are seven fundamental principles guiding humanitarian operations: humanity, impartiality, neutrality, independence, voluntary service, unity and universality (Larson, 2012). The Red Cross Society, National Emergency Management Agency (NEMA), the Nigerian Armed Forces, Nigeria Police, Federal Mainte-

nance Agency (FERMA), Federal Road Safety Corps (FRSC), Nigeria Fire Services (NFS), National Security and Civil Defense Corps (NSCDC), United Nations High Commission for Refugees (UNHCR), UN Disaster Relief Organization and others are world acclaimed humanitarian organizations.

A central aspect of humanitarian services and transport logistics is relief supply chain management (SCM). It is a dynamic and agile supply-chain process which constitutes a substantial industry that respond to over 500 disasters annually, causing death of 750,000 lives and affected about 200 million people (Kovacs &Spens, 2012). Supply chain cost account for over 80% costs incurred in disaster relief operations. The Council of Supply Chain Management Professionals (CSCMP) defines supply chain management (SCM), " as planning and management of all activities associated with sourcing and procurement, conversion and other logistics management activities". SCM involves the acts of coordination and collaboration with channel partners- suppliers, intermediaries, third-party service providers and custom (CSCM, 2006; Kovacs &Spens, 2012). Several components of supply chain include supply chain modelling and optimization, supply chain performance, supply chain processes, portfolio models in SCM and supply chain collaboration and integration (Groxton et al.,2004 ; Min et al., 2005 both cited in Kovacs &Spens, 2012). Relief supply chain management has attained prominent place in humanitarian service due to a number of natural and artificial disasters. Oloruntoba and Gray (2006) describe relief supply chain as unpredictable and turbulent, therefore, requires flexibility. Since disasters are usually sudden, relief supply chains are deployed with little or limited knowledge about the incidence, may be usually in hasty manner coupled with destabilized infrastructural condition. Relief supply chain management is arguably different from business logistics, however, techniques and approaches deployed in normal business logistics can be transferred to fit the purpose of humanitarian service/operations.

Port operations and challenges in Nigeria.

Edih et al.,(2022a) describe port operations as comprehensive activities which take place in maritime transportation environment. These activities encompass trade and ancillary services carried out in the maritime sector. Such operations, according to (Elem, 2008; Peretomode, 2014) are dry docking, coastal shipping services, terminals and jetties infrastructure, offshore construction and fabrication, amongst others. It has been argued that a functional port operation is hinged on effective port management, which does not exclude disaster management techniques and humanitarian logistics and services deployed during emergencies. Accordingly, port management (PM) is the broad range of activities which embodies, planning, organizing, directing, staffing, and controlling the diverse operations in ports. PM therefore involves logistics management, supply chain management, cargo handling facilities, management of fire services, security architecture, as well as related activities that quicken or enhance carriage of goods and persons by sea. Ports mediate between land transport and marine trade. That's why it is the gateway to international trade (Edih et al., 2022a; Okerefe, 2018 ; Jung, 2011). Nilesh (2020) concludes that ports are the backbone of Indian economy and gateway of external trade in this era of global economy, global trade revolution/globalization because 90% of Indian trade is handled by the ports.

According to literature, port's activities are enabler of socio-economic development of nations doing maritime business (Omoke, 2019 ;Edih et al., 2022b). As at 2012 , port operations contributed 0.15% to Nigerian GDP. It is discovered that eight ports/terminals (Lagos port complex, Tincan Island port, Port Harcourt old port, Federal Ocean Terminal, Warri port, Koko port, Calabar port, and Container Terminal) are operational in Nigeria, however, some function at abysmally low performance (Edih et al., 2022a, 2022b) due to numerous challenges. Some of the identified hiccups are , decline in the number of vessels calls at ports alluded to high tax and shallow draught, dearth of port infrastructure, poor participation from the private sector based on strict regulations and policies, bureaucracy through political interference as well as insecurity from sea pirates (Edih et al., 2022b ; Ekpo, 2012 ; Benson &Adekemi, 2018). In Nilesh (2020), port disasters in India ports: Kandia, Porbandar and Navlakhi led to negative economic impact due to damage to port structure (on shore and off shore), damage to machineries, non-functioning of the ports, loss of cargo and loss of business.

During covid'19 pandemic, there was a global economy downturn arising from the stringent containment measures deployed by WHO and nations across the globe (Brodeur et al., 2021). This led to a drastic drop or contraction of global economic activities by 3% (IMF, 2020). Findings from Panagiotis and Michaels (2021) showed negative consequences from covid'19 pandemic on the shipping sector and Adekola (2021) reveals the galloping disruptions in volume of trade in the maritime transportation sector ; maritime defaults and stranded seafarers due to sudden closure of international borders in the short run.

According to Marsh JLT (2020), "the geo-political landscape automation, technological advances, changing regulations, and a green agenda are necessitating vast changes in the maritime ecosystem". Risk challenges in ports and terminals are diverse and complex ranging from natural disasters (wildfire, storms, floods, landslides, earthquakes etc) to man-made risk factors (managerial inefficiencies, financial insecurity, port congestion and consequential demurrage charges, terrorism and political violence/interference, etc). These challenges as well as inherent risks factors have caused huge business interruptions and losses to maritime trade/industry.

Description/illustrations of selected ports.

The three ports selected for the study are; Lagos Port Complex (Apapa), Warri Port Complex (Warri) and Calabar. Port Complex (Calabar).

1. Lagos Complex Port (LPC).

The Lagos port complex which is known as Premiere port (Apapa quays) is situate at Apapa, Lagos State. It is the number one planned river port in Nigeria. The port started commercial operations in 1921 with quay length of 548.64m and a draught of 9. 75m. The quay length and draught were ex-

tended to 160m and 10.5m respectively in 1979. Apapa port has a total of 20 berths that are capable of handling general cargo vessels, refeer vessels, etc. It accommodates 76, 000 tons silo storage capacity. The Nigerian government approved concession in 2004 to four private operators which are ; Apapa Bulk Terminal Ltd, ENL Consortium, Green View Development Ltd and APM Terminal Ltd (Edih, et al., 2022c). Apapa port is equipped with modern cargo handling equipment and personnel support facilities to enhance effective operations. There are four Wheel Gates of about 8m for oversized cargoes. The port has two logistics bases such as Eko Support Services Ltd and Lagos Deep Offshore Logistics accompanied with eight jetties(www.nigeriaports.gov.ng).

Figure 9: Apapa Port Complex, Lagos State.

Source: nigeriaports.gov.ng.

2. Warri Port Complex (WPC).

The Warri Port Complex is the largest among the constellation of ports in the Delta port. It has eight berths in the old port and six berths in the new port including a RoRo berth. The total quay length is 1600m and the draught is 8m. Based on government concession of operations in the port, Intel Nigeria Ltd and Associated Marine Services Ltd were approved to operate terminals.

Figure 10: Warri Port Complex, Delta State.

Source: intelservice.com.

The WPC was declared a Free Zone in May, 2011. Over the years, Warri Port has increased its facilities and enhanced services by developing into a total area covering 1,5300,00sqm that is divided into two operational areas ; Warri New Port (1,020,000sqm) and Warri Old Port (510,000sqm). The 8m draft depth allows vessels to dock easily and safely (www.intelservice.com).

3. Calabar Port Complex(CPC).

It is one of the oldest natural harbours established by the British Chartered Company (BCC), which is known as UAC in the coastal region of Nigeria. The quay length and draught are 550m and 8m accordingly. It has Free Zone which offers wide latitude for import and export trade activities. The Nigerian government approved concession license to Intels Nigeria Ltd ,Ecomarine Nigeria Ltd and Shoreline Logistics Ltd (Edih et al., 2022c). The Calabar Port Complex CPC comprises of the Old Port, the New Port and the Dockyard. It controls and supervises the Crude Oil Terminals at Antan, Odudu, Yoho, Qualbe, and other jetties at NIWA, Mclver, NNPC , ALSCON, DOZZZY and Northwest (www.nigerianports.gov.ng).

Figure 11: Calabar Port Complex, Cross River State.

Source: nigerianports.gov.ng.

2.2. Empirical studies.

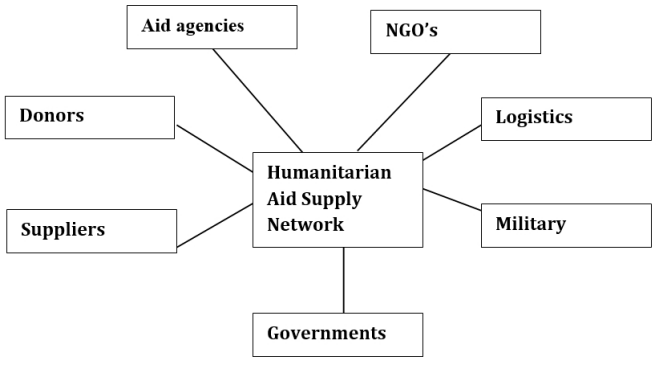
It is observed in Edih et al., (2022) that , the violent-bloody clashes between Fulani herdsmen and farmers is tantamount to man-made disasters or emergencies since the untold consequences are over-reaching and scorching the Nigerian people and economy in several respects; pervasive insecurity, loss of many lives, massive displacement of farmers and villagers, unceasing kidnapping of persons for ransom , shortage of foodstuffs, increase in prices of foodstuffs and high cost of living, destruction of properties/homes etc. As a result, outright ban of open grazing and establishment of ranching method for rearing cattle were recommended. Nagi, Schroeder and Kersten (2021) reveals that emergency plan plays significant function in dealing with natural disasters like floods and extreme winds. The need for stakeholders cooperation and strategic but flexible emergency plan is recommended.

Margarita (2021) examines maritime transportation in humanitarian logistics in Yemen crisis with a view of determining the unique characteristics of sea transportation and factors that influence humanitarian services. The study applies qualitative research method which reveals its contribution to the theory of humanitarian logistics through deep insights into the advantages and disadvantages of deploying maritime logistics during crisis. The study also develops a framework for efficient use of maritime transport mode for humanitarian services. Nilesh (2020) identifies port as one of the major lifelines that sustain the economy of a state/country. Ports are economic infrastructure that enhances growth and development of the state through job creation measures, diversification networks, and revenue generation (taxes and royalties) to national treasury. However, ports seem to be vulnerable to natural and man-made disasters and such disastrous circumstances truncate on-shore and offshore operations in the port. The study emphasizes the need to develop clear cut measures of curtailing the frequencies at which disasters are occurring and also, mitigate the direct or indirect consequences arising from the disruptions.

In Turnbull and Hughes (2017), disasters such as tsunamis and earthquakes were notable causes of monumental damage to port operations and infrastructure across the globe. Countries like Japan, Chile and the United States experienced considerable instances of destruction of port's facilities arising from emergencies accompanied with consequential financial loss. According to Cheng-Hsien (2014), disruptions arising from natural or man made disaster to maritime transport affects the resilience for sustainable port operations. It is observed that port capacity and efficiency/inefficiency have a significant effect on port vulnerability. Therefore, inefficiency of gantry cranes, labour productivity, free trade zone business volume and ground access network may cause port failure.

Larson (2012) elaborates on relationship building in relief supply-chain for disasters by presenting a framework on actor-based typology of humanitarian relationships which include, relationships among NGOs, between NGOs and UN agencies, military units and business firms. The framework helps to explain how compatible and complementary the functions or duties of humanitarian organizations work together to achieve their goal.

Figure 12: Humanitarian Aid Supply Network.



Source: Kovacs &Spens, 2008.

Otsuka et al.,(n.d) affirms that fishing ports can be damaged by earthquakes or tsunamis and such damage has significant effect on the fishing industry. In order to predict seismic or tsunamic disaster and the effect of disaster-reduction measures, the study adopts the input-output analysis model. The trial calculation results are approximate to a BCP (Business Continuity Plan) general basic concept and it was confirmed that the effect of disaster-reduction measures are similar to a BCP basic concept. In DPCL (2010), "Port area represents a complex interphase between human activities and natural environment and inherent to its location is that it is exposed to natural calamities (cyclone, floods, earthquakes) and similarly human activities may lead to hazardous situations arising out of handling and storage of dangerous goods as well as shipping incidents caused by collisions, grounding, sinking and oil spillage"

2.3. Gap in literature.

It is observed that, studies have not been done on the effect of disaster management and humanitarian services/logistics on port operations both in Nigeria and other advanced climes. However, related areas such as theoretical explanations on disaster management and relief operations (Faghawari&Edih, 2023), Supply Chain Management (Larson, 2012), maritime transportation and humanitarian logistics (Margarita, 2021) and consequences of violence on national security and economy (Edih et al., 2022) were addressed. Thus, it is this gap the study intends to cover.

3. Method and Materials.

This study employs multiple regression statistical techniques to analyse and test the three hypotheses. Primary data were generated using structured questionnaire administered to 90 staff of three selected ports in Nigeria. The measuring instrument was validated by content and sampling validation techniques to ascertain the appropriateness or suitability of the set of questionnaire used for the study. And the ports that were chosen based on simple random sampling method are ; Lagos port complex (Apapa), Warri port complex (Warri) and Calabar port complex (Calabar).

Table 1: Frequency distribution table.

Ports	Frequency	Percentage
Apapa port,	30	33.33
Warri port	30	33.33
Calabar port	30	33.33
Total	90	100%

Source: Author's compilation, 2023.

3.1. Model specification.

The model utilized in the study is stated in a functional form as follows ;

$$POP = f(Disast., EMT, HSL). \quad (1)$$

After undergoing the process of linearization, it becomes

$$POP_t = a_0 + B_1.Disast_t. + B_2.EMT_t + B_3.HSL_t + U_t \quad (2)$$

Where;

- OP is port operations and performance.
- Disast. is disaster of all kinds.
- EMT is emergency management techniques/procedures.
- HSL is humanitarian services and logistics.
- B_1,B_2, B_3 are parameters.
- U_t is the error term due to stochastic disturbance.
- a_0 is constant/intercept.

3.2. A Priori expectation.

It is expected that the sub-variables (emergency management techniques and humanitarian services/logistics) would show a positive and significant effects on port operations and performance while disaster would manifest a negative but significant impact on operations in the ports.

4. Result and Discussion.

4.1. Results.

The following three multiple regression tables represent results of data analysis arising from the field survey;

MULTIPLE REGRESSION ANALYSIS.

Table 2: Frequency distribution table.

Model	Unstandardized Coefficient β.	Std Error	Standardized Coefficient β	t	Sig
(constant)	.8106	.1884		4.30	0.000
Disast.	.1895086	.0480	-.2842	5.92	0.000
EMT	.1724621	.0464	.2639	5.69	0.000
HSL	.2087285	.0504	.3081	6.11	0.000

Source: Survey Analysis, 2023.

Table 3: Model Summary.

Model	R	R-squares	Adj:R-Squares	Std Error
1	0.7551[a]	0.5702	0.5651	0.1883728

[a] = Port operation/performance.

Source: Survey Analysis, 2023.

Table 4: ANOVA.

Model 1	Sum of Squares	Df	Mean Square	F	Sig
Regression	106.7373	3	35.5782	150.8829	0.000[b]
Residual	80.4213	341	0.2358		
Total	187.156	344			

[b] = predictors (constant), disast. EMT, HSL

Source: Survey Analysis, 2023.

4.2. Discussion.

Table 2 reveals results on the effects of the three sub- variables (disasters, emergency management techniques and humanitarian services/logistics) being independent variable on port operations (as dependent variable). As indicated in the **table**, Disasters (Disast.) has negative but significant effect on port operations/performance with statistical values (Coef. = - 0.284; p = 0.000 < 0.05), while Emergency Management Techniques (EMT) shows a positive and significant impact on port performance with statistical figures (Coef.=0.264 ; p = 0.000 < 0.05) and Humanitarian Services and Logistics (HSL) reveals a positive and significant effect on port operations with calculated values (Coef.=0.308 ; p = 0.000 < 0.05).

It is therefore inferred that, the statistical value for sub-variable (disaster) shows a negative coefficient and p-value less than 5% (0.05), the null hypothesis is partially rejected but alternative hypothesis is accepted which states that disasters have negative and significant effects on port operations. This submission is supported by the findings in Turbull and Hughes (2017) that, emergencies such like tsunami and earthquakes have caused huge and costly damage to port operations and performance. It is also evident that the advent of covid'19 pandemic disrupted economic activities across the world and the deployment of containment measures exacerbated the scorch and economic hardship by the closure of international borders including port operations (Panagiotis& Michaels, 2021; Adeokola, 2021; IMF, 2020)

While interpretations on second sub-variable (emergency management techniques) reveals a positive and significant effect on port operations since the p-value is less than 5% (0.05). The null hypothesis is therefore rejected and the affirmative hypothesis accepted (i.e, emergency management plan/ techniques have positive and significant effects on port operations). Effective implementation of DMP would reduce the hardship or loss by 26. 4%. It is affirm in Larson (2012) that DMP and supply chain management enhance effective management of disasters and delivery of humanitarian services during and after emergencies have occurred, therefore, enhances port performance. Nagi et al., (2021) also affirms the usefulness of disaster management plan (DMP, as a compass) in effectting response, recovery and humanitarian operations in emergency situations.

In similar vein, the third sub-variable (humanitarian services and logistics) shows a positive and significant relationship with port operations. Since the p-value is less than 5% (0.05), the null hypothesis is rejected while the alternative hypothesis is accepted. It is an indication that, humanitarian services and logistics have positive and significant effect on port operations. In Margarita (2021), humanitarian logistics influence and facilitate rescue and recovery operations during emergencies and Larson (2012) affirms that relief supply chain for disaster management facilitates distribution of of humanitarian items as well as guide and propels effective delivery of services to victims of disaster.

Also **table 3** shows that the adjusted R-square of the model which is 0.565, implies that, 56.5% change in port operations

(dependent variable) was caused by the three sub- variables or predictors (disast., EMT & HSL). That means, the remaining 43.5% is brought about by other factors (such, human resource knowledge/capability, level of infrastructure, adopted technology, Public - Private - Partnership arrangement, port reforms, worker's motivation kit, etc) not considered in the study. It is suggested that, further research should be carried on these factors to assess their impact on port performance.

And **table 4** represents the F-statistics value (150.88) with a p-value (0.000) that is less than (0.05) indicating that at least one of the independent variables (disast., EMT & HSL) affects or is a significant predictor of the magnitude of port operations/performance.

Conclusions.

The study examines the effect of emergency management, humanitarian services and transport logistics on port operations in Nigeria. From the study, It is crystal clear that disasters are more or less inevitable even in organized society because of the increasing influence of both natural and man-made factors on the natural environment and human habitat. Disasters or emergencies portend danger to, disruption of, or destruction of human lives, productive or economic activities, the environment, body polity (organizations, society and the whole world). It is therefore, a clarion call to government, non-governmental organizations and well meaning citizens of the world to be conversant with disaster management and humanitarian logistics skills and techniques in readiness for rescuing and recovery missions during and after disasters. The study concludes that disasters are inimical, anti-progress forces to human growth and development as well as inhibit or stop operations in the ports. Therefore, the knowledge of emergency management and humanitarian operations is germane in managing disasters. Based on the above, the following recommendations would be worthwhile in managing disasters in the Nigerian ports;

1. Standard Disaster Management Unit (SDMU) should be set up in every port and terminal and personnel manning such unit should be trained to acquire up-to-date knowledge in emergency management and humanitarian operations.
2. There should be synergistic partnership between port operators and Disaster Management Agencies and Humanitarian Organizations (DMA/HOs). Such mutual understanding and collaboration would help to address disaster issues wholistically with great zeal, capable hands and pool of resources.
3. There should be continuous collaboration between private port operators and government agencies in the management of disaster and related issues as well as in procuring modern and efficient gadgets for rescuing and recovery operations.
4. Also, disasters detection devices (DDD) should be strategically installed to raise early warning alarms in all the eight ports/terminals in the country.

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