Interrogating Disaster Management in the South East Nigeria: Problems and way forward

[1.] Ude Adaora Margaret
Email: adachukwu1977@gmail.com

[2.] Prof. Barr Walter Ezeodili
Email: walter.ezeodili@esut.edu.ng

[3.] Eneh Maximus Ikenna
Maximus.eneh@esut.edu.ng
Orcid Id: https://orcid.org/0009-0008-4658-5813
[1,2,3.] Department of Public Administration
Enugu State University of Science and Technology Enugu Nigeria

Abstract

Early warning in disaster management is not taken seriously by National Emergency Management Agency (NEMA). There are plethora of disasters ranging from flood, fire outbreak, erosion and many others in Nigeria. In spite of the fact that the incidences of the disasters come now and again, they were still treated with levity. The ugly situation motivated this study which is "Interrogating disaster management in the south east Nigeria: Problems and way forward. The study adopted qualitative research method and specifically, content analysis was used as mode of analysis. Focus group discussion guide and in-depth interview also were used to elicit data from respondents. The data complemented the analysis. Findings revealed that there has never been an implementable institutional/policy framework chatted over the years to nip the ugly incidents in the bud. Also, the management of NEMA appears to be disconnected from the people since many emergency calls by victims were treated with ignominy.

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1. Introduction

The development of early warning systems (EWS) is a critical component of disaster management, designed to minimize the impact of natural and human-induced disasters by providing timely and accurate information. An effective EWS consists of four key elements: risk knowledge, monitoring and warning, dissemination and communication, and response capability (UNISDR, 2006). These systems are designed to predict potential hazards, assess vulnerabilities, and communicate warnings to the affected populations, enabling them to take preventive actions. The importance of early warning systems has grown with the increasing frequency and severity of disasters globally, exacerbated by climate change, urbanization, and environmental degradation (WMO, 2018). For instance, in areas prone to floods, an EWS can predict the onset of heavy rains, monitor river levels, and alert communities at risk, allowing them to evacuate in time. The integration of modern technologies, such as satellite imagery, Geographic Information Systems (GIS), and mobile communication, has significantly enhanced the effectiveness of these systems (Basher, 2006).

The current state of early warning systems (EWS) in Nigeria has seen notable progress, yet there remain significant challenges that need to be addressed to enhance disaster management effectively. Nigeria, being vulnerable to various natural hazards such as floods, droughts, and epidemics, has recognized the importance of EWS in mitigating the impacts of these disasters. Recent initiatives have focused on improving the country's disaster preparedness and response capabilities. For example, the Nigerian Meteorological Agency (NiMet) and the National Emergency Management Agency (NEMA) have been working to enhance their forecasting and dissemination capabilities. In 2023, NiMet launched a new climate prediction system designed to provide more accurate weather forecasts and early warnings, which is crucial for agricultural planning and flood prevention (NiMet, 2023). Despite these advancements, there are still gaps in the system. A 2022 report by the International Federation of Red Cross and Red Crescent Societies (IFRC) highlighted the need for improved infrastructure, better data collection, and more effective communication channels to ensure that early warnings reach the most vulnerable communities (IFRC, 2022). Additionally, there is a need for greater public awareness and education to ensure that communities understand and act upon early warnings. Hence, while Nigeria has made strides in developing its EWS, continued investment and improvements are essential to fully protect its population from the adverse effects of natural disasters.

The implementation of early warning systems (EWS) in South East Nigeria carries significant implications for disaster management, offering critical benefits and posing notable challenges. This region, frequently affected by floods, landslides, and erosion, can greatly benefit from advanced EWS to mitigate these natural hazards. Recent developments have demonstrated the potential of EWS to transform disaster management in South East Nigeria. The Nigerian Hydrological Services Agency (NIHSA) has enhanced its flood forecasting capabilities, providing timely warnings that enable communities to prepare and evacuate when necessary. In 2023, NIHSA's advanced flood early warning system played a crucial role in minimizing the impact of severe flooding in the region, highlighting the system's effectiveness (NIHSA, 2023). Despite these advancements, the region faces several challenges in fully realizing the benefits of EWS. Infrastructure deficiencies, limited funding, and inadequate communication networks hinder the effective dissemination of early warnings to remote and vulnerable

communities. A 2022 study by the African Centre for Disaster Studies emphasized the need for improved community engagement and education to ensure that early warning messages are understood and acted upon (African Centre for Disaster Studies, 2022). Moreover, there is a critical need for collaboration between government agencies, local authorities, and international partners to enhance the efficacy of EWS. The integration of traditional knowledge with modern technology can also play a vital role in making EWS more accessible and relevant to local communities. In sum, the implementation of EWS in South East Nigeria holds immense potential for improving disaster management. Continued investment in infrastructure, education, and community engagement is essential to overcome existing challenges and fully leverage the benefits of EWS, ultimately protecting lives and reducing economic losses in the region. Hence, the integration of EWS across various disaster scenarios in South East Nigeria enhances preparedness, response, and resilience, ultimately saving lives and reducing the socio-economic impact of disasters.

1.2 Statement of the Problem

In South East Nigeria, despite efforts to establish and improve early warning systems (EWS), several challenges persist, hampering effective disaster management. These challenges encompass various aspects of the EWS framework, from data collection and analysis to dissemination and community engagement. One major issue is the inadequate infrastructure for data collection and monitoring. Many areas lack sufficient meteorological and hydrological monitoring stations, limiting the availability of real-time data necessary for accurate forecasting. Additionally, the quality and reliability of existing data can be compromised due to equipment malfunction or lack of maintenance (UNDP, 2021). Another critical challenge is the limited dissemination of early warnings to remote and vulnerable communities. Inadequate communication networks and low literacy rates in some areas hinder the timely delivery of alerts and preparedness information to those who need it most (Nwachukwu et al., 2020). Furthermore, there is a gap in community awareness and preparedness. Despite efforts to raise awareness about disaster risks and response measures, many communities lack the necessary knowledge and resources to effectively respond to early warnings. This can result in delays in evacuation or inadequate preparation, increasing the vulnerability of populations to disasters (UNDP, 2021).

Today in South East, several challenges hinder their effective implementation across various disaster scenarios. Inadequate meteorological and hydrological monitoring infrastructure limits the availability and reliability of data necessary for accurate forecasting and early warning dissemination, particularly in remote areas prone to flooding and erosion. Limited access to communication networks and low literacy rates impede the timely delivery of early warnings to vulnerable communities, hindering their ability to take proactive measures in response to threats such as fire outbreaks and disease outbreaks. Limited funding and human resources for EWS development and maintenance constrain the capacity to monitor, analyze, and disseminate early warnings effectively, exacerbating the challenges of disaster preparedness and response. Inadequate community engagement and awareness about disaster risks and response measures undermine the effectiveness of early warning systems, leading to delays in evacuation and suboptimal preparedness for events such as conflict outbreaks and erosion management. Lack of coordination among government agencies, NGOs, and community organizations impairs the seamless integration of early warning systems into disaster management strategies, resulting in fragmented response efforts and reduced effectiveness in mitigating disaster impacts. Addressing these challenges requires concerted efforts to invest in infrastructure development, enhance communication networks, allocate

sufficient resources, strengthen community engagement, and improve interagency coordination to ensure the effective implementation of early warning systems for disaster management in South East Nigeria.

1.2 Objectives of the Study

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i. Examine the effect of early warning systems on management of environmental pollution in South East, Nigeria.
ii. Determine the effect of early warning systems on erosion management in South East, Nigeria.

1.4 Research Questions

i. How does early warning systems affect management of environmental pollution in South East, Nigeria?
ii. To what extent does early warning systems averted erosion disaster in South East, Nigeria?

1.5 Hypotheses

i. Early warning systems does not have a significant effect on management of environmental pollution in South East, Nigeria.
ii. Early warning systems have no significant on erosion management in South East, Nigeria.

1.6 Scope of the Study

The scope of this study encompasses the early warning systems and disaster Management in South East, Nigeria. The scope of the study on the effect of early warning systems (EWS) on disaster management in South East Nigeria encompasses an examination of how EWS influence flooding incidents, fire outbreaks, conflict outbreaks, erosion management, and disease outbreaks in the states of Enugu, Anambra, and Imo. Enugu, Anambra, and Imo states were selected based on several factors. Firstly, these states represent a diverse geographical and socio-economic landscape within the South East region, allowing for a comprehensive analysis of the influence of EWS across different contexts. Secondly, these states are frequently affected by various disasters, including floods, erosion, and disease outbreaks, making them suitable candidates for studying the effectiveness of EWS in disaster management. Finally, these states have existing infrastructure and institutional frameworks for disaster management, providing a conducive environment for conducting the study. By focusing on these states, the study aims to provide valuable insights into the role of EWS in mitigating disasters and enhancing resilience at the sub-national level, contributing to evidence-based policy formulation and disaster risk reduction efforts in South East Nigeria.

1,7 Material and Methods

The study adopted content analysis as analytical tool. This becomes imperative because the study is an exploratory research. However in-depth interview and focus group discussion complemented the qualitative tools.

2. Conceptual and Contextual issues in Disaster Management

2.1. Early warning systems (EWS) Predictions

Early warning systems (EWS) are vital tools in disaster risk reduction, providing timely alerts to enable individuals, communities, and organizations to prepare for and mitigate the impacts of natural and human-induced hazards. The development and evolution of EWS have been driven by advancements in technology, increased understanding of disaster risks, and the necessity to enhance resilience in vulnerable populations. The concept of early warning

systems has its roots in ancient practices where people relied on natural signs and traditional knowledge to predict hazards. For instance, in many coastal communities, unusual animal behaviors were historically interpreted as signs of impending tsunamis. However, the modern iteration of EWS began to take shape in the mid-20th century with the advent of technological innovations such as radar, satellite imagery, and seismographs (Basher, 2006). Technological advancements have been a cornerstone in the evolution of EWS. The development of satellite remote sensing and geographic information systems (GIS) in the late 20th century significantly enhanced the ability to monitor and forecast natural hazards. Satellite remote sensing allows for real-time observation of weather patterns, volcanic activities, and other geological events, providing crucial data for early warning (Zschau & Küppers, 2013).

The integration of computer modeling and data analytics has further improved the accuracy and reliability of hazard predictions. These models can simulate various disaster scenarios and assess potential impacts, enabling more effective planning and response strategies. Advances in artificial intelligence (AI) and machine learning are now being leveraged to process vast amounts of data and generate predictive analytics, enhancing the precision of early warnings (Buchanan, 2020).

The most common current view of early warning systems comprises a ‘warning chain’, a linear set of connections from observations through warning generation and transmittal to users. In the meteorological community, the term ‘end-to-end’ warning system is often used. The end-to-end concept aims to make forecasts and warnings more relevant and useable to end-users, and has evolved partly in response to the commercialization imperative in many national meteorological services, as well as through efforts to make better practical use of the probabilistic and weakly predictive seasonal forecasts of the El Nino phenomenon (Zschau & Küppers, 2013).

It emphasizes the necessity to have all the links in the early warning chain in place and systematically connected. At the heart of all early warning systems is some sort of model that describes the relevant features of the hazard phenomenon and its impacts, particularly their time evolution. The model provides the means to make projections of what might happen in the future and therefore what actions might be desirable in response. Models may be as elaborate as the physics-based global numerical weather prediction models, or as straightforward as ‘common knowledge’ mental models (e.g. that the noisy approaching tsunami wave will arrive in a few minutes) Phil and Trans, (2006).

They may be slowly evolving, as in a drought model where the loss of soil moisture may occur over months, or very rapid, such as in an earthquake where the differential speed of electromagnetic signals relative to seismic waves can be used to automatically shut down a distant sensitive system a few seconds before damaging stresses occur. Models also underlie the other parts of the warning system, such as the likely impacts of a hazard, the way warnings are communicated and acted on, and the dynamics of evacuation processes, but these vulnerability and response process models are generally much less developed than the geophysical process models (Adeleye et al, 2020). All models are driven by a specification of an initial state, which must be obtained by observations (or from the output of an upstream observation-driven model). Observation systems can be expensive to install and operate and are often rather inadequate, especially in poorer countries. The initial state is, therefore, always imperfectly known, owing to imperfect spatial representation, instrument error and absence of data on some relevant factors. These uncertainties of the initial state propagate through the

models, and together with errors in the model physics and representations thereof and random noise factors, result in uncertainty in the model estimates of future conditions.

2.2 Characteristics of Early Warning Systems

Glantz, 2003) provides that, there are eight characteristics which contribute to successful early warning systems these characteristics are:

Continuity in Operation: The focal point of these systems is to identify potential dangers early. There must be constant monitoring of indicators (Glantz, 2003), Continuity, the warning system should withstand the impact of the disaster.

Timely Warning: A lack of timely warning may defeat the purpose of the early warning system. Although there are substantial differences in warning times e.g. droughts may provide months of warning whereas floods may provide minutes of warning, there should be prompt and efficient responses to these warnings.

Transparency: This ensures that all members of society are involved and the system is not biased to sponsors, political parties and privileged groups (United Nations, 2006).

Integration: This system cannot operate successfully by itself. It needs to be a part of the larger system and this may be community oriented, government oriented or culturally oriented (Glantz, 2003; and United Nations, 2006),

Human Capacity: There must be the required expertise to ensure successful operations (Glantz, 2003),

Flexibility: There should be some form of capacity planning to cater to expanding systems and/or new indicators (Glantz, 2003),

Catalysts: These are the indicators/triggers which will be monitored for impending disasters. The system will only be as good as the accuracy of the triggers in identifying potential danger (Glantz, 2003; and UNISDR, 2004).

Apolitical: The benefits of this system must be realized and this should not be compromised for the sake of fame (Glantz, 2003).

The success of early warning signals is also dependent on the reaction of the people after the warning is issued. This means there needs to be awareness by the people of the risks they are exposed to. The community should be aware of the necessary actions to minimize the threats and loss or damage. It is essential that community leaders understand the advisories received and should be able to advise, instruct and lead the population in a manner which will increase safety and reduce damages and losses.

This aspect is probably crucial as the appreciation of psychological, community and individual processes in stressful times are more important than technology (UNISDR, 2004). The structure of the advisories and warnings should be one which considers the culture and social aspects of the society and is comprehensible and accessible to all affected or potentially affected. It is important that the population does not under or overestimate the intended severity of the warning.

Other factors which contribute to successful responses to early warning signals are sufficient lead time, accuracy, understanding and belief in the warning, the understanding of the reality of a threat, confirmation of the warning from other sources and knowing how to react and being

prepared (World Meteorological Organization, 2020). Early warning systems are developed with a hazard in mind. In many cases, multi hazard early warning systems are advantageous as they are cost effective, sustainable and individual warning systems share common features (PPEW, 2006). Essentially, triggers are continuously monitored for approaching predefined thresholds. When this happens, a warning is issued for the hazard to those who are at risk.

2.3 Classification of Early Warning Systems for Natural Hazards

In the last decade, EWS have undergone a rapid technical development and are applied to prevent damage imposed by different natural hazard processes (Grasso and Singh, 2009). The improvement of EWS technology has been strongly supported in international Projects, such as the Hyogo Framework ((WMO, 2020) and is financially supported by governments and NGOs. Modern EWS are designed according to project specific needs and are commonly installed as prototypes with a low degree of standardization. In practice, EWS are unambiguously referred to as alarm, alert, early warning or early alert, detection, forecasting, monitoring and warning systems. Although a sophisticated classification for EWS could not be found in the literature, several institutions developed definitions for the terms alarm, alerts, warnings, prediction and forecast (Villagr_an de Leon *et al*., 2013). In Switzerland, alarms are directly issued to endangered persons or public, in contrast to warnings which are issued to inform responsible authorities about potential risks (FOCP, 2013).

Alarms are acoustic or optical signals issued to protect endangered persons from imminent or existing hazardous conditions. Warnings are issued by EWS when the possibility of a catastrophic event exists in the near future, either if the event is occurring, is imminent or has a very high probability (Villagr and de Leon *et al*., 2013). Those warnings include recommendations or orders to take actions, such as evacuations (Hamilton, 1997). Alerts are not the same as alarms; they are low-level warnings and typically used to summarize several warnings.

2.4 Components of Modern Early Warning Systems

A comprehensive early warning system consists of four critical components: risk knowledge, monitoring and warning services, dissemination and communication, and response capability (UNDRR, 2020).

Risk Knowledge: This involves understanding the types, frequencies, and magnitudes of potential hazards. It encompasses hazard mapping, vulnerability assessments, and historical data analysis. A solid foundation of risk knowledge is essential for developing effective early warning systems. Risk knowledge is a critical component of early warning systems (EWS), providing the necessary foundation to identify, assess, and understand potential hazards and vulnerabilities. This knowledge underpins all aspects of disaster risk reduction and is essential for effective early warning and response.

Hazard Identification: This involves recognizing the types of hazards that could impact a region, such as earthquakes, floods, hurricanes, or human-induced threats. Accurate hazard identification relies on historical data, scientific research, and local knowledge (UNDRR, 2020).

Vulnerability Assessment: Understanding who or what is vulnerable to identified hazards is crucial. This includes assessing the susceptibility of populations, infrastructure, and economic

activities. Vulnerability assessments help prioritize areas for monitoring and intervention (Wisner et al., 2012).

Risk Mapping: Creating detailed maps that illustrate hazard zones and vulnerable areas aids in visualizing potential impacts. These maps are invaluable for planning and decision-making, allowing for targeted early warning dissemination and resource allocation (Zschau & Küppers, 2013).

Historical Data Analysis: Analyzing past disaster events provides insights into patterns and trends, helping to predict future occurrences and impacts. Historical data enhances the accuracy of risk assessments and supports the development of robust EWS (Basher, 2006).

Comprehensive risk knowledge enables the development of tailored early warning messages and preparedness plans. It ensures that warnings are specific, relevant, and actionable, thereby increasing the likelihood of timely and effective responses. Without solid risk knowledge, EWS cannot achieve their full potential in reducing disaster risks and saving lives (UNDRR, 2020).

Monitoring and Warning Services: Continuous monitoring of hazard indicators and timely issuance of warnings are central to EWS. Technologies such as Doppler radar for weather monitoring, seismic networks for earthquake detection, and satellite systems for tracking hurricanes are integral to these services. Monitoring and warning services are critical components of early warning systems (EWS), providing real-time data and timely alerts that are essential for disaster risk reduction. These services involve continuous observation of hazard indicators, data analysis, and the dissemination of warnings to at-risk populations.

Real-time Data Collection: Monitoring systems use advanced technologies such as satellite remote sensing, seismic networks, and meteorological stations to gather real-time data on potential hazards. These technologies enable the continuous tracking of weather patterns, seismic activities, and other environmental changes (WMO, 2020).

Data Analysis and Hazard Detection: The collected data is analyzed using sophisticated models and algorithms to detect early signs of hazards. For instance, Doppler radar systems are used to monitor and predict severe weather events like hurricanes and tornadoes, while seismographs detect and measure earthquake activities (UNDRR, 2020).

Timely Warning Dissemination: Once a potential hazard is detected, timely and accurate warnings are crucial. Effective communication strategies ensure that warnings reach the intended recipients through various channels, including mass media, mobile networks, and social media. Clear and actionable messages are essential to prompt appropriate responses from communities and authorities (IFRC, 2020).

Monitoring and warning services play a vital role in reducing the impact of disasters. Early detection and warning allow for proactive measures, such as evacuations, resource mobilization, and emergency response planning. For example, the Pacific Tsunami Warning System has significantly improved tsunami detection and warning capabilities, leading to timely evacuations and reduced loss of life in coastal regions (UNESCO/IOC, 2009). While monitoring and warning services are highly effective, they face challenges such as technological limitations, data accuracy, and ensuring warnings reach all vulnerable populations. Recent advancements in artificial intelligence (AI) and machine learning are enhancing the capabilities of monitoring systems, allowing for more accurate predictions and

timely warnings (Buchanan, 2020). Monitoring and warning services are indispensable components of EWS, providing the necessary tools to detect hazards and disseminate timely alerts. By leveraging advanced technologies and effective communication strategies, these services significantly contribute to disaster risk reduction and resilience building.

Dissemination and Communication: Ensuring that warnings reach the intended recipients in a timely and understandable manner is crucial. This component involves the use of various communication channels, including mass media, mobile networks, and community-based organizations. Clear and actionable messages are essential to prompt appropriate responses. Dissemination and communication are pivotal components of early warning systems (EWS), ensuring that timely and accurate warnings reach at-risk populations, enabling them to take appropriate actions to mitigate disaster impacts. Effective communication strategies are essential for ensuring the success of EWS.

Multi-channel Approach: Utilizing diverse communication channels such as radio, television, mobile phones, social media, and community networks ensures that warnings reach a broad audience. This approach is critical for reaching different demographic groups and overcoming barriers such as language and literacy (UNDRR, 2020).

Clear and Actionable Messages: Warnings must be clear, concise, and actionable to prompt immediate responses. Messages should provide specific instructions on what actions individuals and communities should take to protect themselves and mitigate risks (IFRC, 2020).

Community Engagement: Engaging local communities in the dissemination process enhances the effectiveness of warnings. Community leaders, local authorities, and grassroots organizations play a crucial role in disseminating information and encouraging preparedness actions tailored to local contexts (Glantz, 2009). Effective dissemination and communication increase public awareness, understanding, and response to warnings, thereby saving lives and reducing the impact of disasters. For instance, during hurricanes and tsunamis, clear and timely warnings allow for orderly evacuations and preparations, significantly minimizing casualties and property damage (UNESCO/IOC, 2009). Challenges in dissemination and communication include reaching remote and marginalized communities, ensuring message comprehension across diverse populations, and adapting to rapidly evolving communication technologies. Advances in mobile technology and social media have revolutionized EWS by enabling faster and more widespread dissemination of warnings (Buchanan, 2020). Dissemination and communication are critical components of EWS, facilitating the rapid and effective distribution of warnings to vulnerable populations. By leveraging diverse communication channels, ensuring message clarity, and fostering community engagement, EWS can enhance disaster preparedness and resilience.

Response Capability: This involves the readiness and capacity of communities and organizations to act on early warnings. It includes emergency preparedness plans, resource allocation, training, and public awareness campaigns. Community participation and education are vital to enhancing response capabilities. Response capability is a crucial component of early warning systems (EWS), encompassing the preparedness, capacity, and ability of individuals, communities, and organizations to effectively respond to early warnings and mitigate disaster impacts. This component focuses on translating early warnings into actionable responses that save lives and reduce damages.

1. **Emergency Preparedness**: Preparedness involves planning, training, and exercises to ensure readiness for various hazards. Communities and organizations develop emergency response plans that outline roles, responsibilities, and actions to be taken upon receiving early warnings (IFRC, 2020).
2. **Capacity Building**: Building local capacity through training programs, workshops, and drills enhances the ability of responders to implement response plans effectively. Training focuses on skills development, coordination, and communication within response teams (UNDRR, 2020).
3. **Community Engagement**: Engaging communities in preparedness activities fosters ownership and ensures that responses are culturally and contextually appropriate. Community participation in planning and decision-making builds trust and resilience, enhancing overall response capability (Glantz, 2009).

Response capability ensures that early warnings translate into timely and effective actions, such as evacuations, resource mobilization, and medical assistance. For example, in the context of hurricanes or floods, communities with strong response capabilities can evacuate vulnerable populations and protect critical infrastructure before disaster strikes, minimizing casualties and damages (NOAA, 2021). Challenges in response capability include limited resources, infrastructure gaps, and coordination issues among response agencies. Advances in technology, such as real-time data analytics and mobile communication platforms, enhance coordination and decision-making during emergencies (Buchanan, 2020). Response capability is essential for maximizing the effectiveness of early warning systems. By investing in preparedness, capacity building, and community engagement, EWS can ensure that early warnings lead to prompt and coordinated responses that save lives and enhance disaster resilience.

2.5 Environmental pollution

Environmental pollution refers to the introduction of harmful substances or contaminants into the natural environment, resulting in adverse effects on ecosystems, human health, and overall quality of life. These pollutants can be chemical, physical, or biological agents and can originate from various sources, including industrial processes, agricultural activities, waste disposal, and vehicle emissions (Buchanan, 2020). Common types of environmental pollution include air pollution, water pollution, soil contamination, and noise pollution. Air pollution involves the release of harmful gases and particulates into the atmosphere, while water pollution includes the discharge of pollutants into rivers, lakes, and oceans, affecting aquatic life and human water supplies. Soil contamination occurs when hazardous chemicals seep into the ground, impacting plant growth and food safety. Noise pollution, caused by excessive sound levels, can disrupt wildlife and human communities. The cumulative effects of pollution contribute to global issues such as climate change, loss of biodiversity, and health problems like respiratory diseases and cancer (Haddow, Bullock, & Coppola, 2021). Addressing environmental pollution requires stringent regulatory measures, public awareness, and sustainable practices to reduce pollutant emissions and mitigate their impacts (Carson, 1962; WHO, 2018; EPA, 2021)

2.6 Erosion Management

Erosion management refers to the strategies and practices employed to prevent, control, and mitigate the effects of soil erosion, which is the displacement of the upper layer of soil by natural forces such as water, wind, and ice, or by human activities such as agriculture and construction (Buchanan, 2020). Effective erosion management aims to protect soil health, prevent land degradation, and maintain environmental and infrastructural stability. Techniques used in erosion management include the construction of physical barriers such as terraces,

retaining walls, and riprap; the establishment of vegetation cover through reforestation, grass planting, and the use of cover crops; and the implementation of land use practices such as contour plowing, no-till farming, and maintaining buffer strips along waterways. Additionally, erosion management involves policy measures, public education, and community involvement to promote sustainable land use and conservation practices. Successful erosion management not only preserves soil fertility and agricultural productivity but also protects water quality, reduces sedimentation in water bodies, and prevents loss of property and infrastructure due to soil displacement (Pimentel, 2006; FAO, 2019; NRCS, 2021).

2.7 Disease Outbreak

A disease outbreak is the occurrence of cases of a particular illness, specific health-related behavior, or other health-related events in a community or region, clearly in excess of normal expectancy (Haddow et al., 2021). The term is often used interchangeably with "epidemic," although an outbreak is typically more localized and less widespread. Disease outbreaks can be caused by infectious agents such as bacteria, viruses, fungi, or parasites and can also result from exposure to toxins or other environmental factors. Key factors contributing to outbreaks include human behavior, environmental changes, microbial adaptation, and the breakdown of public health measures. Disease outbreaks pose significant public health challenges, requiring prompt identification, effective communication, and coordinated response efforts to contain and manage the spread. Measures to control outbreaks include surveillance, vaccination, quarantine, sanitation, and public education. The impact of an outbreak can be severe, affecting human health, economies, and social stability. Examples include the 2014-2016 Ebola outbreak in West Africa and the COVID-19 pandemic, which underscore the importance of global health preparedness and response systems (Heymann, 2008; WHO, 2018; CDC, 2021).

2.8 Disaster Risk Reduction (DRR)

Disaster Risk Reduction (DRR) is a term used for techniques that focus on preventing or minimizing the effects of disasters. The term has been adopted by the United Nations, which has developed an international strategy on promoting disaster risk reduction as it has been shown to be very cost effective (Haddow et al., 2021). Initiatives that are focused on disaster occurring (flood protection works, known as dykes, levees) or enhance the community's ability to respond to an emergency (ensuring three days food and water). As a disaster is a product of a severe event and people, changing either will have an effect on any disasters that occur. Further examples of initiatives include increasing knowledge and creating legal and policy frameworks (Buchanan, 2020).

The term "Disaster risk reduction" refers to a wide sector of work on disaster management including: mitigation, prevention, risk reduction, preparedness, and vulnerabilities. UNDP defines disaster risk reduction as the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, (Haddow et al., 2021) to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development. The traditional focus of disaster management strategies have been the delivery of relief after a disaster. Even though disaster relief is an important issue, this approach alone does not proactively address the need to reduce the human and environmental impact of future disasters. There is growing realization that countries and communities need to place more emphasis on a holistic approach to disaster risk reduction- an approach that involves risk assessment, risk reduction, early warning and disaster preparedness if the social, economic and environmental costs of disasters are to be effectively reduced.

According to the UN/ISDR, 2002, "Disaster reduction policies and measures need to be implemented, with a two-fold aim: to enable societies to be resilient to natural hazards while ensuring that development efforts do not increase vulnerability to these hazards". Disaster risk can be calculated as the interaction between the probability of hazard occurring and the vulnerability of a community to the hazard, together with the capacity of the community to cope with and recover from a disaster.

The basic approaches to Disaster Risk Reduction (DRR) by UNDP (2008) are as follows:

a. Understand the hazard where and when and why it is likely to occur.
b. Know which areas of the community are most vulnerable to hazards, and what capacities and capabilities are available to cope with disasters.
c. Develop knowledge and information resources to enable the risks to be identified and potential impacts to be adequately assessed. Ensure political commitment to disaster risk reduction at various levels through policy development, legislation, organizational development and promoting community action.
d. Increase education and raise awareness of the risks and motivate for changes in collective behavior to reduce risks.
e. Understand and take action to mitigate or relieve the socioeconomic conditions that create or increase the vulnerability of a community.
f. Implement environmental management, physical and technical measures to reduce risks to communities.
g. Increase the coping capacity of communities through better communications, improved resources, etc.
h. Have a disaster preparedness plan in place. This plan should cover both emergency management and recovery from disaster.
i. Develop hazard monitoring systems and early warning indicators.

DRR must be a priority of poverty reduction and development initiatives to ensure sustainable development in Nigeria. Everybody is exposed to natural hazards and hence to disaster risks. The level of exposure and ability to cope with disaster is however, varied. One can say that poverty is a major factor increasing disaster risk by increasing a community's vulnerability to disasters and reducing its coping capacity. However, poverty and disaster form a negative feedback cycle. If a disaster strikes, the level of poverty increases, leading to increase in disaster risk (Haddow et al., 2021).

For sustainable development to be achieved in Nigeria DRR should be factored into poverty reduction policies, strategies and initiatives at all levels. Poverty stricken communities are far more vulnerable to disasters, and disasters in turn create even greater poverty. Hence, by factoring DRR in poverty reduction, poor communities can receive greater protection, the negative spiral of poverty can be broken and poverty reduction efforts are made more sustainable to enhance development in Nigeria.

Effective approaches for community leaders to implement DRR activities are to ensure that:

a. Participation and transparency in decision making
b. Promotion of gender concerns and needs
c. Empowerment and
d. Accountability

These are values that form the cornerstones of good governance and responsibility leader.

Development patterns that ignore poverty and disaster risk reductions which are not friendly to the environment moves toward vulnerable hazards. Such as the unsustainable use of forest resources and over exploitation of crude oil in the Niger Delta leads to over exploitation and degradation, this increases the vulnerability of the users to disasters (Onah, 2005). Sustainable

development should protest against the impacts of natural and human induced hazards (Haddow et al., 2021). It is balanced between the use of natural resources to meet current needs of a population while at the same time preserving these resources for future generations. Sustainable development reduces disaster risk by causing an upward spiral of environmental protection and development. Sustainable development ensures DRR, which in turn ensures investment and growth.

2.9 Phases of modern disaster management

There are four phases of modern disaster management approach known as the comprehensive emergency management (CEM), a framework first developed in 1979 by the National Governor's Association during its study of emergency preparedness. This according to Federal Emergency Management Agency (FEMA). (2017) was viewed as a four-stage process centered on an emergency event or disaster. The temporal stages before the disaster occurs are identified as mitigation and preparedness, while those after the disaster are identified as response and recovery. Therefore, emergency management is a holistic approach to handling disasters before and after their occurrence.

Mitigation: A hazard mitigation strategy is a coordinated and consistent set of goals, policies, and tools for reducing or minimizing human and property losses from hazards and resulting disasters. Its efforts attempt to prevent hazards from developing into disaster altogether, or reduce the effects of disasters when they occur. The mitigation phase differs from the other phases because it focuses on long-term measures for reducing or eliminating risk. Coppola (2011) argues for packaging mitigation measures with development management programs into coordinated strategies in order to address effectively the opportunities and problems of integrated hazard mitigation. Thus, implementation of mitigation strategies can be considered a part of the recovery process if applied after a disaster occurs.

Mitigating measures can be structural or non-structural. Structural mitigation aims to reduce this damage and eventually save lives. Structural mitigation is a science that requires the expertise of civil engineers. It includes both the new buildings, roads, canals, Dams, and other infrastructure and the strengthening and retrofitting of old structures. It uses technological solutions, like flood levees. Non-structural measures include legislation, land-use planning (e.g. the designation of nonessential land like parks to be used as flood zones), and insurance. Mitigation is the most cost efficient method for reducing the impact of hazards, thus it is not always suitable (Coppola, 2011).

Mitigation includes providing regulations regarding evacuation, sanctions against those who refuse to obey the regulations (such as mandatory evacuations), and communication of potential risks to the public. Personal mitigation is mainly about knowing and avoiding unnecessary risks. This includes an assessment of possible risks to personal/family health and to personal property. A typical example of mitigation would be to avoid buying property that is exposed to hazards, for instance in a flood plain, in area of subsidence or landslides. Home owners may not be aware of a property being exposed to a hazard until it strikes. Specialists can be hired to conduct risk identification and assessment surveys.

Purchase of insurance covering the most prominent identified risks is a common measure.

Personal structural mitigation in earthquake prone areas includes installation of an Earthquake Valve to instantly shut off the natural gas supply to a property, seismic retrofits of property and the securing of items inside a building to enhance household seismic safety. The latter may include the mounting of furniture, refrigerators, water heaters and breakables to the walls, and the addition of cabinet latches. In flood prone areas houses can be built on poles, as in much of southern Asia. In areas prone to prolonged electricity black-outs installation of a generator

would be an example of an optimal structural mitigation measure. A precursor activity to the mitigation is the identification of risks. The higher the risk, the more urgent the hazard specific vulnerability are targeted by mitigation and preparedness efforts.

Preparedness: While preparedness is aimed at preventing a disaster from occurring, personal preparedness focuses on preparing equipment and procedures for use when a disaster occurs, for example planning. Preparedness measures can take many forms including the construction of shelters, installation of warning devices, creation of back-up life-line services such as power, water, sewage and rehearsing evacuation plans.

In the preparedness phase, emergency managers develop plans of actions against when the disaster strikes. Some preparedness measures are:

a. Communication plans with easily understandable terminology and methods

b. Proper maintenance and training of emergency services, including mass human resources such as community emergency response teams.

c. Development and exercise of emergency population warning methods combined with emergency shelters and evacuations plans.

d. Stockpiling and maintain disaster supplies and equipment

e. Development of organizations of trained volunteers among civilian populations.

Organizations like Community Emergency Response Teams and the Red Cross are ready sources of trained volunteers. The latter's emergency management system has high ratings worldwide. Another preparedness measure is casualty prediction, the study of how many deaths or injuries to expect for a given type of event. This gives planners an idea of what resources need to be in place to respond to a particular kind of event. Emergency Managers in the planning phase should be a particular kind of event. Emergency Managers in the planning phase should be flexible, and all encompassing-carefully recognizing the risks and exposures of their respective regions and employing unconventional means of support.

Response: This phase of an emergency may commence with search and rescue but in all case the focus will quickly turn to fulfilling the basic humanitarian needs of the affected population. This assistance may be provided by national or international agencies and organizations (Virtriana, et al, 2023). Effective coordination of disaster assistance is often crucial, particularly when many organizations respond and local emergency management agency (LEMA) capacity has been exceeded by the demand or diminished by the disaster itself. The response phase includes the mobilization of the necessary emergency services and first responders in the disaster area. This is likely to include a first wave of core emergency services, such as fire fighters, police and ambulance crews. Organizational response to any significant disaster- natural or terrorist borne –is based on existing emergency management organizational systems and processes: the Federal Response Plan (FRP) and the Incident Command System (ICS) (Schumacher, 1973). On a personal level the response can take the shape either of a shelter in place or an evacuation. In a shelter-in- place scene, a family would be prepared to fend for themselves in their home for many days without any form of outside support. In an evacuation, a family leaves the area by automobile or other mode of transportation, taking with them maximum amount of supplies they can carry, possibly including a tent for shelter. If mechanical transport is not available, evacuation on foot would ideally include carrying at least three days of supplies and rain-tight bedding, a tarpaulin and a bedroll of blankets being the minimum (Sufri, et al, 2020).

Recovery: Aim of the recovery phase is to restore the affected areas to its previous state. It differs from the response phase in its focus. Here efforts are concerned with issues and decisions that must be made after immediate needs are addressed. Recovery efforts are primarily concerned with actions that involve rebuilding destroyed property, re-employment,

and the repair of other essential infrastructure (Shah, et al, 2022). An important aspect of effective is taking advantage of a "window of opportunity" for the implementation of mitigative measures that might otherwise be unpopular. The recovery phase starts after the immediate threat to human life has subsided. During reconstruction, it is recommended to consider the location or construction material of the property. The most extreme home confinement scenarios include war, famine and sever epidemics and may last a year or more. Then recovery will take place inside the home (Rofiah, Kawai, & Hayati, 2021).

Planners for these events usually buy bulk foods and appropriate storage and preparation equipment, and eat the food as part of normal life. It is the Federal government that often provides the most technical and financial assistance for recovery efforts in the United States.

2.1.17 Emergency management and sustainable development

In Nigeria, for effective emergency management that ensures sustainable development the following should be in place;

Adequate fund: Finance is the life wire of every organization. Emergency management is cost effective and to cope with it, manpower, equipment, relief materials and logistics are needed. Unfortunately, disasters are uncertain with respect to both their occurrence and outcome (Rofiah, et al, 2021).

Teamwork: According to Todaro and Smith (2009) and Belbin (1981) team work is very essential in emergency management. As Smith claims that groups/team make better decisions than individuals. They are important because they are generally considered to outperform individuals. This is what Belbin called corporate performance.

Buscher and Monensen (2007), call it collaboration which means that people actively work together to assess a situation such as talking, jointly investigating which is needed in emergency management. McKenn (1994) identifies seven main factors which are held to determine group cohesion. These include shared attitudes and goals; the amount of time spent together; the extent of the group's isolation from other groups; the level of perceived threat; the site of the group, and its negative effects on interaction: the presence of stringent group entry requirements; and the levels of perceived rewards for the group.

Training/capacity building: Skill acquisition is an important tool in emergency management. Training should be provided by local, state, federal and private organizations which ranges from public information and media relations to high-level incident command and tactical skills such as studying a terrorist bombing site or controlling an emergency scene.

Emergency managers should be trained in a wide variety of disciplines that support them throughout the emergency the emergency life-cycle. Professional certifications such as Certified Emergency Manager (CEM) and Certified Business Continuity Professional (CBCP) are becoming more common as the need for high professional standards is recognized by the emergency management community especially in the United States which can be adapted in Nigeria (Rana, Asim, Aslam, & Jamshed, 2021).

Technological tools: Tools are very essential for instance, the US Emergency Management Information Systems (EMIS) which supports the emergency management process by providing an infrastructure that integrates emergency plans at all levels of government and non-government involvement and by utilizing the management of all related resources including human and other resources for all four phases of emergencies (Oktari, Munadi, Idroes, & Sofyan, 2020). Hence, it is important that organization formulates plans and tools which meet their own specific needs. In the healthcare, hospitals utilize HICS (Hospital incident Command System) which provides structure and organization in a clearly defined chain of command with set responsibilities for each division. In Nigeria NEMA uses the geographic information system which is one of the facilities for preparedness and planning in emergency management.

2.10 Emergency Management in Nigeria

There are wide ranges of hazards identified in Nigeria which include frequent oil spills; pipe line vandalization; increasing levels of urban industrial pollution and waste; rise in the number and severity of floods, especially in Jigawa, Kano, Sokoto, Kebbi, Zamfara, Gombe and some Southern States; (Essoh, and Abutu, 2018). threat of desertification and pest infestation birds and locusts in Sokoto and Yobe – Borno in 1969; epidemic like meningitis mostly in northern part of the country; the not too long reported outbreak of the dreaded avian influenza; gully erosion traditionally in South Eastern states which is becoming pronounced in Auchi and Bida as well as in Agulu-Nanka; wind storms in the northern parts of the country and in Ogurugu in Uzo-uwani in Nsukka of Enugu state; the rampant air crashes of 1992 to 2005/2006; fire disasters especially market infernos in Onitsha, Sokoto, Jos etc.; cases of collapsed buildings such as in Lagos, Enugu. Abuja, Port Harcourt, etc; and ethnoreligious conflicts such as in Kaduna, and Jos. In order to take disaster management to the community level, (Ibeabuchi, 2020), the management of NEMA in August 2006 opened up zonal offices in the six geo political zones of the country. For proximity to the communities for the purpose of communication and coordination, the Agency undertook the sensitization of States to encourage them to establish their State Emergency Management Agencies (SEMAs) through meetings, public enlightenment and conferences (Ajake, et al, 2022).

There have been reports to these initiatives to be enhanced to enhance sustainable development in Nigeria from all the states. Having realized that disasters strike at communities some states have heeded to the call to establish Local Government Emergency Management Committees (LEMCs). The synergy between the three jurisdictional organizations are what will improve the sustainable development we are clamoring for today. Since inception in 1999, NEMA has been active in providing timely relief assistance to victims both at national and international levels through its collaboration with FRSC, federal fire service, Nigeria police force, Nigeria security and civil defense and the Nigeria Red Cross. Also, NEMA achieves its disaster management objective by collaborating with state and local governments, voluntary organizations, the international specialized donor agencies and 57 Disaster Response Units (Shaba, 2009).

2.11 Institutional and Policy Framework for Disaster Management in Nigeria

The National Emergency Management Agency (NEMA) was established via Act 12 as amended by Act 50 of 1999, to manage disasters in Nigeria. Hence, from inception, NEMA has been tackling disaster related issues through the establishment of concrete structures and measures (Ibeabuchi & Nwilo, 2020). The objective of NEMA is to coordinate and facilitate disaster management efforts aimed at reducing the loss of lives and property and protect people's lives from hazards by leading and supporting disaster management stake holders in a comprehensive risk based emergency management programme of mitigation, preparedness, response and recovery. Disaster management in Nigeria dates back to 1906 when the Police Fire Brigade (Federal Fire Service) was established to function beyond firefighting role to saving lives, properties and provision of humanitarian services in emergencies (Oluwasegun, et al, 2018).

However, between 1972 and 1973 Nigeria was hit by a devastating drought which affected the socio-economic conditions of the nation and resulted to loss of lives and property worth millions of naira. This made it imperative for the government to consider a response body to take care of disaster issues because of its serious and adverse effects to life of her citizens. Thus, the establishment of National Emergency Relief Agency (NERA) by Decree 48 of 1976, which was conceived as an Inter-Ministerial Committee, charged with the task of collecting and distributing relief materials to disaster victims. This function of NERA with regards to

Disaster Management was very limited because of the scope under which it operates (Ajake, 2022).

Nigeria in 1990, along with other member countries of the United Nations set up a National Committee for International Decade for Natural Disaster Reduction (IDNDR). The Nigerian Inter-Ministerial body set up four subcommittees, with NERA retaining membership in each sub-committee, to address natural disasters reduction in Nigeria. A working group was also inaugurated with a representative from NERA to work out a situation report on Natural Disaster reduction for the country for the remaining years in the decade (Aljazirah News Online, 2019). This report was submitted in May 1994 after which the committee ceased to exist. This brought back the task of drawing up a National Agenda on issue of disaster management in all its ramifications. The government in 1993 based on the objectives and goals of IDNDR decided to expand the scope of managing disasters to include all the areas of disaster management. This included prevention, mitigation, response and recovery. Decree 119 of 1993 thus raised the Status of the Agency to an independent body under the presidency, with the functions of formulating general policies and guidelines relating to management of disasters in Nigeria and friendly countries.

In 1997, having realized the obvious shortcomings of NERA in the management of disasters, the management of NERA under the leadership of the then Director, Mrs. Oluremi Olowu, organized a National Workshop involving major stakeholders in disaster management in Nigeria including Oil Companies, construction companies, government and nongovernmental organizations and representatives of UNDP (UNDP, 2004). The workshop deliberated extensively on a number of issues and considered several critical success and survival factors for effective disaster Management in Nigeria and came up with a communiqué:

a. Noted the need to expand the functions of the National Emergency Relief Agency to include proper management of Disasters in the country, to amend the decree setting proper management of Disasters in the country, to amend the decree setting up NERA and to change the name of the Agency to National Emergency Management Agency (NEMA).
b. Noted the need to structure the new agency along the following areas: Search and Rescue; Policy and Strategy; Information, education and Prevention; Administration, Finance and Logistics; Relief and Rehabilitation and Research and Planning.
c. Noted that appropriate budgetary allocations should be made for the operations of the Agency.
d. Suggested the need for an Interim committee to put in place immediately to study the deliberations and recommendations of the workshops towards implementation.

2.11 Challenges of NEMA in Nigeria

NEMA works through the state bodies in all the states of the federation called state emergency management agency (SEMA). In an effort to ensure that emergency services are provided as at when needed, the Governor of the state is the Chairman of the agency. This also implies that the interest of the Governor determines the efficiency of the agency
at the state levels. It is for this reason that some states respond to emergency issues more than others (Essoh & Abutu, 2018). Nevertheless, some basic challenges affect the management of emergencies/disasters in Nigeria. These include:

Inadequate funding: Substantial finance is needed in the provision of relief materials and logistics issues. Government does not provide enough funds for these. Most states depend on donor agencies for emergency relief.

Inadequate facilities: In Nigeria, NEMA has only one helicopter. This shows the level of commitment of government in the emergency management. At the state level, there are few

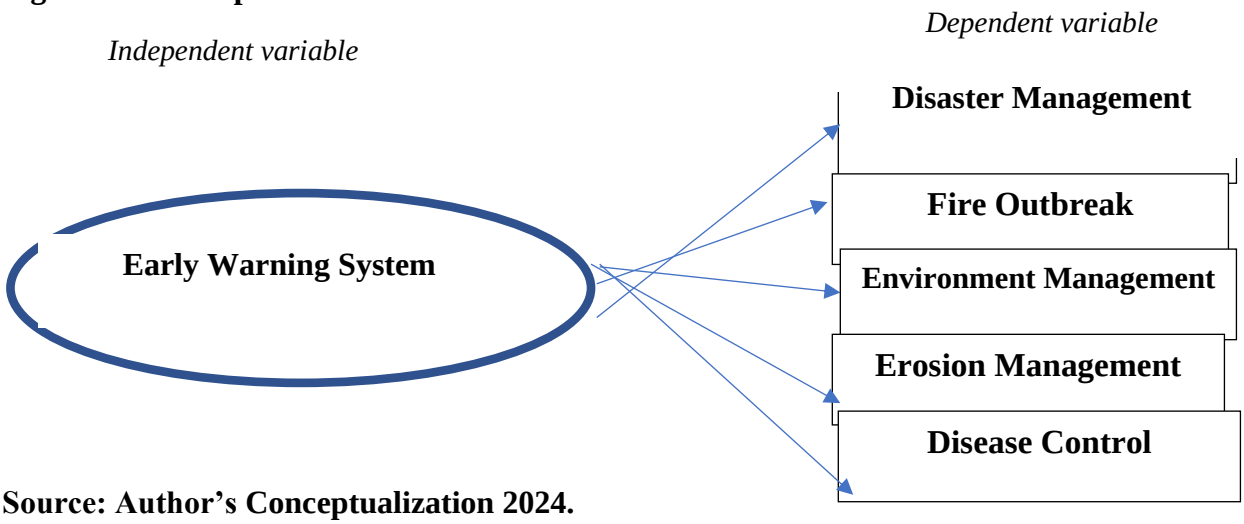
and often old vehicles to attend to emergencies. For instance, the fire service trucks, most of the times they complain of not having water or fuel which makes them not to respond to disasters on time.

Political factor: NEMA is placed under the directives of the vice president while at state level, the governor is the chairman of the agency. This simply means that the interest of the people in charge determines the fate of emergency management at both state and federal level. Instability in government and policies affect emergency management in Nigeria.

Lack of awareness and advocacy: prevention of disaster is better and less expensive to manage than responding to it. There is low level of awareness of imminent disasters, such as erosion-prone areas.

Weak policy: Since emergency management is determined by the interest of the person in charge i.e the vice president and the governor at both federal and state levels respectively, it shows that there is no functional system for emergency management in Nigeria. NEMA is constitutionally established by Act 12 of 1999, hence, it has become government duty and responsibility to manage disasters which are inevitable in the state, Therefore, failure to respond to this negates the responsibility of government (Adam & Fazekas, 2021).

Figure 2.1 Conceptual Framework



Source: Author's Conceptualization 2024.

2.12 Theoretical Framework

Systems Theory

Systems theory, originally developed in the natural sciences, has been applied to various fields including disaster management. It views complex phenomena as systems composed of interconnected parts that work together to achieve a common purpose. Systems Theory, propounded by biologist Ludwig von Bertalanffy in the 1930s, offers a holistic framework for understanding complex phenomena by analyzing them as integrated systems of interrelated and interdependent components. The theory emphasizes several key tenets that have profound implications across various fields.

Interconnectedness underscores the idea that changes in one part of a system can impact the entire system. This holistic perspective is crucial for comprehending the complex interactions and dependencies within any given system, whether biological, social, or technological.

Holism asserts that the system as a whole is greater than the sum of its parts. This principle encourages a comprehensive view, recognizing that individual elements cannot be fully

understood in isolation but must be seen in the context of their interactions and relationships within the system.

Open Systems describe how systems interact with their environments, exchanging information, energy, and matter. This dynamic interaction allows systems to adapt and evolve, highlighting the importance of external influences on system behavior.

Feedback Loops are critical for system regulation, involving mechanisms that can either amplify changes (positive feedback) or stabilize the system (negative feedback). These loops are essential for maintaining balance and ensuring the system's resilience to external disturbances.

Adaptability denotes the system's ability to adjust to changes in its environment, which is vital for survival and evolution. This tenet underscores the importance of flexibility and responsiveness in complex systems.

Lastly, **Hierarchy** refers to the structured layers within systems, where subsystems are nested within larger systems. Each hierarchical level contributes to the overall system's function and complexity, illustrating the multi-layered nature of systems. Bertalanffy's Systems Theory provides a foundational lens for analyzing and understanding the intricate web of interactions that define complex systems, offering valuable insights for various disciplines from ecology to organizational management.

Application of Systems Theory on Early Warning Systems and Disaster Management in South East Nigeria

Systems Theory, propounded by Ludwig von Bertalanffy in the 1930s, provides a valuable framework for enhancing early warning systems and disaster management in South East Nigeria. This theory emphasizes interconnectedness, holism, open systems, feedback loops, adaptability, and hierarchy, all of which are crucial for an integrated approach to disaster management.

In South East Nigeria, applying Systems Theory can enhance the coordination among various stakeholders involved in disaster management, including government agencies, local communities, and international organizations. The interconnectedness principle ensures that changes in one component, such as improved communication technologies, positively affect the entire system's efficiency.

The holistic approach encourages comprehensive planning and preparedness, considering all potential disaster scenarios and their impacts. Open systems highlight the importance of interacting with the environment, allowing for real-time data collection and analysis through Geographic Information Systems (GIS) and remote sensing technologies. Feedback loops are essential for timely and effective responses. Positive feedback can amplify successful strategies, while negative feedback helps correct inefficiencies. Adaptability enables the system to adjust to new threats, such as climate change-induced disasters, ensuring resilience.

Finally, understanding the hierarchical structure of disaster management systems helps streamline operations at various levels, from local to regional. By integrating these tenets, South East Nigeria can develop robust early warning systems and disaster management practices that are responsive, resilient, and sustainable. In the context of disaster management, systems theory helps in understanding how different components such as early warning mechanisms, emergency response teams, government agencies, and local communities interact to form an integrated disaster management system. This theory is particularly useful in analyzing the effectiveness of early warning systems, as it emphasizes the importance of

coordination and communication among various stakeholders. For South East Nigeria, applying systems theory can help identify gaps in the current disaster management framework and suggest improvements for better integration and cooperation among different entities.

5. Conclusion

Early warning has been identified as imperative go guide the citizens towards the direction of safety. But the warnings were in most cases not heeded to by citizens. Also the study showed that National Emergency Management Agency is not up and doing in their duty of managing disasters when they occur. The Government on the other hand has no strong institutional/policy frameworks that are implementable to nip the problem in the bud.

The study therefore recommends that a strong and implementable institutional and policy framework to manage disaster should be formulated and effectively implemented to reverse the situation. Also, awareness should be created among citizens especially those who are susceptible to disaster to heed to instructions.

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