NIGERIA 2012 FLOOD DISASTERS – THE ROLE OF MODERN TECHNOLOGY IN DISASTER MANAGEMENT

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ABSTRACT

The Nigerian nation witnessed its worst flood disaster in over four decades in 2012. Thirty three states of the federation were affected. Over 7.7 million people were victims nationwide; with 3.8 million people internally displaced persons (IDPs) and 363 reported death. Nigerian economy lost 2.29 trillion naira representing 1.4% of our GDP. Nigeria was losing half a million barrels daily oil production output during this period, this accounts for more than one fifth of the nation's daily output. Food production was grossly affected with rice fields in the flood valleys of rivers Niger and Benue virtually wiped out. But disasters only occur to the extent that the population is unprepared to respond, unable to cope, and consequently, severely affected. This paper reviews modern technology that could help Nigeria prepare, mitigate, and recover from such disasters, these include: Geographical Information System (GIS), Global Positioning System (GPS), Remote sensing, Satellite navigation system, GSM/Cellular Mobile Telephone System, Internet, Television and radio broadcasting and Social media and social networking.

Keywords: Flood, Disaster, GDP, Food Production, Modern Technology.

INTRODUCTION

Disaster is defined as a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of the affected people to cope using its own resources (IDNDR 1992). Emergency on the other hand is "a situation generated by the real or imminent occurrence of an event that requires immediate attention" (Srinivas, 2005).

Disaster management is the organization and management of resources and responsibility for dealing with all humanitarian aspects of emergencies, in particular preparedness, response, and recovery in order to lessen the impact of disasters (IFRC, 2014).

Disaster is the resultant consequence of a hazard; natural or manmade (e.g., volcanic eruptions, earthquakes, floods, catastrophic accidents, fires, explosions, etc.) that affects humans and/or the built environment. When appropriate emergency management is absent, man becomes vulnerable; this leads to financial, environmental, or human impact. The extent of the loss depends on the capacity of the population to support or resist the disaster i.e. their resilience.

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One of such disasters is the October 2012 floods in Nigeria. The Nigerian nation witnessed its worst flood disaster in over four decades in 2012. Thirty three states of the federation were affected. Over 7.7 million people were affected nationwide, resulting in over 3.8 million people been registered as internally displaced persons (IDPs) due to the flood. Loss of lives was estimated to total 363 people. Nigerian economy lost 2.29 trillion naira representing 1.4% of our GDP (Nnodim, 2013). Oil production in the Niger Delta were also disrupted, the nation was losing half a million barrels daily production output during this period, this accounts for more than one fifth of the nation's daily output (Anna, 2012). The cocoa industry was predicted to loss half of its projected 300,000 tonnes yearly production. In the flood valleys of rivers Niger and Benue rice fields were virtually wiped out; leading the Nigerian President to reassuring Nigerians that the floods will not trigger food crises. Some of the remote causes of the 2012 flood as identified by experts include;

1. Release of water in September by Cameroonian authorities from Lagdo dam in August 2013 which coincided with similar release from Kainji, Jebba and Shiroro dams
2. Refusal of FGN to construct a buffer dam to absorb excess discharge from Lagdo dam
3. Heavy rainfall; volume, duration, spatial distribution,
4. Inability of natural water courses to convey excess water, etc.
5. Extreme weather conditions (Srinivas, 2005).

Natural hazards themselves do not necessarily lead to disasters. Natural hazards like flood, earthquakes, etc. however intense, inevitable or unpredictable, translate to disasters only to the extent that the population is unprepared to respond, unable to cope, and, consequently, severely affected. The vulnerability of humans to the impact of natural hazards is to a significant extent determined by human action or inaction. Even the occurrence of recent climatic anomalies attributed to global climate change is traced to human activities.

Thus disasters could, in fact, be reduced, if not prevented. With today's advancements in science and technology, including early warning and forecasting of natural phenomena, together with innovative approaches and strategies for enhancing local capacities, the impact of natural hazards, somehow could be predicted and mitigated, its detrimental effects on populations reduced and the communities adequately protected.

Modern technologies have change man's influence and control over his environment. These technologies have become important tools in studying, monitoring and managing disasters. The technologies employed in disaster management include:

- Geographical Information System (GIS)
- Global Positioning System (GPS)
- Remote sensing
- Satellite navigation system
- GSM/Cellular Mobile Telephone System

- Internet
- Television and radio broadcasting
- Social media and social networking (Sahu, 2012).

Application of Geographical Information System (GIS) in Disaster Management

This is an information system that is capable of integrating, storing, editing, analysing, sharing and displaying geographically-referenced information. In other words GIS is a tool that allows users to create interactive queries/searches, analyse the spatial information, edit data, maps and present the results of all these operations. GIS finds use as follows:

1. **To Map Vulnerable Areas:** Maps of high risk areas can be created prior to citing development projects.

2. **Locate Critical Facilities:** The GIS provides information on the physical location of shelters, drains and other physical facilities. This is useful for disaster managers.

3. **Create and Manage Associated Database:** GIS can be used to generate hazard and risk maps for existing settlements and cities and in the planning of disaster preparedness and disaster relief activities.

4. **Vulnerability Assessment:** GIS can provide useful information on "high-risk" or vulnerable areas within the country. This can create disaster awareness for government and the public.

5. **Planning:** This is critical to disaster management. The extent to which lives and properties will be saved during disaster is dependent on the level of planning that takes place and the extent to which technology has been incorporated in planning efforts. GIS provides this framework and allows planners and disaster managers to view spatial data by way of computer based maps.

6. **Mitigation:** GIS allows disaster managers to determine the level of mitigative structures that should be in place given the vulnerability of an area or population.

7. **Preparedness:** Identification and location of resources and vulnerable areas can be done with GIS. Disaster managers can better coordinate emergency personnel, critical infrastructure and communication network both in terms of availability and distribution.

8. **Response:** GIS technology provides accurate data on exact location of disasters, so that responses are better coordinated. It's used as a floor guide for evacuation routes, assembly points and safe points, etc.

9. **Recovery:** GIS will provide a synopsis of damaged sustained, where and the number of persons or institutions affected.

10. **Emergency Shelters:** It captures specific details emergency shelters like number of children, adults, disabled, etc. this will facilitate stocking demands and distribution of relief.

11. **Distribution of Relief:** when disasters cut off communities, food drops become order of the day, GIS can be used identify the specific areas where clusters of victims are located and the unique needs of these clusters (Johnson, 2000, Sahu, 2012).

Application of Global Positioning System (GPS) in Disaster Management

Navigation System with Timing and Ranging Global Positioning System (NAVSTAR GPS) popularly known as GPS was developed by the United States Department of Defence solely for military purposes but deployed for civilian use in the 80's. Its applications include automobile and marine navigation, tracking, farming and research. It is made up of 24 well-spaced satellites that orbit the earth and with ground receivers exact geographic locations can be identified with great accuracy.
The greatest advantage of GPS is because it operates in any weather, anywhere and at all times. It functions simply to give the exact location of the receiver but the level of precision of GPS makes it an important technological tool in disaster management. GPS data is usually integrated with GIS to provide information during disaster. Its greatest utility is during the response and recovery phases especially in tracking of emergency vehicles or supplies.

- Pinpointing the location of disaster damage sites.
- Helping scientists to anticipate disasters prone areas.
- Help Meteorologists in storm tracking and flood prediction.
- GPS has become an integral part of modern emergency response systems – whether helping stranded motorists find assistance or guiding emergency vehicles.
- Helps identify and view the location of police, fire, rescue, and individual vehicles or boats, and examine how their location relates to an entire network of transportation systems in a geographic area, easing dispatch of emergency/rescue/relief services.
- Incorporation of GPS into mobile phones places an emergency location capability in the hands of everyday users (Sahu, 2012)

Application of Remote Sensing in Disaster Management

Remote sensing is the use of electromagnetic (EM) wave radiation to acquire information about an object or phenomenon by a recording device that is not in physical or intimate contact with the object.

In disaster management remote sensing technology utilizes man-made sensors that are attached to aircrafts, or satellites, etc. capable of recording or capturing images. Remote sensing is usually classified by wavelength regions, these are; visible and reflective infrared remote sensing, thermal infrared remote sensing and microwave remote sensing.

Visible and reflective infrared remote sensing is the most common and cheap type of remote sensing utilising regular cameras or video recorders which are attached to airplanes to provide aerial photographs. It allows for making "before" and "after" comparisons in the event of a disaster. Infrared and microwave remote sensing find application in thermal and chemical pollution disasters.

USES IN FLOOD DISASTER MANAGEMENT

- Remote sensing as a technological tool allows users the opportunity to view what is taking place in an affected area, without jeopardizing the safety of the user.

- Can be used to determine flood potential of an area because it could highlight features of the geography that could make the community susceptible to the hazard.

- It allows response workers to stay away from danger zones while at the same time gather pertinent information to facilitate timely response, rescue and relief efforts.

Note that the above also applies to other disasters like hurricanes, volcanic eruptions, tsunamis, wild fires, etc.

Application of Satellite Navigation System in Disaster Management

Satellites are the only wireless communications infrastructure that are not susceptible to damage from disasters, because the main equipment sending and receiving signals (the satellite spacecraft) is located outside the earth's atmosphere. Two types that support disaster management and emergency response activities: geo-stationary satellite systems (GEO) and low-earth orbit satellites (LEO). GEO satellites are located 36,000 km above the earth in a fixed position providing services to a country or a region (up to one-third of the globe). They provide a full range of communications services, including voice, video, and broadband data with ground equipment, ranging from very large, fixed gateway antennas down to mobile terminals the size of a cellular phone. About 300 commercial GEO satellites are in orbit, being operated by global, regional, and national satellite carriers. LEO satellites on the other hand operate in orbits between 780 km and 1500 km, they provide voice and low speed data communications. They also utilise hand-held units about the size of a large cellular phone.

Satellite navigation system provide seismic and flood-sensing data to government agencies, providing early warning of an impending disasters, broadcast disaster-warning notices and facilitate general communication and information flow between government agencies, relief organizations, and the public. It also provides narrowband and broadband Internet Protocol (IP) communications (internet, data, video, and voice over IP).

Application of GSM/Cellular Mobile Telephone System in Disaster Management

The Global System for Mobile Communications (GSM)/Cellular Mobile Telephone system can be effectively utilised as warning devices. Short messages can be sent to recipients warning of imminent threat disasters (tropical storms, floods, wild fires,

etc.). Images can also be circulated of communities already affected. With most social networks accessible on mobile devices, they have become great tools in disaster amelioration, evacuation and relief distribution (Vyas and Desai, 2007, COL 2013).

Application of Internet in Disaster Management

In the present era of electronic communication, the internet provides a useful platform for disaster mitigation communication. It is a valuable asset, provided the rate of illiteracy in the disaster area is insignificant, the residents understand the language in use and is familiar with the computers and the software, and has physical access to both the net and computers. The internet provides support for major operations and functions of disaster managers, irrespective of distances between headquarters and field offices. Access to the internet permits continuous updates of disaster information, accounts of human and material resources available for response, and state-of-the-art technical advice. It also provides an important linkage between disaster sites and the outside world where most of relief assistance are likely to come from (Vyas and Desai, 2007, COL 2013).

Application of Television and radio broadcasting in Disaster Management

Television is a powerful tool in broadcasting disaster warnings, and is widely used in many countries, with growing popularity. The combination of picture and sound provided by Television has tremendous impact on the viewing public, providing opportunity for disseminating realistic messages. Its message is also significant for the international community that more often than not is responsible for provision of relief materials.

The radio is the most popular and widespread information tool used in disaster management due to its affordability and widespread reach. Radios are more readily available in homes, cars, schools and at the workplace and can quickly and easily transmit information to the public through disaster preparedness documentaries, commercials designed to build awareness, discussion groups and interviews, radio dramas and call- in programmes. The radio takes information directly to people from all walks of life, quickly and easily, even the very poor in the most remote rural village.

Satellite radios can play a key role during the disaster warning and disaster recovery phases. Its key advantage is the ability to work even outside of areas not covered by normal radio channels. Satellite radio can also be of help when the transmission towers of the normal radio channels are damaged in disaster (Vyas and Desai, 2007, COL 2013).

Application of Social Media and Social Networking in Disaster Management

Social media and social networking sites like Facebook, Twitter, Flickr, YouTube, Google+, etc. can be used as a tool by disaster managers in dissemination of disaster warning, data sharing/gathering, evacuation, relief distribution etc. Examples of suggested applications of social media and social networking include:

- Use blogs to rapidly publicize the need for assistance grants.
- Create geo-tagged photo groups to document damage.
- Publicize volunteers willing to share recovery-relevant expertise.

- Use map-based mashups (combinations of data in webpages) to display relevant local information.
- Immediately share "lessons learned."
- Integrate volunteer directories with social networks to simplify information sharing.
- Distribute weather information via methods that support geographic targeting.
- Encourage sharing of resource information among corporations that will most likely be involved in recovery work.
- Use for voluntary sharing of information among affected populations (Vyas and Desai, 2007, COL 2013).

CONCLUSION AND RECOMMENDATION

Hazards natural or manmade become disasters when man loses the ability to effectively manage it. Advancement in modern technology has put in man's hands tools to effectively monitor, predict, prepare, mitigate, and recover from disasters. These technologies in form of Geographical Information System (GIS), Global Positioning System (GPS), Remote sensing, Satellite navigation system, GSM/Cellular Mobile Telephone System, Internet, Television and radio broadcasting and Social media and social networking can be put to work by disaster managers in planning and hazard reduction. Disaster mitigation and warning messages, disaster responses, rescue and relief distribution could all be beneficiaries of these new technologies.

In Nigeria most of these technologies are available even if scattered among different government agencies, what is absent is their coordinated use. This was what made 2012 flood such a bad disaster. Nigerian Emergency management Agency (NEMA) must wake up and take full responsibility for coordinating these agencies with these technologies for effective disaster management and not restrict itself to relief distribution alone.

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