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TECHNOLOGY AND DISASTER MANAGEMENT IN NIGERIA: PROSPECTS AND CHALLENGES

Funmilayo Idowu Agbaje & Ruth Ochanya Adio-Moses
Institute for Peace and Strategic Studies
University of Ibadan, Ibadan, Nigeria.

Abstract
The use of technology in disaster management is not a new phenomenon globally, but in Nigeria such technology has not been put to effective use by disaster management agencies.This paper reviews the present state of technology usage in disaster management in Nigeria with the aim of recommending prospective interventions in the future. Extant literature was used in analysing the prospects and challenges of deploying technology during disaster management process. This paper thus examines the centrality of technology to disaster management in Nigeria, identifies new and not-so-new technology that could be useful in handling disaster issues, and highlights the important elements of some of the identified technology, their strengths as well as their limitations. Evident prospects and challenges facing the implementation of technology in disaster management in Nigeria are discussed. The paper makes recommendations toward a more technology-savvy disaster management system for the country through adequate training of disaster management officials, provisions of equipment and capacity building efforts to enhance synergy between private and public sectors.

Keywords: Technology, Disaster Management, Prospects, Challenges

Introduction

The frequency of disaster and destructive impacts are issues of growing concern throughout the world, Nigeria inclusive. Disasters threatening large populations living in diverse environments have been on the increase. It has been recorded that between 2006 and 2016, annual averages of 69,827 deaths caused by disasters have been recorded globally (Guha-Sapir etal, 2017:1). Particularly, Nigeria has experienced losses of significant magnitude, witnessing reoccurring floods, insurgency and terrorism, incidences of building collapse, ocean surges and more recently earth tremors. Consequently the vulnerability of people

and assets have increased exponentially, partly due to raise in temperature and extreme weather events exacerbated by global warming/climate change (National Emergency Management Agency, 2019). These disasters also have far-reaching, socio-economic and environmental implications for sustainable development. It is thus expedient to develop effective tools for their management. In Nigeria, scholarly attention has not been adequately given to the use of technology at every stage of the management of disasters, namely preparedness, response, recovery and mitigation. These are the four widely accepted stages in disaster management cycle designed to aid emergency managers in their actions in order to minimise the impact of disasters at all levels. The National Emergency Management Agency (NEMA) and the various State Emergency Management Agencies (SEMAs) at the federal and state levels respectively in Nigeria have been very active in the discharge of their responsibilities through various strategic and pragmatic activities aimed at managing disasters. NEMA's mission is to coordinate resources towards efficient and effective disaster prevention, preparedness, mitigation and response in Nigeria. Despite the fact that NEMA has developed several mechanisms and frameworks in a bid to fulfil its mandate, there are still significant inadequacies in their capacity to anticipate, assess, forecast, prevent, mitigate, prepare and respond to disasters. The gap that remains largely unattended to in discussing their responsibilities relates to the low level of incorporation of technology- old and new- and knowledge of its uses in their operations.

NEMA was established in 1999 to coordinate resources toward efficient and effective disaster prevention, preparation, mitigation and response in Nigeria. The Agency was saddled with the responsibilities of contingency stockpiling, search and rescue, training and capacity building, awareness generation among other responsibilities geared toward disaster risk reductions. It is also expected that they collaborate with other security agencies for effective service delivery. However, the Agency is poorly equipped as it currently relies on Geographical Information

System, four Mobile Clinics and just one Helicopter to serve the entire nation. Thus, inadequate efforts to address the information and technology needs of stakeholders in disaster management in regard of effective skills and technology-related options are among the bottlenecks that confront sustainable disaster management efforts in Nigeria. Indeed, technology plays an important function in every step of disaster management cycle because it enhances the capability of disaster managers to co-ordinate an effective emergency response. Considering the diverse effects of climate change in the world today with attendant string of natural disasters, technology and the dissemination of information about its uses are key to disaster management. Technology has been effectively used in managing disasters in Indonesia, Myanmar, Chile and Sri Lanka among several other nations that are prone to natural disasters (United Nation, 2019).

Rapid technological advancements in the management of natural and man-made disasters, therefore, mean that both emergency response crews and survivors need to be better equipped in tackling the immediate challenges they face during a disaster.In recent times, there has been a technological leap from search and rescue strategies which existed decades ago. The use of social media, drones, satellite imagery through GIS, real-time disaster modelling and widespread connectedness mean more efficient and necessary information flow. Real-time data allow emergency management to develop more targeted response. Against this background, this paper examines the role that technology and related awareness could play in the various stages in the management of disaster in Nigeria, including those of preparation, response, recovery and mitigation.

Problematique

Disaster is an occurrence that can jeopardise the development of a nation. The attendant damage as well as loss of lives and properties can have devastating effects on the well-being of the people. In Nigeria, flooding and armed conflicts are the major causes of disaster. According to World Health Organisation (WHO, 2012), flood disasters in Nigeria have claimed the lives of

many either from direct impact or consequential effects such as water borne disease and weak buildings that can lead to collapse. According to Global Conflict Tracker (Council Foreign Relations, 2020), Boko Haram insurgency in Nigeria has killed more than 37,500 people and more than 2,744.000 people have also been displaced.

The effectiveness of NEMA and SEMAs in managing disasters in Nigeria have been hampered by challenges ranging from lack of adequate training, lack of synergy and inadequate use of technology that can foster timely delivery of service. Despite the consequences of disaster, an adequate and well-coordinated disaster management plan, such as deployment of technology in reducing the risk of disasters, a recovery plan and a highly prepared response team that can translate to reductions in damages and loss of lives are still lacking. Scholars (Chong and Kamarudin, 2017; Olanrewaju etal., 2019) have focused on disaster management planning between approaches, the need for coordination in disaster management cycle and resilience in individuals and communities. However, the literature on the importance of technology at every stage of disaster management namely mitigation, preparedness, response and recovery is scanty.

This is made more alarming by the fact noted above that disaster is a phenomenon that has become an issue of growing concern throughout the world. In recent years, there has been a dramatic rise in the frequency and magnitude of disasters, threatening large populations living in diverse environments in Nigeria. Floods, armed conflicts, oil spillage and other man-made disasters have claimed many lives in Nigeria and rendered many homeless (Olanrewaju etal., 2019; Odewole, etal., 2020). The usual practice is for stakeholders to work against the clock to find and rescue survivors, provide life-saving medical treatments, and set up the infrastructure for a long-term humanitarian intervention. However, the lack of order in inter-organizational information sharing in periods of disaster often leads to overlapping initiatives and extensive mismanagement of resources, which are in turn

linked to more loss of lives and livelihoods. In addition, the lack of understanding of the relevance of space-acquired data to effective management of disaster remains a challenge. Another limitation is the inadequate knowledge on technological advancement by managers of emergencies. The consequence is that this has not only incapacitated preparation for emergency but also tense negative impact on smart and effective response and recovery actions. This paper thus addresses the need for enhanced technology in disaster planning and analysis stage, situational awareness, data management and field operations.

Conceptual Clarifications

Disaster Management

The concept hitherto known as Disaster Recovery is now modified and referred to as disaster management. This concept is geared toward the management of disaster which focus on a more comprehensive approach that places emphasis on preparedness and rehabilitation. It is a strategic plan aimed at mitigating the risk, even before the occurrence of a disaster. The management of disaster involves creating awareness, synergy and commitment to implement various risk reduction strategies at all levels (UN-ISDR, 2005 cited in Aitsi-Selmi etal., 2015). It is not only a positive concept, but a process and procedure in which mapping a disaster occurrence can translate to learning that can stimulate adaptation and modification in development planning rather than a simple reconstruction of pre-existing social and physical conditions.

Technology

Technology is the application of scientific knowledge for practical purposes, in this instance for disaster management. It can also be viewed as an activity that forms or changes culture (Mannix, 2005; Borgmann, 2006). Increasingly, nations are employing the use of technology in managing disaster. This is because technology can penetrate where people cannot or find difficult to access. It can also enhance mechanisms put in place to manage disasters in terms of efficiency. Technologies can be useful in spreading critical information quickly, improving understanding of the

causes of disasters, enhance early warning systems, assess damage in new ways and add to the knowledge base of the social behaviours and economic impacts after a crisis strikes (Ocha, 2020). This concept is germane to this paper because there is a pressing need in Nigeria, to systematize, standardize the application of technology interventions in managing disasters at prediction, detection, response and relief stages.

Methodology

This paper attempts to review the state as well as potentials of the use of technology in disaster management in Nigeria with the aim of recommending prospective interventions in the future, relying on extant reports and practice to analyze the prospects and challenges of deploying technology during disaster management processes.

Perspectives on Technology and Disaster Management

In recent disaster management debate, scholars have demonstrated the advancement of scientific research as it applies to early warning systems, including identifying risk and the strengthening of infrastructure for different types of hazards (Shaw etal, 2017:31). Indeed, the role of information technology in forecasting, monitoring and managing disasters in real time cannot be overemphasized. Alexander (1991:457) assessed the role of information technology in disaster management with emphasis on telecommunications and simulation modelling. He further discussed the general nature of real-time technology and provided a review of the appropriate techniques of monitoring the physical impacts of earthquakes, volcanic eruptions, tsunamis, floods and landslides using Colombia as reference.

For a long time, studies on environmental disasters followed the same logic used by government bodies, including investing in disaster recovery strategies, with emphasis on relief measures for those affected, reconstruction of damaged sites and accounting for financial, human and social losses (Alexander, 1997:284-304). Although essential, these strategies have gradually

become insufficient, as the frequency of these events has increased. According to Beck (2000:211), the inception of the communication technology revolution has created the possibility of extending access to information to the wider population. This has become real and it has influenced the way in which risk is communicated.

Through different major disasters, it has become evident that there must be a balance between hard and soft technology and physical, process and social solutions. The exchange of relevant information is critical in the immediate aftermath of a major disaster and advances in, and access to, new technologies have facilitated progress in information sharing efforts in the field. Information communication technologies (ICTs) in particular are changing the way stakeholders communicate and share data within and across borders during crises (Bjerge etal, 2016:1). In addition, analyses have shown that changes in technology-based tools in disaster management would facilitate easier use of the system by all and subsequently would lead to an increase in the amount of information shared (Hannigan, 2012:79).

In 2005, the United Nations International Strategy for Disaster Reduction (UNISDR) suggested a strong role for science and technology (UNISDR , 2005, 2016) to:

> Support the improvement of scientific and technical methods and capacities for risk assessment, monitoring and early warning, through research, partnerships, training and technical capacity-building. Promote the application of in situ and space-based earth observations, space technologies, remote sensing, geographic information systems, hazard modeling and prediction, weather and climate modeling and forecasting, communication tools and studies of the costs and benefits of risk assessment and early warning.

As indicated before, adequate attention has not been paid in Nigeria to employing technology and related communications skills and strategies to disaster management. It is against this

background that this paper calls for more scholarly and policy engagement to address this challenge.

Mobile Phones

Mobile phone technology can be used not only in ordinary communication but also for the management of emergency and disaster situations. The telephone is one of the most useful tools when it comes to responding to disaster. It has the ability to store and access a large amount of information quickly. More importantly, is the smart phone which can be most useful in disaster response. Through the use of smart phones, social media such as Facebook, Twitter, WhatsApp, among others, can be employed for widespread dissemination of information in emergency/disaster situations. Social media allow emergency response crews to immediately connect with survivors and direct their attention accordingly.In addition, integration of mobile phones in emergency and disaster management can aid mobile cash transfers for vulnerable populations. It can be used in raising funds for the affected populace and as a means of getting emergency support services to crises populations.

The challenges identified with the use of mobile phones in emergency and disaster management in Nigeria include the high costs of purchasing smart phones and poor mobile network connectivity, especially in remote areas. In certain cases, cell phone signals might be not available and civilians might not know what to do as they cannot reach NEMA or SEMA websites. Moreover, illiteracy often leads to reluctance in embracing the mediation of the technology in aid delivery. Another challenge is inadequate power supply in Nigeria. This may lead to poor battery energy for phones. However, having an extra battery for phones (or a solar charger) will ensure the emergency use of device in case electricity power fails for an extended period of time. NEMA should also attempt to develop an app which contains all the standard procedure in a state of emergency for smartphones users. For example in the Philippines (Fajardo & Oppus, 2010:344), the disaster management system Android

application known as MyDisasterDroid determines the optimum route along different geographical locations that the volunteers and rescuers need to take in order to serve the most number of people and provide maximum coverage of the area in the shortest possible time. Genetic algorithm was applied for optimization and different parameters were varied to determine the most optimum route (Oppus, 2010:343-353).

Drones

Drones, or Unmanned Aerial Vehicles (UAVs), are already being used in humanitarian response around the world. An unprecedented number of small and lightweight UAVs were launched in the Philippines after Typhoon Haiyan in 2013. The use of both flying and underwater drones allows rescue workers to analyse a situation before proceeding with their operations. Drones are used to conduct search and rescue operations. It is also useful in providing information on hard to access locations. The view from above is important for humanitarian response, and drones can capture aerial imagery at a far higher resolution, more quickly and at much lower cost. They can be used to map the affected areas in high resolution within a short time, which, in turn, can aid swift and efficient response (Aprvrille, etal, 2015).

In addition, drones are often equipped with intelligent flight planning software that allows first responders to easily create highly customizable flight paths that focus on specific areas of interest, leading to organized and focused search efforts. Drones are also outfitted with various sensor options that include visual, thermal, LiDAR, hyperspectral and multispectral options. Why are these important? In earthquakes and landslides, these sensors can be flown to conduct ground truthing surveys. The thermal sensor, for example, is perfectly suited for detecting the heat a human body emits, which helps locate survivors. Various sensors suites are efficient in obtaining data to create an exact 3D reconstruction of disaster zones, which when compared with historical data from satellites, offers new perspectives on the

extent of damage, and terrain or field deviation that could help manage future disasters.

While the most common use of UAVs in humanitarian response today is data collection, mapping and monitoring, research is underway on the delivery of goods, particularly smaller items such as vaccines or other small medical supplies. The demand and desire for this type of technology to assist in emergency response in Nigeria is apparent as disaster response teams search for strategies to accomplish tasks easier and more efficiently. The convergence and advancement of technologies, including unmanned aerial systems, will grant first responders with enormous opportunities to save more time, money and lives. The use of UAVs in humanitarian action also poses challenges particularly around legal and regulatory issues. In many countries where humanitarian work does not have an appropriate legal framework, the use of UAVs is cleared on an ad hoc basis with local and national authorities. Another issue has to do with the governance of privacy and data protection for using UAVs in humanitarian operations. Regulators are debating how to deal with UAVs' capability to cover private property and capture sensitive personal information. When imagery collected by a UAV is stored, privacy and data protection issues are raised such as how the data can be accessed, accumulated and distributed. As such, any use of UAVs by humanitarian actors needs clear policies on which data and information they will share or make public, how they will secure it and how long they will store it. Because of these concerns, transparency and engagement with communities or local authorities are critical for humanitarian interventions that involve the deployment of operating UAVs.

One of the major obstacles to deploying UAVs thus remains a concern over privacy; hence there is a need to develop best practices for transparency and engaging local authorities and communities, including data security guidelines. More research and evidence is needed to identify the comparative advantages and effectiveness of using UAVs. This is particularly needed with respect to integrating aerial observation and data collection into

needs and damage assessments, and search and rescue. Addressing these challenges will be an important step in moving UAVs for disaster response and relief operations from a promising technology to a game-changing reality (Htet, 2016:1-3).

Geographic Information Systems (GIS)

Geographic Information System (GIS) is a computer-based application of technology involving the use of spatial and attributes information as a decision support tool (Frank etal, 1993:3-14). It keeps information in different layers and generates various combinations pertaining to the requirement of decision making. Geographic Information Systems (GIS) provide essential disaster management decision support and analytical capabilities (Tomaszewski, 2014: 3-10). Geo Information can assist immediately by helping decision makers understand the scope of the damage and identify locations where people may be trapped or injured or require medical support and rescue. GIS can also display areas where services have been restored in order to quickly reallocate recovery work to priority tasks.

In Nigeria, GIS has been used by NEMA as an effective tool in management of disasters. Various disasters like earthquakes, landslides, floods, fires, tsunamis, volcanic eruptions and cyclones are natural hazards that kill lots of people and destroy property and infrastructures every year. In the disaster relief phase, GIS, grouped with global positioning system (GPS) is extremely useful in search and rescue operations in areas that have been devastated and where it is difficult to find bearings (Enders and Brandt, 2007: 223-229). GIS has made it easy to analyse and manipulate geographical information.

However, even though it has come with several advantages, there are various limitations to the use of GIS. Some basic hardware, including like computer system, printer, network systems, along with GIS software, are required to set up GIS in any organisation. Besides the hardware and the software, there is need to have fully trained personnel - and that is expensive to train and acquire. The system is very expensive due to the complex interconnection of the various components that make it

up. Furthermore, the data collected and stored in GIS system is usually complex with plenty of definition and restructuring required. This means that special skills are required to understand and interpret the data collected by the system.The process of collecting, storing and analysing information using the system is long and tedious and therefore time consuming. It may take a long time to get complete information regarding a particular set of data due to the vastness of the data available. Thus, as much as GIS is needed in tackling disaster issues, it also requires adequate preparation in terms of finance and skills acquisition.

Biometrics

Biometrics is the technical term for body measurements and calculations. It refers to metrics related to human characteristics. Biometrics authentication is used in computer science as a form of identification (Jain etal, 1999:2-5). It is also used to identify individuals in groups that are under surveillance.This is possible because Biometric identification uses physiological and behavioural characteristics of an individual. It is the careful collection of information on all actionable and relevant individual characteristics for use in rapid and positive identification under almost any circumstances. Increased focus on disaster threats, therefore, has resulted in greater attention to background screening and automated methods to assist the management and risk reduction processes for initial and continued access to secure facilities and classified information.

Recent technology applications can provide national and state emergency agencies with an ever-increasing variety of data for screening and continued recovery during disaster. Applying this model to emergency management in Nigeria presents broader cultural issues, including information privacy and interoperability. It is suitable for biographical and biometric identification of displaced victims, as well as the ability to conduct comprehensive biometric and text-based searches to help identify missing and deceased victims. Ultimately, employing biometrics in disaster

management results in a more accurate identification of casualties.

Noteworthy is the fact that even though biometric identification provides a profile of identifying information so that other sources, such as fingerprints or footprints, could be used in circumstances of plane crash, catastrophic fire outbreak, or any disaster, it can be limited in disasters that claim lives or limbs as the co-mingling of blood or tissues from multiple victims may make DNA identification difficult, if not impossible. Fire or decomposition could hamper the use of DNA. Similarly, if such an event occurrs in a remote or non-industrialized location, laboratory facilities and subject matter expertise may not exist.

Wearable Technology

Wearable technology are mini computers and sensors embedded in watches, jewelleries, clothing, shoes, backpacks, headwear, eyewear, prosthetics and medical implants, temporary tattoos, body cameras and basically just about everything else that attaches to the body, leverages mobility and can be operated hands-free (Ledger, 2014: 1-20). Wearable technology can help in locating survivors during disaster.

For example, Cambridge Design Partnership announced in August 2015 that it has developed the world's first wearable device designed to measure and monitor the vital signs of multiple trauma patients for emergency response in disasters and battlefield situations. When designing the new compact device, Cambridge Design Partnership interviewed a range of army medics about their needs and challenges in multiple casualty emergency situations. An unmet need that was identified was for a low-cost device to bridge the gap between manual methods of vital signs measurement - which can be laborious and challenging amidst the noise and stress of a disaster or on the front line and more expensive patient monitoring systems (www.wearabletechnologyinsights.com). Wearable applications can assist response to urgent situations of people who work in dangerous and hostile environments appropriately and monitor their safety status.

There is a need for federal and state governments in Nigeria to actively connect with entrepreneurs and other technology savvy groups to develop software and hardware solutions that can support people's future data in real-time, enabling the emergency team to care for a greater number of casualties, providing more effective casualty triage to deliver improved outcomes (Fischer & Gellersen, 2010: 38-47).

Indeed wearable technology faces a number of critical challenges. In contrast to the positive prospects of wearables in the early days when wearable technology started being commercialised, many survey results show that their proliferation rate in society has not met expectations. The results found that one-third of consumers who have owned wearable products (especially Apple and Samsung Gears) stopped using it within six months. Moreover, half of them no longer use it while one in 10 adults own some form of wearable devices (Clawson etal, 2015: 648).The reasons are that some wearables are miniaturized with high power consumption, and they exclude sensors and data transmission devices that can endure the harsh conditions during disaster.There is also the potential risk of private information leakage due to wearable devices' capabilities to collect a vast amount of information (Kirkham & Greenhalgh, 2015: 26-33). Thus, future wearables should be easier to use and collect more accurate and diverse individual information than ever and should be utilizable in wider areas. They must also provide accurate and needed information at the right time to the user and they should operate non-invasively and eventually be invisible.

Overall Prospects and Challenges

From the aforementioned, it has become evident that the use of technology in managing disaster has a lot of potentials that can aid the process. First, technology can enhance connectivity. Connectivity is highly needed during disaster and it takes an appropriate technology to break the barriers caused by massive destructions that usually greet disaster. For instance, mobile networking devices have been used to crowd-control information

during disaster in Nigeria. This connects people to the resources needed for survival and also, enables quick, life-saving humanitarian interventions. In addition, the proliferation of mobile and social media solutions, have resulted to evolutions of timely information, efficient responses and relief which ultimately benefits victims of disasters during flood or during armed conflicts..

Furthermore, the use of technology in disaster management has created a new era of big data analytics intelligence for disaster response. This has provided stakeholder with crucial information on how to act, what to act on, and which one to act on. It has helped in obtaining real-time information about an area without stepping foot there through visualisation platforms that inform situational awareness. This way, priorities are known and response efforts that enhance situational awareness are thus optimised. In essence, while technology may not have the capacity to replace human and animals' needs during disaster such as, shelter, water, clothes, medication and comfort, it can build resilience among the affected people. Moreover, it has paved ways and fast-track the arrival of both national and international aid as well as help in developing mechanisms of survival ahead of future disaster occurrence.

In Nigeria, there are challenges to effective management of disasters, especially by the responsible federal and state agencies – NEMA and SEMAs. There is still lack of adequate synergy among public and private stakeholders. The occurrence of disaster is usually overwhelming for a nation, hence the mitigation, response and recovery stages often require coordination of multiple actors and multi-level governance structures. It demands not only government attention but also, cooperation from national security agencies, traditional rulers, religious bodies, international organisations, community agencies and heterogeneous legal personalities. This is still a major challenge in Nigeria as scanty information concerning disaster events and its management, especially using technology-based methods, are available to stakeholders. In other word, there are no automated manual

records for disaster response and humanitarian assistance organisations for effective interoperations.

In most cases, NEMA and SEMAs do not have a clear idea of some of the problems they are trying to solve. There is lack of disaster mapping and planning that often results in not having sufficient processes and practices in place to address its occurrence. What is evident presently is that they wait for disaster to happen before seeking for ways to address them. In addition, the presently available technology such as GIS, mobile phones, drones do not adequately fathom into operation, both the tactical and strategic efficiency (that is, the immediate and long-term use). There is also a pressing need to incorporate more tech-friendly devices such as Radar, Rescue Jets, Flying Labs and Clinics, Unmanned Aerial Vehicles, Digital Mapping and Analysis Devices among several others into disaster management techniques in Nigeria. Even though Nigerian government has made provisions for an appropriate framework and policies, there are still gaps in terms of constant review of those policies, risk monitoring activities and communication with the public. These are important tasks needed for coordinated and effective disaster relief actions.

Conclusion and Recommendation

The increased availability of new technologies in recent decades has created opportunities for a more detailed and rapid analysis of, and responses to, natural and other hazards. Disaster Management can be very efficiently and cost effectively handled in Nigeria by employing innovations in modern technology. Highly sophisticated and effective Disaster Management systems can also be developed accordingly, putting some of the attendant challenges into consideration. This will help in reducing the number of casualties and damages caused by disasters in the country.

Against this background, the paper recommends more research into more proactive uses of technologies in disaster management in Nigeria as technology is predominantly being

used in enhancing emergency and disaster response in many developed nations. There are opportunities for the use of sophisticated and not-so- sophisticated technology in early warning, preparedness and other mitigation activities that can help Nigeria build resilience in the face of the ever growing threat of emergencies and disasters. There is a pressing need for the federal and state governments and private bodies to consciously invest in science and technology by including in their budget the required funds for acquiring up-to-date instruments for managing disaster in the country. In addition, a pool fund should be raised annually for disaster risk reduction and its attendant requirements.

Promoting education, synergy and capacity building among NEMA, SEMA and other state and non-state actors is necessary for future use of technology in disaster management. Training programmes should be upgraded among disaster management agents on how to manage and reduce risk from disasters. This is very important since most of the new technologies available for disaster risk management are framed to work with precision. Disaster management officials, therefore, should improve their situational awareness by using technology such as GIS and communication devices to improve their situational awareness such as disaster tracking, data analysis, predictions of destructive force, coordination of evacuations among other useful strategies.

In similar vein, real time connectivity is a priority for effective use of many of the existing and upcoming disaster management technologies hence the need for government to provide and also, encourage intensive training and use of risk pooling and sharing, social risk management and innovations including safety-nets in the area of special app development and uninterrupted internet connectivity. Finally, there is a need for interoperability among organisations handling disaster issues. Government should ensure common standards that will enhance national organisation and sharing of resources during response operations. This will further connect people, data and diverse processes which require not only flexible technology and accepted

standards but also, the fewest possible bureaucratic and regulatory barriers.

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