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ASSESSMENT OF THE RISK MANAGEMENT FOR VARIOUS TYPES OF DISASTERS: IMPACT AND SUSTAINABILITY

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Abstract: Disaster management and crisis action planning play a primary role in disaster avoidance, mitigation response, and recovery. According to the research, effective disaster management is largely dependent on the efforts of emergency response organizations. There are disaster risk management problems concerning the communication process, the development of coordination, and the exercise of authority. This paper will overview and assess the risk management for various types of disasters which are classified into five main parts: Geophysical, Hydrological, Climatological, Meteorological, and Biological. Biological disasters are two types in origin namely, Calamities which are produced in crops by certain animals, and pandemics which are caused by the spread of infectious diseases among large numbers of people, and this kind of crisis creates new risks that needed to be identified. The investigation in this research will identify the risk concept that comes from natural disasters and prepare the plans and set priorities to respond effectively where and when needed, by implementing the risk assessment. However, the similarities are significant concerning the health, social, economic, and environmental aspects of all types of disasters, COVID-19 pandemic was the complete opposite from an environmental and social point of view i.e., but highly affected the death rate and urban health.

Keywords: Crisis management, Pandemics, Risk management, Disaster impacts, sustainability.

INTRODUCTION

A hazard is a potential threat to people, property, livelihoods, or ecosystems as well as damage or destruction to facilities and environmental resources. It is described as "the risk of a natural or human-caused physical event resulting in death, injury, sickness, or other health consequences, as well as destruction and loss to property, infrastructure, and livelihoods" [1]. A hazard is a dangerous occurrence that leaves a huge number of people dead or severely damaged property in its wake. Depending on where and how people live, a natural disaster may or may not turn into a catastrophe. Dangerous events do not pose a threat or cause disasters in places devoid of human habitation [2]. Natural disasters have direct deep impacts on the affected regions that they utterly destroy and cause physical and psychological harm for individuals and communities, along with loss of human life and property, when natural disasters occur they disrupt the daily lives, and the socio-economic activities for a certain period of time [3]. This study intends to give planners a quick overview of disaster management and the damaging effects of hazard occurrences, as well as their implications for long-term sustainability. and also shows how scientists can contribute in rescue operations and preparedness by using lessons learned from previous disasters to aid in forecasting in order to prepare for, and enhance

societal adaptability to, upcoming disasters' environmental and associated health impacts. A disaster is a result of the combination of hazard, vulnerability, and insufficient measures that lead to eliminating the chances of rescue and affecting vulnerable populations and causes catastrophes and damages, Figure 1 below shows illustrate the relationship between hazard and vulnerability [4].

A natural hazard is an unforeseeable and/or uncontrollable natural phenomenon of extraordinary intensity that poses damage to life, properties, and the environment. A hazard is a possible source of danger or a circumstance that might result in loss. It's also known as a possible or current situation that might destroy lives or threaten property and the environment (Middelmann, 2007) also the hazard is an unexpected threat to humans and/or their property (Mayhew, 1997). These definitions show that hazards involve social, technological, and political dimensions in addition to environmental ones. Such hazards include; Geophysical, Hydrological, Climatological, Meteorological, and Biological disasters. The term vulnerability means being oversensitive to damage or injury, however, concerning natural disasters it is the situation and characteristics of a person or group that influence their capacity to resist and recover [5].

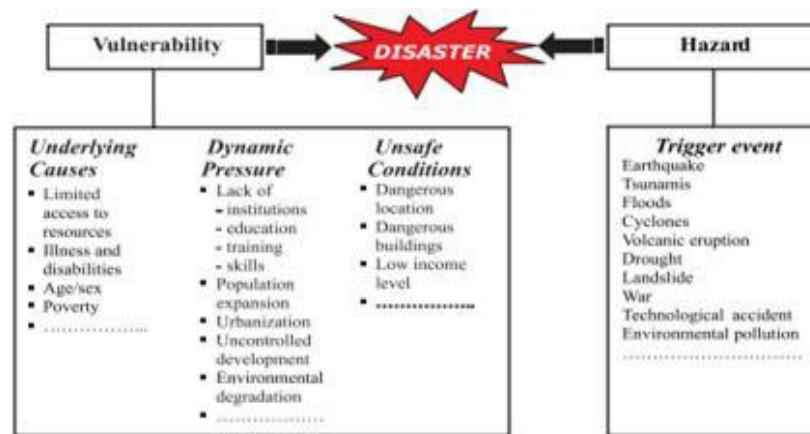


Figure 1. The relationship between hazards and vulnerability[4].

The United Nations Office for Disaster Risk Reduction DRR, specify the natural disaster as “the disasters with either short period and affect relatively small areas like earthquakes or disasters that occur slowly and affect large areas like Droughts” [6]. According to the International Federation of Red Cross & Red Crescent IFRC, Societies "Natural disasters are phenomena that occur naturally triggered by quick or gradual start catastrophes that have direct repercussions on human health and subsequent impacts bringing more death and suffering,". [7]. As disasters become major threats to human life and the global economy, governments and international organizations must cooperate to enhance risk management globally and regionally, and raise awareness among people that disasters of all kinds, whether natural or human-made, must be dealt with professionally and consciously, and that the responsibility rests with individuals and institutions together in order to reduce disasters and improve the ability to mitigate them. the natural or human-caused disasters can be classified as follows [8]:

1. **Geological disasters**; Earthquakes, Volcano Activity, Landslides, Sinkholes, Tsunami.
2. **Hydrological disasters**; Avalanche, Flood.
3. **Climatological**; Heatwaves and cold waves, Extreme Temperatures, Drought, Wildfires.
4. **Meteorological**; Cyclones, Storm Surge Waves.
5. **Biological disasters**; Plagues - Calamities produced in crops by certain animals, pandemics which are caused by infectious diseases between many people such as; Coronavirus / COVID-19 [6].

DISASTER CRISES MANAGEMENT AND CRISIS ACTION PLANNING

The information systems framework for Disaster Management DM first main objective is to reduce disaster losses and conserve developmental gains by many methods; Policy and planning decisions for disaster

preparedness and mitigation. preparing Hazard mapping and Vulnerability Assessment. Database of disaster history of pattern and trend analysis. Database of the disaster management plan, Awareness & training materials, Inventory of legal, techno legal, administrative, and institutional framework. the second main objective is the Quick emergency response and recovery by using the material and human response resources database. Besides, the Database of critical facilities, Infrastructure, and lifelines. As well as the database of trained human resources and finally with the Demographic information GIS-based information system [9]. In calamity counteraction, moderation, reaction, and recuperation, Information and Communication Technologies (ICTs) assume a critical base. Simultaneously, government organizations and other philanthropic entertainers partaking in dynamic and salvage tasks require a great deal of exact and opportune data. Four standards can be depicted in ICTs for Calamity The board: multi-risk, multi-staged, multi- innovation, and multi-partner [10]. Figure 2 below shows the main Phases of Disaster Management.



Figure 2. Phases of Disaster Management [11]

The communication process and information flow

The primary role of emergency organizations in disaster management is to carry out the activities of emergency responders. This includes the coordination of various agencies and the exercise of authority. Although disaster planning can help prevent disasters, it can also serve as a guide for handling the various aspects of crisis management. One of the most critical factors that can affect the success of disaster management is the communication process. There are various problems that prevent emergency organizations from effectively communicating with the public [12].

Organizational issues related to information flow can be seen in at least five main types of organizational behavior:

- a. intra-organizational.
- b. Inter-organizational.
- c. From organizations to the public.
- d. From the public to the organizations.
- e. Inside structures of organizations.

The discussion which follows examines both the real information flow problem of the organizations in community disasters and mythological beliefs. It indicates how false assumptions about organizational behavior can undermine, and thus invalidate disaster preparedness planning and requires tactical management of specific difficulties [12]. Figure 3 explains the Risk management cycle.



Figure 3. Risk management cycle [13]

Information Flow Between Organizations

Under normal conditions, officials from various organizations will often chat informally, as they are accustomed to conversing with one another as friends and acquaintances. When tragedy occurs, however, official connections with previously unknown authority within organizations with whom there were no prior ties are frequently required. It's not uncommon for organizations to make contact with groups who were beforehand unknown to them before the crisis. As a result, establishing and supporting a formal communication flow between officials who are unfamiliar with others in outside organizations may be difficult [14].

In the Intra organizational Information Flow, all organizations must communicate consistently and internally exchange data with their group members under ordinary conditions. The communication scheme is developed to process and exchange relatively predetermined types and quantities of information. Though, during a disaster, the team members who are using the communication system will often increase significantly [15]. This can be done in part by internal staffing changes undertaken by the organization to meet the demands of the crisis situation. E.g., double shifts may be used, or volunteers may be incorporated into the workforce. Frequently, the current communication system cannot accommodate the volume of data necessary to these additional system users.

Normally, communications are routed through specific channels. The flow of information in non-crisis conditions follows the standard organizational line of command. As a result, system user information requirements, data exchange circumstances, and information and data flow from top to bottom (and vice versa) are all relatively well defined [15]. When the additional demands upon the internal communication system surpass its capability, this results in 'overload,' the net result of which causes either results in the loss of communication or system failure or delay of information to, from, and between staff members [16].

Nonetheless, conveying information throughout the organization becomes more difficult during a calamity. It is not uncommon, for example, for numerous people to fill a job that was previously only held by one person; officials to take on non-routine duties, or officials to be reassigned to serve in temporary emergency positions within the organization. These and other circumstances might lead to situations where standard communication methods are insufficient to ensure that all important information reaches individuals who need to be informed about organizational actions.[17].

Information Flow From Administrations to the General Public

In disasters situation, organizations may have to pass on information to citizens in general, but this is often done rather poorly. Typically, these effects result from the organization's failure to recognize that knowledge that is crucial to organizational staff is not fundamentally valuable to threatened individuals. Officials might collect extensive information on a flood or a chemical threat, for example. The organization will next release an official statement of instruction to the general public based on this information, which will exclude the details of its conclusions and other pertinent information [18].

THE IMPACT OF DISASTERS

Earthquakes, volcanic eruptions, floods, and drought are examples of uncontrolled events that have an influence on the environment in which we live. Toxins are often produced from disasters into the ecosystem via loops that move between air, land, and water, eventually burying themselves in lakes or deep ocean deposits. Wildfires, floods, volcanic eruptions, tsunamis, and earthquakes, on the other hand, can release these elements in great quantities and quickly. Methyl mercury, a very poisonous type of mercury present in aquatic settings, can be emitted to the atmosphere as a result of geothermal activity. Mercury vapor affects the neurological, digestive, and immunological systems, as well as the lungs and kidneys, and maybe lethal if breathed. Because of the polluted toxic air, eight hundred persons die each hour, i.e. thirteen persons per minute. The Asia-Pacific area has a share of millions of these deaths. The UN Office for Disaster Risk Reduction's Global Assessment Report on Disaster Risk Reduction, 2019 revealed how hazards including air pollution, illnesses, droughts, and climate change connect and feed on each other, accelerating their negative health and environmental issues. Humans and assets are becoming vulnerable to a wide range of crises, in previously unknown locations and at unknown levels. Heatwaves combined with dry conditions can cause catastrophic wildfires that contribute significantly to air pollution which plays a role in the production of greenhouse gas (GHG) emissions, particulate matter, and other components, so, the heatwaves consider the most serious environmental hazard after global warming [19]. Negative impacts change the lives of individuals, families, communities, cities, and states, mostly can affect the economy of the entire country. The carrying capacity of the impact of the disaster has a great relationship with the level of preparedness, flexibility, and adaptation. However, recently it has been noticed that disasters are increasing in severity, especially human-made disasters, now the need to be prepared for a world full of unexpected shocks has become clearer than ever due to the acceleration that has been taken place in many countries all around the world, the industrial revolutions, technological, and biological activities, have given disasters new characteristics causing rapidly spread all over the world and increased the impact of disasters globally and in all levels [20].

a- Social (Individual And Community Impact)

One of the most serious issues that arise during and after tragic events is health problems, and in cases where mobility, transportation capabilities, and infrastructure are affected survivors of natural disasters may be cut off from rescue and urgent medical assistance. In addition, standing water, as in hurricanes and floods, can be a source of bacteria and microorganisms that can spread illness. Not to mention that survivors of any tragedy may suffer from mental health issues such as post-traumatic stress disorder [21].

Disasters can have immediate effects on human health, such as injuries, deaths, and disease outbreaks, as well as long-term effects such as noncommunicable illnesses, psychological morbidity, and impairments. Damage to health facilities and disruptions to health services typically impede the health sector's ability to respond to these consequences. The impact is often felt physically, and psychologically at the individual level. Natural disasters result in property damage, financial loss, death, illness, and deterioration of physical and mental health. In developing countries, the effects have a greater impact, sometimes leading not only to a shortage of resources, but also to the loss of security and safety, and massive human migrations. Because of the discharge of hazardous chemicals, flames, and explosions, a 'Natech' (natural-hazard-triggered technology) event can compound the impact of a natural catastrophe on the environment and human health.

Risk managers have just recently begun to investigate the causes and effects of such catastrophes, while there may be preventative and preparedness measures as well as response and recovery strategies in place to address the risks posed by technology and natural disasters, these are seldom coordinated. Furthermore, there is a scarcity of risk analysis and planning methodologies and tools; as a result, it is critical to design strategies that include the potential of dealing with all of them at the same time [22].

b- Economic Impact

Infrastructure damage is the most urgent destructive problem of natural disasters, the damage of the public and private infrastructure can cost a lot, and not all communities are prepared to support post-disaster recovery. Additionally, many landowners lack property insurance or the financial resources to rebuild, and certain natural catastrophes are not covered by insurance; this means that people may lose all of their fixed and unfixed assets with no recourse. Natural catastrophes can have long-term negative impacts in addition to the acute loss of life and infrastructure devastation. Usually, after crises, the incident will last for years throughout the areas and the surrounding. For example, due to one of the disasters that occurred in New Orleans, more than 200,000 houses have been demolished and more than 70% of citizens have been displaced. For that, a massive amount of aids should be allocated as a kind of help for the cities and surrounding areas to revive the economy and have a reasonable recovery to re-construct the infrastructure [22].

c- Environment Impact

Disasters strike has varying degrees all across the world, many disasters are known to be quick, whereas others, such as drought and climate change, are long-term, and can occur globally at varying frequencies and magnitudes. Various disasters have the potential to change the natural environment, for example, the cyclones that occurred in Myanmar in 2008, or the wildfires that spread in California through the years are examples of how areas of land can be dramatically damaged the whole ecosystem just from a single disaster event. Estimates of sea-level rise due to melting glaciers is an important subject to debate for how to manage global climate change and its natural consequences since tidal waves threaten whole islands and several coastal settlements. Furthermore, the fast desalination of salty seas is a major concern, it has the potential to deprive the globe of edible fish and coral reefs.

Air pollution is one of the negative environmental factors that cannot be controlled, here are five ways in which disasters, natural or industrial, can either cause or exacerbate due to air damage:-

- 1- disasters in cities result in many technical problems, i.e, factories, and industries sites can be damaged, resulting in the discharge of toxic or harmful compounds, such as the 2011 nuclear accident at the Fukushima Nuclear Power Plant in Japan, when the tsunami cut the power that provide cooling to three reactors,.
- 2- Natural disasters make it easier for dangerous materials to be released, i.e, when the stored gasoline inside large tanks destroyed by fire or chemicals burns up, it affects a vast region and a lot of people.
- 3- Increased discharge of accumulated pollutants, such as when Mt Mayon in the Philippines exploded on January 13, 2018, spewing a 2500 meter-high cloud of grey vapor and ash.
- 4- The floodwaters for a long time will still be full of microorganisms and bacteria this can cause lung damage, asthma, allergies, and the hypersensitivity pneumonitis becomes worse due to dust mites, pollutants, and germs left behind after a flood.
- 5- Droughts are more likely to cause sandstorms. A strong sandstorm blanketed Khartoum in March 2018, causing officials to postpone flights and close schools in the capital and surrounding communities.

Many nations rely on a variety of infrastructure facilities to reach sustainable development, such as highways, electric grids, ports, telecommunications networks, factories, and so on, in order to carry out socio-economic activities, any failure of these systems might result in severe impacts, and to avoid such

losses, systems must be flexible and able to sustain and operate efficiently without large interruption, as well as recover swiftly with minimal cost [23].

d- The impact of human disasters as a compound of natural and man-made disasters: (The impact of the pandemic COVID 19)

A disaster of this kind causes severe destroy for livelihoods, economic catastrophe and can damage people's life for a long time. An epidemic is defined as "either an unexpected increase in the number of cases of a contagious diseases that already occurs in the region or country involved or the presence of an illness originally absent from a territory", according to the University of Louvain's Centre for Research on the Epidemiology of Disasters (CRED), the definition is used in public health to describe when a disease attacks a bigger number of individuals than predicted. [24].

The COVID 19 is highly contagious and has been linked to a high incidence of deaths. Direct contact or close proximity to infected persons is the major and the mobility of people has rapidly increased the spread the illnesses, pandemics have a direct and indirect influence on public health and people's livelihoods, and they can result in losses in manufacturing, jobs, trading, tourist, public and private transportation, education sectors, and many others. Additional expenditures must be incurred by the afflicted country to deal with the emergency, isolate, quarantine, and provide the right treatment for patients is an additional burden, especially in low-income countries. However, there are obvious impacts in the short and medium-term that will cause permanent damages, in the near term, more quarantine places are needed since the number of injured has much more exceeded the capacity of hospitals and health centers in some countries, as well as other side effects as a result of the increase in acute respiratory diseases and other diseases caused by the disaster, in the medium term, the living conditions become hard due to the pandemic and may extend for a while as a direct result of the increased vulnerability, health, and poor living conditions among individuals, and on societies as a result of the deterioration and disruption of the infrastructure and failure in basic services [25]. Such disasters have health, social and economic consequences because they introduce new types of risks that have never been familiar before, It not only leads to deaths due to the rapid spread of the disease that has never been witnessed before, but also negatively affect the safety and security of people, as well as reduce normal living standards due to many hidden costs or economic consequences. Part of this paper will identify the risk principle that will arise from pandemics, prepare plans, and set priorities to respond effectively where and when needed, by implementing risk assessment, threats, vulnerabilities, and impacts to reach the best scenario that will control the pandemic, and finally, the study in this research will address the question that everyone is concerned about: will conditions return to the way they were before the crisis. Although there are significant similarities in terms of the sustainability aspects of all types of disasters, the COVID-19 pandemic was somehow the opposite from an environmental and social point of view, i.e. the priority here has been changed, the psychological and social impact are two further consequences on the population besides health. Where previously in disasters, social engagement was a necessary requirement to bring people together and assist family members, relatives, friends, and workmates, but nowadays for their and your own safety and sake, it is better to be away and contact remotely as much as possible. Disasters affect the population both directly and indirectly. It is useful to keep a separate record of people who lost their jobs as a result of the destruction of the company where they worked, as well as laborers who lose income, as this may provide an early significant warning and assess the direct and indirect effects on the population and for each sector. Private property damage is often classified and documented in the housing sector, whereas production damage and losses are included in evaluations of the impact on productive sectors. Although the loss of life is considered a permanent cost to society that cannot be replaced or recovered, the most well-known effect on catastrophe victims is an effect on their living levels. Disasters also posed a danger to people's security and confidence, as well as the loss of houses and belongings, lowering regular living standards, in addition to the psychological suffering, and social changes, the depression of individuals who do not get enough support, indirect costs are among the unquantifiable effects on the population., such damages might have severe short- and long-term consequences. A recent Lancet Psychiatry paper (Xiang et al. 2020) recommends for early consideration to mental health in the face of the COVID19 pandemic, especially mental health evaluation, counseling, and treatments, based on previous pandemics experiences. Now the need for

psychiatric treatments is increasing all over the world this is making scientists turn to digital psychiatry includes unique capabilities and resources, such as artificial intelligence, computer-assisted mental health services, and a variety of many other modern technologies, which can support internationally. For a more efficient and effective system and in order to reduce psychological stress, initiatives have been established for remote communication and harnessing modern technology and electronic transformation and linking the psychological treatment process with machine learning, including virtual reality, and AI, one of these initiatives is a Croatian initiative that supported by the European Union [26].

CONCLUSION

The paper reviews the main objectives and principles of the information systems framework for disaster management, as well as, the communication process and information flow; information flow between organizations, and information flow from administrations to the general public. Moreover, how the negative impacts can change the lives of in the cities. The carrying capacity of a disaster's impact has a strong link to sustainability, and it has recently been observed that disasters caused by industrial revolutions, technological advancements, and biological activities are becoming more severe, particularly those that are the result of human actions, behaviors, and decisions that become part of global environmental change processes. The negative consequences of such crises pose new social, economic, and environmental risks. The negative consequences of such crises pose new social, economic, and environmental risks, improving technology will improve risk management and reduce vulnerability. Healthy systems can aid post-disaster resilience, enhance health, and may also reduce the frequency and severity of risks, as well as the provision of preventive protection services.

RECOMMENDATIONS

Recommend researching and accumulating crisis management states from prior civilizations in all areas of life, including religious, political, international, and individual. An examination of what has been done in a crisis situation since then may find little has changed. We should also mention that crisis management has gotten more observable in recent years. Different approaches to world crisis management can be used, and we propose a historical, ethical, and sociological approach and framework that will include all perspectives of crisis management, including ethics, leadership, and communication. It is critically needed by the world.

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