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Research article

DISASTER RISK REDUCTION MANAGEMENT IMPLEMENTATION IN THE PUBLIC ELEMENTARY SCHOOLS OF THE DEPARTMENT OF EDUCATION, PHILIPPINES

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Abstract: This study evaluates the implementation of the Disaster Risk Reduction Management (DRRM) program in terms of disaster planning awareness and preparedness to respond during hazards to prevent disasters in public elementary schools in the Alfonso Lista District, Schools Division of Ifugao. A total of thirty-six (36) public elementary school heads and school disaster risk reduction management (SDRRM) coordinators served as respondents. The survey questionnaires patterned from the DepEd-DRRM Manual were utilized in the study. The weighted mean and the Spearman rank correlation coefficient were used as statistical tools. The findings of the study show that the district implemented safe learning facilities and environments; formed and managed a school-based DRRM; and that the DRRM program was integrated into the curriculum for the benefit of the pupils, personnel, parents, and stakeholders visiting the schools. It reveals that the people involved in implementing the DRRM program are fully prepared for the readiness of the school facilities while the disaster preparedness activities are still improving. The school personnel are aware of and do understand the DRRM program and activities. Furthermore, the extent of disaster preparedness of the elementary schools is significantly associated with the level of their DRRM implementation in terms of safe learning facilities and environment, school risk reduction management, and DRRM integration into learners' curricula. Moreover, the implementation of DRRM in the public elementary schools of the district is directly and significantly associated with the level of awareness and understanding of the involved personnel.

Keywords: Disaster Risk Reduction Management, disaster planning awareness, learners' curriculum, implementation, hazards

1. Introduction

The safety of learners is always of topmost concern in all schools. Safety precautions must be put in place at all educational establishments. Unfortunately, there have reportedly been significant disasters at several schools. Simatwa (2007) noted correctly that there has been an increase in the number of students dying or being hurt as a result of school violence, natural disasters, developing diseases, and emergencies that could have been averted if safety regulations were carefully followed. Aside from other issues and a growing problem like this global pandemic COVID-19 that affects children's education, the Philippines has been plagued by natural calamities including earthquakes, volcanic eruptions, and typhoons. The Philippines is the third-most disaster-prone country in the world, as determined by a study by Selected DRRM Organizations and CSO Coordination from April 2016, according to Joanino and Vargas (2021).

Thus, the government established the National Disaster Risk Reduction and Management Council as a result of Republic Act No. 10121, the Philippine Disaster Risk Reduction and Management Act of 2010, which was passed as a result of the government's recognition of the need to be more resilient and prepared in the event of disasters. Since 2007, the Philippines has started to mainstream disaster risk reduction into the education sector (Ocampo and Esplada 2020). The Department of Education prioritizes the mainstreaming of disaster risk reduction in the school system through the DepEd Order No. 55, s. 2017. Seemingly, Mukarram (2020) noted that goal 13 of the Sustainable Development Goals (SDG) makes it a priority to strengthen resilience to climate-related hazards, and education plays a crucial role in encouraging disaster preparedness. This is the rationale behind the strict implementation of the Disaster Risk Reduction Management (DRRM) Program at every school.

In the Department of Education, every institution has a specified role and responsibility in the implementation of DRRM as stipulated in DepEd Order No. 21, s. 2015. As DepEd's frontline service provider to the learners who are the major stakeholders, it states that schools will be the primary source of data. It was stated that, under the direction of the school administrators and the SDRRM Coordinators, schools should work to establish by ensuring the establishment of an Early Warning System such as bulletin board for weather advisories, IEC materials, a bell or siren emergency signal; secondly, conducting an annual student-led rick identification and mapping within and around the school; providing mental health, psychosocial support, or counseling services for teachers, non-teaching staff, and students on DRRM; maintain, disseminate, and post pertinent and updated emergency hotlines in strategic locations throughout the school and other conspicuous places in the community; posting of safety and preparedness memoranda; develop a team of DRRM experts at the school to support the implementation of preparedness and response measures. Ensure that the school's baseline education data is up to date; prepare and submit reports on any hazards' impacts; ensure that the guidelines on DepEd Order No. 43, series of 2012 through Executive Order No. 66 is followed; undertake rapid assessment of damages after each hazard and submit RADaR (Rapid Assessment of Damages Report); facilitate immediately resuming classes to track students; and monitor recovery and rehabilitation interventions being implemented in the school.

In the case of the thirty-four (34) schools of Alfonso Lista District, DRRM has been long implemented but as to how the different programs and activities towards the roles of the school administrators and SDRRM Coordinators specified in DepEd Order No. 21, s. 2015

have been executed, there is no evidence yet of proper implementation because the program has not been evaluated. It is in this premise that the researchers felt the need to conduct a research along this field to evaluate the extent of implementation of DRRM program in the schools of Alfonso Lista Districts and to provide evidenced-based results for a better execution of the roles and responsibilities of the School Administrators and SDRRM Coordinators as basis for the enhancement of implementation of the program so that eventually, the culture of safety will be developed among the pupils and the people in the community. This research is sought to determine how well the schools are prepared for a prospective earthquake disaster from the facet of the School Administrators and SDRRM Coordinators, based on the views of the School Administrators and SDRRM Coordinators; and to make recommendations towards effective disaster preparedness. One of the crucial roles required of school administrators and staff is to take measures to always ensure the safety of learners. Thus, there is a need to evaluate whether the herein said frontlines are aware of the safety plans and are well prepared for any outbreak of disasters in school. The study focuses on collecting data from the school through governing body safety representatives - the SDRRM Team.

1.1 Literature Review

The Department of Education (DepEd) envisions to protect and even promote the right of all citizens and to provide a child-friendly, gender-sensitive, safe, and motivating environment **for effective learning to happen, administrators and staff, as stewards of the institution must** adopt policies, systems, processes, and behaviors as well as initiate continuous improvement processes adapting to the changing needs of times. The internal stakeholders as the frontliners take important responsibilities and accountabilities to become major exponents to achieve safe learning schools and tasked to formulate, implement, and coordinate policies, plans, programs, and projects.

Over 20 million students in both private and public schools in the Philippines are affected by numerous catastrophes each year, and instruction is frequently severely disrupted, according to a report by the United Nations (Aronsson-Storrier 2021). The World Risk Report 2018 places the Philippines third among all nations with the highest risks globally in terms of disaster risk, with an index value of 25.14%. 74% of the population is at risk from the consequences of several hazards, which affect at least 60% of the country's total land area (Raza, et al., 2022). This is partly because of the country's position and geographic setting, which increase the risk of coastal hazards including typhoons and storm surges. The country is also situated within the "Ring of Fire," which puts the safety of the inhabitants at considerable risk from earthquakes and volcanoes. Additional natural disasters that increase the risk of exposure are floods, landslides, droughts, and tsunamis.

In the Earthquakes Hazard in CAR, Philippines, Sanchez (2020) as cited by Gumba et al., (2020) disclosed that Cordillera Administrative Region is a geologically hazardous because of its peculiar mountainous terrain. Benguet, Baguio City, Mountain Province, Ifugao, the mountainous parts of Abra and Kalinga, are also landslide-prone areas while the low-lying areas of Ifugao, Abra, Apayao and Kalinga are flood-prone. The City of Baguio alone as a major educational center in the region recorded 28 buildings and 132 residences damaged or destroyed. Two schools were severely damaged, trapping students and faculty members inside the building. The mountainous nature is contributory to the region's vulnerability to lots of disaster like rain-induced landslides and flashfloods and earthquakes.

In 2011, around eight (8) typhoons hit the Cordillera region wherein the most damaging typhoons were Mina, Pedring and Quiel (September 25- 27, 2011 and September 30 – October 1, 2011) respectively. All classes at all levels and government offices were suspended;

communications bogged down in Kalinga, Ifugao, Mt. Province, Abra and in some areas of Benguet and Apayao; most provinces in the region were isolated for almost a month due to damages on infrastructures. Four (4) died in Ifugao including 3 children due to fallen trees and landslide, 24 injured and 2 were missing (Asian Development Board, 2012).

Guevarra et al. (2007) suggested that every school implement a thorough training program on disaster preparedness in their study. It is important to create a disaster preparedness plan and to evaluate risks and weaknesses. It is true that having a school disaster management plan that is practical and effective will serve as a guide for all interested parties in constructing a secure and safe school. As the schools do their crucial roles, the community should join them. A case study in Iloilo City as cited by Alcayna et al. (2016) showed that community-driven DRR required strong social networks, alternative finance facilities, technical professional networks that support community processes, and community managed information. Bradley et al. (2016) as cited by Cayamanda (2018) disclosed the importance of proper communication and networking in the implementation of DRRM. Communication is a potentially valuable way of avoiding and reducing harm caused by disasters. It provides the public with information about the effects of an event and how actions may affect the outcome of the event. Hence, communication should be included while looking into the safety of learning facilities, school disaster management, and DRRM in education.

In the study of Jurilla (2016), she found out that there are municipalities and districts that were very effective in all aspects of their disaster risk reduction management in terms of preparedness and they recommended that municipal DRRMCO and members should conduct a review of their DRRPP and enhance the program by adopting flexible intervention activities in order to improve the different aspects of disaster preparedness.

Among the highest priority issues presented by the Disaster Risk Reduction in the Philippines are strengthening local institutional capacity for DRR, technical support from national agencies, academe and DRR professionals of Local Government Units are the most critical factors to aid in the tangible implementation of DRR actions at local level (UN Office for Risk Reduction, 2018). This entails proper and well coordination among the identified offices to be able to work together to reduce the negative impact of calamities. Additionally, it is essential to include local leaders and communities in the official DRR and CR infrastructure to sustain the mainstreaming of contextualized knowledge and to prevent top-down approaches to risk reduction. Additionally, a coordinated and thorough planning approach with a clear grasp of the connections between DRR stakeholders is required. The paper identified one of the major gaps as being caused by the scant attention and funding given to DRR research. It is essential to comprehend how different sectors of society will be affected by disasters and climate change to better protect society from their effects in the future. This can be done through enhancing knowledge availability through data collection and analysis. The relationships between society, environment, economy, and culture and their impacts are the focus of the DRR research (United Nation Disaster Risk Reduction, 2019). Studies on DRRM promotes critical thinking and problem-solving as well as social and emotional life skills that are essential to the empowerment of groups threatened or affected by disasters.

With all the citations above, there is really a need to evaluate the implementation of DRRM program not just in the community but in the schools being the frontline service provider to the learners as primary stakeholders.

1.2 Research Objectives

This research study aimed to evaluate the Disaster Risk Reduction Management (DRRM) Program implementation in schools. It sought to identify the capabilities of members of the

SDRRM Team in the implementation of the different activities under the DRRM Program by establishing the extent of disaster planning awareness and level of preparedness in public elementary schools of Alfonso Lista Districts I & II. The objectives of this study were guided by the following research questions: 1) What is the level of implementation of the Disaster Risk Reduction Management Program of the schools in terms of: 1.a) Safe Learning Facilities & Environment; 1.b) School Disaster Risk Reduction Management; and 1.c) DRMM Integration in the Curriculum? 2) What is the extent of disaster preparedness in elementary schools in Alfonso Lista District I & II in terms of: 2.a) Persons Involvement; 2.b) School Facilities; and 2.c) Disaster Preparedness Activities? 3) What is the degree of awareness and understanding of elementary schools on DRRM program and activities? 4) Is there a significant relationship on the level of implementation of DRRM in the elementary schools of Alfonso Lista and their extent of disaster preparedness? 5) Is there a significant relationship in the level of implementation of DRRM in the elementary schools of Alfonso Lista and their degree of awareness and understanding?

2. Methodology

This study used the descriptive comparative to answer the questions on the level of implementation and the degree of awareness and understanding of the Disaster Risk Reduction Management Program. The correlation method was used in this research to test the relationship between the level of implementation of DRRM programs, the extent of disaster preparedness, and the degree of awareness and understanding of the elementary schools. The respondents of this study were the thirty-six (36) elementary School Heads and School DRRM Coordinators from public elementary schools' respondents who have been in the service for at least 6 months to 1 year as a member of the School DRRM Team of Alfonso Lista District. The questionnaire checklist (online or offline) that was used in this study aimed at drawing out proper responses relative to the objectives of this study and was patterned and lifted from the School Disaster Risk Reduction and Management (DRRM) Manual developed by the Department of Education and DepEd Order No. 37, s. 2015. The Comprehensive Disaster Risk Reduction and Management (DRRM) In Basic Education Framework, DepEd Order No. 21, s. 2015. Disaster Risk Reduction & Management Coordination and Information Management Protocol and DepEd Order No. 23, s.2015, DepEd- Student-led School Watching and Hazard Mapping Checklist. It was modified to suit the study. The main tool that was used in this study is a questionnaire checklist. To be able to describe the different DRRM variables under study, the following statistics have been used: The weighted mean was computed to determine the level of implementation of the DRRM Program, the extent of disaster preparedness, and the degree of awareness and understanding of DRRM programs and activities; Pearson r is also used to determine if there is a significant relationship between the level of implementation of DRRM in the elementary schools of Alfonso Lista and their extent of disaster preparedness, and the level of implementation of DRRM in the elementary schools of Alfonso Lista and their degree of awareness and understanding.

A permit to conduct the research was secured by requesting a letter of permission from the Schools Division Superintendent through the Public Schools District Supervisor. Data gathered from answered questionnaires was checked, classified, tabulated, and analyzed according to the research design described in this chapter. The researcher first sought approval for the conduct of this research from the proper authorities. After getting approval, the researcher met with the 54 school heads and designated school DRRM coordinators in coordination with the Public Schools District Supervisor of their participation in the study. More-

over, the data gathered from the respondents was treated with the utmost confidentiality. To guarantee the safety of the research participants throughout the research procedure, ethical concerns were taken into consideration with the strictest discretion. To prevent coercion into participation, respondents have the freedom to participate voluntarily and to revoke their consent at any time. For them to comprehend the nature of the research and how it can affect their participation, the respondents in this study have a right to know the study's objective. All personal information was handled confidentially.

3. Findings and Discussions

Level of implementation of the Disaster Risk Reduction Management Program of the Schools

Table 1 shows the implementation level of the DRRMP in terms of safe learning facilities and the environment. Results reveal that, in general, the schools' implement safe learning facilities and an environment with an overall weighted mean of 3.08. This means that the school heads and the designated school DRRM coordinators do follow the IATF rulings for safe facilities and environmental conditions to avoid the spread of the deadly coronavirus. The schools fully implemented the maintenance, dissemination, and posting of relevant and updated emergency hotlines in strategic locations throughout the vicinity, as revealed by the weighted mean of 3.44. This goes with the provision of the Department of Education and other donors providing the fund for the needed signage and posters.

The posting of safety and preparedness measures and evacuation plans is implemented as revealed by the weighted mean of 3.06. This means that safety precautions and reminders are posted in visible and strategic places. Also, in cases where an emergency arises, an evacuation plan is provided to guide the individuals to be safe away from obliteration. Aside from the posters for safety measures, the schools ensure the establishment of an early warning system that is rated at 2.97, which means that it is being implemented. Moreover, the schools implement the maintenance of the safekeeping of vital school records and learning materials and pre-identify the possible Temporary Learning Spaces (TLS) and alternative delivery modes of education as shown by the weighted means of 3.03 and 2.89, respectively. The above result jives with the study of Comighud (2020), that the DRRM is well implemented in ten (10) districts of Bayawan City Division, Negros Oriental. It implies that school heads and teachers are implementing the disaster risk reduction program to avoid casualties among the learners and school employees as well.

Table 1. Implementation Level of the DRRM Program of the schools in terms of Safe Learning Facilities & Environment

PARAMETERS	WEIGHTED MEAN	QUALITATIVE INTERPRETATION
1. Ensure the establishment of an Early Warning System:	2.97	Implemented
2. Maintain the safekeeping of vital school records and learning materials	3.03	Implemented
3. Pre-identify possible Temporary Learning Spaces (TLS) and alternative delivery modes of education	2.89	Implemented
4. Posting of safety and preparedness measures and evacuation plans	3.06	Implemented
5. Maintain, disseminate, and post relevant and updated emergency hotlines in strategic locations throughout the school	3.44	Fully Implemented
OVERALL WEIGHTED MEAN	**3.08**	**Implemented**

Table 2 presents the implementation level of the DRRM Program in terms of school DRRM. Generally, the schools in the Alfonso Lista District fully implemented the formation and management of school DRRM as revealed by the overall weighted mean of 3.32. Each school in the district established a DRRM team to assist in the implementation of preparedness and response measures (WM = 3.33), monitor the effects of hazards, including the use of the school as an evacuation center (WM = 3.33), keep track of all school personnel during emergencies and/or disasters (WM = 3.42), prepare and submit reports on the effects of any hazard (WM = 3.28), and ensure DepEd Order No. 43 is properly implemented (WM = 3.56), "conduct RADaR" (rapid assessment of damages report) (rapid assessment of damages report) after each hazard" (WM = 3.47), "enable immediate resume of classes to track learners" (WM = 3.33), and "conduct rapid assessment of damages after each hazard" (WM = 3.33). To ensure the availability of updated baseline education data for the school (WM =3.22), the schools implemented maintenance of close coordination with the local BDRRM Council on the conduct of preparedness activities and on response needs, among others (WM =3.14), and integrated DRRM into regular school programs and activities as well as the School Improvement Plan (SIP) (WM =3.06).

Table 2. Implementation Level of the DRRM Program of the schools in terms of School Disaster Risk Reduction Management

PARAMETERS	WEIGHTED MEAN	QUALITATIVE INTERPRETATION
1. Organize school DRRM team to support the implementation of preparedness and response measures	3.33	Fully Implemented
2. Maintain close coordination with local BDRRM Council on the conduct of preparedness activities and on response needs, among others	3.14	Implemented
3. Ensure the availability of updated baseline education data of the school	3.22	Implemented
4. Integrate DRRM in regular school programs and activities and School Improvement Plan (SIP)	3.06	Implemented
5. Monitor the effects of hazards, including the use of the school as evacuation center	3.33	Fully Implemented
6. Track all school personnel during disasters and/ or emergencies	3.42	Fully Implemented
7. Prepare and submit reports on the effects of any hazard	3.28	Fully Implemented
8. Ensure implementation of DO No. 43, s. 2012 or the "Guidelines on the Implementation of Executive Order No. 66, s. 2012 (Prescribing Rules on the Cancellation or Suspension of Classes and Work in government Offices Due to Typhoons, Flooding, other Weather Disturbances and Calamities)"	3.56	Fully Implemented
9. Conduct rapid assessment of damages after every hazard and submit RADaR (Rapid Assessment of Damages Report) to hotline numbers	3.47	Fully Implemented
10. Facilitate immediate resumption of classes to track learners	3.33	Fully Implemented
11. Monitor recovery and rehabilitation interventions being implemented in the school	3.33	Fully Implemented
OVERALL WEIGHTED MEAN	**3.32**	Fully Implemented

Table 3 presents the implementation level of the DRRM Program in the schools in terms of DRRM integration into the curriculum. The schools implemented the DRRM Program by integrating it into the curriculum, as revealed by the overall weighted mean of 3.09. This implies that the school head values prevention over cure by letting the teachers, staff, and learners be ready and prepared when disaster strikes. The school DRRM coordinators' responses, with a weighted mean of 3.42, demonstrated that the schools fully implemented the conduct of disaster preparedness measures, including but not limited to quarterly multi-hazard drills appropriate to the school's specified hazards, such as earthquakes, fire, and floods. This could be verified by schools' activities by implementing the integration of DRRM in the lesson plans (WM = 3.11), initiation of an innovative work plan for DRRM advocacy (WMK = 2.92), preparation and provision of teaching materials and modules for DRRM lessons (WM = 2.94), and providing capacity building for teachers, non-teaching staff, and learners on DRRM (WM = 3.00). Schools also implement the conduct of annual student-led risk identification and mapping within and around the school premises to ensure a safe environment that is conducive to teaching and learning with a weighted mean of 3.17. In relation, the study of Kanyasan et al. (2018) showed that schools having DRRM integrated with the curriculum must have an evaluation to have better implementation as the years go by. Hence,

the DRRM work plan must be reviewed regularly to ensure that the implementation is conducted with the right quantity, quality, and timeliness.

Table 3. Implementation Level of DRRM Program of the schools in terms of DRRM integration in the curriculum

PARAMETERS	WEIGHTED MEAN	QUALITATIVE INTERPRETATION
1. Conduct an annual student-led risk identification and mapping within and around the school premises to ensure a safe environment that is conducive to teaching and learning	3.17	Implemented
2. Provide capacity building for teachers, non-teaching staff and learner on DRRM	3.00	Implemented
3. Conduct disaster preparedness measures, including but not limited to quarterly multi-hazard drills applicable to school's identified hazard such as earthquake, fire and floods	3.42	Fully Implemented
4. Integrate DRRM in the lesson plans	3.11	Implemented
5. Prepare/Provide teaching materials, modules for DRRM lessons	2.94	Implemented
6. Initiate innovative work plan for DRRM advocacy	2.92	Implemented
OVERALL WEIGHTED MEAN	**3.09**	**Implemented**

Extent of Disaster Preparedness in the public elementary schools In Alfonso Lista District I & II

Table 4 presents the extent of disaster preparedness in public elementary schools in terms of the number of people involved. As revealed by the overall weighted mean of 3.42, the elementary schools of the Alfonso Lista District are fully prepared when disaster strikes with the full support of their stakeholders. It can be gleaned from the table that the involved stakeholders are fully prepared, to wit: school heads (WM = 3.53), SDRRM Coordinators (WM = 3.53), other teaching personnel (WM = 3.53), non-teaching personnel (WM = 3.39), learners (WM = 3.25), local government unit (WM = 3.61), and other outside stakeholders (WM = 3.36). The result is due to the pledge of the people working in the government to serve and protect their clients, which made them fully prepared. For the learners to be fully prepared. This is because of the learning where the DRRM is integrated into their curriculum as being implemented in the schools. On the other hand, parents are just as prepared, as revealed by the response weighted mean of 3.14. This could be associated with their fear of some parents not readily being near the school where their loved ones, the school children, are present and could be one of the victims when disaster happens.

Table 4. Extent of disaster preparedness in public elementary schools in Alfonso Lista District I & II in terms of Persons Involvement

PERSONNEL INVOLVED	WEIGHTED MEAN	QUALITATIVE INTERPRETATION
School Head	3.53	Fully Prepared
SDRRM Coordinator	3.53	Fully Prepared
Other Teaching Personnel	3.53	Fully Prepared
Non-Teaching Personnel	3.39	Fully Prepared
Learners	3.25	Fully Prepared
Parents	3.14	Prepared
LGU	3.61	Fully Prepared
External Stakeholders	3.36	Fully Prepared
OVERALL WEIGHTED MEAN	**3.42**	**Fully Prepared**

Table 5 shows the extent of disaster preparedness in terms of school facilities. The result showed that the elementary schools are prepared when disaster comes as to school facilities, with a 2.87 overall rating. This is true since the area experiences a passage of typhoons yearly, so the school heads and school DRRM coordinators are always reminded to ensure the safety of the learners as well as other important facilities, particularly the ICT. The schools have DRRM Corners in school and/or in classrooms and contingency plans for earthquakes,

typhoons, landslides, fires, and the like, as revealed by a weighted mean of 3.11 and 3.00, respectively. Furthermore, an evacuation plan for every school is prepared with a rating of 3.00. This could be supported by the placement of proper signage on classrooms and school premises with a rating of 3.11. Part of the signage leads to the evacuation center that is available and prepared with a rating of 2.97. Furthermore, emergency supplies and equipment are prepared, which include first aid kit, a fire extinguisher, etc. with a rating of 2.81. The presence of a safe exit ladder on a two-storey building or more is applied to limited schools wherein this shows some preparedness for the safety of the evacuating individuals as revealed by the weighted mean of 2.28. This means that the heads of the schools with second floors or higher must plan to ensure that the safe exit ladder is strategically placed to be fully prepared in times of disasters.

Consequently, there is a family earthquake preparedness plan and a student-family reunification plan as revealed by the weighted mean of 2.78. Also, to ensure the continuous and consistency of learning by the learners, the schools are prepared with ancillary facilities or temporary learning spaces with a weighted mean rating of 2.69.

Table 5. Extent of disaster preparedness in public elementary schools in Alfonso Lista District I & II in terms of School Facilities

PARAMETERS	WEIGHTED MEAN	QUALITATIVE DESCRIPTION
Contingency Plan (Earthquake, Typhoon, Landslide, Fire, etc.)	3.00	Prepared
Evacuation Plan	3.00	Prepared
Family Earthquake Preparedness Plan and student-family reunification plan	2.78	Prepared
Proper signages on classrooms and school premises	3.22	Prepared
Presence of safe exit ladder on two-storey building or more	2.28	Partially Prepared
Emergency supplies and equipment (first aid kit, fire extinguisher etc.	2.81	Prepared
Presence of ancillary facilities or temporary learning space	2.69	Prepared
Availability of Evacuation Center	2.97	Prepared
Presence of DRRM Corner in school and/or on classrooms	3.11	Prepared
OVERALL WEIGHTED MEAN	**2.87**	**Prepared**

Table 6 reveals the extent of preparedness for disaster preparedness activities. It could be gleaned from the table that, overall, the schools are prepared for a possible disaster that will happen, as revealed by the 2.85 weighted mean. It could be noted that the elementary schools in Alfonso Lista are partially prepared for flood evacuation drills with a 2.44 weighted mean. This could be because most schools are situated in elevated areas that are not prone to flooding. Nevertheless, some schools still have flood evacuation drills for the benefit of learners who live in flood-prone areas. Further, the schools are prepared for lockdown and fire drills as revealed by the responses with a weighted mean of 2.53 and 3.00, respectively. This is associated with the reality that schools have had lockdown and fire drill experiences. The lockdown was just recently experienced due to the pandemic, and most of the schools have experienced or witnessed fire incidents that alarmed them, leading to preparation through drills. Consequently, as to earthquake drills, the schools are fully prepared with a weighted mean response of 3.42. This implies that the schools are implementing the quarterly school head earthquake drills on specified dates based on schedules. Earthquake school heads and fire events have been experienced in many places that the school heads and SDRMM Coordinators of Alfonso Lista considered to be prepared for the safety of the majority, if not all, of the learners and workers as well.

Table 6. Extent of disaster preparedness in elementary schools in Alfonso Lista District I & II in terms of Disaster Preparedness Activities

ACTIVITIES	WEIGHTED MEAN	QUALITATIVE DESCRIPTION
Earthquake Drill	3.42	Fully Prepared
Flood Evacuation Drill	2.44	Partially Prepared
Fire Drill	3.00	Prepared
Lockdown Drill	2.53	Prepared
OVERALL WEIGHTED MEAN	2.85	**Prepared**

Degree of Awareness and Understanding of Elementary Schools on DRRM Programs and Activities

Table 7 shows the degree of awareness and understanding of elementary schools in Alfonso Lista about DRRM programs and activities. Generally, the teachers are aware of and do understand the DRRM program and activities, as revealed by the response overall weighted mean of 3.04. This could be the outcome of the implementation of capacity building for the teachers, staff, and learners in the schools as shown in Table 3. The respondents of this study are aware of and understand the disaster preparedness framework (WM = 3.22), vulnerability assessment (WM = 2.97), the importance of planning (WM = 3.14), the alignment of the institutional framework (WM = 3.06), resource base (WM = 2.86), the essentiality of warning systems (WM = 3.00), response mechanisms (WM = 3.00), public education and training (WM = 3.06), and rehearsals (WM = 3.00).

The respondents' responses manifested that they are aware of and do understand all the above-cited programs and activities. Firstly, the respondents have been oriented and some have attended seminars and webinars on DRRM. Secondly, this could be attributed to the reality that Alfonso Lista, Ifugao is a pass of disasters like typhoons every year and every summer, fire hits the pasture grassy lands. The incidents led the respondents to understand the need for courses of action to be undertaken to ensure the safety and security of the learners and workers at the school.

Table 7. Degree of awareness and understanding of elementary schools on DRRM program and activities

PROGRAMS AND ACTIVITIES	WEIGHTED MEAN	QUALITATIVE INTERPRETATION
Disaster Preparedness Framework	3.22	Understand
Vulnerability Assessment	2.97	Understand
Planning	3.14	Understand
Institutional Framework	3.06	Understand
Resource Base	2.86	Understand
Warning systems	3.00	Understand
Response mechanisms	3.00	Understand
Public education and training	3.06	Understand
Rehearsals	3.00	Understand
OVERALL WEIGHTED MEAN	**3.04**	**Understand**

Significant Relationship on the Level of Implementation of DRRM in the Elementary Schools of Alfonso Lista and their Extent of Disaster Preparedness

Table 8 presents the level of implementation of DRRM and its relationship with the extent of disaster preparedness. Statistical results show that the implementation of Safe Learning Facilities and Environment is significantly correlated to the disaster preparedness of the re-

spondents as to people involved in DRRM (r(34) =.588, p.001), school facilities (r(34) =.752, p.001), and disaster preparedness activities (r(34) =.471, *p =.005=.005*). This implies that as long as the people involved are prepared with the school facilities and activities related to disasters, the implementation of the safe learning facilities and environment jives with it. School risk reduction management implementation is significantly correlated to the disaster preparedness of the people involved (r =.778, p.001) and school facilities (r =.667, p.237). people

The statistical results reveal that the implementation of the DRRM integration in the curriculum shows a significant relationship with the people's involvement in disaster preparedness as revealed by p.001), and by r(34) =.606, p.001), and the school facilities with r(34) =.675, p.034). This is consistent with the research conclusions of Rambau et al. (2012) that expanded teaching of dangers and disasters to students is essential. Therefore, incorporating DRRM into the curriculum of students is one way to reduce the number of victims in disasters.

Table 8. Level of implementation of DRRM in the elementary schools of Alfonso Lista and their extent of disaster preparedness

DRRM Implementation Level	Extent of Disaster Preparedness		
	Persons Involvement	School Facilities	Disaster Preparedness Activities
Safe Learning Facilities & Environment	.5877* *(p< .001)*	.7525* *(p< .001)*	.4707* *(p= .005)*
School Risk Reduction Management	.7782* *(p< .001)*	.6671* *(p< .001)*	.2085^{ns} *(p= .237)*
DRRM Integration in the Curriculum	.6057* *(p< .001)*	.6752* *(p< .001)*	.3940* *(p= .034)*

*Significant at 5% ns- not significant at 5%

Significant Relationship in the Level of Implementation of DRRM in the Public Elementary Schools of Alfonso Lista and their Degree of Awareness and Understanding

Table 9 presents the level of implementation of DRRM and its association with the degree of awareness and understanding. The result shows that the implementation of safe learning facilities and the environment of the schools has a significant relationship with the degree of awareness and understanding of the school personnel as revealed by $r(34)= 0.6580$, p 0.001. This means that the stakeholders' awareness and understanding of disaster management is significantly associated with the implementation of safe learning facilities and the environment of the elementary schools of the Alfonso Lista District. It clearly shows that the awareness and understanding of the involved people in DRRM is directly applied to the needed implementation of a safe learning facility as well as to the vicinity of the schools.

As to the school risk reduction management, it reveals that there is also a moderate positive correlation with the awareness and understanding of the involved personnel, with r(34)=-0.6962, p 0.001, which is significant. This may be due to the oneness of decision made despite the difference in culture, experience, strategy, and point of view of the involved personnel on the management of the risk of occurring when disaster happens. Thus, the awareness and understanding of the involved personnel in the DRRM of the schools has a significant relationship with their risk reduction management.

Furthermore, the awareness and understanding of the involved personnel in disaster management in the elementary schools of Alfonso Lista has a moderate positive correlation with DRRM integration in the curriculum with r(34)=-0.6362, p 0.001. This implies that there is a significant relationship between the involved personnel and the DRRM integration in the curriculum due to the fact that the curriculum is being cascaded down from top management. Thus, the personnel in-charge of the formulation of the content of the curriculum

considers the integration of the DRRM for the benefit of the learners. This means that the curriculum cascaded down to schools that are not integrated with the DRRM part is also being added by the teacher in-charge with risk reduction management through a contextual approach.

Table 9. Level of implementation of DRRM in the elementary schools of Alfonso Lista and their degree of awareness and understanding

DRRM Implementation Level	Awareness and understanding	Interpretation
Safe Learning Facilities & Environment	.6580* *(p<0.001)*	Moderate Positive Correlation
School Risk Reduction Management	.6962* *(p<0.001)*	Moderate Positive Correlation
DRRM Integration in the Curriculum	.6362* *(p<0.001)*	Moderate Positive Correlation

*Significant at 5%

In corroboration, the DepEd Order 37 series of 2015 stated that to access quality governance in education, there are three pillars to be protected, such as safe learning facilities, school disaster management, and DRR in education. This is aligned to the global Comprehensive School Safety Framework and Republic Act 10121 that focuses on prevention and mitigation, preparedness and response, rehabilitation and recovery. Thus, all public school employees need to be aware of the DRRM services of the Department of Education to be able to implement its content in their respective schools.

4. Conclusions and Recommendations

It can be deduced that the public elementary schools in Alfonso Lista implemented safe learning facilities and environments; formed and managed a school-based DRRM; and the DRRM Program was integrated into the curriculum for the benefit of the pupils and all stakeholders visiting the vicinity. The people involved in implementing the DRRM program are fully prepared for the readiness of the school facilities and disaster preparedness activities that are still improving. Furthermore, school personnel are aware of and do understand the DRRM program and activities. Moreover, the extent of disaster preparedness is significantly associated with the level of their DRRM implementation in terms of safe learning facilities and environment, school risk reduction management, and DRRM integration into learners' curriculum. Hence, the implementation of DRRM is directly and significantly associated with the level of awareness and understanding of the involved personnel. Following recommendations on the conclusions, the following are made: all implemented DRRM programs and activities should have a regular or annual evaluation to study needed improvements to attain full implementation for each parameter. While to enhance the preparedness of the facilities and activities being conducted, linkage with other government agencies for training and upgrading of the facilities is needed. Also, partnerships with private business firms could be a solution through their social responsibility programs and projects. Due to climate change that causes hazards and disasters, school officials should program annual DRRM training that could upgrade the employees' understanding of disaster prevention and mitigation measures. The disaster preparedness activities of the schools should be enhanced through more frequent drills to match the implementation of risk reduction management. Lastly, the schools' personnel need to be more capacitated through upgraded training on DRRM as well

as the school facilities must be upgraded to be fully prepared for any disaster that may happen at any time in the future.

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Research article

LEVEL OF COORDINATION BETWEEN THE HUMANITARIAN AND GOVERNMENTAL ORGANIZATIONS IN GAZA STRIP AND ITS IMPACT ON THE HUMANITARIAN INTERVENTIONS TO THE INTERNALLY DISPLACED PEOPLE (IDPS) FOLLOWING MAY ESCALATION 2021

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Abstract: In Gaza Strip, where emergencies always occur leading to devastating humanitarian consequences, both the governmental and the humanitarian non-governmental organizations need to work together to serve the affected communities. This study aimed at identifying the level of coordination that exists between the humanitarian organizations and its impact on the humanitarian interventions provided in response to the IDPs of May escalation 2021. To achieve its objectives, the study used the descriptive analytical approach where interviews were conducted with relevant stakeholders. The study mainly found that the coordination is an essential component of the humanitarian and governmental organizations' work that positively impact the efficiency of their interventions and that both humanitarian and governmental organizations coordinate and partner with each other and with relevant stakeholders including governmental and non-governmental organizations and it also found that the level of coordination in response to May escalation of hostilities reached 80 per cent however more improvements are required for effective interventions and response. The study recommended humanitarian organizations to accelerate their response to the emergency status and make use of their resources available as quickly as possible to avoid causing negative impact and that the IDPs working group under the Inter-Cluster Coordination Group to be activated to improve the response to IDPs and to improve the coordination and collaboration between the governmental and humanitarian organizations to the greatest extent possible for further effective response.

Keywords: Coordination, Gaza Strip, Humanitarian Interventions, IDPs, May Escalation

1. Introduction

Humanitarian interventions usually involve a significant number of national and international entities working in the same geographic areas and pursuing the same broad objectives. However, coordination and collaboration among them are frequently limited at best. In any given emergency response, failure to collaborate might result in coverage gaps, duplications, and inefficiencies (Saavedra and Knox-Clarke, 2015). During conflicts, where infrastructure, people, services and humanitarian aid providers themselves may be targets, the factors and choices influencing aid interventions are more complex than in non-conflict settings (Sanderson, 2019). And as humanitarian requirements escalate during such times, governments and humanitarian organizations need to anticipate, prepare for and respond to crises more successfully (OCHA, 2012). For a successful disaster management, effective coordination and collaboration among stakeholders is required at international, regional, national and organizational level (Migdad, 2012).

Coordination is considered a key operational principle for any effective response to disasters. It helps avoid duplication in the efforts targeting the affected population and is crucial to strengthen the interaction between humanitarian institutions and national and local governments to quickly respond and prevent any losses or damages that may result from disasters. For the UN system, governments, and non-governmental organizations, coordination is a vital component of disaster prevention, mitigation, readiness, and response (Pathirage, et al., 2008). According to organizations engaged in emergencies, three levels of coordination have been identified: communication, where information and knowledge is shared between organizations; alignment, where organizations 'may adjust their activities to create a more effective response on the basis of the activities of other organizations', for example ensuring they work in different neighborhoods; and collaboration, where organizations may have common goals and share activities (Sanderson, 2019).

Over the years, Gaza has suffered from multiple escalations killing and injuring thousands of people, destroying and damaging thousands of buildings and housing units and creating extreme unending vulnerabilities. And as the government capacities to deal with the recurrent Israeli hostilities over Gaza were always not enough, the humanitarian community and its organizations had to intervene to provide the assistance and relief to the affected population, reduce their vulnerabilities and increase their resilience. Such interventions were conducted either directly with the related ministries or in a coordinated manner that is led by the UN Office for the Coordination of Humanitarian Affairs (OCHA).

2. Problem Statement

The level of coordination between the humanitarian community and governmental organizations was perceived differently with a number of variables affecting it, here comes the need to assess that level of coordination in the recent crisis that hit Gaza Strip which is the escalation of hostilities in May 2021.

This was witnessed through the delay in taking the decision of opening UNRWA's Designated Emergency Shelters (DES) by UNRWA and the government in Gaza and providing the response to the displaced civilian people during the escalation. While the humanitarian interventions from a number of humanitarian agencies' side were provided since the beginning of the escalation, there were few obstacles concerning the service delivery.

From those points, it was important to measure if the level of coordination during the escalation was enough and effectively responding to the needs of IDPs from both the governmental and non-governmental organizations' points of view.

What is the level of coordination between the humanitarian and governmental organizations and its impact on the humanitarian interventions to the Internally Displaced People (IDPs) following May escalation 2021?

From this main question, the following sub-questions are derived:

- How responsive the humanitarian international organizations were to the urgent coordination efforts?
- What are the tools of coordination between the humanitarian and governmental organizations?
- How the coordination processes between the humanitarian organizations are managed?

3. Study Goals

This study aimed at assessing the level of coordination between the humanitarian organization and the governmental bodies in Gaza and its impact on the humanitarian interventions to the IDPs of May escalation through the below sub-goals:

- Identify the nature, level and tools of coordination among the governmental organizations.
- Identify the nature, level and tools of coordination among the humanitarian organizations.
- Measure the impact of coordination on humanitarian interventions.
- Determine the impact of the coordination level on the response targeting IDPs of May 2021 escalation on Gaza.

4. Study Importance

By identifying the level of coordination between the governmental and humanitarian organizations in Gaza specially in response to May escalation, this study will:

1. Provide a clear picture on whether the level of coordination is enough and is supporting the affected people and meeting their needs.

2. Shed light on the gaps in the response provided following May escalation.

3. Suggest ways to improve the coordination between the governmental and humanitarian organizations to respond effectively.

4. Develop the researcher's capacities in the field of coordination and humanitarian interventions.

5. Study methodology

The study used the case study and the descriptive analytical approaches. To apply the methodology, interviews which questions were derived from humanitarian coordination tools were used

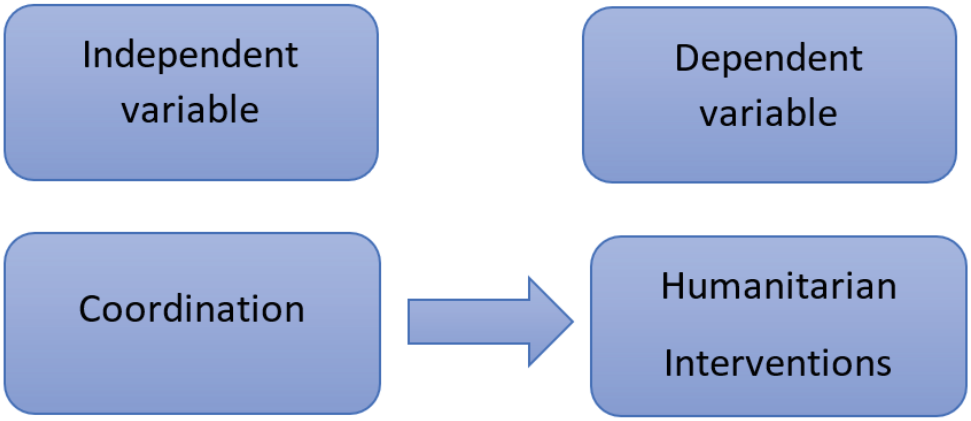
Study Population:

Humanitarian and governmental organizations working in Gaza Strip and responded to May escalation in 2021.

Study Sample:

Representatives of one governmental organization (Ministry of Social Development) and two humanitarian organizations – one local NGO and one INGO – OXFAM and AISHA Association for Women and Child Protection

Study variables



Study Terminologies

Coordination:

Coordination is the orderly utilization of arrangement instruments to convey compassionate help with a durable and powerful way. Such instruments incorporate vital arranging; gathering information and overseeing data, preparing assets and guaranteeing responsibility, organizing a utilitarian division of work, arranging and keeping up a serviceable structure with have political experts and giving initiative (Minear et al. 1992).

Humanitarian organizations:

Entities with a mission to prevent and/or alleviate human suffering in armed conflicts. They are usually involved in: searching for, collecting and transporting the wounded and sick, missing and dead; providing medical treatment to the wounded and sick; assisting prisoners of war; and assisting the civilian population through the provision of humanitarian relief. They are also sometimes referred to in IHL as impartial humanitarian bodies (ICRC).

Local government institutions: Local government institutions may comprise of municipal governments, boards of education, district health boards and a variety of other special purpose institutions. These institutions provide services needed by their residents, such as land use planning, roads, utilities, public transit, economic development promotion, education, health services, and infotainment (IGI Global).

May escalation:

The 11-days of intense fighting, 10-21 May 2021, between Israeli forces and Palestinian armed groups in the Gaza Strip, was the gravest since 2014. In Gaza, scores of civilians were killed and injured. Tens of thousands were displaced. Homes and vital infrastructure were destroyed or damaged and the supply of basic services was severely disrupted. The outbreak

of hostilities followed weeks of rising tension in East Jerusalem around access restrictions of Palestinians to holy sites during the month of Ramadan and the threat of forced eviction of Palestinian families by the Israeli authorities in Sheikh Jarrah (OCHA, 2021).

Humanitarian interventions:

Is a set of measures the organization working in the emergencies' field apply after the emergency occurs where those organizations work in all phases of emergencies in order to mitigate their impacts. It includes financial interventions and cash assistance, psychological interventions and others (Abu Dayya, 2019).

IDPs:

Internally displaced persons (IDPs), according to the *United Nations Guiding Principles on Internal Displacement,* are "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border" (UNHCR).

Previous studies

The Role of Coordination between Municipal Councils and Local Government's Entities on Level of the Services Provided in the Kingdom of Saudi Arabia: an Exploratory Study - (El Elwan, 2020)

The study aimed at identifying the role of coordination between municipal councils and other local government's entities on the level of provided services. The study used both the descriptive analytical method. The results of this study showed that the level of coordination between municipal councils and other local governmental service providers is moderate and that the current level of coordination between municipal councils and other local service providers of governmental entities affects the level and quality of provided services. The study recommended the need to increase the level of coordination between municipal councils and the government and different councils and that the regulations and legislation that support coordination to be set between municipal councils and other local service providers of governmental entities.

Assessing the Management of International Humanitarian Interventions in Crises in the Gaza Strip - (Abu Dayya, 2019)

The study aimed at evaluating the management of the international humanitarian interventions in the Gaza Strip during crises and identifying the most effective types of humanitarian interventions. The study used the descriptive analytical approach through conducting interviews and distributing questionnaires. The study found that there was an intermediate level of satisfactions for the international humanitarian interventions in response by the beneficiaries and an intermediate level of satisfactions for the partners institutions in management of international humanitarian interventions. The study recommended to activate the national center of crises and disaster to act quickly during crises, and to build a national system for coordination between all humanitarian interventions at the national and local level.

Realities and challenges of relief operation in shelters during 2014 aggression on Gaza from the beneficiaries and service providers' perspective (Case study-Beit Hanoun Area) - (Alburai, 2018)

The study aimed at studying the reality of the relief work during the aggression of 2014 and determine the obstacles of the coordination and the relief work. The study used the descriptive analytical methodology depending on data collected from questionnaires and interviews. The study found that of the main factors that impacted the relief work during 2014 aggression were the lack of a clear strategy for the relief agencies to provide the services and communicate, lack of needs' registry system in addition to the lack of communication with the IDPs to determine their needs and having services' satisfaction feedbacks. The study recommended forming a joint central operation room between the governmental, local and international organizations as well as developing a software program to monitor the work of the sectors and determine their needs and weaknesses.

International and local NGO supply chain collaboration: An investigation of the Syrian refugee crises in Jordan - (Adem et al., 2017)

The study aimed at identifying the key drivers and challenges to supply chain collaboration in the humanitarian sector and to appraise the relationships between international non-governmental organizations (INGOs) and local non-governmental organizations (LNGOs) during disaster relief. The study used the qualitative method and discussed literature from the commercial and humanitarian sectors. The study found that resources sharing between INGOs and LNGOs would facilitate effective coordination of activities for refugee care and that the poor communication between INGO and LNGO partners results in poor planning and logistic process failures. The study recommended further investigation into the approaches addressing the diverse cultural and decision-making perspectives of Local NGOs and INGOs.

Coordination with international organizations and its role in supporting the governmental health sector in Gaza Strip - (Al-Ghouti, 2015)

The study aimed at identifying the coordination with international organizations and its role in supporting the health sector in the Gaza Strip and to recognize the obstacles hindering the coordination process. The study used the descriptive analytical methodology depending on data collected from questionnaires and interviews. The study found that the political situation in the Gaza Strip and its impact on the international organizations response hinders the coordination between the international organizations and the public health sector. The study recommended enhancing the role of good coordination between international organizations and the public health sector and preparing and updating a guideline including the priorities of the various needs and activities of the public health sector.

The institutions of civil society and its impact on the oversight role of Community development in the United Arab Emirates – Public welfare associations – Case study - (Hosani, 2013)

The study aimed at identifying the role of the civil society organizations in the development of the community in the United Arab Emirates and in identifying the relationship between the civil society organizations and the state. The study used both the descriptive analytical method and the historical method. The study found that the complementary role between the civil society organizations and the state helped developing and serving the community in the United Arab Emirates. The study recommended the need to draft regulations for the actual partnership between the state, the civil society organizations and the private sector

and strengthening the proper strategic planning to the civil society organizations where their programs are sustainable.

The coordination of actors intervening in crisis following natural disasters: the issues arising in the emergency-development transition. The case of Haiti - (Fiscale, 2011),

The study aimed at identifying the managerial and coordination challenges among actors involved in the emergency-development transition phase following the Haiti earthquake and their implications in terms of effectiveness and appropriateness of the humanitarian intervention. The study used literature review and interviews in the field with the most relevant actors involved in the coordination. The study found that a common communication strategy still seems to be lacking among Information Managers of cluster lead-agencies, the international staff in charge of participating in coordination forums are poorly familiar with grassroots problems and the highly qualified national staff are lacking due to poor training to local staff. The study recommended each cluster to have a governmental counterpart, include the beneficiaries in the projects' phases, invest in resources to foster coordination mechanisms at municipal and departments level and hire more senior staff to perform coordination functions.

A Study of NGO Relations with Government and Communities in Afghanistan - (Jelinek, 2006)

The study aimed at looking at the relationship between provincial and central government actors, communities and NGOs, investigating NGOs' engagement with government structures, and what can they achieve in engaging with each other. The study used inductive qualitative research strategy, including observations, structured, semi-structured interviews, and group discussions. The study found that there is a favorable impression of NGOs by the government that is where NGOs had involved the government through sharing information about their plans, programs, and activities, inviting them to events, trainings, workshops, etc. and coordinating activities with them. The study recommended that NGOs to continue the development of a more coordinated approach with Government ministries and keep them up to date with their activities, design their programs in line with the government plan and priorities, and have MoU with the government including clear roles and responsibilities. Government should support NGOs as partners in humanitarian and development work and develop a strategic partnership with NGOs, acknowledging their skills and expertise and learning from them.

Theoretical framework

In May 2021, tension rose in East Jerusalem around access restrictions of Palestinians to holy sites during the month of Ramadan and the threat of forced eviction of Palestinian families by the Israeli authorities in Sheikh Jarrah. In response and in solidarity with Palestinians there, an outbreak of hostilities in Gaza has resulted. Between 10 and 21 May, the gravest fighting between Israeli forces and Palestinian armed groups in Gaza Strip since 2014 has intensified (OCHA, 2021). The humanitarian consequences of this escalation have been devastating, exacerbating the impact of around 14 years of Israeli blockade, internal Palestinian political divisions and recurrent escalations. According to the Office of the High Commissioner for Human Rights (OHCHR), 261 Palestinians were killed, including 67 children and 41 women; of those fatalities, 130 were civilians. Over 2,200 Palestinians were injured, including 685 children and 480 women, some of whom may suffer a long-term disability requiring rehabilitation. At the height of the escalation, 113,000 internally displaced persons (IDPs) sought shelter and protection at UNRWA schools or with hosting families. According to the Shelter Cluster 8,250 people remain displaced, as their houses were destroyed or severely damaged (OCHA, 2021). International organizations, including the United Nations

and its specialized agencies, donor representative agencies, and international nongovernmental organizations (NGOs) have always played a key role in delivering assistance in the occupied Palestinian territories (oPt). Since the creation of the Palestinian Authority (PA) in 1994, these organizations' activities have been coordinated with the PA in accordance with its national development priorities (Qarmout and Beland, 2012). NGOs are considered as independent, impartial and neutral agencies that provide relief, rehabilitation, reconstruction and / or development assistance. The relationship between NGOs and governments have occasionally been tense, where a government is sometimes afraid of being replaced by NGOs and/or exposed for a lack of accountability and transparency with donor or public funds. Governments may also view NGOs as potential competitors for donor funding. NGOs work also at the grassroots level to provide aid, services, and information to those in need as well as a wider audience of policymakers, state organizations, and donor agencies (Jelinek, 2006). It should also be noted that the relationship between the non-governmental organizations and the government is not of one nature, such relationships differ from one case to another and have many forms and mechanisms. This is attributed to a number of variables that are related to the nature and directions of the political regime in the country in addition to the nature of activity of such non-governmental organizations and their relationships with the external and internal powers (Muamer, 2011). At all times, both non-governmental organizations and the government should be sharing the same goal which is to prioritize assistance to beneficiaries who are in need of support and interventions (Jenlik, 2006). Due to the humanitarian coordination and financial instruments, more lives are being saved, more quickly and efficiently (OCHA, 2012). Coordination is the systematic use of policy instruments to deliver humanitarian assistance in a cohesive and effective manner. Such instruments include strategic planning, gathering data and managing information, mobilizing resources and assuring accountability, orchestrating a functional division of labor in the field, negotiating and maintaining a serviceable framework with host political authorities and providing leadership (Minear et al., 1992). In Gaza Strip, and at times of emergencies, a high level of coordination is maintained between the actors working in emergencies to better respond to the affected population (Abu Dayya, 2019). This has been proven in the response to the escalation in 2014, where governmental bodies like the Ministry of Social Development (MoSD) has managed and led the relief work in Gaza Strip through cooperation and coordination with all the international organizations, local organizations, municipalities and other community bodies. All the challenges faced during the escalation made it crucial for MoSD to coordinate at all levels to facilitate its response to the affected people (MoSD, 2015). In May 2021 escalation, where, in addition to the devastating consequences, a caseload of IDPs has resulted. Over 70,000 have been displaced in UNRWA schools during the hostilities and most of them returned home after the cessation of hostilities. However, at the current time, over 9,000 people remain displaced due to the destruction and damage of their homes and are in need for humanitarian interventions including sheltering services (OCHA, 2021).

Study Tool

After reviewing the studies of Abu Dayya, 2019 and Alghoti, 2015 and the CBM Core Humanitarian Standards Self-Assessment report 2018, the researcher reached out to the following questions as the study tool that are in the below schedules of respondents' answers:

Ministry of Social Development (MoSD)

1. Nature of Coordination between organizations

1. Governmental Organizations- Intergovernmental coordination

Table (1): Nature of coordination between the governmental organizations

	Question	Yes	No	Comments
1.	Does the ministry coordinate with other ministries?			The ministry coordinates with the Ministry of Interior, National Security and Ministry of local Governance based on the nature of the crisis
2.	Are the staff aware of the importance of coordination among themselves?			The ministry applies the coordination protocol within the ministry emergency plan
3.	Does the ministry have a special coordination committee to coordinate with other ministries?			The ministry is a member in the governmental committee that includes all the ministries engaging during emergencies
4.	Has the ministry developed a plan to trigger complementary relationships with other ministries?			There is a governmental plan that includes the role of each ministry
5.	Do the Staff have the experience to coordinate with other ministries?			The experiences vary based on the training the staff received and their work experience in different emergency committees
6.	Does the ministry exchange human resources and expertise with other ministries?			Ongoing meetings in general
7.	Does the ministry exchange information and data with other ministries about their programs and services?			A unified database exists between all the governmental organizations
8.	Are there joint action plans between the ministry and other ministries?			A unified governmental plan that includes the roles of each ministry
9.	The ministry benefits from the expertise of other ministries to develop its services?			Mostly with Ministry of Public Work and Housing

From the above table, it becomes clear to the researcher that the governmental organizations in Gaza coordinate with each other, are aware of the importance of coordination and have the required experiences. However, the levels of coordination planning differ due to the risks associated with the different crises in Gaza Strip. There are disparities in the coordination between governmental organizations, and for this reason, there are attempts to have the best coordination model despite challenges. In order to achieve that, some mechanisms are being deployed such as a governmental committee that includes all the ministries engaging during emergencies, a joint governmental plan that includes the role and responsibilities of each ministry and a unified database between all the governmental organizations where information and data about their programs and services is shared.

2. Coordination between governmental and non-governmental organizations (NGOs, INGOs, UN and local organizations)

Table (2): Nature of coordination between the governmental and non-governmental organizations

	Question	**Yes**	**No**	**Comments**
1.	Is there a MoU or clear understanding or policy between the organization and the related ministry?			There is an international structure during emergencies led by OCHA (Emergency Coordination Center)
2.	Are there periodical meetings between the organization and the related ministry?			Types of meetings differ per the risks' nature

	Question	Yes	No	Comments
3.	Does the coordination between the organization and the government positively impact the efficiency of the organization work?			The work of the organization is linked with the increase in coordination efficiency
4.	Is the relationship between the organization and the government considered complementary?			Some gaps exist in terms of the quick response of the organizations to activate the status of emergency and respond
5.	Is there a clarity of roles and responsibilities each party have to do?			Roles differ according to the work, goals and internal system of the organization; MoSD role is supervision and senior coordination
6.	Are the governmental officials aware of the importance of coordination with the humanitarian organization and how to make use of it?			MoSD seeks enhancing and developing coordination to realize the humanitarian standards and ensure the humanitarian interventions are in line with the needs of affected population

From the above table, it becomes clear to the researcher that the level of coordination between the humanitarian non-governmental organizations and the governmental bodies is reflected in having clear roles and responsibility, periodic joint meetings and in being part of the international structure during emergencies that is led by OCHA (Emergency Coordination Center). Those results are in agreement with the study of (Jelinek, 2006) which found that there is a favorable impression of NGOs by the government that is where NGOs had involved the government through sharing information about their plans, programs, and activities, inviting them to events, trainings, workshops, etc. and coordinating activities with them. The results are also in line with the recommendation of the same study that called the NGOs to continue the development of a more coordinated approach with Government ministries and keep them up to date with their activities, design their programs in line with the government plan and priorities and have MoU with the government including clear roles and responsibilities, where in this regards the government said that instead of having MoU there are coordination structure where roles are clarified. It was also found that the coordination between the humanitarian non-governmental organizations and the governmental bodies positively impacts the efficiency of the organization work and the relationship is considered complementary; however, some gaps exist in terms of the quick response of the humanitarian organizations to activate the status of emergency and respond. In the same context the study of (Hosani,2018) found that there is a complementary role between the civil society organizations and the government and that helped developing and serving the community in the United Arab Emirates.

2. Level of Coordination

Table (3): Level of coordination between the governmental and humanitarian organizations

	Question	Yes	No	Comments
1.	Communication between the governmental and humanitarian organizations has an effective impact on the success of coordination?			Meetings are conducted during emergencies with the international organizations specifically OCHA and UNRWA

	Question	Yes	No	Comments
2.	The level of information exchange between the governmental and humanitarian organizations achieves the aspired goal?			There is a time difference in the quick response of the humanitarian non-governmental organizations. The time between the service delivery and the implementation notification to the ministry; by that time other responding organizations would have responded leading to duplication in services provided.
3.	There is a joint and effective cooperation between governmental and humanitarian organizations?			The efficiency of coordination between governmental and humanitarian non-governmental organizations is linked with the ability to have coordination policies in partnership with relevant stakeholders
4.	The current level of coordination between the governmental and humanitarian organizations decreases the time and efforts?			Coordination has increased during May escalation and COVID-19 response to a great extent
5.	The current level of coordination between the governmental and humanitarian organizations achieves the aspired goal to some extent?			Achieving the aspired goal depends on the level of the government involvement of humanitarian organizations in developing coordination mechanisms
6.	Are the interventions conducted by humanitarian organizations identified in consultation with the related ministry (according to priorities)?			The ministry shares their ways forward with the non-governmental humanitarian organizations; some revert, ask for more information and discuss with the ministry while others (few in numbers) proceed in their mandate and work without consultations even if it doesn't relate to the emergency status; this causes some disruption to the ministry during emergencies
7.	The governmental organizations provide updated information on the needs of IDPs?			There is a matrix with the NGOs that includes all the information required and needs of people affected (specifically during May escalation)

From the above table, it becomes clear to the researcher that the communication between the governmental and non-governmental humanitarian organizations has an effective impact on the success of coordination specifically during emergencies which is in line with the results of (Adem et al. 2017) that found that poor communication results in poor planning and logistic process failures.

According to the above table, it was also found the level of information exchange between the governmental and humanitarian non-governmental organizations achieves the aspired goal; however, there is a time difference in the response provided by the humanitarian organizations that may lead to duplication in services provided. The study of (Jelinek, 2006) also agreed that the NGOs sharing information with the government about their plans, programs and activities or through other mechanisms proved a favorable impression by the government. It was also found that the interventions conducted by humanitarian non-governmental organizations are not identified in consultation with the related ministry according to priorities and that the ministry shares information on their way forward, their needs and resources but not all the organizations reach out and consult with the ministry which led to disruption. This comes in disagreement with the study of (Jelinek, 2006) which recommended the NGOs to design their programs in line and consultation with the government plan and priorities. Moreover, there is a joint and effective cooperation between the governmental and humanitarian organizations where the current level of coordination between them decreases the

time and efforts and achieves the aspired goal to some extent and this was witnessed during May escalation and COVID-19 responses. MoSD also mentioned that the updated information on the needs of IDPs are shared on a matrix that NGOs have access to, such a system was recommended by (Alburai, 2018) where the lack of needs' registry system impacted the relief work during 2014 aggression.

3. Coordination Tools:

Table (4): Coordination tools within the governmental organizations

	Coordination Tool	Humanitarian Organization	Governmental bodies	Comments
1.	Periodic meetings are conducted between concerned stakeholders			On a daily basis and whenever required
2.	Coordination committee exists to coordinate with other bodies			There is an emergency governmental committee that includes all the relevant stakeholders. The ministry is involved in the cluster system under the umbrella of OCHA. Periodic meetings are ongoing
3.	Involved in the coordination meetings			Coordination meetings happen at both governmental and non-governmental levels.
4.	Joint goals and objectives are discussed and agreed upon with other stakeholders.			Goals are shared to avoid duplication of efforts and to provide the humanitarian response at the suitable time and according to the quality criteria.
5.	Use of written communication to coordinate with other stakeholders			Written communication is used through emails in addition to virtual meetings.
6.	Plans and programs are shared with other stakeholders			Every organization knows its roles. This helps reaching all the targeted populations and avoiding duplication of efforts.
7.	Visits are exchanged to learn from others' experiences and experiments			An assessment after each emergency/event involving the related focal points is conducted considering all the observations and notes and then a report is developed. No joint trainings to all the teams in terms of roles were conducted, however joint drills and simulations where each implemented their roles was conducted
8.	Joint workshops are organized with other stakeholders			Joint workshops are organized to benefit from each other's' experiences and to exchange points of views.
9.	Assessments information is shared with the relevant coordination groups in a timely manner and in a format that can be readily used by other humanitarian agencies			At the governmental level, a main database exists that can be accessed by all ministries. For the INGOs and local NGOs, MoSD data can be accessed through a special account. There is a matrix for the Emergency Coordination Center

	Coordination Tool	Humanitarian Organization	Governmental bodies	Comments
10.	The organization policies and strategies include a clear commitment to coordination and collaboration with others, including national and local authorities without compromising humanitarian principles			There is a manual specifying the roles at the governmental level. The structure with the humanitarian organizations is also clear
11.	**How is information about the organization's competences, resources, and areas and sectors of work shared with others responding to the crisis?** Through reports published at the governmental level during response which include the resources, where they were spent, the needs and any other observations and through other coordination tools such as the matrix, meetings …etc.			
12.	**How do programme plans include measures to regularly share information and coordinate activities with other national and international stakeholders?** Through the governmental manual and the cluster system			

From the above table, it becomes clear that MoSD uses a variety of coordination tools both at the governmental and non-governmental levels. Some traditional tools like meetings, workshops, discussions are used, which is in agreement with the study of (Jelinek, 2006) which found the positive impact behind involving both governmental and non-governmental organizations together through information sharing, trainings and workshops. The MoSD also deploys other tools including a governmental manual, emergency committees, a governmental database, a matrix that is shared with the humanitarian organizations and reporting in emergencies which comes also in line with the recommendations of the same study that called to keep developing coordination approaches with the government.

4. Humanitarian Interventions

Table (5): Humanitarian interventions within the governmental organizations

	Question	Yes	No	Comments
1.	Do you have prior planning to respond to emergencies?			There is a reference frame, standards and pre-formed committees
2.	Do you collect indicators that an emergency may occur?			Through ongoing follow up (winter storms, at the political side)
3.	Do you seek support from external experts when planning for emergencies?			An external expert, through OCHA, has previously provided a training on how to manage emergency shelters
4.	Do you have preventive measures at your organization before the emergency occurs?			An emergency structure exists, and a team is defined. MoSD usually guides national and international organizations to be prepared
5.	Do you have scenarios for effective response?			Two drills/simulations were conducted virtually in 2020 on how to respond to an emergency status
6.	Are gaps in response identified and addressed?			The issue is in the availability of resources to respond during emergencies. Another issue is the delayed declaration of the emergency status in the organizations. The response from the resources of MoSD is usually faster than the response of the organizations

	Question	Yes	No	Comments
7.	The organization participates in relevant coordination bodies and collaborates with others in order to minimize demands on communities and maximize the coverage and service provision of the wider humanitarian effort?			The international organizations are informed of the affected areas, the expectations and the needs so that only the affected people are responded to.
8.	How does programming coordinate with other actors (NGOs, government agencies, etc.) and take their programmes into account when designing, planning and implementing programmes? When the emergency plan is formed, all stakeholders and their roles, resources and capacities are included.			
9.	How are activities that directly involve people and communities harmonized with those of other actors who work with the same populations? MoSD always try to decrease the duplication but can't prevent it as there are no one organization whether governmental or non-governmental that can cover all the needs rather it depends on existing capacities. During emergencies, May 2021, the partner international organizations depended on the data from MoSD and were granted access to MoSD database that includes information about IDPs. In case there are extra assistances, needy vulnerable families are assisted even if not affected by the emergency itself (escalation)			

From the above table, it becomes clear to the researcher that when it comes to interventions, MoSD is considering some measures including planning, collecting indicators, taking preventive measures and conducting simulations/drills. MoSD coordinates with all relevant stakeholders and coordination bodies in emergency and focuses its efforts to minimize the duplication that may result during response. Those results are in agreement with the study of (Hosani, 2013) that called for the partnership between all relevant stakeholders and focused on the need to strengthen strategic planning of NGOs.

Humanitarian Non-Governmental **Organizations:**

*** OXFAM**

1. Nature of Coordination between organizations

1. Inter-humanitarian organizations coordination

Table (6): Nature of coordination between the humanitarian organizations

	Question	**Yes**	**No**	**Comments**
1.	Does the organization coordinate with other humanitarian organizations?			Coordination level varies based on the work nature of each organization.
2.	Are the staff aware of the importance of coordination among themselves?			Staff are aware of the importance of coordination to a great extent; the coordination is always maintained at different levels during their work.
3.	Does the organization have a special coordination committee to coordinate with other humanitarian organizations?			There is a focal point for each sector
4.	Has the organization developed a plan to trigger complementary relationships with other humanitarian organizations?			Coordination is maintained through other mechanisms
5.	Do the Staff have the experience to coordinate with other humanitarian organizations?			Staff have coordination experience due to the organization's nature of work
6.	Does the organization exchange human resources and expertise with other humanitarian organizations?			Human resources and expertise are shared in order to share and benefit from other experiences

	Question	Yes	No	Comments
7.	Does the organization exchange information and data with other organizations about their programs and services?			Information is exchanged in alignment with the humanitarian principles to serve the affected population
8.	Are there joint action plans between the organization and other NGOs?			There are partnerships with other organizations
9.	Does the organization benefit from the expertise of other NGOs to develop its services?			Good practices are shared to benefit from the different experiences

From the above table, it becomes clear to the researcher that the humanitarian organizations in Gaza coordinate with each other, are aware of the importance of coordination and have the required experiences. To facilitate the coordination, Oxfam has sector focal points and is part of the cluster system where they coordinate and share information with other organizations, has joint action plans and exchange human resources and expertise with other humanitarian organizations through partnerships. However, they don't have a specific plan to trigger the complementary relationships with other humanitarian organizations rather such relationships are maintained through other ways. Those results come in agreement with the findings of (Adem et al., 2017) study that sharing resources between International NGOs and Local NGOs would facilitate effective coordination of activities, including for refugee care and that the poor communication between them results in poor planning and logistic process failures.

2. Coordination between Governmental and non-governmental organizations (NGOs, INGOs, UN and local organizations)

Table (7): Nature of coordination between the governmental and non-governmental organizations

	Question	Yes	No	Comments
1.	Is there a MoU or clear understanding or policy between the organization and the related ministry?			More specifically with MoPWA
2.	Are there periodical meetings between the organization and the related ministry?			Periodical meetings are done on a regular basis and whenever required.
3.	Does the coordination between the organization and the government positively impact the efficiency of the organization work?			Mainly it does, but sometimes the coordination is not at the required level, thus not positively impacting the efficiency of the organization work.
4.	Is the relationship between the organization and the government considered complementary?			The relationship is considered complementary, as this achieves the objectives of humanitarian interventions.
5.	Is there a clarity of roles and responsibilities each party have to do?			The roles are clear through the Cluster system and through being involved through the governmental coordination structures, tools and mechanisms like the matrix.
6.	Are the governmental officials aware of the importance of coordination with the humanitarian organization and how to make use of it?			Awareness on the coordination importance exists to some extent.

From the above table, it becomes clear to the researcher that the level of coordination between the humanitarian organization (OXFAM) and the governmental bodies is reflected in having clear roles and responsibility, periodic joint meetings, and high efficiency of work. Those results are in agreement with the study of (Jelinek, 2006) which found that through

involving the government in NGOs plans and activities and coordinating with them, a favorable impression was received and thus encouraging coordination with the government. The results are also in line with the recommendation of the same study that called the NGOs to continue the development of a more coordinated approach with Government ministries, keep them up to date with their activities, and have MoU with the government including clear roles and responsibilities.

It was also found that the coordination between the humanitarian organization (OXFAM) and the governmental bodies positively impacts the efficiency of the organization work and the relationship is considered complementary. In the same context, the study of (Hosani,2018) found that there is a complementary role between the civil society organizations and the government and that helped developing and serving the community in the United Arab Emirates.

2. Level of Coordination

Table (8): Level of coordination between the governmental and humanitarian organizations

	Question	Yes	No	Comments
1.	Communication between the governmental and humanitarian organizations has an effective impact on the success of coordination?			Communication is considered an important level of coordination
2.	The level of information exchange between the governmental and humanitarian organizations achieves the aspired goal?			The ultimate goal of exchanging information is help supporting the affected population
3.	There is a joint and effective cooperation between governmental and humanitarian organizations?			The cooperation was proved through ongoing programs and partnerships
4.	The current level of coordination between the governmental and humanitarian organizations decreases the time and efforts?			To some extent, sometimes coordination requires extra times and efforts
5.	The current level of coordination between the governmental and humanitarian organizations achieves the aspired goal to some extent?			Coordination saves lives and decreases the impact of vulnerabilities on people
6.	Are the interventions conducted by humanitarian organizations identified in consultation with the related ministry (according to priorities)?			Consultations are always required to clearly address the interventions' target areas
7.	The governmental organizations provide updated information on the needs of IDPs?			Following May 2021 escalation, updated lists of IDPs were provided to OXFAM for intervention

From the above table, it becomes clear to the researcher that the communication between the governmental and humanitarian organization (OXFAM) has an effective impact on the success of coordination which is in line with the results of (Adem et al. 2017) which found that poor communication, which is a level of coordination, results in poor planning and logistic process failures. According to the above table, it was also found the level of information exchange between the governmental and humanitarian organization (OXFAM) achieves the aspired goal and that there is a joint and effective cooperation between the two parties. This is in line with the study of (Jelinek, 2006) that found that the NGOs sharing information with the government about their plans, programs and activities or through other mechanisms proved a favorable impression by the government. It was also found that the interventions conducted by Oxfam are identified in consultation with the related ministry according to priorities. This comes in agreement with the study of (Jelinek, 2006) which recommended the NGOs to design their programs in line and consultation with the government's plan and priorities.

When it comes to sharing updated information of IDPs, OXFAM confirmed receiving the needed information from the government side.

3. Coordination Tools:

Table (9): coordination tools within the humanitarian organizations

	Coordination Tool	Humanitarian Organization	Governmental bodies	Comments
1.	Periodic meetings are conducted between concerned stakeholders			Meetings are regularly conducted with humanitarian and governmental organizations
2.	Coordination committee exists to coordinate with other bodies			There are focal points supporting the coordination
3.	Involved in the coordination meetings			OXFAM is part of the cluster system and other coordination systems under OCHA
4.	Joint goals and objectives are discussed and agreed upon with other stakeholders			Oxfam goals and programs are discussed through partnerships and the consortium approach involving a number of key actors to achieve specific goals
5.	Use of written communication to coordinate with other stakeholders			Written communication is the main way of communication with others in addition to in-person and virtual meetings
6.	Plans and programs are shared with other stakeholders			Oxfam plans are shared to minimize the duplication and benefit the maximum number of population
7.	Visits are exchanged to learn from others' experiences and experiments			To some extent.
8.	Joint workshops are organized with other stakeholders			Workshops involving a variety of stakeholders are organized to share experiences and exchange points of views
9.	Assessments information is shared with the relevant coordination groups in a timely manner and in a format that can be readily used by other humanitarian agencies			It is much important to share information about need assessments with others, so no assessment is done twice or needs of specific categories are missed
10.	The organization policies and strategies include a clear commitment to coordination and collaboration with others, including national and local authorities without compromising humanitarian principles			Commitment to coordination is the basis of OXFAM's work where humanitarian principles are always respected
11.	**How is information about the organization's competences, resources, and areas and sectors of work shared with others responding to the crisis?** Through the official cluster system, encouraging collaboration, encouraging consortium approach and working in partnership with local NGOs			
12.	**How do programme plans include measures to regularly share information and coordinate activities with other national and international stakeholders?** Through the cluster system			
12.	**How do programme plans include measures to regularly share information and coordinate activities with other national and international stakeholders?** Through the governmental manual and the cluster system			

From the above table, it becomes clear that OXFAM uses a variety of coordination tools with different stakeholders. Some traditional tools like meetings, workshops, discussions are used with governmental and humanitarian organizations, which is in agreement with the study of (Jelinek, 2006) which found the positive impact behind involving both governmental and non-governmental organizations together through information sharing, trainings and workshops. OXFAM also has focal points to coordinate with other bodies and the staff are involved in the coordination meetings where Assessments' information is shared in a timely manner and in a format that can be readily used by other humanitarian agencies

OXFAM shares its resources, competencies and information through the official cluster system, encouraging collaboration, encouraging consortium approach and working in partnership with local NGOs

4. Humanitarian Interventions

Table (10): Humanitarian interventions within the governmental organizations

	Question	Yes	No	Comments
1.	Do you have prior planning to respond to emergencies?			Contingency plan exists
2.	Do you collect indicators that an emergency may occur?			Depending on sector specific indicators
3.	Do you seek support of external experts when planning for emergencies?			Through global advisors
4.	Do you have preventive measures at your organization before the emergency occurs?			Some measures are in place to minimize the impact of emergencies
5.	Do you have scenarios for effective response?			OXFAM developed scenarios to enhance response
6.	Are gaps in response identified and addressed?			Example: financial resources
7.	The organization participates in relevant coordination bodies and collaborates with others in order to minimize demands on communities and maximize the coverage and service provision of the wider humanitarian effort?			OXFAM has ongoing partnerships and coordinate with all stakeholders
8.	**How does programming coordinate with other actors (NGOs, government agencies, etc.) and take their programmes into account when designing, planning and implementing programmes?** Through meetings, information sharing and the cluster system.			
9.	**How are activities that directly involve people and communities harmonized with those of other actors who work with the same populations?** Through coordination mechanisms (meetings, 4ws system, information sharing)			

From the above table, it becomes clear to the researcher that OXFAM is considering some measures when it comes to its interventions for emergencies including planning through having a contingency plan, collecting sector-specific indicators, taking preventive measures and having scenarios for effective response. OXFAM coordinates with other stakeholders and share information through meetings, the cluster system and other coordination mechanisms.

Those results are in agreement with the study of (Hosani, 2013) which called for the partnership between all relevant stakeholders and focused on the need to strengthen strategic planning of NGOs.

- **AISHA Association for Women and Child Protection**:

1. Nature of Coordination between organizations

1. Inter humanitarian organizations coordination

Table (11): Nature of coordination between the humanitarian organizations

	Question	Yes	No	Comments
1.	Does the organization coordinate with other humanitarian organizations?			Yes, through the cluster system.
2.	Are the staff aware of the importance of coordination among themselves?			The staff clearly understand that coordination is important to achieve the organization's humanitarian goals
3.	Does the organization have a special coordination committee to coordinate with other humanitarian organizations?			Aisha is a member in the protection cluster and coordinate and share information with cluster coordinator and members and other humanitarian organization
4.	Has the organization developed a plan to trigger complementary relationships with other humanitarian organizations?			The relationships are organized clearly through the cluster system
5.	Do the Staff have the experience to coordinate with other humanitarian organizations?			It depends on the organization's nature of work
6.	Does the organization exchange human resources and expertise with other humanitarian organizations?			Aisha partners with other organizations to complement the human resources and to share experience with each other
7.	Does the organization exchange information and data with other organizations about their programs and services?			Yes, following the humanitarian principles
8.	Are there joint action plans between the organization and other NGOs?			Through partnerships with other organizations
9.	Does the organization benefit from the expertise of other NGOs to develop its services?			Through sharing good practices and lessons learnt

From the above table, it becomes clear to the researcher that the humanitarian organizations in Gaza coordinate with each other, are aware of the importance of coordination and have the required experiences. To facilitate the coordination, Aisha is part of the protection cluster where they coordinate and share information with the cluster members, have joint action plans and exchange human resources and expertise with other humanitarian organizations through partnerships. However, they don't have a specific plan to trigger the complementary relationships with other humanitarian organizations rather such relationships are maintained through other ways. Those results come in agreement with the findings of (Adem et al., 2017) which found that sharing resources between International NGOs and Local NGOs would facilitate effective coordination of activities, including for refugee care and that the poor communication between them results in poor planning and logistic process failures.

2. Coordination between Governmental and non-governmental organizations (NGOs, INGOs, UN and local organizations)

Table (12): Nature of coordination between the governmental and non-governmental organizations

	Question	Yes	No	Comments
1.	Is there a MoU or clear understanding or policy between the organization and the related ministry?			AISHA is licensed by the Ministry of Health for the mental health clinic and services
2.	Are there periodical meetings between the organization and the related ministry?			Periodic meetings are conducted all the time to improve aspired results
3.	Does the coordination between the organization and the government positively impact the efficiency of the organization work?			The government is a main source of information that helps building interventions
4.	Is the relationship between the organization and the government considered complementary?			None of the parties can provide the whole assistance required, this can only be done through coordination and complementary relationships
5.	Is there a clarity of roles and responsibilities each party have to do?			There are specific units and staff dedicated to serve their roles based on the nature of the projects and their competencies
6.	Are the governmental officials aware of the importance of coordination with the humanitarian organization and how to make use of it?			This is proved through the ongoing follow-up and engagement

From the above table, it becomes clear to the researcher that the level of coordination between the humanitarian organization (Aisha) and the governmental bodies is reflected in having clear roles and responsibility, periodic joint meetings, high efficiency of work. Those results are in agreement with the study of (Jelinek, 2006) which found that through involving the government in NGOs plans and activities and coordinating with them, a favorable impression was received and thus encouraging coordination with the government. The results are also in line with the recommendation of the same study that called the NGOs to continue the development of a more coordinated approach with Government ministries, keep them up to date with their activities, and have MoU with the government including clear roles and responsibilities. It was also found that the coordination between the humanitarian organization (Aisha) and the governmental bodies positively impacts the efficiency of the organization work and the relationship is considered complementary. In the same context the study of (Hosani,2018) found that there is a complementary role between the civil society organizations and the government and that helped developing and serving the community in the United Arab Emirates.

2. **Level of Coordination**

Table (13): Level of coordination between the governmental and humanitarian organizations

	Question	Yes	No	Comments
1.	Communication between the governmental and humanitarian organizations has an effective impact on the success of coordination?			Communication helps sharing ideas and information and facilitating response
2.	The level of information exchange between the governmental and humanitarian organizations achieves the aspired goal?			Coordination is the success element to achieve the organization's goals
3.	There is a joint and effective cooperation between governmental and humanitarian organizations?			On a regular basis

	Question	Yes	No	Comments
4.	The current level of coordination between the governmental and humanitarian organizations decreases the time and efforts?			Coordination accelerates the interventions of the organizations
5.	The current level of coordination between the governmental and humanitarian organizations achieves the aspired goal to some extent?			Through the government support, the humanitarian interventions are conducted effectively in a timely manner
6.	Are the interventions conducted by humanitarian organizations identified in consultation with the related ministry (according to priorities)?			Whenever there are new priorities, consultations with the government are done
7.	The governmental organizations provide updated information on the needs of IDPs?			Reflecting on May 2021 escalation, Aisha didn't receive timely updated information about IDPs and thus delaying the required interventions through Aisha

From the above table, it becomes clear to the researcher that the communication between the governmental and humanitarian organization (Aisha) has an effective impact on the success of coordination which is in line with the results of (Adem et al. 2017) that found that poor communication, which is a level of coordination, results in poor planning and logistic process failures. According to the above table, it was also found the level of information exchange between the governmental and humanitarian organization (Aisha) achieves the aspired goal and that there is a joint and effective cooperation between the two parties. This is in line with the study of (Jelinek, 2006) that found that the NGOs sharing information with the government about their plans, programs and activities or through other mechanisms proved a favorable impression by the government. It was also found that the interventions conducted by Aisha are identified in consultation with the related ministry according to priorities. This comes in agreement with the study of (Jelinek, 2006) which recommended the NGOs to design their programs in line and consultation with the government's plan and priorities. When it comes to sharing updated information of IDPs, Aisha said they didn't receive the needed information from the government side whereas MoSD said it has an accessible matrix including the information on IDPs that NGOs can use.

3. Coordination Tools:

Table (14): coordination tools within the humanitarian organizations

	Coordination Tool	Humanitarian Organization	Governmental bodies	Comments
1.	Periodic meetings are conducted between concerned stakeholders			Such meetings allow the exchange of ideas to achieve the harmonization required
2.	Coordination committee exists to coordinate with other bodies			Based on the nature of coordination required
3.	Involved in the coordination meetings			Involved in the cluster system
4.	Joint goals and objectives are discussed and agreed upon with other stakeholders			Stakeholders are all involved in the discussion of interventions' objectives
5.	Use of written communication to coordinate with other stakeholders			The written communication is the main tool of communication, other tools such as meetings are also used

	Coordination Tool	Humanitarian Organization	Governmental bodies	Comments
6.	Plans and programs are shared with other stakeholders			Plans and programs are shared at the governmental, non-governmental and the community level
7.	Visits are exchanged to learn from others' experiences and experiments			In order to enhance interventions
8.	Joint workshops are organized with other stakeholders			To exchange experiences
9.	Assessments information is shared with the relevant coordination groups in a timely manner and in a format that can be readily used by other humanitarian agencies			With both governmental and humanitarian organizations
10.	The organization policies and strategies include a clear commitment to coordination and collaboration with others, including national and local authorities without compromising humanitarian principles			Commitment to coordination is not stated in policies rather through different coordination structures and mechanisms
	1. How is information about the organization's competences, resources, and areas and sectors of work shared with others responding to the crisis? AISHA has strong ties and high coordination with various non-governmental organizations and strong links with governmental organizations. AISHA is also an active member in the Gaza Strip Child Protection Network (CPN) that is led by the Ministry of Social Affairs, and an active member in the Protection cluster; the Child Protection /MHPSS group led by UNICEF, and the legal task force. Therefore, the information sharing occurs in high coordination with partners and external consultants and expertise.			
12.	**How do programme plans include measures to regularly share information and coordinate activities with other national and international stakeholders?** AISHA, in designing their projects, coordinates with Sub working groups to share information and coordinate activities with other national and international stakeholders.			

From the above table, it becomes clear that Aisha uses a variety of coordination tools with different stakeholders. Some traditional tools like meetings, workshops, discussions are used with governmental and humanitarian organizations, which is in agreement with the study of (Jelinek, 2006) which found the positive impact behind involving both governmental and non-governmental organizations together through information sharing, trainings and workshops. Aisha coordinates with other bodies through the cluster system where it is an important member and the staff are involved in the coordination meetings where assessments' information is shared with both governmental and humanitarian organizations in a timely manner and in a format that can be readily used by other agencies. Aisha shares its resources, competencies and information through the cluster system and high coordination with partners and the direct engagement with the government. Activities are coordinated with national and international stakeholders.

4. Humanitarian Interventions

Table (15): Humanitarian interventions within the governmental organizations

	Question	Yes	No	Comments
1.	Do you have prior planning to respond to emergencies?			AISHA has contingency and emergency plan
2.	Do you collect indicators that an emergency may occur?			Through the experience in crises and data collection
3.	Do you seek support of external experts when planning for emergencies?			Through ideas exchange and trainings
4.	Do you have preventive measures at your organization before the emergency occurs?			Trainings to staff, emergency team and others
5.	Do you have scenarios for effective response?			This helps during the immediate management of the crisis
6.	Are gaps in response identified and addressed?			Depending on the capacities available
7.	The organization participates in relevant coordination bodies and collaborates with others in order to minimize demands on communities and maximize the coverage and service provision of the wider humanitarian effort?			The main goal of Aisha is to protect the affected population and provide assistance as much as possible
8.	**How does programming coordinate with other actors (NGOs, government agencies, etc.) and take their programmes into account when designing, planning and implementing programmes?** When AISHA design, plan and implement their programs, they usually involve all stakeholders in need assessment and focus groups to design the programs based on their needs			
9.	How are activities that directly involve people and communities harmonized with those of other actors who work with the same populations? When AISHA design projects, they adopt theory of change which include three levels of intervention (individuals, community, and duty bearers).			

From the above table, it becomes clear to the researcher that Aisha is considering some measures when it comes to its interventions for emergencies including planning through having a contingency and emergency plan, collecting indicators, taking preventive measures and having scenarios for effective response. Aisha involves all the relevant stakeholders (including individuals, community, and duty bearers) through the project/program phases, and this is done through meetings, focus group discussions, information sharing and the cluster system. This comes in agreement with the study of (Fiscale, 2011) which recommended to include the beneficiaries in the projects' phases, invest in resources to foster coordination mechanisms and the study of (Hosani, 2013) who called for the partnership between all relevant stakeholders.

Similarities and differences of the responses:

Area	Similarities	differences
Nature of Coordination	Inter-organizations coordination Both the humanitarian and governmental organizations coordinate with each other and their staff are aware of the importance of coordination and have the experience required Both the humanitarian and governmental organizations have their own coordination mechanisms that ranges from having focal points and being part in committees. Each the humanitarian and governmental organizations have a kind of joint action plans and unified plan between each other. Each the humanitarian and governmental organizations exchange information about their programs and services with each other.	Inter-organizations coordination The humanitarian organizations don't have a specific plan to trigger the complementary relationships with other humanitarian organizations while the governmental organizations have a joint governmental plan that includes the role and responsibilities of each ministry. The humanitarian organizations exchange human resources and expertise with other humanitarian organizations through partnerships and benefit from others' expertise to develop their services while the governmental organizations do not exchange human resources and expertise with others, however they regularly conduct meetings and they benefit from others' expertise to develop their services.
	Coordination between Governmental and non-governmental organizations There are clear roles and responsibilities between the humanitarian and governmental organizations where they are engaged in joint meetings including during emergencies in the coordination and emergency structure. The coordination between the governmental and humanitarian organizations positively impacts the efficiency of their work. Both also considered the relationship between them complementary; **however**, the governmental organization said there are some gaps in terms of the quick response of the humanitarian organizations to activate the status of emergency and respond. Both the humanitarian and governmental officials are aware of the importance of coordination between each other and how to make use of it.	
Level of Coordination	The communication between the humanitarian and governmental organizations effectively impacted the success of coordination; this was clear in the response to emergencies. The level of information exchange between the governmental and humanitarian organizations achieves the aspired goal; however, according to the governmental organization, there is a time difference in the response provided by the humanitarian organizations that may lead to duplication in services provided. There is a joint and effective cooperation between the governmental and humanitarian organizations The current level of coordination between the governmental and humanitarian organizations decreases the time and efforts and achieves the aspired goal to some extent and this was witnessed during May escalation and COVID-19 response.	The interviewed governmental organization said that the interventions conducted by humanitarian organizations are not identified in consultation with the related ministry according to priorities and clarified that the ministry share information on their way forward, their needs and resources but not all the organizations reach out and consult with the ministry which led to disruption. However, the interviewed humanitarian organizations said their interventions are identified in consultation with the related ministry. The interviewed governmental organization said that updated information on the needs of IDPs are shared on a matrix that NGOs have access to. However, one of the interviewed organizations confirmed that while the other said that they didn't receive update information on IDPS.

Tools of Coordination	Periodic meetings and joint workshops are conducted and the plans and programs are shared with other stakeholders. The organizations' joint goals and objectives are also discussed and agreed upon with other stakeholders. Both organizations are involved in coordination meetings and have either focal points or are part of different coordination mechanisms like the cluster system or the governmental emergency committee at the government level. To learn from others' experiences and experiments, the interviewed humanitarian organizations exchange visits **however** the governmental organization said they conduct an assessment after each emergency and conduct simulations/drills to enhance their capacities. Assessments' information is shared with the relevant coordination groups in a timely manner and in a format that can be readily used by other humanitarian agencies; a matrix was also made available by the governmental organization to NGOs partners. There is a clear commitment by the humanitarian and governmental organizations to commitment within strategies/policies or other ways; including the governmental manual specifying the roles and responsibilities and the humanitarian coordination structure. **However,** one of the humanitarian organizations said that commitment is not stated within their policies and strategies. The governmental and humanitarian organizations have different ways sharing their competencies and areas of work; the governmental organization focused on the reporting during emergencies to reflect resources, needs and gaps while the humanitarian organizations in general are encouraging collaboration and partnerships and are engaged in the cluster system in which the governmental organizations are also involved. Both organizations share information and coordinate with different stakeholders through the cluster system or using the governmental manual at the government level.	
Humanitarian Interventions	The governmental and humanitarian organizations plan to respond to emergencies in different ways; the humanitarian organizations have emergency and contingency plans while the governmental have reference frame, standards and pre-formed committees Both organizations collect indicators that an emergency may occur through continuous follow up and having sector specific indicators. Both organizations seek the support of external experts when planning to emergencies. Preventive measures are taken before an emergency occurs; guidance is also provided by the government to the national and international organizations Scenarios and simulations/drills are conducted for effective response and gaps are identified and addressed. Both organizations participate in coordination bodies and collaborate to ensure assistance has reached the communities without duplication resulted All stakeholders are included when planning for emergencies and information is shared with them To harmonize the responses provided, coordination mechanisms are put in place including meetings, information sharing and database (at the governmental level).	

Findings

1. Coordination is an essential component of the humanitarian and governmental organizations' work that positively impact the efficiency of their interventions
2. For effective response, both humanitarian and governmental organizations coordinate and partner with each other and with relevant stakeholders including governmental and non-governmental organizations.
3. The relationship between the humanitarian and governmental organizations is complementary and is maintained within their work of and not necessarily stated in specific plans.
4. The roles and responsibilities of the governmental and humanitarian organizations are clear and explained through coordination mechanisms.
5. The governmental organizations developed platforms to share information with all stakeholders in order to facilitate the provision of response.
6. The governmental organizations identified some gaps in the response to May 2021 escalation that are represented in the delayed response time and the declaration of emergency status by the humanitarian organizations; there was a delay in the opening of emergency shelters and in the provision of services.
7. Governmental organizations share the needed information on their capacities and resources with other stakeholder to encourage collaboration and ensure effective coordination and response
8. The cluster system under the umbrella of OCHA is an effective coordination platform involving both humanitarian and governmental organizations.
9. Humanitarian organizations develop their own contingency and emergency plans to respond to emergencies.
10. The governmental organizations involve all the related stakeholders and their resources in their emergency plans
11. The coordination between the humanitarian and governmental organizations achieved its goals to some extent.
12. The updated information on the IDPS of May 2021 escalation was made available by the MoSD however it didn't reach all stakeholders.
13. Different tools of coordination are being used by both governmental and humanitarian organizations including periodic meetings, joint workshops, information exchange, plans and programs sharing, visits exchange, drills and simulations and the involvement in governmental and non-governmental (international) coordination structures.
14. The level of coordination in response to May 2021 escalation was proved good however more improvements are required for effective interventions and response.

Recommendations

1. The humanitarian organizations to respond to the emergency in a quicker way as any delay in the response, even if the scale of the emergency is small, would cause negative impact.
2. The time difference in service provision to be tackled; as by the time a list of affected people is shared with an organization and them starting to respond, a gap occurs

where a duplication in services or deprivation of timely assistance to people can happen.

3. The activation of the IDPs working group under the Inter-Cluster Coordination Group to improve the response to IDPs.
4. To widely disseminate and encourage the access of the humanitarian organizations to the database of MoSD where all information required exists.
5. Humanitarian organizations to accelerate response to make use of their resources available.
6. Improve the coordination and collaboration between the governmental and humanitarian organizations to the greatest extent possible for further effective response.

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Annexes:

Study Tool

1. Nature of Coordination between organizations

1. Governmental Organizations

   Inter-governmental coordination
   Does the ministry coordinate with other ministries?
   What are the coordination tools used?
   Are the staff aware of the importance of coordination among themselves?
   Does the ministry have a special coordination committee to coordinate with other ministries?
   Has the ministry developed a plan to trigger complementary relationships with other ministries?
   Do the Staff have the experience to coordinate with other ministries?
   Does the ministry exchange human resources and expertise with other ministries?
   Does the ministry exchange information and data with other ministries about their programs and services?
   Are there joint action plans between the ministry and other ministries?
   The ministry benefits from the expertise of other ministries to develop its services?

2. Inter humanitarian organizations coordination

   Does the organization coordinate with other humanitarian organizations?
   What are the coordination tools used?
   Are the staff aware of the importance of coordination among themselves?
   Does the organization have a special coordination committee to coordinate with other humanitarian organizations?
   Has the organization developed a plan to trigger complementary relationships with other humanitarian organizations?
   Do the Staff have the experience to coordinate with other humanitarian organizations?
   Does the organization exchange human resources and expertise with other humanitarian organizations?
   Does the organization exchange information and data with other ministries about their programs and services?

Are there joint action plans between the organization and other NGOs?
The organization benefit from the expertise of NGOs to develop its services?
Coordination between Governmental and non-governmental organizations (NGOs, INGOs, UN and local organizations)
Is there a MoU between the organization and the related ministry?
Are there periodical meetings between the organization and the related ministry?
Does the coordination between the organization and the government positively impact the efficiency of the organization work?
The relationship between the organization and the government is considered complementary?
Is there a clarity of roles and responsibilities each party have to do?
Are the governmental officials aware of the importance of coordination with the humanitarian organization and how to make use of it?

2. Level of Coordination

Communication between the governmental and humanitarian organizations has an effective impact on the success of coordination?

The level of information exchange between the governmental and humanitarian organizations achieves the aspired goal?

There is a joint and effective cooperation between the governmental and humanitarian organizations?

The current level of coordination between the governmental and humanitarian organizations decreases the time and efforts?

The current level of coordination between the governmental and humanitarian organizations achieves the aspired goal to some extent?

Are the interventions conducted by humanitarian organizations identified in consultation with the related ministry (according to priorities)?

The governmental organizations provide updated information on the needs of IDPs?

3. Coordination Tools:

Coordination is conducted through periodic meetings between concerned stakeholders?

Do you have a coordination committee to coordinate with other bodies?

The teams are involved in the coordination meetings?

Do you have joint goals and objectives agreed upon with other stakeholders?

Do you depend on written communication to coordinate with other stakeholders?

Do you share your plans and programs with other stakeholders?

Do you exchange visits to learn from others experiences and experiments?

Do you organize joint workshops with other stakeholders?

How is information about the organization's competences, resources, and areas and sectors of work shared with others responding to the crisis?

How do programme plans include measures to regularly share information and coordinate activities with other national and international stakeholders?

The organization policies and strategies include a clear commitment to coordination and collaboration with others, including national and local authorities without compromising humanitarian principles?

Do you share assessment information with the relevant coordination groups in a timely manner and in a format that can be readily used by other humanitarian agencies?

4. Humanitarian Interventions:

Do you have prior planning to respond to emergencies?
Do you collect indicators that an emergency may occur?
Do you seek support of external experts when planning for emergencies?
Do you have preventive measures at your organization before the emergency occurs?
Do you have scenarios for effective response?
How does programming coordinate with other actors (NGOs, government agencies, etc.) and take their programmes into account when designing, planning and implementing programmes?
Are gaps in response identified and addressed?
The organization participates in relevant coordination bodies and collaborates with others in order to minimize demands on communities and maximize the coverage and service provision of the wider humanitarian effort.
How are activities that directly involve people and communities harmonized with those of other actors who work with the same populations?

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Research article

REMOTE SENSING AND GIS ASSESSMENT OF DOMESTIC FUEL ENERGY SUPPLY: A THREAT TO GLOBAL DRR CRUSADE IN SOUTH-WESTERN NIGERIA

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Abstract: Nigeria that is crown the giant of Africa is acclaimed to have one of the world's highest economic growth rates, averaging 7.4% by the World Bank report, yet her over 80 million people (42.4%) are currently living below the poverty line. Instead of eradicating poverty by the year 2030 according to the UN SDG in Nigeria, about 7 people are entering poverty every minute. The average kerosene price per litre in Nigeria is ₦284.03 and the price of cooking gas per 25kg is ₦4000. Charcoal and fuel wood therefore becomes the only alternative domestic power source. In fact, Nigeria currently ranks second to Brazil in the production of charcoal and currently exports 380,000 metric tonnes of charcoal annually. This study uses secondary data and remote sensing GIS to analyse the trends of poverty, charcoal and fuel wood production in the country and the loss of vegetal cover in the western region of the country. The result reveals that there is positive correlation between poverty, fuel wood, charcoal and loss of vegetal cover, and this implies that Disaster Risk Reduction(DRR) programmes must be intertwine with poverty reduction.

Keywords: Charcoal, DRR, GIS, Fuel wood, Land Cover, Poverty.

1. Introduction

The level of community vulnerability in Africa, and Nigeria in particular is high, while resilience that refers to the ability of people to cope with and withstand new, changing or unexpected events or situations is very low comparatively due to failed state (GTZ 2002, 2003). Poverty in its multiple dimensions has a strong influence on people's vulnerability to disaster,

and vice versa ,and because of the complex relationship between poverty and vulnerability, disasters typically worsen the poverty situation of these groups, as well as their vulnerability to future risk. It has been reported that more than 20 million people in Sub-Saharan Africa are vulnerable to one disaster or the other due to different levels of environmental degradation. The United Nations (2016) confirmed that Yemen, Somalia, South Sudan and Nigeria top the list of countries where over 20 million people facing the threat of starvation and famine are found. Nigeria in particular may be facing its largest humanitarian crisis as poverty aggravates in the land and well over 2 million persons internally displaced are confronted with extreme hunger. Separate reports from the Central Bank of Nigeria (CBN, 2017), African Development Bank (AFDB, 2017) and World Bank (WB 2017) consistently agree that most of the vulnerable to poverty are in northern Nigeria.

According to Oyedepo et al (2018) referencing Insight Nigeria, (2014), the absolute measure of poverty puts the poor in Nigeria at 99.284 million (60.9%); and the dollar per day measure puts it at 99.75 million (61.2%); while the subjective measure of poverty rating puts it at 153.08 million (93.9%). Ahiuma-Young (2016) quoting the National Bureau of Statistics (NBS), states that about 160 million Nigerians (76.19%) of the country's total population of 2100million live in poverty as global poor hits one billion mark In these cases, the poverty trap can be described as a downward spiral, ending in a hopeless situation for the affected people (Kwak and Smith. 2013).

The high unemployment and poverty push and the pull of both national and international demand for cheep domestic energy (charcoal and fuel wood) is the driver of excessive exploitation of forest resources for income generation and other traditional fuel at the expense of local community health and sustainable development. The charcoal production process have been observed to be a major cause of environmental health hazards, depletion of community based resources, and deforestation that is aggravating the current climate change and its effects (Fawehinmi and Oyerinde, 2002).This study therefore seeks to examine poverty level, charcoal production and environmental degradation as affect sustainable development and disaster risk reduction in the South-Western Nigeria.

The key objectives of the study are: to examine the level of poverty generally in Nigeria, the relationship between poverty and environmental disaster, the accessibility of alternative domestic power supply and charcoal production activities south-western part of Nigeria as it relate to DRR and sustainable development.

1.1 Review of Literature

Poor countries are much at risk of disasters and the consequences of natural hazard than the other wealthier nations of the world. Poverty erodes society's self-help capabilities in preventing extreme natural occurrences from turning into a human disaster (Eschborn, 2005). Rapid population growth and societal poverty often led to the overexploitations of natural resources that exacerbate the vulnerable of those settlements, and the poor knowledge of natural hazard identification also prevent such community from taking sufficient precautionary measures for their safety. Disaster vulnerability has everything to do with poverty and development, and vice versa (Wolfensohn and Cherpitel, 2002). Disasters triggered by natural events often raise poverty rates in the affected regions and thereby erode achieved development progress, as illustrated in Figure1.

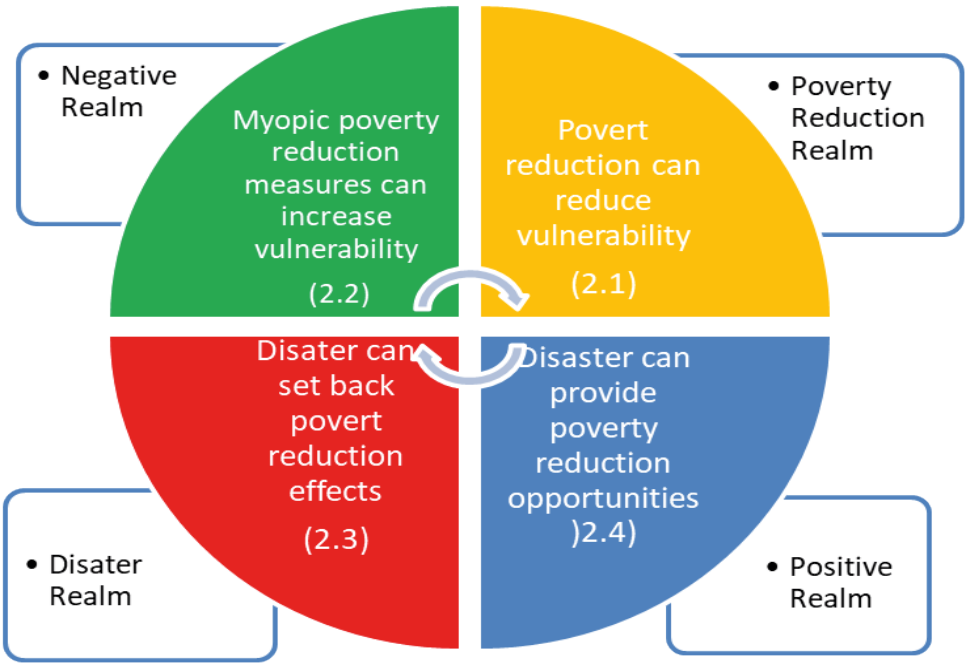

Figure 1. The relationship between poverty and vulnerability to disasters.
Source: After: UNDP 1994,, 10.

When it comes to poverty discuss statistically, over 50% of the world population (about three billion people) are living on less than $2.50 a day. Although Nigeria has one of the world's highest economic growth rates of about 7.4% according to the World Bank report (2014, 2016), over72.4% of the population (160 million Nigerians) currently live below the poverty line. From every indication including the current COVID 19 pandemic challenges, the poverty level may get worse than the global projection for 2030 or 2050 (Homi and Meagan 2021).According to the World Bank standards, living in extreme poverty mean living on less than $1.90 (₦684) per day. The first item of the 2015 UN Sustainable Development Goals is "to eradicate extreme poverty for all people everywhere by 2030". However to achieve this globally, researchers have projected that 90 people need to leave poverty line every minute to eradicate poverty totally by 2030; and for Africa, 57 people have to leave every minute; while for Nigeria, 12 people have to leave per minute (Guardian Editorial Board, 2021).Debt was an increasing problem across all income groups of African countries prior to COVID-19, and the pandemic has only exacerbated the problem. In fact, African countries had been borrowing heavily in the global financial markets in recent years. Ironically and unimaginably for Nigeria, about 7 people are entering extreme poverty every minute. Although Nigeria's poverty profile for 2021 has not yet been released, it is estimated that the number of poor people will increase to 90 million, or 45% of the population, in 2022. If the World Bank's income poverty threshold of $3.20 per day is used, Nigeria's poverty rate is 71% (Chris et al, 2021).

Poverty in Nigeria is not unconnected to the nation's population that is growing faster than its economy, and by 2050, according to the UN, Nigeria will be third most populous country in the world after India and China. In fact, the 2021 budget is to run on deficit, and to be funded by much borrowing in addition to the existing foreign national debts according to President Mohammad Buhari (Oladeinde, 2020). More so, the country's dwindling oil revenue due to the global oil market recession affected nation's GDP negatively leading to more rate of unemployment in the country. The high level of corruption has also helped in plunging millions people in the country into worse poverty as the able bodies are now engaging in criminal acts, while others are busy ravaging the forest resources within their domain

for charcoal production. Charcoal that consisting of carbon is produced by the slow process of heating wood and other substances in the absence of oxygen, called Pyrolysis. Charcoal production is best with hardwood species; therefore, the bulk of charcoal wood is harvested from primary and in some cases secondary forest (Brandley, 1991).

Charcoal, though an old source of energy is still much a source of energy for cooking in both rural and urban centres. Charcoal in addition, is now an export commodity in the world including Nigeria, with a large market in the EU, USA and Asia as prices range from $170 -$300/ton depending on the packaging. Tropical Africa accounts for 70% of the exports and the market is all year round with a slight drop between July and September, (Omoakin et al, 2015). In fact, the charcoal industry is a multibillion dollar global industry. According to Foraminifera (2013) quoting the Food and Agricultural Organization (FAO), over 40million metric tonnes of charcoal are consumed globally and approximately 2.4billion people rely on wood and charcoal for their daily fuel. According to the report, Nigeria currently ranks second to Brazil in the production of charcoal and that the western world particularly prefer Nigeria's charcoal which exports about 380,000 metric tonnes of charcoal annually; as the country is rich in tropical hardwood, which burns slower and hotter. The United Kingdom is one of the largest consumers of charcoal, though other countries around the world like Holland, France, Netherland, Germany Spain, Bulgaria and Denmark also consume the product in large quantity.

Studies like that of Olagunju (2006) revealed that a small team of 4-8 people can produce three pickup loads of charcoal in two weeks. In fact, South-Western Nigeria is leading in the business due to many factors that are not unconnected to the abundant rainforest coverage and poor access to a more profiting livelihood business. Indeed, the Charcoal Development Dealers Association of Nigeria (CDDAN) recently took a step towards smooth exportation of their products by commencing the process of certification through an international organisation (Ogunesan, 2017).

In an effort to banning the exportation of charcoal in Nigeria by the Federal Government on the premise that the Charcoal Dealers failed to adhere to its policy of cut-one-plant-two, the association reported their plan to maintain the afforestation status and even strive to meet international standards in the course of their trade Furthermore, according to Salami and Briege (2010), the CDDAN president had been working in collaboration with the Forestry Research Institute of Nigeria (FRIN) to plant 30 hectares of Eucalyptus and Teak trees at Ijio in Iwajowa Local Government Area and Otu in Itesiwaju Local Government council, in Oyo State. Also in their bid to further step up their ranking among the best exporters on the world map, they hosted a representative of one of the world's leading firm in forest management certification, Pacific Salmon Commission (PSC), to Nigeria.

2.Methodology

2.1. The Study area

The Western part of Nigeria c that was formed in 1967 consists of 6 states which are: Ogun, Oyo, Osun, Ondo, Ekit, and Lagos states, see figure 2. The area lies between longitude 2 31 and 6 00 East and latitude 6 21 and 8 37 N (Agboola, 1979) with a total land area of 77,818km2 and a projected population of 28,767,752 in 2002 (NPC, 1991). The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states; in the West by the Republic of Benin and in the South by the Gulf of Guinea. It has over 80 constituted Forest Reserves with a forest area cover of 793,266ha as stated in table1.

Table 1. South Western States and their Land Areas. Source (Frunbol&Lasos, 1998).

States	Total Land Area km2	No of Forest Reserves	Area of Forest Reserves (Ha)	No of Local Gov
Oyo	27,848	19	169,173	33
Ondo/Ekiti	20,451	37	329,288	17& 16
Ogun	16,086	16	195,790	20
Osun	9,491	11	92,242	30
Lagos	3,939	03	6,873	20

The largest Western state is Oyo State that is about 28,454 km2 in land mass. The western region of Nigeria is homogenous, mainly inhabited by the Yoruba ethnic group who are primarily agrarian but have a predilection for living in high-density urban centres. Ibadan had been the centre of administration of the old Western Region of Nigeria since the days of British colonial rule and agriculture is the main occupation of the people of the rural and suburban areas. The climate of the region is usually with small temperature range that is almost constant throughout the year. Some of the town records a maximum of 28 °C (82.4 °F) for its hottest month while its lowest temperature is 26 °C (78.8 °F). This region experiences heavy and abundant rainfall with convectional rainstorms due to the regions proximity, to the equatorial belt. The annual rainfall received is usually about 2,000mm (78.7 in) that is known for tropical rainforest climates worldwide that enhances abundant agricultural food and cash crops. There are a number of government farm settlements in places like Ipapo, Ilora, Eruwa, Ogbomosho, Iresaadu, Ijaiye, Akufo and Lalupon.

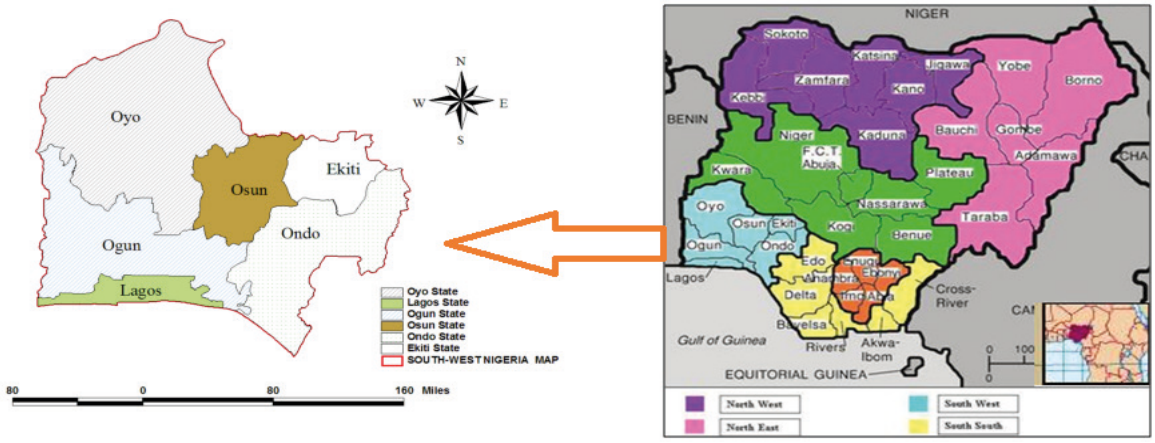

Figure 2. Location of the western states of Nigeria.
Source: Google Image.

2.2 Data sources

In assessing the impact of charcoal and fuel wood production in the country and the loss of vegetal cover in the western region of the country, the study employed the use of multi-temporal satellite images of 2000, 2005, 2010 and 2018 over the area as detailed in table 2. For the charcoal production process and species of trees, field observations was carried out in some selected villages, while oral interview was also conducted to ascertain the level of production and the associations they belong to for their marketing. Existing poverty baseline value was also used to carry out regression analysis to determine the significant influence of poverty depth on environmental degradation.

Table 2. Image properties for the years under study

Year	Path and Row	Sensor	Resolution	Date
2000	191/54	ETM^+	30m	06/02/2000
2005	191/54	ETM^+	30m	18/11/2005
2010	191/54	ETM^+	30m	18/12/2010
2018	191/54	ETM^+	30m	19/03/2018

Source: Author's compilation, 2018

On each of the images obtained, the selected Local Government Area was clipped out using the "Sub-map of raster tool" on the "operation list" of ILWIS 3.3 Academic software. Bands 4,3,2 were used to form the false colour composite for the study, and to calculate the Normalized Difference Vegetation Index (NDVI) of the area, the near infrared band (band 3) and the visible band (band 4) were used to perform this task. NDVI calculation of an area ranges from minus one (-1) to plus one (+1) with 0 representing an approximate value of no vegetation. Values closer to +1 (0.8 - 0.9) shows a significant level of vegetation or possible density of green leaves. This study uses the NDVI formula on ILWIS 3.3 Academic software (NDVI = (NIR - RED) / (NIR+ RED)).

3.Results

3.1 Charcoal Production process

In each of the production centres, harvested logs of trees are covered with grasses/leaves and thereafter, the leaves are covered with earth. The leaves/grasses serve as a lagging material between the logs of wood and the earth covering the entire setup. While covering, a small portion of the heap is left uncovered on any side of the entire setup for the introduction of fire. After lighting the opening is covered and tiny holes are created in various parts of the heap so as to enable the inflow of oxygen for combustion as revealed in figure 3 a,b,c,d. This thermal degradation of biomass results in formation of products of incomplete combustion (PIC) such as CH4, CO2 alkanes, alkenes, oxygenated compound and particulate matter.

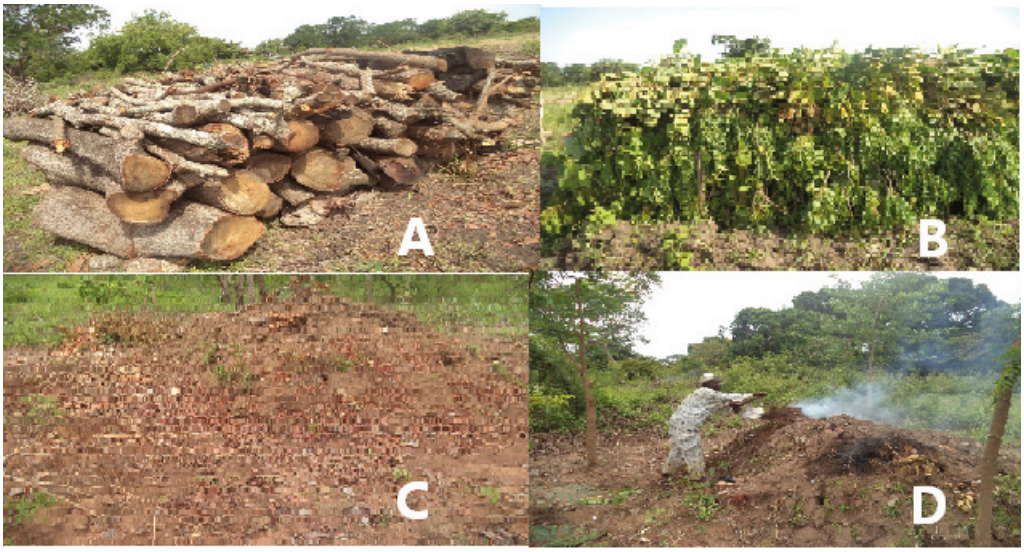

Figure 3. Local charcoal production processes in south-western Nigeria.
Source: Adapted from Omoakin et al., (2015).

Table 3 reveals the survey result of some selected villages that are dominated by the charcoal producers who are also members of the larger charcoal business association.

Table 3: Charcoal production in selected villages of south western Nigeria

S/N	Bags per week	Production	%
1	20-Jan	36	73.6
2	21 – 40	6	12.2
3	41 – 60	5	10.2
4	61 – 80	2	4
	Total	49	100

Source: Field survey

3.2. Effect of Poverty Level and Charcoal Production on Environmental Degradation

In assessing the significant influence of poverty depth on the environmental degradation, the variables that had significant co-efficient are the quantity of wood collected, knowledge of environmental conservation and size of farm land. The analysis revealed that the coefficients of the quantity of wood collected is 0.0404 with ($P<0.01$) significant, meaning that an increase in the quantity of wood collected would result to a proportionate increase in the poverty depth of the farmers by 4.04%. Going by the already established monthly absolute poverty line of $7.3 (₦2,627) for the study area, the study observed that about 42% of the farming households were poor. This agrees with previous expectation that the indiscriminate felling of trees makes the farmlands prone to degradation. This finding is in conformity with the findings of Okwi *et. al* (2006) and that of Lal and Okigbo (1990) that deforestation and fuel wood is a major source of human induced environmental degradation, accounting for nearly 15% of the total land degradation in Africa.

3.3. GIS analysis of deforestation impacts on land cover in the area between 2000 and 2018

The land cover change analysis for the year 2000, 2005, 2015 and 2018 is as shown in figure 4 and table 4 respectively which reveals that there is a decrease in secondary vegetation in 2005, with a land area of 770.46 km2 as against the 927.35km2 recorded in 2000. A decline of 31.38 km2 was recorded annually in the land area of secondary vegetation between 2000 and 2005. The decline in disturbed vegetation resulted in an increase in the land area of undisturbed vegetation with a magnitude of change of 132.67 km2 and an annual frequency of change of 26.54km2

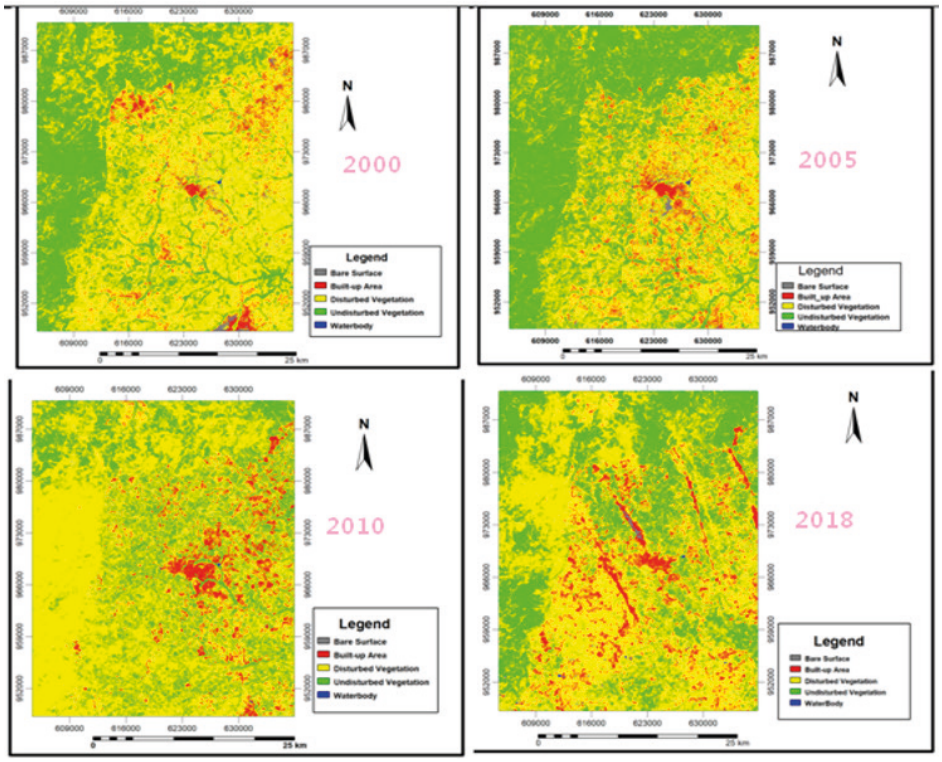

Figure 4: Land Cover of Olorunsogo in 2000, 2005, 2010, and 2018. Source: Author, 2019

Table 4: Spatial Changes in Land cover between 2000 and 2005. Source: Author, 2018.

Land cover	2000 (KM^2)	2005 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up	65.25	91.03	28.78	5.76	44.11
Bare Surface	15.08	13.64	-1.44	-0.29	-9.55
Sec..Vegetation	927.35	770.46	-156.89	-31.38	-16.92
Pri.Vegetation	380.22	512.89	132.67	26.54	34.89
Water Body	0.38	0.26	-0.12	-0.02	- 31.57
Total	1388.28	1388.28	3.0	0.65	20.96

It can also be deduced that land reclamation is not uncommon in this area as physical developments progresses and this has resulted in a decline in the areas coverage of water bodies.

Table 5: Spatial Changes in Land cover between 2005 and 2010.Source: Author, 2018.

Land cover	2005 (KM^2)	2010 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up areas	91.03	102.46	11.43	2.29	12.57
Bare Surface	13.64	2.78	-10.86	-2.17	-79.62
Disturbed Veg.	770.46	1042.02	271.56	35.25	35.25
Undisturbed Veg.	512.89	240.72	-272.17	-54.44	-53.07
Water Body	0.26	0.29	0.03	0.006	11.54
Total	1388.28	1388.28	-0.01	-19.06	-73.33

In table 5, a total of 271.56 km^2vegetal covers were lost between 2005 and 2010 with an annual decline of 35.25Km^2 within the period. The increase in the land area of secondary veg-

etation between 2005 and 2010 can be attributed to anthropogenic activities in the local government area which include deforestation for charcoal production, fuel wood, and lumbering for physical development. The land area of undisturbed primary vegetation also declined due to the anthropogenic activities in the area between 2005 and 2010. A total of 54.44km^2 of the primary vegetation were lost annually in the area, with a magnitude of change of -272.17km^2.

Table 6: Spatial Changes in Land cover between 2010 and 2018.

Land cover	2010 (KM^2)	2018 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up	102.46	119.25	16.79	2.10	16.39
Bare Surface	2.78	4.10	1.32	0.17	47.48
Disturbed Veg.	1042.02	1058.83	16.81	2.10	1.61
Undisturbed Veg.	240.72	205.15	-35.57	-4.45	-14.78
Water Body	0.29	0.94	0.65	0.08	224.14
Total	1388.28	1388.28			

Source: Author, 2018.

Between 2010 and 2018 in table 6, an increase in anthropogenic activities, population growth and quest for space for physical development can be attributed to the increase in bare surface degraded lands. The bare surfaces/ degraded lands increased to 1.32km^2. A further increase was observed for secondary vegetation area; with an annual increase of 2.10km^2 between 2010 and 2018. Between 2010 and 2018, a total land area of 4.45km^2 was lost to anthropogenic activities (charcoal and fuel wood) annually in the study area. The analysis of the NDVI of the LGA was carried out for the year 2000, 2005, 2010 and 2018 is as depicted in figure 5 to further reveal the impact of deforestation in the area.

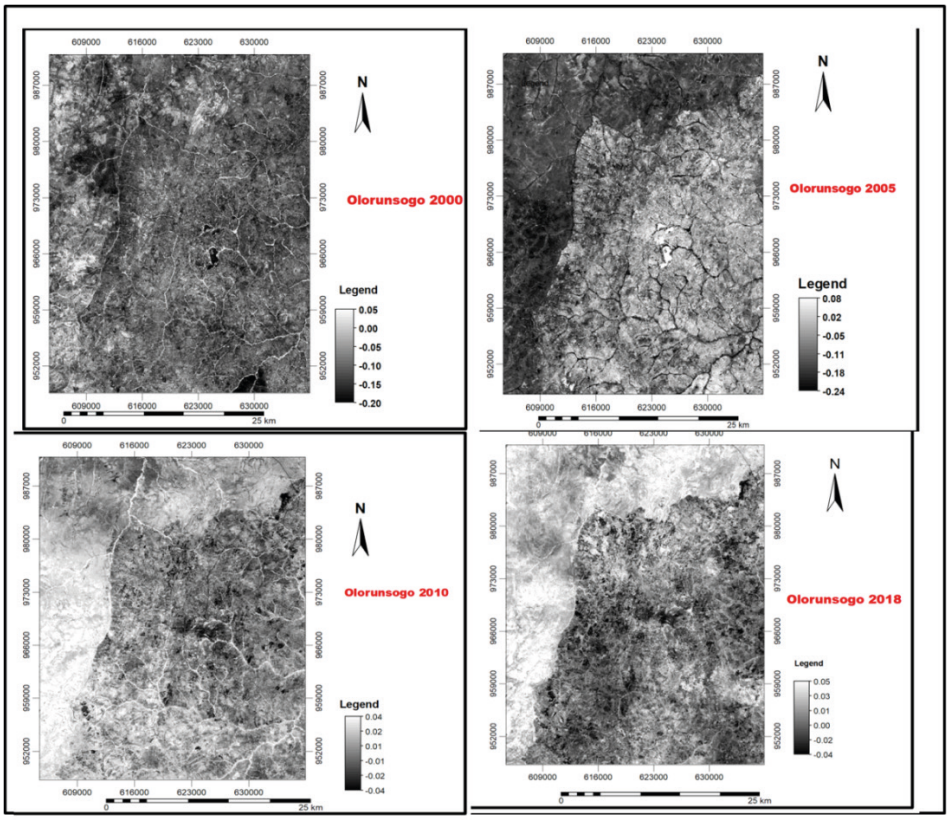

Figure 5: NDVI for Olorunsogo in 2000, 2005, 2010 and 2018. Source: Author's 2019.

In the year 2000, the NDVI result range from – 0.58 to + 0.35. The analysis revealed that the unhealthy vegetated surfaces range from - 0.58 to - 0.01, while the vegetated surfaces range from + 0.01 to + 0.35. This result shows that a substantial level of greenness was observed in the area. The 2000 image analysis also revealed that 16.61Km^2 of the area are without vegetation, but a slight change was however recorded in 2005. The value of the NDVI within this period (2005) range from - 0.44 to + 0.33, the value of the unhealthy vegetated area range from - 0.44 to - 0.01 while the value of the vegetated area range from +0.01 to +0.33. The increase in the anthropogenic activities (bush burning, deforestation for fuel wood and charcoal) also translated into the increase in the areas with no vegetation. A total of 34.68km^2 of the area are without vegetation in the year 2005. The NDVI value for the year 2010 range from - 0.13 to + 0.01, this result shows a decrease in green vegetation. The NDVI of 2010 recorded a value of - 0.13 to - 0.01 for unhealthy vegetation, while the vegetated area ranges from +0.01 to + 0.07. A drastic increase in the areas of non vegetation was recorded within this period as the non-vegetated area increased from 34.68Km^2 in 2005 to 263.53Km^2 in 2010. These results show that these LGAs are fast losing their lush vegetation due to consistent increase of anthropogenic activities. Although, the non-vegetated area declined slightly with a land area of 194.79Km^2 in 2018, the lushness is still not substantial. The analysis revealed that the vegetated area range from + 0.01 to + 0.08 while the unhealthy Vegetation range from - 0.14 to 0.01. The NDVI value of -0.14 to +0.08 was recorded in 2018.

4. Discussions

In Nigeria and sub Sahara Africa, poverty is the bane of environmental degradation and domestic energy policy formation that price kerosene and cooking gas beyond the common man affordability aggravate the demand for and sales of fuel wood in the urban centres. Poverty constrained options often induce the poor to deplete resources at rates that are incompatible with long term sustainability (Holden *et. al.,* 2004). Studies revealed that a percentage increase in the knowledge of environmental conservation has the tendency of decreasing poverty by 46% among the farmers. It has also been argued that, the high proportion of the ill informed local communities on the adoption of appropriate land management technologies and the poor coordination of extension services in the country is the major challenge (Maiangwa *et al*. 2007). Also in the work of Lacaux, et al., (1994), charcoal kiln emission ratio of CO, CH4, NMHC, and NH3 to CO2 are larger than those from savannah bush burning because CO, CH4, NMHC have much higher global warming potential than CO2. In term of migration from fuel wood and charcoal to Cooking Gas utilization in the country, Nigeria is among the most backward. Although, world's top ten countries in terms of natural gas proven reserves, over 180 trillion cubic feet ((NNPC 2015, World Energy Review 2015), world's top five exporters of liquefied natural gas (LNG) and a major supplier to the West African Gas Pipeline (WAPCo) (Pesaran, Shin, and Smith, 2001.). With the commissioning of the West Africa Gas Pipeline (WAGP) in 2011, the country is yet to fully utilize the Global Gas Flaring Reduction Partnership (GGFR). (Onolemhemhen et al, 2017). The however commenced exportation of gas to neighbouring Ghana with plans to extend delivery to Benin and Togo as well (Delano, 2014), yet the domestic gas utilization in the country is far below average. The major challenging issue is the affordability of the product where the average price for the refilling a 12.5kg cylinder for Liquefied Petroleum Gas (Cooking Gas) is about $18.25 (₦7500). Apart from petrol (PMS) for vehicles, Kerosene is the most widely used in the country for lighting and cooking in both rural and urban areas. Kerosene is often seen as poor man's fuel but ironically in the Nigeria, is the most priced atUSD0.973 EUR0.838 $0.86 (₦4000.00) per litre (National Household Kerosene Price Watch, 2018). This situation has forced millions of

Nigerians into the use of fuel wood and charcoal as substitute. This of cause is detrimental to sustainable environment.

4.1 The prospect of DRR in Nigeria

Globally, there is growing realisation that countries and communities need to place more emphasis on a holistic approach to Disaster Risk Reduction (DRR) as against DRM. DRR approaches should generally involve; risk assessment, risk reduction, early warning and disaster preparedness if and only-if the socioeconomic and environmental costs of disasters will be effectively reduced. Disaster risk can be calculated as the interaction between the probability of a 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 elements that formulate disaster risk for a community are expressed in the following risk equation:

$$\text{Risk} = \frac{\text{Hazard x Vulnerability}}{\text{Capacity}}$$

Risk: The probability of a disaster occurring.

Hazard: A potentially damaging physical event, phenomenon or human activity which may lead to a disaster.

Vulnerability: A set of conditions and processes (physical, social, economic and environmental) that increase the susceptibility of a community to the impact of hazards.

Capacity : A combination of all the strengths and resources available within a community that can reduce the level of risk or the effects of a disaster.

Risk perception in rural areas of Nigeria is relatively low and this is not unconnected to the poor socioeconomic characteristics of the people. The poor infrastructural facilities and low economic generating activities exacerbated the proneness of the communities to poverty related environmental hazards. Fuel wood and Charcoal production in the South-Western parts of Nigeria increases because there is a total neglect of cash crops like Cocoa, Coffee Cola-nut and rubber tree. The rural famers and the able bodies who are not gainfully employed engaged in illegal lumbering and Charcoal business as a way of self-employment as also observed in the work of Otu-Danquah, (2010).

5.Conclusion

Environmental degradation and disasters intertwine with community poverty and deprivations in all its forms. The gains of any community or national development are usually eroded by the impacts of poverty and disaster occurrences and that is the feature of most Sub Saharan countries like Nigeria where access to domestic energy supply is beyond the reach of the common populace. The need for sustainable development and its allied programmes like Green Development, Green Infrastructure, Green Financing, Clean Air Act, Resilient City, Smart City and DRR are the key issues raised in the just concluded COP26 at Glasgow. Leaders of developing countries of the world and particularly Nigeria cannot but reprioritize their environmental policy implementation with more inclusiveness in the adoption of Strategic Environmental Analysis (SEA) if SDG and COP26 goals will not be a mirage to them.

5.Recommendations

International organizations and researchers have established the fact that poverty reduction and development initiatives must be integrated into DRR for sustainable development. The primary mission of the UNDP is to assist developing countries in poverty reduction through variety of initiatives and structures. The following are some of the recommendation for this part of Nigeria and other African countries:

- There is an urgent need for strong advocacy drive for every community to embrace agro-forestry. The State Government in conjunction with the local authority should come up with simple inclusive rules and regulations governing the use of existing natural forests resources. This will ensure a systematic harvest and or felling of forest resources.
- There is the need to introduce environmental aid programme with political-will that will abate environmental degradation and accelerate economic growth. This will promote environmental-friendly development among the rural poor.
- Grassroots education and awareness raising on the potential risks inherent in deforestation and motivation for changes in collective behaviour to reduce risks;
- There should be practical understanding and taking action to mitigate socioeconomic conditions that create the vulnerability of those communities;
- Develop disaster preparedness plans that cover both emergency management and recovery from potential disaster in the region with hazard monitoring systems and early warning indicators.

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Research article

THE COMPLACENCY OF FLOOD VICTIMS, SOCIO ECONOMIC FACTORS, AND EFFECTS AND VULNERABILITIES OF FLOODS IN LOWER KANO PLAINS, KISUMU COUNTY, KENYA

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Abstract: The behavior and thinking of disaster victims should be analyzed and understood even as experts continue to deescalate the destructive effects of such occurrences. Why people choose to live and reside in ecologically fragile environments like flood plains or steep slopes prone to mudslides or avalanches is a complex phenomenon that social scientists need to demystify. This study was conducted in the Nyando sub-catchment, Kano Plains in Kisumu County, Kenya. The study's objectives were to understand the reason for complacency of flood victims and to determine the effects and vulnerabilities of flood events in Kano Plains. Both qualitative and quantitative methodologies were used. Stratified sampling technique was used to select the three flood prone areas in Kano, namely, Nyando, Miwani and Lower Nyakach as study sites. Simple random sampling technique was used to select 100 households for the survey while Purposive sampling was used to select the key informants. Methods of data collection were; questionnaires, key informant interviews, focus group discussions (FGDs) and desk reviews. Descriptive statistics was used to analyze the questionnaires, and the qualitative data from key informants was analyzed using content analysis method. FGDs recordings were transcribed and analyzed thematically using NVIVO software. The main research findings were that socio economic factors such as household income, household size and culture play an important role in determining the choice of site to reside, thus the complacency, and that loss of farmland (17.98%), houses and property (69.66%) were considered the most serious effects of floods. The study therefore concludes that socio economic determinants such as household income, household size and type of housing have a significant role in determining household vulnerability to floods.

Keywords: Community Vulnerability; Complacency; Differential Vulnerability; Flood Risk; Flood Effects.

1. Introduction

Current disasters are becoming more complex and climate change presents a greater chance for even worse impacts (Aalst and Burton, 2002). Aalst and Burton, 2002, further realize that degradation of the natural environment has often been mentioned as a natural hazard risk factor, although little has been done in terms of policy formations to tackle the challenge. Urama and Ozor (2010) noted that sub-Saharan Africa has often reported cases of floods, and this has been mainly due to climate change, which has led to the loss of lives and property worth billions of dollars, the main reason for this being poor planning for such incidences. Kenya has had serious floods and drought disasters throughout the nation causing major destructions and even causing deaths in some instances. Natural occurrences including flash rainfall, river floods and coastal floods often lead to serious hazards (National Environment Management Authority, 2004). Certain incidences of floods sometimes are a result of human induced factors such as deforestation, interference with watersheds and areas prone to floods. For instance, floods have as well occurred along some basins having average rainfall as a result of excess runoff triggered through human activities such as land clearance for cultivation, settlement and general degradation.

1.1. Statement of the Problem

Since floods have been a frequent occurrence in Nyando river basin, this has substantially caused degradation in the area. Nyando River passes through Kano Plains and traverses a wide area of the lower Kano Plains, which is prone to frequent flooding. Such floods normally cause psychosocial problems, poses danger to health, disrupts settlements and infrastructure, causes food insecurity due to losses on farms, and a general malaise of the population, as a result hindering any type of development of this high potential Kano Plains (Opere, 2013). Vella (2012) states that in 2009, 1126 people (206 households) lost their houses and an additional 3,000 people were affected in various ways by the floods, schools were destroyed and subsequently closed, diseases associated with floods such as cholera breakout was recorded and about 2,000 farmers' crops got washed off in Kano Plains. A major cause of floods in River Nyando is due to bursting of the banks as a result of the river overflowing (Olang and Furst, 2011). This is a frequent occurrence in the long and short seasons of rain. The upstream of river Nyando are in Kericho and Nandi Counties which experience high precipitation annually; it is this rain which results in most serious floods in the basin (Olang and Furst, 2011). Also contributing to the floods are the flat topography, deforestation and black cotton soils within the watersheds that prevent rapid infiltration, which increase surface runoff (Onyango *et al*., 2005). The problem is aggravated through gulley erosion and poor land-use practices (Onyango *et al*., 2005).

1.2. Floods as a Hazard

One of the most overwhelming and frequently occurring natural hazards globally is flooding. Due to the damages it leaves behind, flooding remains a significant topic in the world today. Damages caused by this hydrological hazard ranges from socio-economic damages to loss of lives and properties (Komolafe *et al*, 2015). Between 1995 and 2015, The United Nations Office for Disaster Risk Reduction (UNISDR) and the Belgian-based Centre for Research on Epidemiology of Disasters (CRED) stated flooding had the highest percentage of natural disasters by disaster type with 3062 occurrences (43%). This report revealed further that in the past two decades, there have been 157,000 deaths from floods globally. The report

also says that 3062 flood disasters affected 2.3 billion people all over the world between 1995 and 2015, accounting for 56% of all those affected by weather-related disasters (Floodlist, 2016). Likewise, 290 flood-disasters were reported in Africa, with 23 million people affected and 8,183 dead; this also caused economic losses of $1.9 billion between 1996 to 2005 (Musungu and Motala 2012). There is a rise in global awareness for mitigation measures to flood damage due to the observed escalation in magnitude, frequency, and intensity of flood events worldwide (Hall *et al*., 2014). Most of these efforts have focused on quantitative methods of flood mitigation. However, this study employed a participatory approach to flood mitigation by engaging the local community in this research.

1.3. Complacency of Floods Victims

Aside from communities living in floodplains being pre disposed to the risk of floods due to geophysical factors, behaviour such as apathy in community based disaster preparedness activities during normal times when nothing happens exacerbates risk, Okayo 2015. In addition, other socioeconomic factors such as poverty, overpopulation, level of education, gender, poor land-use practices, culture and absence of flood mitigation mechanisms also heighten the vulnerability of populations to floods. For instance, women are forbidden from owning land in some cultures and this prevents them from making important decisions on issues regarding land (Nethengwe, 2007). A study by Speis *et al.,* 2019 found out that the 2017 floods in Attica region, Greece, has shown both short and long term psychosocial impact on the residents. Findings showed that residents had anxiety, depression, and post-traumatic stress from the floods, indicating that the exposure to these flood related impacts led to poor mental health, low level of income and lack of social support from their family members. Opportunities for effective integrated flood management should enable the government to realize that vulnerability is heightened by several physical factors such as; the degree of protection from flood hazards, the quality of available infrastructure, the level of access to relevant resources, and the capacity to avoid, withstand or recover from flood hazards. Many affected people are neither aware of some coping strategies used elsewhere, Flood Mitigation Strategy (2009).

2. Materials and Methods

This section covers the research design, study area, sampling procedure, sample size, research instruments and data analysis.

Research Design

This study adopted a descriptive research design, which involves describing the characteristics of a phenomenon and collection of information through interviewing or the administration of questionnaires to a selected sample size. Descriptive design is useful for extensive research, and is not only convenient for fast data collection but also ensures a high level of confidentiality. Descriptive design was chosen because it helped in the collection of data from the respondents spread across the study area. The study used the procedure of Rea and Parker, due to its ability to bring out issues important for development and management of human resources and their expectations.

Study Area

This research was carried out in the Kano Plains in Kisumu County, Kenya (Figure 1). The study focused on three sites in Kano plains, namely Nyando, Miwani and Lower Nyakach. Kisumu County is bordered by Nandi County and Nandi Hills to the North, Kericho County

to the East, and Homa Bay County to the South, and Nyabondo Escarpment to the South-East (NEMA, 2004; LBDA, 1992; Republic of Kenya, 2001). Kano Plains is located between longitudes 43^0 and 35^0 50' E and latitudes 1^0 30'N and latitude 0^0 and 05'S (NEMA, 2004). The Nyando basin has various land use characteristics, largely influenced by rainfall patterns and socio-cultural practices (Olang and Fürst, 2011). Main soil type in the area comprises vertisols, which is used to grow sugarcane, rice and cotton. However, there is a significant reduction in total cotton production and per hectare (WMO and UNEP, 2004). The floodplain has minimal rainfall, with mean annual rainfall ranging between 800 mm and 1200 mm. However, the northern and southern parts of the basin experience more than 1600 mm respectively. Most of the rainfall is experienced in the north in Nandi Hills, and this gradually reduces towards the south eastern side (WMO and UNEP, 2004). A peculiar characteristic of Nyando floodplains are the frequent floods aggravated by human activities due to the growing human population (Olang and Fürst, 2011). The rapidly expanding number of people in the basin is the main reason behind the majority of the land cover dynamics (Olang and Fürst, 2011). The upper catchment is mainly thick forests (e.g., Tinderet Forest), whereas the middle catchment has, scattered trees and grass, as a result of clearing, cultivation and burning due to human settlement (Opere, 2013).

The study area is captured in Fig. 1 below:

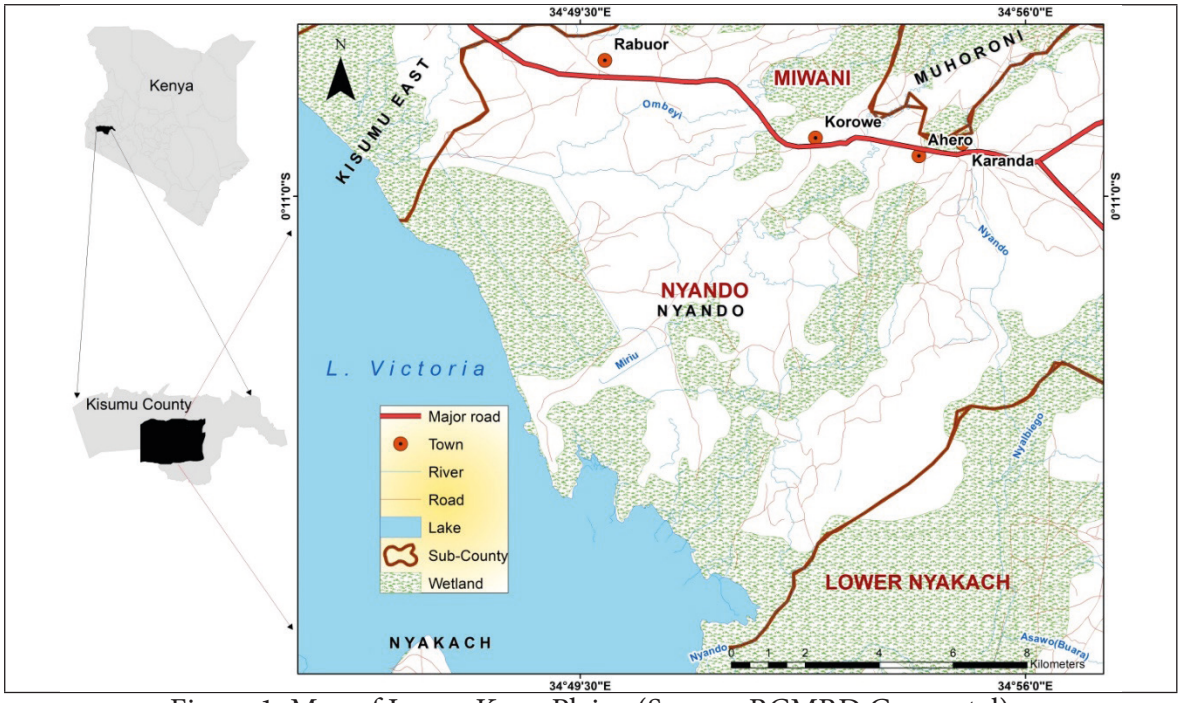

Figure 1. Map of Lower Kano Plains (Source; RCMRD Geoportal)

Sampling Procedures and Sample Size

The research was carried out in the three sub locations namely; Nyando, Miwani and Lower Nyakach. According to Kenya National Bureau of Statistics, KNBS 2019 census, the study area had 305,799 households (N). Stratified sampling technique was employed in this study to select the three study sites. Simple random sampling technique was used to select the 100 households from the strata that participated in the study; while purposive sampling technique was used to select the key informants. The sample size was calculated from a total of 305,799 households in the three study sites, using formula by Yamane, 1967.

Where;

$$n = \frac{N}{[1+N\,(e)^2]}$$

n= Sample size

N= population size

e= margin of error

The formula is useful in places with known populations; and the sample size obtained was:

Population size (N) = 305,799 Margin of error (e) = 10%

N = 305,799/1+305,799 (0.1)2

n = 99.95

n = approximately 100 respondents which were proportionately distributed in accordance to the individual populations in each of the three study divisions.

The distribution of the respondents is as per Table 1.

Table 1: Sample Size Distribution in the three Study Sites

Sub Location	Sample size	Population	Percentage (%)
Miwani Sub Location	**30**	**90,873**	29.71
Nyando Sub Location	**53**	**161,508**	52.82
Lower Nyakach Sub Location	**17**	**53,418**	17.47
Total	100	305,799	100.00

Source: Adapted from KNBS (KPHC 2019).

2.1 Research Instruments

The research instruments used for data collection in this study were; questionnaires, key informant interviews, focus groups discussions (FGDs) and desktop reviews.

2.2 Data Analysis

Quantitative data collected using questionnaires was cleaned, verified, and entered into the SPSS software for analysis. Data was analysed using descriptive statistics, and this was done as per the study objectives, to show relationship between socio-economic factors and their influence on floods management in Nyando. The results were summarized and presented in tables, pie charts, and graphs. In addition, SPSS was used for Chi-square ($\chi 2$) test which is one of the most useful non-parametric tests, also called a distribution free test for testing hypotheses when the variables are nominal (Pearson, 1900).

3. Results and Discussions

This section presents the analysed data of the research's finding including the demographic characteristics of the sampled respondents. In addition, the section presents and discusses

the results based on the main objective of the study, the socio economic determinants of community vulnerability to floods and the effects and vulnerabilities of floods.

Socio Economic Determinants of Community Vulnerability

Issues that were considered under this section included; Gender, Education, Marital status of the respondents, Size of household and Dependency ratio, Level of income, the Influence of households' proximity to River Nyando, and the Vulnerability of types of housing to flooding. These issues were considered to be some of the factors important for vulnerability assessment.

Gender of the Respondents

It has been widely acknowledged that men and women are affected differently by disasters due to the differences that exist in their social relations. From the study, it was established that 50.56% of the respondents agreed that women were most affected by floods than men while 46.06% saying men were the most affected gender. However, contrary to the findings of Odeyemi and Peter (2018), the study found the contribution of gender to be differential vulnerability small, this is because it was established that in most households, both gender was affected by floods in similar ways. Losses that occurred affected both gender almost in equal measure as gender roles in the modern days cross-cut and therefore both gender were likely to be affected equally.

Level of Education of the Respondents

The study established that the level of education attained by the respondents were as summarized in Table 2. The education level of the respondents was pertinent in the study since it showed various community members' knowledge on the potential flood hazards and the level of awareness on their vulnerability to flooding in Kano plain. It also helped in determining the push and pull factors for residing in the flood plain and their knowledge in the coping strategies to the flooding.

Table 1: Level of Education of the Respondents.

Education Level	Frequency (n=91)	Percentage (%)	Frequency affected (n=89)	% Affected
Secondary	47	51.65	46	51.69
Primary	37	40.66	37	41.57
Tertiary/College/University	6	6.59	5	5.62
No formal Education	1	1.10	1	1.12
Total	**91**	**100.00**	**89**	**100.00**

Source, Author, 2022

98.90% of the respondents had formal education (Table 2), indicating a high level of formal education among the residents in the study area. However, of these 98.90%, 89 respondents, were still affected by floods. The findings here contradicting those of Odeyemi and Peter (2018) that acknowledged education to be an indicator of cultural capital that gives a prediction of potential vulnerability to disasters, thereby increasing uptake of precaution.

Marital Status of the Respondents

Concerning marital status of the respondents, the results given in Table 3 were found.

Table 3: Marital Status of the Respondents

Marital status	Frequency (n=91)	Percentage (%)	Frequency (n=89)	% Affected by floods
Married	70	76.92	68	76.40
Widowed	15	16.48	15	16.85
Single	4	4.40	4	4.49
Divorced	2	2.20	2	2.25
Total	91	100.00	89	**99.99**

Source: Author, 2022

Table 3 indicates that (81.32%) of the respondents were married, 12.09% were widowed, while 4.40% were single, and 2.20% were divorced. Nethengwe (2007) acknowledges family and social resources as valuable indicators of flood vulnerability. Social networks can provide avenues of support and assistance during disasters. The tendency of households most affected by floods lying with the widowed, single and divorced (Table 3) the findings correlating with Yamano and Jayne (2002) research that found that households headed by 2 people are better placed to cope with floods than those headed by single heads.

Size of Household and Dependency Ratio

It was crucial to know the households' size; since this influenced their effort to generate income which dictated their economic power. Results are captured in Figure 2.

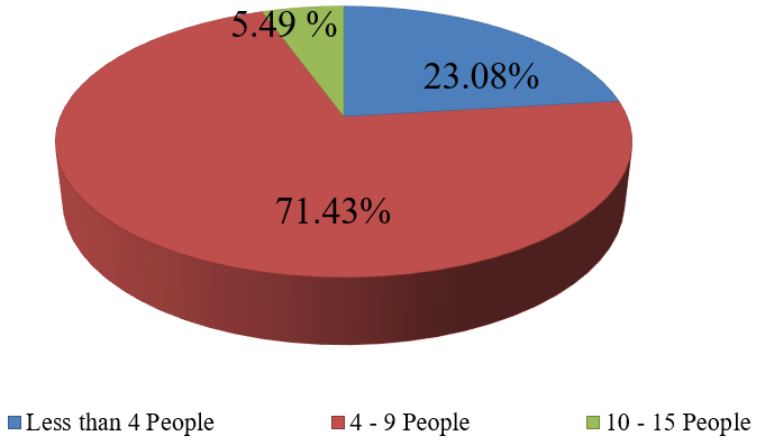

Figure 2. Size of Household (Source: Author, 2022)

Figure 2 revealed that 23.08%, 71.43% and 5.49% of the respondent were members of household size of less than 4 people, 4 - 9 people, and 10 - 15 people respectively. These findings gave insight on the possible vulnerability of the households that included the number of children to take care of, and senior citizens in case of any floods events. Similar to the work of Odeyemi and Peter 2018, the findings meant that households in the study area were more vulnerable to floods, due to their large number of dependents.

Level of income of the Respondents

The level of income of the respondents was as given in Figure 3. The level of income was found to be an important factor in preventing or reducing effects of disasters such as floods. People may continue living in disaster prone areas because they may lack the ability to move to safer places. Therefore, understanding the income levels of the respondents was important in understanding the resilience level of the population.

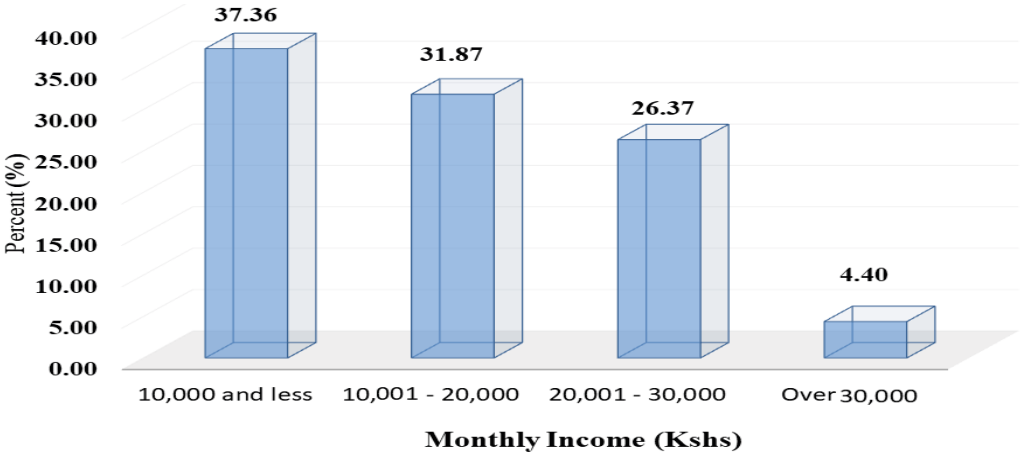

Figure 3. Respondents' Monthly Income (Source: Author, 2022)

Figure 3 shows that 37.36% of the respondents earned Kshs. 10,000 and less, followed by 31.87% who earned Kshs. 10,001 - 20,000, while 26.37% earned Kshs. 20,001 - 30,000, and only 4.40% of the households earned above Kshs. 30,000. The findings indicated that a majority (69.23%) living in the Kano flood plain earned a monthly income of less than Ksh. 20,000. This may mean that their level of financial capacity to cope with flood events is low, thus high vulnerability and risk. These findings concur with the study by Raburu and Okeyo-Owuor (2005), who found out that low economic status of the riparian communities had increased their demand for wetland resources, where they overexploited the resources therein including using it for livestock and crop farming, thus exacerbating their vulnerability. SERA Project (2002), similarly found a correlation between household resources and flood vulnerability to be that coping with and recovery from flood impacts demand resources that can cushion the household from negative flood impacts.

Households' proximity to River Nyando

The study sought to determine the households' proximity to River Nyando, as this could result in the severity of effects of floods in the Kano Plains. The distances were obtained from satellite images of scale 1:10,000 of the study area. A two-way contingency table (Table 4) was conducted to evaluate whether households' proximity was associated with livelihoods affected by floods in Kano plain. The proximity to river Nyando had six levels (Less than 100 Meters, 101 - 300 Meters, 301 - 500 Meters, 501 - 700 Meters, 701 - 900 Meters and more than 900 Meters) whereas livelihoods affected by floods had two levels (yes and no).

Table 4. Households' proximity to River Nyando vs Livelihoods affected by Floods

Yes No			Livelihood affected by floods		Total
Respondent distance from the River	Less than 100 Meters	Count	7	0	7
		Expected Count	6.8	.2	7.0
		% within Respondent distance to the River	100.0%	0.0%	100.0%
	101 - 300 Meters	Count	28	2	30
		Expected Count	29.3	.7	30.0
		% within Respondent distance to the River	93.3%	6.7%	100.0%
	301 - 500 Meters	Count	32	0	32
		Expected Count	31.3	.7	32.0
		% within Respondent distance to the River	100.0%	0.0%	100.0%
	501 - 700 Meters	Count	17	0	17
		Expected Count	16.6	.4	17.0
		% within Respondent distance to the River	100.0%	0.0%	100.0%
	701 - 900 Meters	Count	2	0	2
		Expected Count	2.0	.0	2.0
		% within Respondent distance to the River	100.0%	0.0%	100.0%
	More than 900 Meters	Count	1	0	1
		Expected Count	1.0	.0	1.0
		% within Respondent distance to the River	100.0%	0.0%	100.0%
Total		Count	87	2	89
		Expected Count	87.0	2.0	89.0
		% within Respondent distance to the River	97.8%	2.2%	100.0%

Table 4 shows that 75.82% of the respondents lived within 500 metres of River Nyando. Only 24.18% of the respondents lived beyond 500 metres of the river. 97.8% had experienced floods. These findings are vital because they reveal the level of vulnerability and risk of the households to the effects of flooding. This settlement pattern agrees with a study by Masese *et al.* (2016) who established that some residents risked by living close to the river simply because floods provided rich alluvial fertile soil for their crops, plenty of fish, water for domestic use and irrigation, and relief from NGOs, government and other stakeholders.

The Influence of Types of Housing to Floods Vulnerability

The nature and structure of housing determines, to some extent, their level of vulnerability and/or resilience to the effects of floods. The housing structure also gave an indication on the households' economic status. Table 5 and 6 shows the types of housing and the ownership status by the respondents respectively.

Table 5. Types of housing owned by the Respondents in Kano Plains

Type of housing	Frequency (n=91)	Percentage (%)
Permanent house	17	18.68
Temporary house	74	81.32
Total	**91**	**100.00**

(Source: Author, 2022)

Table 6. Housing status owned by the Respondents in Kano Plains. (Source: Author, 2022)

Housing status	Frequency (n=91)	Percentage (%)
Owned house	87	95.60
Rented house	4	4.40
Total	**91**	**100.00**

Table 5 shows that 81.32% of houses in the study area were temporary. The permanent houses were only 18.68%, and out of that, 95.60% of the houses were owned by the respondents, and only 4.40% were being rented (Table 6). The temporary houses were houses with walls of mud, while the permanent houses were constructed with stones and/or bricks. This finding implies that a majority of respondents' houses were temporary, and therefore bound to heighten vulnerability in the event of a flood occurrence. This is because the materials used would not be able to withstand the destructive force of floods; and this finding is similar to a study by Nyakundi *et al.* (2010), who found housing quality index an important indicator of flood vulnerability.

Housing Structures to Floods Vulnerability Descriptive Analysis

A three-way contingency table (Table 7) was conducted to evaluate whether households' structures was associated to livelihoods affected by floods in Kano plain.

Table 7. Housing Structures to Floods Vulnerability Contingency in Kano Plains

Average monthly income in Kenyan shillings Yes No				Livelihood affected by floods		Total
10,000 and Less Shillings	House structure	Permanent	Count	2	1	3
			Expected Count	2.9	.1	3.0
			% within House structure	66.7%	33.3%	100.0%
		Temporary	Count	27	0	27
			Expected Count	26.1	.9	27.0
			% within House structure	100.0%	0.0%	100.0%
	Total		Count	29	1	30
	Expected Count		29.0	1.0	30.0	
	% within House structure		96.7%	3.3%	100.0%	

10,001 - 20,000 Shillings	House structure	Permanent	Count	4	0	4
			Expected Count	3.9	.1	4.0
			% within House structure	100.0%	0.0%	100.0%
		Temporary	Count	24	1	25
			Expected Count	24.1	.9	25.0
			% within House structure	96.0%	4.0%	100.0%
	Total		Count	28	1	29
	Expected Count		28.0	1.0	29.0	
	% within House structure		96.6%	3.4%	100.0%	
20,001 - 30,000 Shillings	House structure	Permanent	Count	8		8
			Expected Count	8.0		8.0
			% within House structure	100.0%		100.0%
		Temporary	Count	16		16
			Expected Count	16.0		16.0
			% within House structure	100.0%		100.0%
	Total		Count	24		24
	Expected Count		24.0		24.0	
	% within House structure		100.0%		100.0%	
Over 30,000 Shillings	House structure	Temporary	Count	4		4
			Expected Count	4.0		4.0
			% within House structure	100.0%		100.0%
	Total		Count	4		4
	Expected Count		4.0		4.0	
	% within House structure		100.0%		100.0%	
Total	House structure	Permanent	Count	14	1	15
			Expected Count	14.7	.3	15.0
			% within House structure	93.3%	6.7%	100.0%
		Temporary	Count	71	1	72
			Expected Count	70.3	1.7	72.0
			% within House structure	98.6%	1.4%	100.0%
	Total		Count	85	2	87
	Expected Count		85.0	2.0	87.0	
	% within House structure		97.7%	2.3%	100.0%	

Table 7 indicates, 72 (82.76%) of Kano plains residents lived in temporary houses of which 27(37.50%) and 24(33.33%) had experienced floods and had Less than 10,000 Shillings and between 20,000 to 30,000 Shillings as their monthly income respectively.

Table 8. Housing Structures to Floods Vulnerability Inferential Statistics

Average monthly income in Kenyan shillings		Value	Df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Less than 10,000 Shillings	Pearson Chi-Square	9.310[c]	1	.002		
	Continuity Correction[b]	1.839	1	.175		
	Likelihood Ratio	4.950	1	.026		
	Fisher's Exact Test				.100	.100
	N of Valid Cases	30				

10,001 - 20,000 Shillings	Pearson Chi-Square	.166[d]	1	.684		
	Continuity Correction[b]	.000	1	1.000		
	Likelihood Ratio	.302	1	.582		
	Fisher's Exact Test				1.000	.862
	N of Valid Cases	29				
20,001 - 30,000 Shillings	Pearson Chi-Square	.[e]				
	N of Valid Cases	24				
Over 30,000 Shillings	Pearson Chi-Square	.[f]				
	N of Valid Cases	4				
Total	Pearson Chi-Square	1.540[a]	1	.215		
	Continuity Correction[b]	.086	1	.769		
	Likelihood Ratio	1.157	1	.282		
	Fisher's Exact Test				.317	.317
	N of Valid Cases	87				
a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.						
b. Computed only for a 2x2 table						
c. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .10.						
d. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .14.						
e. No statistics are computed because Livelihood affected by floods is a constant.						
f. No statistics are computed because House structure and Livelihood affected by floods are constants.						

The group who had a monthly income of less than 10,000 showed statistical association of the two variables (Housing structures and livelihoods affected) was confirmed by Likelihood ratio, p=0.026, due to the assumption that all the cells should have expected the counts to be equal to or greater than five, as depicted in Table 8, which shows that 3 cells (75.0%) have expected a count of less than 5. The minimum counts expected should be 0.10. There was a partially significant association between households' housing structures and livelihoods affected by floods in Kano plain; c2 (1, N=87) = 9.310c, P=.002.

The Chi-square is a significant statistic, and should be followed with a strength statistic. To measure the association between categorical variables that include more than two levels, Cramér (1946) recommended the following statistic, commonly referred to as Cramér's V or Cramér's phi: φC = square root of (χ 2 / N(L – 1)). The study found out that phi and Cramer's V registered a partial significance of P=0.002, which implies that the null hypothesis is rejected, and affirming that there was a partial significant association between house structures and livelihoods affected by floods in Kano plains, specifically among those earning less than 10,000 shillings per month. The findings here correlate with the study by Okayo *et al.* 2015 who found low income households chose precautionary measures reflecting limited financial reserves while medium to high income households preferred coping strategies that increase their financial reserves, consequently shielding them from flood related losses.

Effects and Vulnerability of Floods in Flood risk areas of Kano plains

The study found out that 97.80% of respondents had experienced flooding in Kano plains, with only 2.20% who had not been affected by floods. On the effects and vulnerability to floods, the study considered properties destroyed, such as houses, crops, livestock businesses, deaths from flooding, and effects on water sources and infrastructure such as roads.

Properties Destroyed during the Floods

Respondents were asked about what household properties were damaged or destroyed by floods during the flood incidences. Their responses were as summarized in Table 9.

Table 9. Property of the respondents destroyed by floods in Kano Plains. Source: Author, 2022.

Property Affected/Destroyed	Frequency (f=89)	Percentage (%)
House and household properties	62	69.66
Farm Land/crops	16	17.98
Loss/injury on livestock	6	6.74
Shop/Business properties	3	3.37
Loss/injury on human life	2	2.25
Total	**89**	**100.00**

(Note: n=89 because the 2 (2.20%) of respondents admit to have not experienced foods and had no property destroyed).

It is evident from the results in Table 9 that (69.66%) of the respondents lost or got their houses and household properties destroyed, while 17.98% lost farm land/crops. Those with loss/injury on livestock were 6.74%, those whose shops/business properties were destroyed were 3.37%, and loss/injury of human life was 2.25%. These findings correspond with that of Keller (2001), who noted that flood impacts include damages caused by flooding and those caused by the disruption and malfunctioning of services and systems associated with flooding. Primary effects of floods include injury and loss of life, damages caused by floods to homes, communication networks and buildings, while secondary impacts include short-term turbidity of the river, hunger, disease, and displacement of people from their homes. One respondent from Kanyagwal village in Nyando sub-County said during a key informant interview when asked about the effects of floods:

"In Nyando, floods wash away our farmlands, thus resulting to food losses and hunger as well as our socio economic livelihood, since this is an area where we practice horticulture highly. There is need to harvest this storm water for economic empowerment especially since this area has a high potential for horticulture. Floods also destroy our farmlands and cause loss of human and animals' lives as well as destruction to homes. They disrupt daily living, education and hinder livelihoods" (KII 13th May 2019).

In Miwani sub-location, where the people's main socio-economic activities were growing of sugarcane and rice plantations, the respondents said that floods washed off their crops and caused major setbacks financially and rendered them food insecure.

The respondents were also asked to quantify their losses in the most recent flood event, and their estimates were as given in Table 10

Table 10. Quantity of property of the respondents destroyed by floods in Kano Plains. Source: Author, 2022

Quantity of losses (Ksh)	Frequency (f=89)	Percentage (%)
10,000 and less	18	20.23
10,001 – 20,000	16	17.98
20,001 – 30,000	26	29.21
Over 30,000	29	32.58
Total	**89**	**100.00**

Results in Table 10 show that 32.58% of the respondents lost properties of over Kshs 30,000, followed by 29.21% that lost property between Kshs 20,001 - 30,000, then 20.23% lost Kshs 10,000 and less, and 17.98% lost between Kshs 10,001 - 20,000. This finding implied that the losses incurred rendered households more vulnerable to flooding, and this agrees with

the findings by Masese *et al.* (2016), who found that populations were more vulnerable to flood events as a result of significant losses incurred.

Effects of Floods on Homesteads and Infrastructure

The study found out that some of the effects of floods on homesteads and infrastructure in the study area were as shown in Plate 1 and Plate 2.

Plate 1: Destruction of a house due to effects of flood in Magina (Source: Author May, 2019)

Plate 2: Effects of flood on roads in Magina (Source: Author May, 2019)

From the transect walk, a number of roads and social amenities like schools and hospitals were found damaged by floods. Residents also talked of disruption of power lines and telephone communication networks, during heavy floods. The photos were taken in May 2019 after the short season rains for ease of identification of areas prone to floods. Masese *et al* (2016), similarly reported that damage to infrastructure not only exacerbates impact of flood disasters, but also creates problems in the evacuations of the affected population. Kabir and Hossen, 2019, records that in Bangladesh, a third of the country is vulnerable to flooding annually. They note that, flooding in the country impacts infrastructure like the roads leaving the country with impassable road network. They also note that flooding collapses the mud-houses in the rural areas leaving 32% of the residents homeless. Another damage caused by flooding, according to their study, is the effects to other infrastructures like electric power lines and other public amenities, leaving the residents exposed to avoidable calamities.

1.1.1. Effects of Floods on Water Sources and Energy for Cooking

The study found out that the effects of floods to water sources and cooking energy were as shown in Table 11.

Table 11. Respondents' sources of water and energy for cooking in Kano Plains. Source: Field survey, 2019

Water/Energy	**Frequency (n=91)**	**Percentage (%)**
River	81	89.01
Borehole	7	7.69
Piped	2	2.20
Other	1	1.10
Total	**91**	**100.00**
Firewood	76	83.52
Charcoal	9	9.89
Kerosene	4	4.40
Gas	2	2.20
Total	**91**	**100.00**

About 89.01% of the respondents depended on River Nyando as their source of water, while 7.69% cited boreholes as their source of water and 2.20% and 1.10% cited piped water and rain water as their sources of water respectively. The findings here correlate to the results from a study by Nyakundi *et al* (2010) which discovered that most of the residents experienced shortages of clean water for domestic use during floods.

Concerning energy for cooking, firewood was mentioned by 83.52% as their main source of energy. This was followed by charcoal (9.89%), kerosene (4.40%), and finally gas (2.20%). From these findings, it is clear that the majority of the respondents depended on firewood as their source of energy, and these were obtained from the nearby bushes and shrub. Therefore, during floods, the respondents had nowhere to collect the firewood. In addition, the clearance of the bushes and shrubs predisposes the area to severe flood vulnerability, due to lack of vegetation to reduce the speed of flood water run-off. These findings agree with those by Olang and Furst (2011) that indicated deforestation in the Kano plains as contributing factor to floods vulnerability.

Effects of Floods on Sanitation

About 97.80% of the respondents used pit latrines, with only 2.20% who could afford flush toilets . This implies that a majority of the population would be affected by water-borne diseases due to poor sanitation in the event of floods. This agrees with the findings of a study by Masese *et al.* (2016), who also found out that there is often an upsurge of water borne diseases attributed to unsafe water sources and flooded sanitation facilities.

One participant from the FGD held in Lower Nyakach sub location said:

"During floods, our pit latrines are swallowed up in the water and the contents swept off by the run off and this increases the cases of diarrhea and bilharzia and livestock diseases which are hard to treat especially during these long rain seasons" (FGD 13th May 2019).

The study agrees with Echendu, 2020, study that stated that flooding affects the potential of Nigeria achieving the SDG in time as the floods increase the rate of infectious diarrhea disease, typhoid fever, poor nutritional value to the citizens and impact on clean water as the

flood water disrupts the natural purification process of water aquifers. The study also found out that flood water affects the pit latrines in Nigeria carrying the human waste to drinking points leading to individuals getting ill from drinking contaminated water.

4. Summary and Conclusion of Findings

The study found that gender was not a significant factor as the ratio of males to females affected by floods was almost similar, just as for education level of the respondents, since only 1.10% were found to have no formal education, for the former (gender), reason being modern gender roles are similar while for the later (education), the apathy in heeding precaution against floods being overreliance on aid from government and other well-wishers. It was established that income plays an important role in response to floods with a likelihood ratio of p=0.026. There was high dependency ratio in the study area with 71.43% households having between 4 - 9 members. Both the young and old were equally affected by floods. It was also established that houses headed by single parents were hard hit during floods.

On effects and vulnerability of floods, the study found out that 97.80% of the respondents had been affected by flooding and from the affected group, 69.66% lost or got their houses and household properties destroyed, other losses were farm land/crops destroyed, loss/injury on livestock, destroyed shops/business properties and loss/injury of human life. 89.01% of the respondents depended on River Nyando for their source of water, with 7.69% depending on boreholes, 2.20% piped water and 1.10% rainwater. Firewood was the main source of cooking energy (83.52%), followed by charcoal (8.89%). 97.80% of the respondents used pit latrines with only 2.20% who could afford flush toilets. As far as the type of housing for the respondents was concerned, 81.32% were temporary, and only 18.68% were permanent and this presented a potential vulnerability to floods. The study also found that 75.82% of the respondents lived within 500 meters of River Nyando, which represented a high risk and vulnerability during floods.

From the study, it can be concluded that;

1) Flooding causes death, psychosocial problems, economic losses and infrastructural damages.

2) Flooding worsens the economic status of a community, as it destroys their livelihood like farming and businesses.

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Research article

SEISMIC VULNERABILITY ASSESSMENT OF EXISTING BUILDINGS BY RAPID VISUAL SCREENING METHOD: A STUDY ON WARD 27 IN DHAKA SOUTH CITY CORPORATION

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Abstract: With the rapid growth of urbanization, the possibility of hazard has increased. Owing to high population concentrations and economic activities, the likelihood of hazards in urban areas is more nuanced than in rural areas. Vulnerability assessment of hazards has been a hot topic in the field of Engineering and Urban and Regional Planning. Due to the complicated hazard characteristics, not only engineering but planning approaches are required in order to effectively mitigate hazards. In recent years, the rapid growth of Dhaka cities has accelerated the pressure on existing buildings, and there is a need to establish adequate seismic safety screening methods for existing buildings specific to building typologies. Dhaka City is in danger of an earthquake and several incidents have occurred. In most situations, the lack of appropriate precautionary steps, administrative inefficiency, inadequate funds for equipment and lack of public knowledge make the situation worse. Ward 27, an old part of Dhaka City, was chosen for seismic vulnerability assessment in this survey. For seismic vulnerability assessment, a sample of 300 buildings was evaluated using Rapid visual screening (RVS) process by Federal Emergency Management Agency (FEMA). The rapid visual screening process is the initial stage in the assessment of existing buildings. The survey focuses on earthquake issues such as building type, size and shape of the plot, specific distances from surrounding structures, road width and basic building information. The use of Rapid Visual Screening (RVS) in the field of research allows screened buildings to be divided into two categories: those that are expected to have sufficient seismic efficiency and those that could be seismically unsafe and that should be further studied.

Keywords: Earthquake; Seismic Vulnerability; Rapid Visual Screening; Dhaka City.

1. Introduction

In terms of disaster risk, Bangladesh is the fifth most disaster-prone country in the world, with natural disasters striking the country almost every year on average (WEC, 2011). History of seismic events and current tremors reported in Bangladesh and nearby regions indicate that Bangladesh is at high risk of earthquakes, and that large-scale quakes will occur in the near future, according to the International Seismological Union. Three active and shoving tectonic plates, as well as a shallowly dipping mega thrust, all of which have the potential to unleash massive earthquakes, are located beneath Bangladesh's tectonic plates (Apu & Das, 2020; Steckler et al., 2016). The country of Bangladesh has been devastated by five earthquakes with magnitudes greater than 7.0 on the Richter scale in the last 150 years (Shaw et. al., 2013). Factors like population growth, migration, and the expansion of economic activities in metropolitan areas have all been suggested as factors that are contributing to the rise in earthquake risk (GoB, 2015). In addition to earthquakes, Bangladesh is prone to structural collapse, as evidenced by the deaths and injuries caused by the collapses of Old Dhaka (2004), the Spectrum (2005), and Rana Plaza (2013). There is no way to predict what would happen if there is a major earthquake or structural collapse in this country (Alamet.al., 2008).

It marks 400 years since the founding of Dhaka city, which has progressed without the benefit of a master plan, with structures created on the spur of the moment. Construction of buildings on artificially sand pilings along the recent floodplains of the Buriganga, Turag, Balu, and Sitalakhya Rivers has reached a maximum number, both engineered and non-engineered (Rahman et al., 2015). Buildings were constructed without the use of an earthquake-prevention mechanism in the majority of instances (Ahmed et al., 2010). Three zones are shown on Bangladesh's seismic hazard zone map to have seismic coefficients of 0.04 g, 0.05 g, and 0.08 g, respectively, based on the data. The seismic coefficients for three different zones in Bangladesh are depicted in Figure 1. The danger level in Dhaka, which is located in the northwest of the country, is as high as 0.05 grams per kilogram of body weight (BNBC, 1993).Table 1 shows the five major faults in Bangladesh's subsurface (EMF, 2014). Seismogenic data and small-magnitude earthquake occurrences near Dhaka Megacity suggest that these faults could cause a major earthquake at some point in the future. It is critical to determine how vulnerable the Dhaka Megacity is to an upcoming earthquake (Khan, 2016).

Vulnerability assessment is a key phase in risk assessment, which translates the level of danger. The vulnerability assessment examines areas such as demographic clusters, age-specific demographics, and developmental stresses. According to the 1994 UNDP, "vulnerability depends on the degree of failure of the element at risk at a certain level of severity. It is usually an element that is at risk at a certain degree of seriousness. Generally speaking, the percentage of loss (between 0: no damage at 1: total risk) is expressed as the percentage of loss (between 0: no damage at 1: total damage) for the stated risk." The appraisal is undertaken so that populations can establish tailored interventions to minimize their exposure and their risk for failure (Sterlacchini, 2011).

With the Rapid Visual Screening (RVS) method, the author hopes to determine the seismic susceptibility of existing buildings in Dhaka. When it comes to evaluating existing structures, the rapid visual screening method is the first step. As a result of the application of Rapid Visual Screening (RVS) in the field of research, screened buildings may be separated into two categories: those that are expected to have appropriate seismic efficiency and those that may be seismically unsafe and should be further investigated.

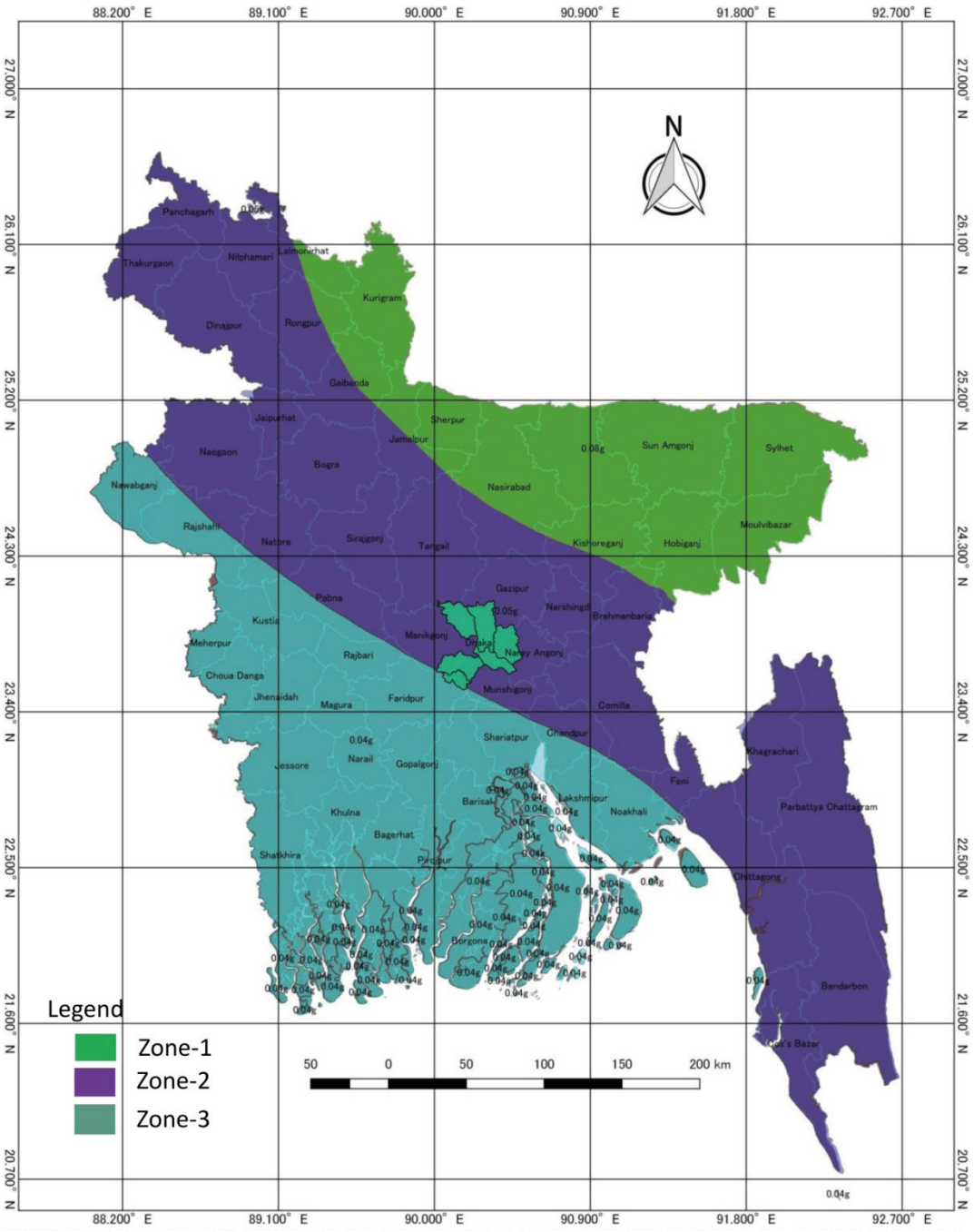


Figure 1. Zones at risk from earthquakes in Bangladesh (BNBC-1993).

Table1: Fault Line Sources and Estimated Maximum Magnitude

Source	EstimatedMaximumMagnitude
Madhupur Fault	7.5
Dauki Fault	8.0
Plate Boundary Fault 1	8.5
Plate Boundary Fault 2	8.0
Plate Boundary Fault 3	8.3

1.1 FEMA Rapid Visual Screening

FEMA has created a test system for the identification of possible seismic hazards in structures. The fast visual screening system is constructed without structural calculations. Usually on site, the inspection, data gathering and decision-making processes take place. The seismic numerical and risk screening is focused on this. The RVS system can be combined with the community planning database on GIS and can also be used for specialized tools for risk analysis. The suggestion is that a seasoned seismic architecture specialist should investigate buildings with a score less than that of the 'cut-off' score. The value of the "cut off" score and the option of the RVS type depend on the seismic zone of the region. The approach also allows for a quick and fast reassessment of the vulnerability of buildings already surveyed on the basis of the availability of new information that could become accessible in the future due to scientific or technical advances (Ballarin et al., 2017).

1.2 Seismic Vulnerability Assessment by FEMA- Rapid Visual Screening (RVS) Method

RVS method was used in this analysis to quantify the seismic susceptibility value. The mild seismicity data collection system FEMA-154, which is applicable to Bangladesh, was used. The scores are based on the projected amounts of land shaking in the district, as well as the city's or region's seismic preparation and construction activities. The "cut-off" score of 2 is used for this study, according to FEMA 154. Based on the impact on the seismic force, the potential damage to the structure can be graded in a number of ways. This information would be used to decide if a higher-level evaluation of the building is needed. In general, a score of S 0.7 implies a high degree of insecurity, necessitating further inspection and rehabilitation of the residence. The sense of the "cut off" score and the RVS style choice are determined by the earthquake zone of the city. Buildings with a score of S less than the cut-off score should be investigated by a seismic architecture specialist with expertise.

Table 2: List of Building Type Classifications

Building code	**Building description**	**Building code**	**Building description**
W1	Light wood-frame residential and commercial buildings Smaller than or equal to 5000 square feet	**C2**	concrete shear-wall buildings
W2	Light wood-frame buildings larger than 5000 square feet	**C3**	Concrete frame buildings with unreinforced masonry infill walls
S1	Steel moment-resisting frame buildings	**PC1**	Tilt-up buildings
S2	Braced steel frame buildings	**PC2**	Precast concrete frame buildings
S3	Light metal buildings	**RM1**	Reinforced masonry buildings with flexible floor and roof diaphragms

S4	Steel frame buildings with cast-in-place concrete shear walls	**RM2**	Reinforced masonry buildings with rigid floor and roof diaphragms
S5	Steel frame building with unreinforced masonry infill walls	**URM**	Unreinforced masonry bearing-wall buildings (Also made to include wattle and daub structures- building technique which utilizes a woven lattice of wood strips daubed with wet such as clay and straw.)
C1	Concrete moment-resisting frame buildings		

(FEMA P-154: Rapid Visual Screening for Potential Seismic Hazards, December 2015).

1.3. Variables of Seismic Vulnerability

Seismic building risk depends on different variables of seismic hazard, i.e. building form, number of floors, vertical irregularity, and plan irregularity. The following factors are described below:

1.3.1 Building types

In urban areas of Bangladesh, a wide range of architectural styles and building materials are used. Local materials like mud and straw, as well as semi-engineered materials like burnt brick and stone masonry and engineered materials like concrete and steel, are used. The use of building materials affects the seismic vulnerability of different building shapes. As local materials are used without engineering inputs, the volatility of a building is usually larger and the instable strength of produced materials the less.

1.3.2 Plan Irregularity and Vertical Irregularity

Irregularity of the building plan is a divergence of two dimensions from a rectangular plan. This discrepancy of the plan contributes to inconsistencies in the distribution of steadiness and weight, which in turn increases the probability of damage location under heavy ground upset. Regularity of the plan is promoted in earthquake-resistant structure (Rahman, 2014).

1.3.3 Set Back Rule

The setbacks are meant to provide illumination, ventilation, and safety to adjacent buildings as well as the projects under consideration. The setbacks are the minimum needed open space between the property's boundary and the proposed building to be constructed on the plot. A construction or a specified section of it must be set back from the Side Lot Line by a certain number. They function as traffic areas surrounding buildings in larger neighborhoods and facilitate car parking. When it comes to high-rise buildings, it is important not only to move fire tenders around the structure, but also to discourage the fire from spreading to surrounding properties. Therefore, they are perceived to be a significant planning parameter. A setback is a distance measured back from the property line and must be kept clear of every structure for the purposes of road widening, protection, air and fire control, etc. The setback needed for the upper floor extends to the entire house.

1.3.4 Soft Storey

Several modern buildings have been planned with the unusual feature of leaving the ground floor exposed for parking, i.e., the ground storey columns do not have any curtain walls separating them from one another. Open ground floor buildings, often known as soft storey buildings, are frequent names for these types of constructions. Only columns support the ground floor of this open ground floor structure, and all partition walls and columns support the top floor of this open ground floor structure. A number of open ground floor constructions have collapsed during earthquakes around the world, indicating that they are not well-suited for earthquake-prone areas. Because there are no partitions between the top and lower floors, the upper level is significantly more static than the open floor. This results in a structure where the top level moves virtually as if it were a single block, and where much of the lateral movement is confined to the soft ground floor (Jahan, 2011).

1.3.5 Short Column and Pounding Effect

A short column is one that has a slenderness ratio of 30 to 120-150 and high compression and bending. As the short columns are steeper than the large columns, they are more susceptible to seventeen 17 seismic forces, resulting in higher damage during an earthquake. Existing constructions with short columns can be repaired in various ways to avoid damage from upcoming earthquakes (Rahman, 2014).

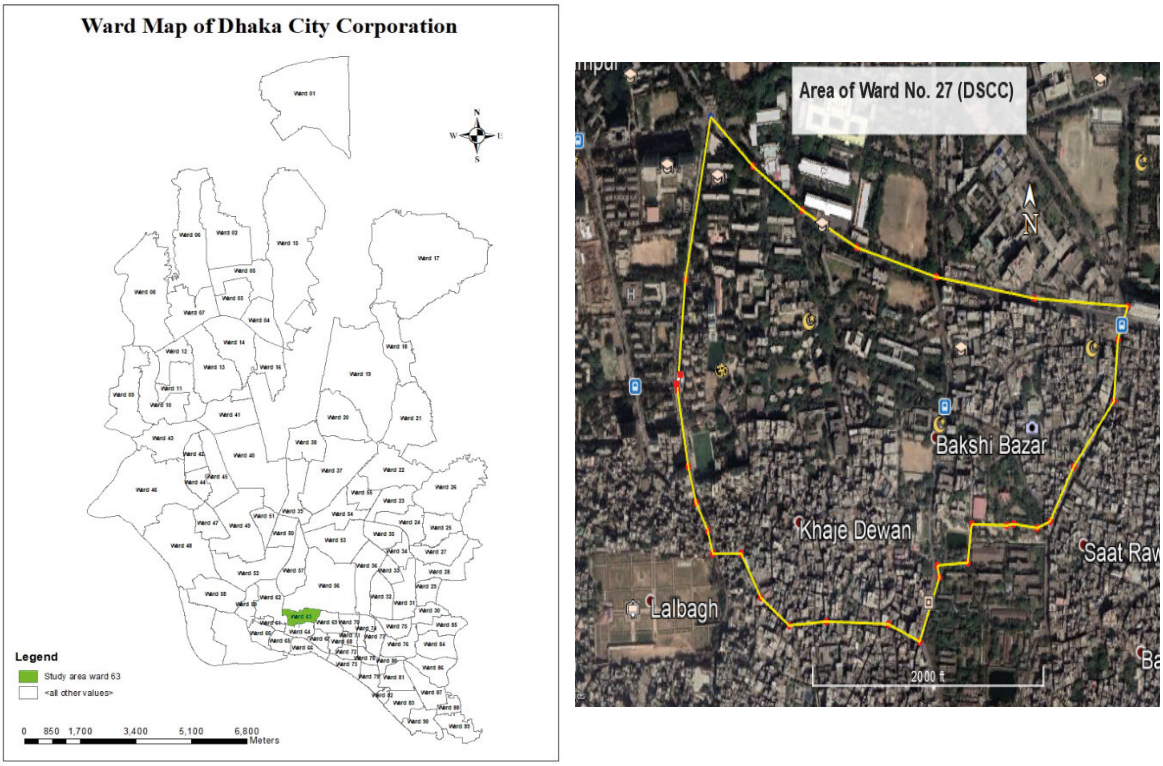


Figure 2: Location of the research area

2. Materials and Methods

2.1 Research Area Selection

Ward No. 27 (formerly ward 63) is situated in Old Dhaka on the northern side of the Buriganga River. The ward covers an area of around 107.48 hectares (Rajuk, Detailed Area Plan, 2010-2015). The ward is administered by the Dhaka South City Corporation's Lalbagh Thana (DSCC). Ward 56 is to the north, Ward 64 is to the south, Ward 69 is to the east, and Ward 62 is to the west of the research district. Lalbag Fort is located on the Ward's northern border.

2.2 Collection of Data

The study is primarily focused on primary data gathered by field survey. The secondary data has been gathered from various sources. The map of the research area has been collected from DSCC. GIS data like building shape files, highways, administrative boundaries, local facilities, etc. have been collected from RAJUK (DAP, 2015).

2.2.1 Types and Uses of Structure

The study area consists primarily of pucca structures, which are approximately 80.67 percent. The other types included Semi pucca 13.67%, katcha 4.33% and under construction are about 1.33% of all buildings. According to RAJUK (2015), about 59.63% of buildings are residential and 16% are for mixed use. The shape file shows that 62.67 percent of buildings are solely for residential use. Commercial and commercial apps account for 5% and 3% of overall applications, respectively. Public facilities, which mostly include mosques, cultural centers, and clubs, account for 4%; education and research account for 1.67 percent; and mixed use accounts for 19.67 percent.

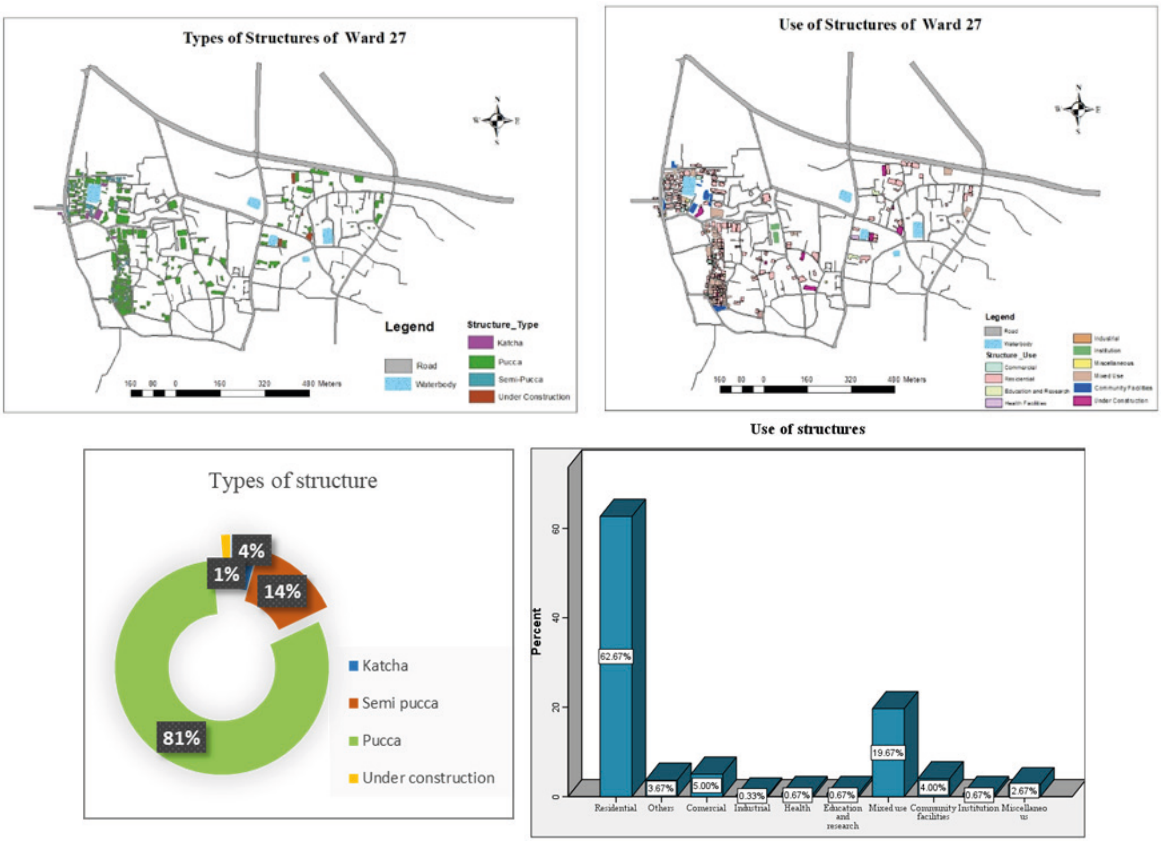


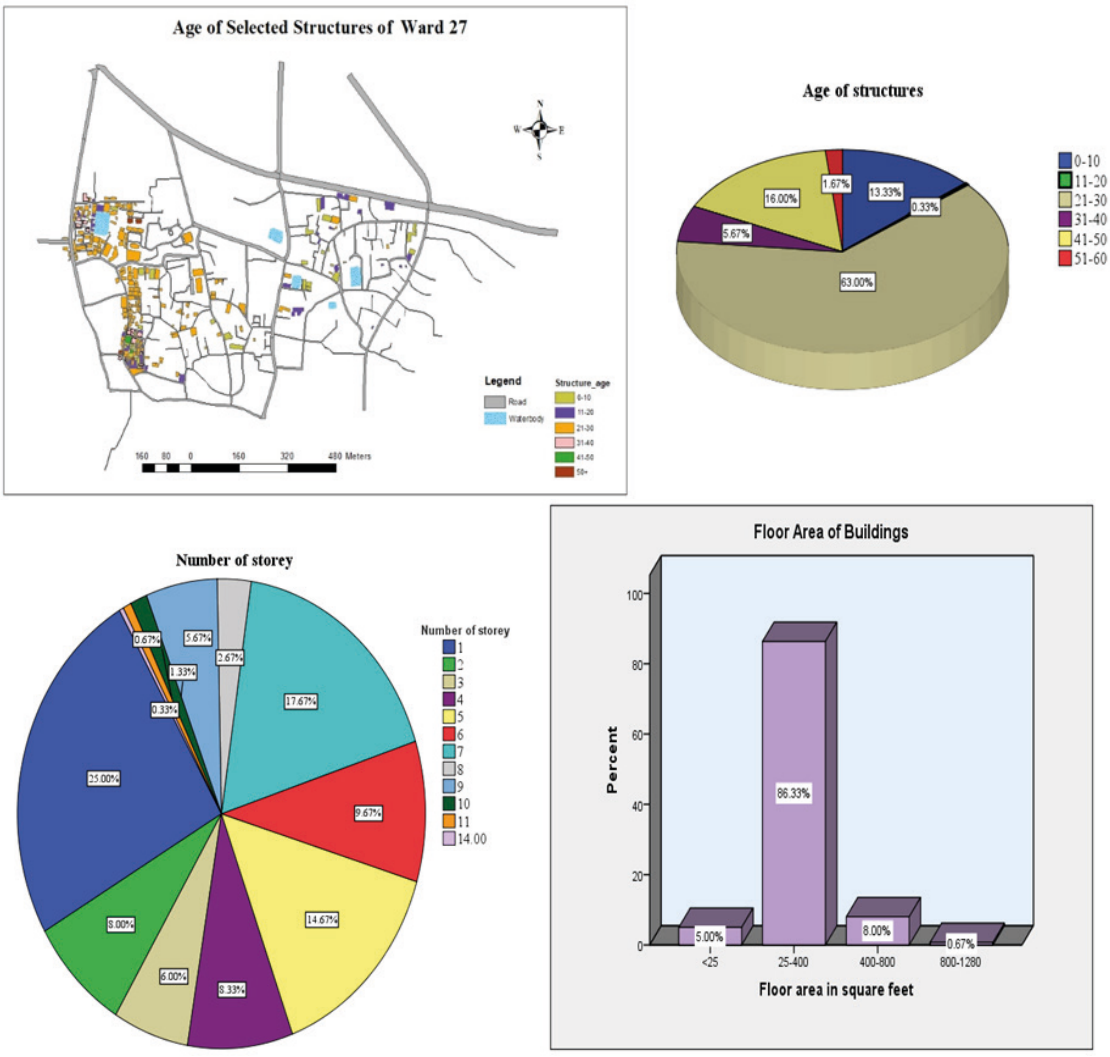
Figure 3: Types and uses of selected structures of ward no. 27

2.2.2 Age, number of storey and floor area of selected structures

Due to the exponential growth of the population, the majority of the current structures have recently been demolished and reconstructed. 33 percent of structures were constructed 11 to 20 years ago, 63 percent were constructed 21 to 30 years ago, 5.67 percent were constructed 31 to 40 years ago, 16 percent were constructed 41 to 50 years ago, and 1.67 percent was constructed 31 to 40 years ago. Figure shows distribution of age of buildings.

When RAJUK (2015) data was compared, it is observed that the proportion of one-story buildings declined from 71.74 percent to 25%, whereas the proportion of four-story, five-story, and six-story buildings increased significantly. Buildings of 7, 8, 9, 10, and 11 floors were also added. The research area has expanded vertically as vacant land has become scarce and population and economic growth have increased.

The building owners in the sample area do not follow the RAJUK Building Construction Law. As a result, the building's floor size is almost equal to the number of floors in this ward. The plot's total land area is equivalent to the floor space of the house. The floor space varies from 25 square feet to 1280 square feet. The bulk of the buildings (86.33 percent) have a residential floor space of 25-400 square feet. Buildings with a surface area of 400-800 square feet, mostly commercial shops and shantytowns, account for 0.67 percent of the total

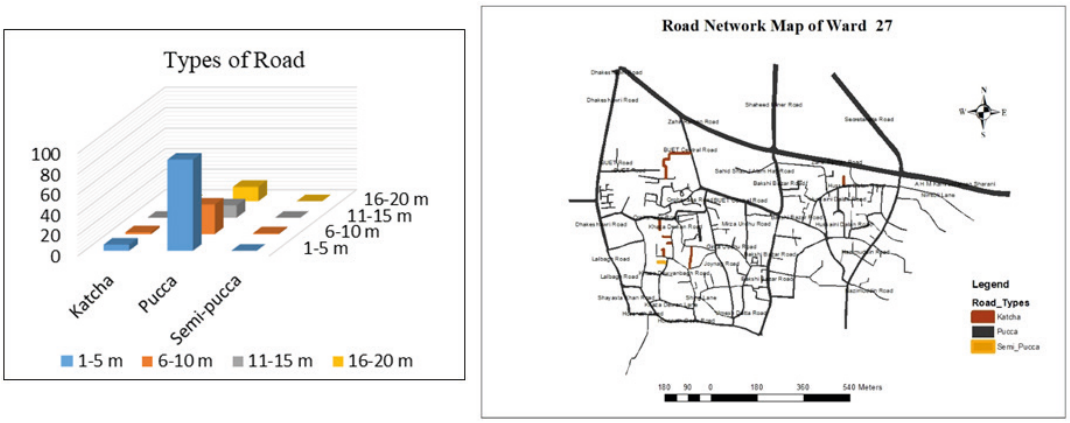


Source: RAJUK, DAP (2015)

Figure 4: Age, number of storey and floor area of selected structures of ward no. 27

2.2.3 Transportation network

The main roads through the area are A H M Kamruzzaman Sharani, Zahir Raihan Road, Dhakeshawri Road, and Lalbagh Road. From the GIS shape file, BUET Central Road, Secretariate Road, Bakshi Bazar Road, Shaheed Miner Road are considered as secondary road. The Horonath Gosh Road, Orphanage Road, Hussaini Dalan Road, Khaza Dewyanbagh Road, Umesh Datta Road, Shayasta Khan Road etc. are regarded as tertiary road of this area. The area's road network is unrefined and confusing because the streets and lanes are twisting, narrow, and link to one another in such a way. A variety of dark lanes and streets of differing widths have been discovered at numerous points along their length. As a result, with the vast amount of land used for the road network, the entire system was designed without proper planning and design. From the GIS shape file, it has found that most of the roads are 0.99 m – 20 m wide among which most of them are pucca and the width of semi pucca road is 2 m. The width of katcha road is 1m-3.05 m.



Source: RAJUK, DAP (2015)

Figure 5: Transportation network map of ward 27

2.2.4 Data Processing and Assembling

The raw data has been edited to remove possible errors and processed to suitable format to ease the data analysis. In this required correction and estimation, the collected data has been compiled and analyzed manually. It has been processed in a certain way after gathering data from primary and secondary sources. Maps have been digitized according to collect data by Arc GIS 10.3 software. After digitizing attribute data have been prepared with the help of same software. Furthermore, some of the data gathered have been coded so that it can be readily interpreted and used for research. Data has been presented in tabular, graphic and other formats. The mathematical package used for this are Microsoft Excel 2013 and SPSS 23.

2.2.5 Interpretation of Final Score

Using the FEMA P - 154, data sheet of rapid visual screening for the existing building is prepared. After filling up the factors related to seismic vulnerability the final score (S) has been calculated.

Table 3. Score of RVS According to Damage Potentiality

RVS Score	Damage Potential
S < 0.3	High probability of Grade 5 damage; Very high probability of Grade 4 damage

0.3 < S < 0.7	High probability of Grade 4 damage; Very high probability of Grade 3 damage
0.7 < S < 2.0	High probability of Grade 3 damage; Very high probability of Grade 2 damage
2.0 < S < 3.0	High probability of Grade 2 damage; Very high probability of Grade 1 damage
S > 3.0	Probability of Grade 1 damage

(FEMA P-154: Rapid Visual Screening for Potential Seismic Hazards, December 2015)

From the structural score predicted from data sheet, building having above grade 2 damage will require further investigation regarding seismic vulnerability. Generally, the score S < 0.7 indicates high vulnerability requiring detailed evaluation and retrofitting of the building. The buildings with grade 1 or grade 2 damage do not require further evaluation.

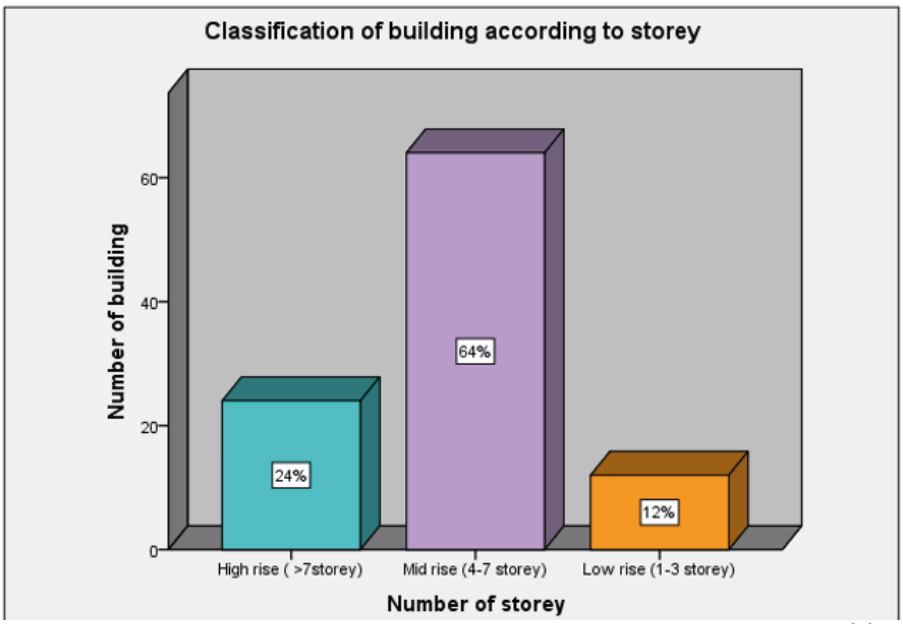
3. Results and Discussion

3.1. Seismic vulnerability analysis

The primary objective of this research is to evaluate vulnerability of seismic hazard buildings. To conduct the evaluation, a total of 300 structures, including residential, industrial, colleges, college, government, etc, covering 17.5 per cent of existing buildings, have been surveyed. Physical survey has been carried out for these 300 buildings. RVS method has been used to assess the seismic vulnerability of the existing buildings in the study area.

3.1.1 Number of storey

From the field survey 2020, it is evident that 24% of buildings are >7 storey, 64% of buildings are 4-7 storey and 12% of buildings are 1-3 storey.



Source: Field survey, 2020

Figure 6: Distribution of buildings according to number of storey

3.1.2 Construction type

The research area consists entirely of safer RVS (FEMA) buildings (23 percent). Of them, pucca, C3 form is the top 9.2%, pucca URM is 2.3%. Total highly fragile group of structures fell into 12%. This category does not have a semi-pucca building. In this group, 23 percent of the system falls under relatively low levels of vulnerability. 11.4% is of the C3 type, and 0.8% of the buildings of the pucca type are C2. If this is the case, 1.3% is C3 style and 4.1% is semi-pucca type URM houses.

Table 4: Construction type of building according to RVS score

	Construction Type						Total
RVS	Katcha	Pucca			Semi pucca		
Score	0	C2	C3	URM	C3	URM	
0.31-0.7	0	0.5	9.2	2.3	0	0	**12**
0.71-2	0	0.7	9	8.43	4.54	3	**25.67**
2.01-3	0	0.8	24.4	5.4	0.4	4	**35**
3.01-4.4	0	0.8	11.4	5.4	1.3	4.1	**23**
0	4.33	0	0	0	0	0	**4.33**
Total	4.33	2.8	54	21.53	6.24	11.1	100

3.1.3 Uses of building according to score

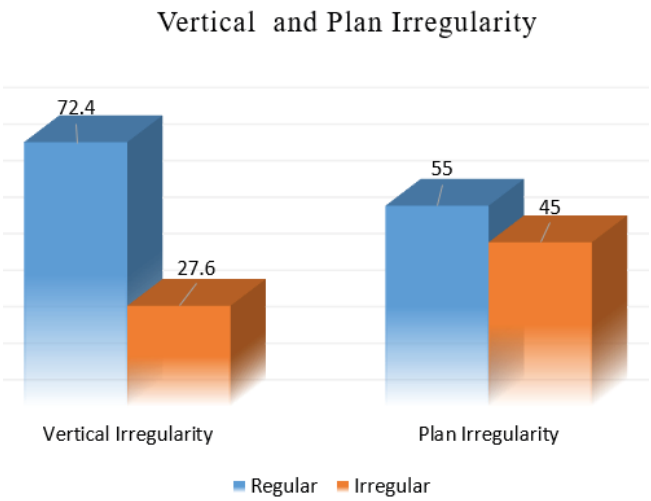
Among high vulnerable category, 24.88% buildings are residential, 13.33% are commercial and 18.18% are industrial in total sample buildings. Among moderate vulnerable category, 30.22% buildings are residential, 22.22% are commercial, 9.09% are industrial and 25% are official buildings in total sample buildings. 26.67% buildings are residential, 33.33% are commercial and 18.18% are industrial in total sample buildings among the moderately low vulnerable buildings. Among low vulnerable buildings, 18.22% buildings are residential, 24.44% are commercial, 54.55%are industrial and 25% are official buildings. Table below indicates different uses of building according to RVS score.

Table 5: Different uses of building according to RVS score

RVS Score	Different uses of building (Number)								
	Residential	Commercial	Industrial	Govt.	Assembly	Historic	Emergency service	Office	School
0.31-0.7	56	9	2	0	0	0	0	0	0
0.71-2	68	10	1	0	0	0	0	1	0
2.01-3	60	15	2	0	0	0	2	2	2
3.01-4.4	41	11	4	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0

3.1.4 Vertical irregularity and plan irregularity

From the field survey, it is found that 27.6% of buildings in the region are vertically irregular and 72.4% buildings are vertically regular. About 55% of the sample buildings have a regular shape (square or rectangular) and 45% of buildings are found to have irregular (T-shaped, L shaped, etc.).



Source: Field survey, 2020

Figure 7: Vertical irregularity and plan irregularity of buildings.

3.1.5 Final output from RVS score

The RVS (FEMA) system is used to assess a building's vulnerability to seismic danger. The RVS (FEMA) method has been used to evaluate 287 of the 300 surveyed structures, the rest of the buildings are katcha and have not been considered. The data has been mainly obtained by visual inspection. Among high vulnerable category, 58% buildings are less or equal 6-storey and 42% buildings are above 6- storey. Among moderate vulnerable category, 63 % buildings are less or equal 6-storey and 37% buildings are above 6 -storey. Among moderately low vulnerable category, 74% buildings are less or equal 6 -storey and 26 % buildings are above 6 -storey in total sample buildings. Among low vulnerable category, 77 % buildings are less or equal to 6-storey and the buildings which above 6- storey are 23%.

Table 6: RVS score of buildings according to vulnerability category

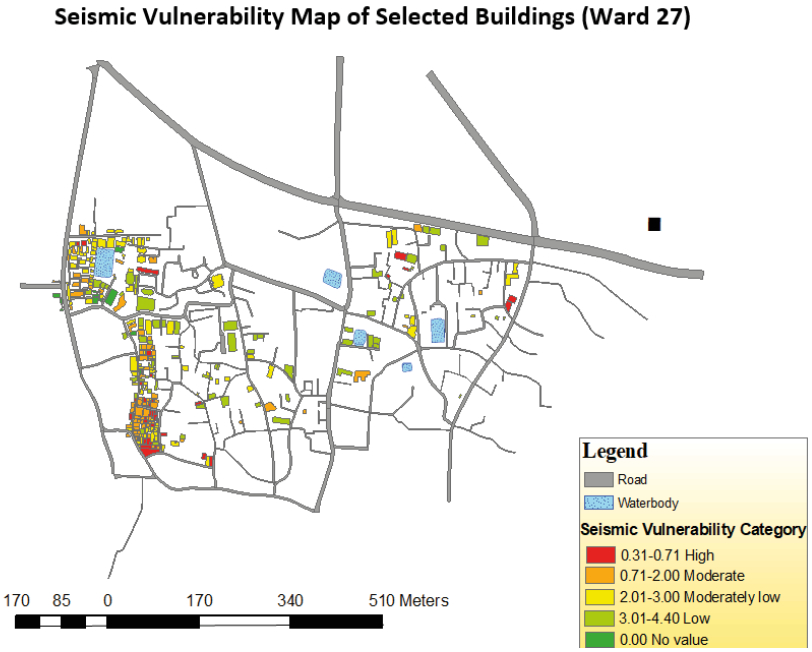
RVS Score	No. of Buildings (Floor less or equal six)	No. of Buildings (Floor above six)	Frequency	Percent	Vulnerability category
.31-.70	21	15	36	12	High vulnerability
.71-2.0	49	28	77	25.67	Moderate vulnerability
2.01-3.0	77	27	104	35	Moderately Low vulnerability
3.01-4.4	54	16	70	23	Low vulnerability
0.00	-	-	13	4.33	-

Source: Field survey, 2020

Among 300 surveyed buildings, 13 katcha structures (4.33 percent) are found to be out of scoring due to their construction materials among the 300 surveyed buildings. About 23 percent of buildings received a score of 3.01 to 4.4, 35 percent received a score of 2.01-3.0, and 25.67 percent received a score of 0.71-2.0 where 12% of the structures were scored 0.31.70. The Figure 8 shows seismic vulnerability scenario in the study area.

The buildings surveyed occupy 17.5% of the current structures in the study city. About 54 percent of buildings are C3 style and pucca type, and 6.24 percent are C3 type semi-pucca type buildings. 21.53 per cent land Unreinforced masonry buildings (URMs) and pucca and 11.1 per cent are URM and semi-pucca. One-storey buildings are the largest with 25 per cent occupancy. About 27.6 percent of buildings are vertically irregular and 45 percent of build-

ings are irregular in shape. Pucca and apartment structures appear to be more fragile than the other. The tallest structure in the research area is a 14-story building. According to RVS (FEMA), the majority of buildings in Ward 27 are now deemed to be of less seismic concern (61 per cent), although another 39 per cent require further evaluations. Most buildings (23 per cent) are structurally sound, 35 per cent are moderately fragile. About 25.67 per cent of buildings are moderately susceptible where 12 per cent of buildings are extremely vulnerable to seismic hazards.



Source: Author, 2020

Figure 8: Seismic Vulnerability Map of Selected Buildings (Ward 27)

4. Conclusion

For specific stakeholders, vulnerability evaluation is a tool for making decisions on how to respond to and adapt to threats. Using the FEMA 154 Rapid Visual Screening approach, you may quickly and easily detect potentially hazardous buildings in the preliminary screening phase. This method is the fastest and cheapest way to assess a building. There is only a small fraction of Dhaka City that has been studied. More than half of all buildings surveyed were determined to be of the C3 structural type, which has four to five floors and residential occupancy. The seismic risk for the majority of the buildings in the study region is still 61 percent; while an additional 39 percent needs to be evaluated. Map layers are developed based on the results of the vulnerability assessment.

Policymakers may be able to prioritize special consideration areas or hotspots for disaster management if the method is implemented throughout the city. Seismic hazards can be accounted for in terms of social aspects of vulnerability. If a region has a high level of seismic activity, it can be determined whether or not there is a significant risk. As part of spatial planning, it is essential to have a common understanding of what is needed to reduce vulnerability. With this research, local citizens are given a lot of opportunity to contribute to help them reduce their own risk of becoming victims of natural disasters. Many countries have found that involving local residents in disaster response planning is an effective way to reduce catastrophe risk.

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Research article

RESILIENCE TO NATURAL DISASTERS: A CASE STUDY ON SOUTHWESTERN REGION OF COASTAL BANGLADESH

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Abstract: Bangladesh is one the disaster-prone countries in the world and has been suffering from different negative impacts. However, over the years, the coastal communities have developed their resilience capacity. This research assessed the local peoples' resilience against natural disasters at Kazirchar village in Muladi Upazila of Barishal district of the coastal region. In this study, an extensive literature review on disaster resilience, well-structured questionnaire survey, and focus group discussions were conducted to collect primary data. Most of the indicators show low values for socioeconomic resilience. The index value of literacy rate (1.12), primary health care facility (1.25), food consumption (1.30) and income (1.30) showed low disaster resilience. The result from the survey area implies a low level of institutional resilience (1.75). The reason behind low institutional resilience was weak disaster management activities. The index value of training (1.42), school/college (1.92), public awareness programme (2.14), and coordination (1) showed medium to very low of disaster resilience index. Results also showed that the villagers have low physical resilience. From the survey, electricity supply (1.08), dependency on rainfall (1.08), cyclone and flood warning system (2.10), water bodies (1.56) and housing pattern (2.94) were the physical indicators of this village and showed medium to low disaster resilience index. The overall disaster resilience score ranges from 1 to 2.94. Depending on the score, disaster resilience level was divided into five categories from high (3>2.5), medium (2.5>2), low (2>1.5) to very low (1.5>1.0). Based on the resilience index, the overall disaster resilience of Kazirchar village was low because of its low socio- economic (1.67), institutional (1.75) and physical (1.68) resilience values. The findings of this study will help to take necessary actions for building a more disaster resilient coastal Bangladesh.

Keywords: Natural disasters, Resilience, Coastal areas, Bangladesh.

1. Introduction

Bangladesh is considered one of the most climate-vulnerable and disaster-prone countries in the world (Ahmed et al., 2016; Rakib et al., 2019). Particularly, the coastal plains of Bangladesh are extremely prone to natural disasters. The country faces natural disaster at least once a year. The frequency, unpredictability, uncertainties of livelihoods, location and pattern of settlements associated with climatic events often make people more vulnerable. Such vulnerabilities have negative impacts on socio-economic and ecological aspects of coastal life (Uddin and Haque, 2012). Historically, between 1877 and 2009, a total of 159 cyclones including 48 severe cyclonic storms, 43 cyclonic storms, and 68 tropical depressions hit people in the coastal areas of Bangladesh (Rakib et al., 2019; Sultana and Mallick, 2015). Other hydro-meteorological coastal disasters, including storm surges, waterlogging, and salinity intrusion in the soil are also increased in this region. Climate change could be added to the number, intensity, and extent of disasters with more extreme weather events that may result in change in coastal people's lifestyle and routine work with the increasing chance of being vulnerable due to other social and situational factors (UNISDR, 2008; Rakib et al., 2019). In the coastal areas, on an average, poor households experience 7% of the asset losses, however, 42% of the welfare losses due to natural disasters (Verschuur et al., 2020). Three main coastal regions of Bangladesh (Chittagong coast, Khulna Coast, Barishal Coast) are commonly affected by cyclones. Throughout the century around half a million deaths cause because of at least 44 severe cyclonic storms that made landfall on Bangladesh coast. Among all these, the Killer November Cyclone of 1970 alone caused 300,000 deaths and affected 4.7 million officially. The Great Backerganj cyclone of 1876 killed approximately 200,000 people while the cyclone crossed the coast of Backerganj (present Barishal) near Meghna estuary. The 1991 cyclone in Bangladesh is considered as the worst killer Cyclone in human history that killed 138,882 people and injured another 139,054 (Hossain and Mullick, 2020; Mallick and Rahman, 2013). Cyclone *Sidr* was an extreme weather event with immense repercussions on humans and coastal plains in Bangladesh, taking 3,406 lives, and damaged crops and infrastructure significantly across 30 districts, 200 upazilas and 1,950 unions (Uddin and Haque, 2012). On 27-29 May of 2009, a severe cyclone *Aila* attacked offshore 15 districts of the southwestern part of Bangladesh with wind speeds up to 120 km/hour and about 150 persons killed and cultivated land and crops lost. The aftermath impact of natural disaster lasts long (Rahman, 2019). Two consecutive cyclones, "Sidr" and "Aila," brought noteworthy changes in the living pattern of affected areas. People are struggling to go back to their previous quality of life prior to *Sidr* and *Aila*. Dams were damaged and sea saline water came to the agricultural lands easily. Salinity in the water has increased which has affected the production of crops and agricultural lands are not suitable for growing crops anymore (Kabir et al., 2016). However, local affected people have been increasing their resilience capacity against natural disasters. In this study, we assess the resilience of affected local communities against different natural disasters.

Concept of Resilience

Nowadays the term 'Resilience' is widely used by natural disaster researchers, policy makers, government and non-governmental organizations which can be identified as abilities as well as capacities, along with skills and knowledge to deal with adversities. Resilience is comprised of capacities to absorb stress or destructive forces through resistance or adaptation; capacities to operate or maintain certain basic functions during disastrous events; and capacities to recover from destructions or 'build back better' after any disaster (Chowdhooree, 2019). In other words, resilience can be defined as '*The ability of groups or communities to cope with, [and adapt to], external stresses and disturbances as a result of social, political, and*

environmental change' (Adger, 2000). In simple words, resilience is defined as the ability of households or communities to effectively cope with and adapt to the riverbank erosions and other climatic hazards in such a way that helps to minimalize the loss of life and economic assets (Alam et al., 2018).

The term resilience is used in different research papers to define various kinds of resilience. In the case of disaster resilience, there is no solid definition which describes disaster resilience though disaster resilience means the capacity of hazard-affected bodies to resist loss during disaster and to regenerate and recognize after disaster in a specific area in a given period (Habiba et al., 2011; Zhou et al., 2010). Community resilience attributes function interactively rather than independently (Uddin et al., 2020). Several studies found that disaster preparedness and resilience of the coastal people are average or below average (Rahman and Li, 2018). Char-the island- dwellers have a poor level of resilience due to access to food, income and health facilities, agricultural and non-agricultural assets, and adoption of technology which made them unable to withstand against any adverse effect of natural disasters (Sarker et al., 2020a). Moreover, resilience capacity among the disaster affected communities in the vulnerable char areas fails to manage the harmful and adverse impact of natural disasters on the social system (Sarker et al., 2020b). Resilience attributes that were deeply embedded in community characteristics assisted in ameliorating immediate impacts as well as in building future adaptive capacities (Ahmed et al., 2016). A welfare-orientated perspective like 'leaving no-one behind' helps to identify adaptation options that enhance resilience (Verschuur, 2020). Besides, women engagement at the local operational level of disaster management, capacity building program through activating local government, NGOs intervention and public-private partnership, disaster policies, infrastructural developments and coastal plantation might be a possible solution to enhance the resilience of the char dwellers across Bangladesh (Sarker et al., 2020a; Islam et al., 2017; Uddin and Haque, 2012). Therefore, context-specific disaster management policies and effective monitoring systems should be developed to improve resilience.

Disaster resilience

The word resilience comes from the Latin word 'resilio' which means "to spring back" (Klein et al., 2003). Resilience was first used to social systems research (Adger, 1997) and linked human–environment systems (Holling, 1973;Carpenter et al., 2001). According to the fourth assessment report of IPCC, "*Resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change*". Disaster resilience refers to a hazard-affected area's ability to withstand loss during a disaster and to regenerate and adapt after a disaster in a particular time frame (Zhou et al., 2010). Disaster resilience research necessitates the integration of socioeconomic and physical data from multiple sites within a certain geographic area (Shahid and Behrawan, 2008). Furthermore, social, institutional, cultural, religious, economic, environmental, hydrologic, topographical, educational, and political aspects all have a role in the development of a useful disasters' resilience index (Viljoen et al., 2001).

Past research on disaster resilience in Bangladesh

As a disaster-prone country, there were some studies conducted in disaster resilience in Bangladesh (Table 1). Buildings, cities, women, community-based resilience, policies needed to foster disaster resilience were the different dimensions of resilience covered in previous

studies. The keywords of the published articles mainly clustered in three groups (Figure 1) whereas the researchers changed their focus on resilience research in Bangladesh over the time (Figure 2). For instance, in recent times, community resilience, adaptative disaster management, livelihood are the major areas of investigation.

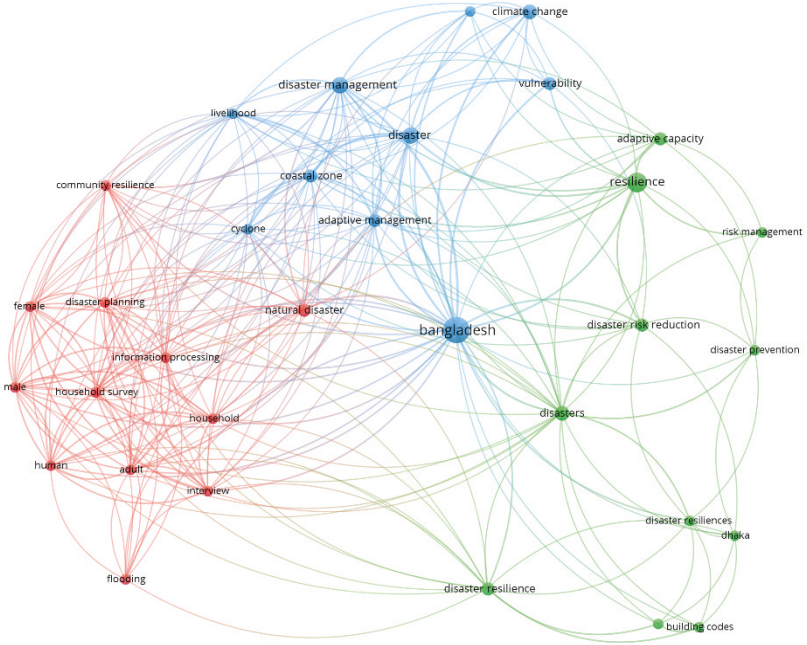

Figure 1: Cluster of co-occurrences of keywords related to disaster resilience research in Bangladesh

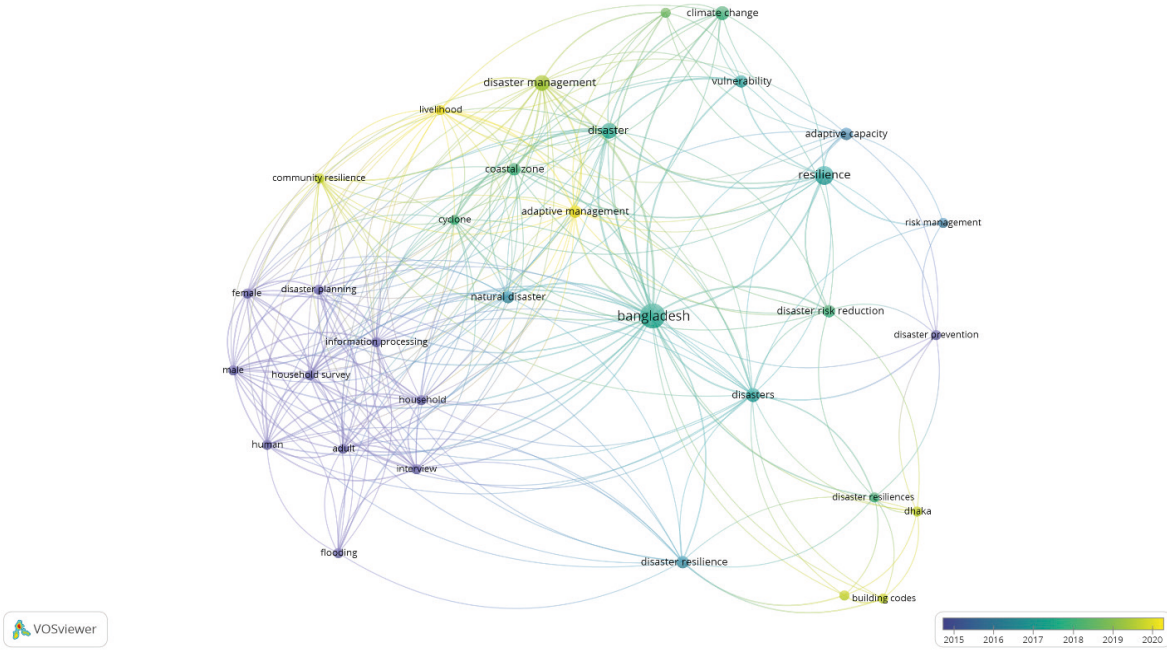

Figure 2: Network of co-occurrences of keywords related to disaster resilience research in Bangladesh over the years

Table 1: Summary of past research on disaster resilience in Bangladesh

Sector	Method used	Major findings	Recommendations	Source
Building	Documented and analysed the views of relevant stakeholders through qualitative approach	1) Lack of compliance 2) Unawareness about Bangladesh National Building Code 3) Reluctant to follow regulations and codes 4) No incentives for following codes 5) Limitations of enforcement	1) Capacity building 2) Incorporation of knowledge on regulations and codes for disaster resilience 3) Capacity building of built environment professionals 4) Awareness raising through training, media, and public events	Ahmed and Kabir, 2021
	Log-frame approach	1) Reason behind of compliance lacking: a) Socio – economic b) Political c) Cultural conditions 2) Evidence-based knowledge is a critical component	1) Raising awareness among communities on effectiveness and barriers to enforcing building codes	Ahmed et al., 2018
Resilience policies	1) Novel welfare loss modelling framework 2) High-resolution spatial analysis 3) Comparison of various adaptation options	1) Poor households experience, on average, 7% asset losses, but 42% welfare losses 2) Combining dike heightening, post-disaster support and stronger housing can reduce welfare losses up to 70%, and foster sustainable development by benefitting the poor, increasing resilience, and demonstrating robustness under socio-economic and climatic uncertainties.	1) Welfare-orientated perspective 2) Leave no-one behind	Verschuur et al., 2020
	Systematic review of policies and strategies and institutional settings	1) National and local level institutions are already grappling 2) Limited institutional capacity in mainstreaming climate smart risk reduction strategies		Hussain and Huq, 2013

	Participatory research methods: household survey, focus group discussions, key informant interviews, and case studies	1) Traditional-informal and quasi-formal institutions play vital role for rapid recovery 2) Resilience attributes ameliorating immediate impacts and building future adaptive capacities 3) Community resilience attributes and their functionality depends on their economic base, occupations, and their respective contexts of vulnerability. 4) Community resilience attributes function interactively rather than independently.	Community attributes require a clear understanding of network functioning, and the processes that drive institutional structures, relations, and outcomes.	Uddin et al., 2020
Community	Economic model of production, and in-depth interviews	1) Local communities are almost entirely reliant on self-generated social capital 2) Resourcing is necessary to better plan, response, and recovery	1) Emphasis on disaster prevention activities 2)Further need of integrated response	Islam et al., 2017
	Focus group discussions, and household surveys	1) Engagement with hazard-resilient and vulnerability-reducing livelihood activities 2) achieved resilience characteristics, better managing their available resources. 3) DRR based on Sustainable Livelihood approach has positive results		Ahmed et al., 2016
	"Dominant-less dominant" research methodological framework: i) household survey, ii) semi-structured questionnaire survey, iii) oral history interviews, and iv) key informant interviews	1) wetland communities are highly vulnerable to flash flood 2) Vulnerability occurs due to asymmetrical social power structure 3) reactive recovery measures result in maladaptation and passive towards risk mitigation 4) transformative patterns showed modified or changed behavior of community to achieve sustainability	1) Designing development interventions to enhance adaptive capacity 2) Emphasis on diverse range of skills and educational development	Choudhury and Haque, 2016

Livelihood	Resilience Index Measurement and Analysis (RIMA) model	1) Char dwellers have a poor level of resilience 2) Char dwellers residing near to the mainland area relatively more resilient than the distant char areas.	1) Access to food, income and health facilities, agricultural and non-agricultural assets, and adoption of technology which need to be improved for their survival. 2) Capacity building program through activating local administration, NGOs intervention and public-private partnership	Sarker et al., 2020
	1) Sustainability Livelihood Approach (SLA) Model 2) Survey	1) Disaster preparedness and resilience are average or below average 2) Institutional framework and policies, plans, programs are comprehensive and capable of achieving targeted goals and objectives. 3) Lack of proper integration and coordination 4) Scarcity of resources, 5) Lack of transparency and accountability		Rahman and Li, 2018
Administrative	Qualitative and quantitative approaches	1) Most of the char dwellers are not aware of their rights 2) Char dwellers suffers from basic public services 3) Poor administrative system to respond to adverse effects of natural disasters 4) Poor administrative resilience	1) Context-specific disaster management policies and effective monitoring systems should be developed 2) Improvement of administrative response in the geographically isolated areas	Sarker et al., 2020
Governance	qualitative method i.e., Case Study approach & Participatory Rural Appraisal toolbox	1) Good governance, financial and technical capacity and autonomy and cross-scale institutional linkages are necessary for successful local-level disaster management	1) Policy and research attention require a closer examination 2) Dynamics of local-level institutions 3) Integration of 'governance' and 'resilience' research streams	Choudhury et al., 2019
Coastal resilience	Qualitative case study	1) Livelihoods, location, and pattern of settlements are important for indicating vulnerability 2) Better preparedness and improved early warning systems can save lives	1) Cyclone preparedness still needs improvement 2) Strengthening of people's adaptive capacity	Uddin and Haque, 2012
		1) Limiting factors: a) bio-physical b) socio –economic c) technological d) institutional		Saroar, 2018

Urban environment	Urban Disaster Resilience Index (UDRI) model	1) Utility services and environmental conditions are each playing a role in determining the resilience 2) Urban Disaster Resilience Index is lower than physical and social resilience and higher than whereas natural and institutional resilience 3) Improving infrastructure alone cannot ensure disaster resilience	1) Holistic and continuous approach is required	Kabir et al., 2018
Women/Gender	In-depth interviews	1) Two million people were affected in the floodplains and low-lying areas in Sirajgang in 2012 2) Seven hundred and fifty families were made homeless 3) Unemployment	1) Women engagement in local operational level	Islam et al., 2017
Health security	Informal interviews, field diaries, and observation	Understanding health security reduce the effects of disasters	Improve of health security for poorer households in general and women	Ray-Bennett et al., 2016
	Household surveys, interviews, and focus group discussions	Coping strategies and agentive capabilities vary from one micro-context to the next.	Need a dynamic and integrative resilience approach	Ray-Bennett et al., 2010

Methodology

Sampling procedure

Purposefully, the study region was chosen in Barishal district, which is one of the most vulnerable districts to natural disasters. One Union Parishad named Kazirchar Union Parishad, and the Kazirchar village were purposefully chosen. We chose 50 households systematically from the village's approximately 300 households. Households were sampled from two different locations based on their proximity to the river and char areas. In this study, 30 of

the 50 households were from the Char area, and the remaining 20 were from the riverside (Figure 3).

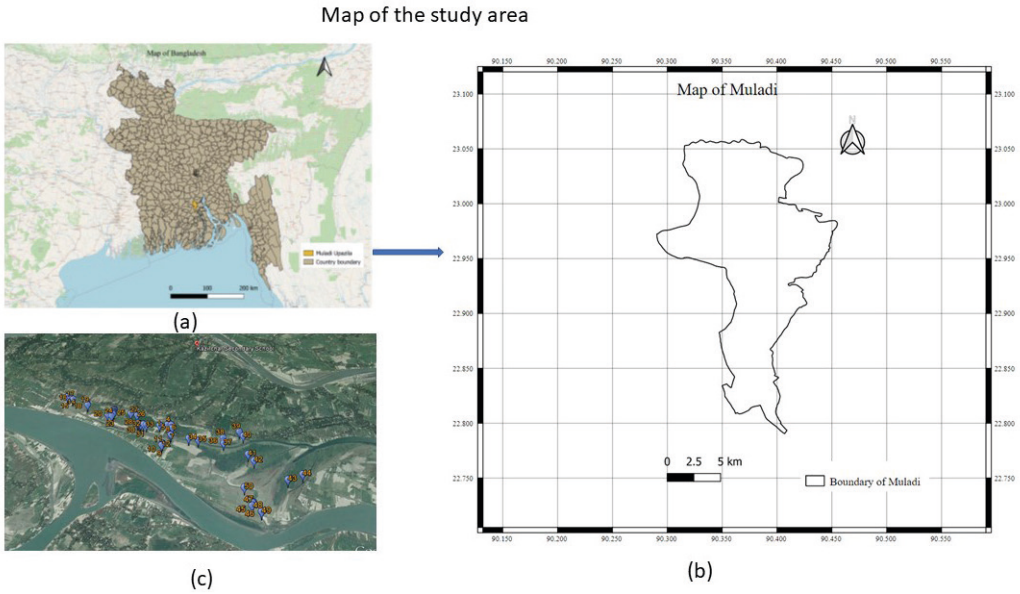

Figure 3: Geo-location of surveyed households in Kazirchar village, Muladi Upazila, Barishal

Collection of primary data

For the purpose of collecting data from each household, a well-structured semi-questionnaire was prepared. A pilot survey was conducted with 10 households in the study area to test the survey design and procedure. After testing this survey, we modified some questions and improved our surveying technique. We also made a number of changes to the interview schedule, including revisions to the wording of some questions, adjusting the survey's time, identifying unclear or ambiguous questions, and evaluating the appropriateness of response options. The final questionnaire had three sections such as respondents' socio-economic resilience, institutional resilience, and physical resilience. Monthly average income, respondents' educational status, household type, job status, disaster perception, disaster adaption measures, shelter, and portable water protection, livelihood, agriculture, and other topics were gathered through interviews with respondents using this questionnaire. Key informants, such as school teachers, and religious and political leaders, double-checked the socioeconomic data provided by the respondents of surveyed households.

Data analysis

The Weighted Mean Index (WMI) approach was used to create the disaster resilience index (DRI). Initially, a rating scale was created, and weight was allocated subjectively depending on how respondents perceived the vulnerability of each characteristic as they were compared one by one. Each dimension (socio-economic, institutional, and physical) corresponds to several variables that were used to generate their respective scores (Shaw, 2009). There were eleven variables in the socio-economic dimension of the DRI, for example, literacy rate, natural disaster knowledge, primary health care facility, food consumption, occupation, income, savings, asset sales, participation in NGOs, and loan. These characteristics were chosen to better explain each family's vulnerability in terms of physical, socioeconomic, and institutional dimensions of resilience. The numbers 1, 2, 3, and 4 were assigned to rating scales, equivalent to extremely low, low, high, and very high, respectively. As a result, WMI was

computed by multiplying the sum of respondents' weights by the index of each variable (obtained by dividing the sum of rating scales under each variable by the number of elements) and then dividing the total by the number of variables in each dimension. After averaging the resilience levels of each dimension, overall DRI values were determined. SPSS 17.0 was used to compile and analyze the acquired field data.

Results and discussion

Socio-economic resilience

In this study, education and knowledge about natural disaster health, food consumption, income, use of savings are considered for the socio-economic dimension. Most of the indicators show low values for socioeconomic resilience. The index value of literacy rate (1.12), primary health care facility (1.25), food consumption (1.30) and income (1.30) showed low disaster resilience (Figure 4).

Stakeholders are influenced by their socio-economic characteristics and natural resource management activities. Hossain et al. (2009) depicted that socio- economic factors are interrelated and influenced by one another. The educational status of a person affects his occupation, income, skill, and adaptation to modern technology (Hossain et al., 2009). Education is an important issue for understanding and coping with any adverse situation. For example, in the study area literacy rates are below 50% and these households have poor knowledge of disaster and low predictable capacity against disaster. In the survey area, agriculture is the main income-generating source for people, but people have been practicing the use of different short-duration crops to adapt to the impacts of disasters. They engage themselves in nonagricultural farming involving rearing live stocks, dairy farms, cattle fattening, fish culture and other income-generating activities such as business, day labour, services, and construction. Moreover, they use food grain reserves during the disaster period and reduce their daily consumption.

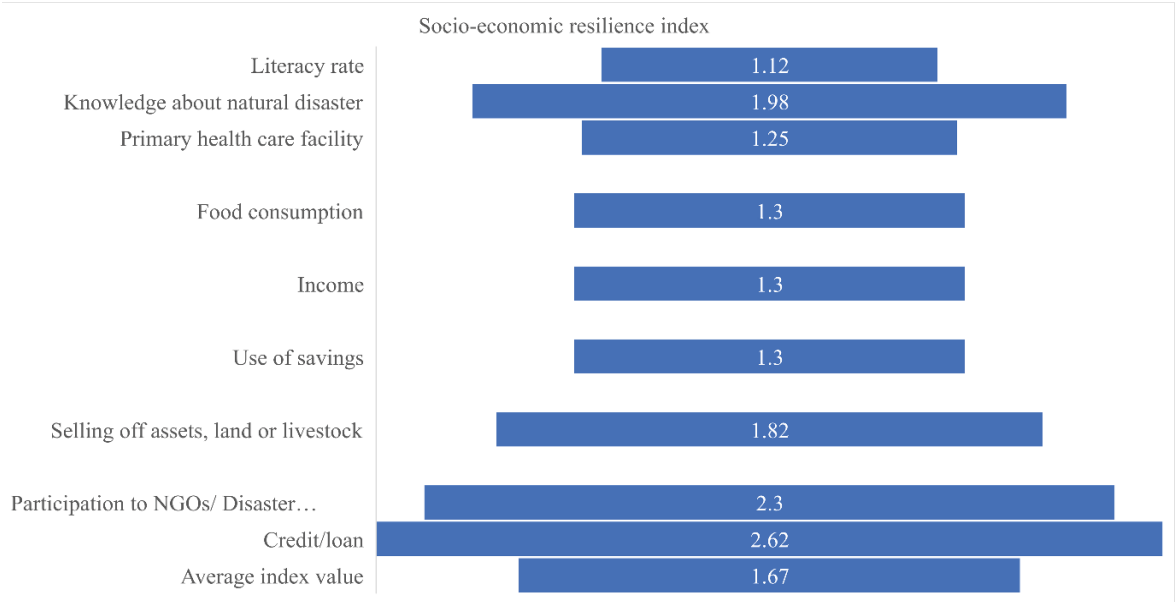

Figure 4: Socio-economic resilience to disaster resilience of local communities in Kazirchar, Bangladesh

Institutional resilience

The Government of Bangladesh approved the CDMP under Ministry of Food and Disaster Management to increase resilience at all levels and reduce damage and losses from natural disasters (Habiba et al., 2011). The result from the survey area implies a low level of institutional resilience (1.75). The reason behind low institutional resilience was non-existence of disaster management activities. The index value of training (1.42), school/collage (1.92), public awareness programme (2.14), and coordination (1) showed medium to very low of disaster resilience index (Figure 5). For disaster management Bangladesh has established an institutional mechanism that apparently recognizes the role of different stakeholders (Khan and Rahman, 2007). In the Disaster Management Bureau (DMB), have created which has coordinated all activities related to disaster management from the national to grassroots level. Marchildon et al. (2008) claimed that institutions have been critical to local, regional, national, and international efforts in reshaping agriculture in drought-prone environments. In the study area, governments and other NGOs are found operating in the field. Among these agencies, Department of Agricultural Extension (DAE), Department of Livestock, Department of Fisheries, Department of Health, Department of Water and Sanitation, Local Government and Engineering Department (LGED) and other NGOs like ASA, BRAC are working at field level to increase the institutional resilience to natural disasters.

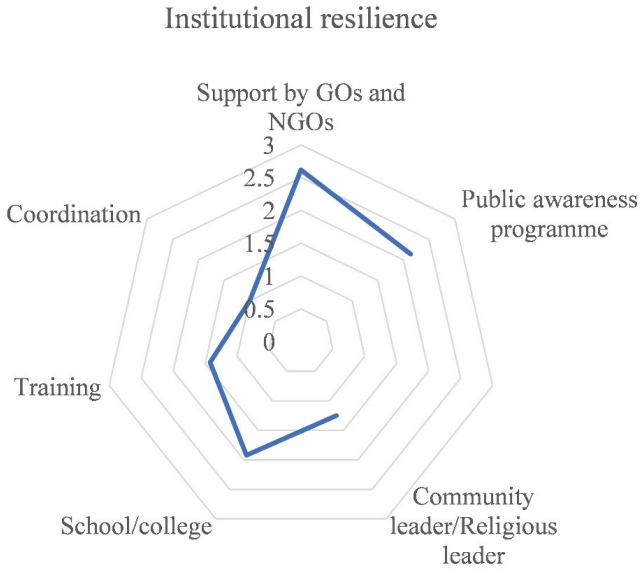

Figure 5: Institutional resilience to disaster resilience of local communities in Kazirchar, Bangladesh

Physical resilience

Study showed that the villagers have low physical resilience. From the survey, electricity supply (1.08), dependency on rainfall (1.08), cyclone and flood warning system (2.10), water bodies (1.56), and housing pattern (2.94) were the physical indicators of this village showed medium to low disaster resilience index (Figure 6). Households in this area extensively use irrigation water for daily agricultural purposes. The utilization and contribution of ground water in Bangladesh has increased from 41% in 1987-1988 to 75% in 2001-2002, and surface water has declined accordingly (Shahid and Hazarika, 2011). During the dry period, ponds dry up and moisture of the soil is quickly evaporated away (Saadat et al., 2009). As result, households extremely depend on ground water for irrigation purposes. As a remote area, the supply of electricity goes down for a long time and farmers cannot get irrigation water.

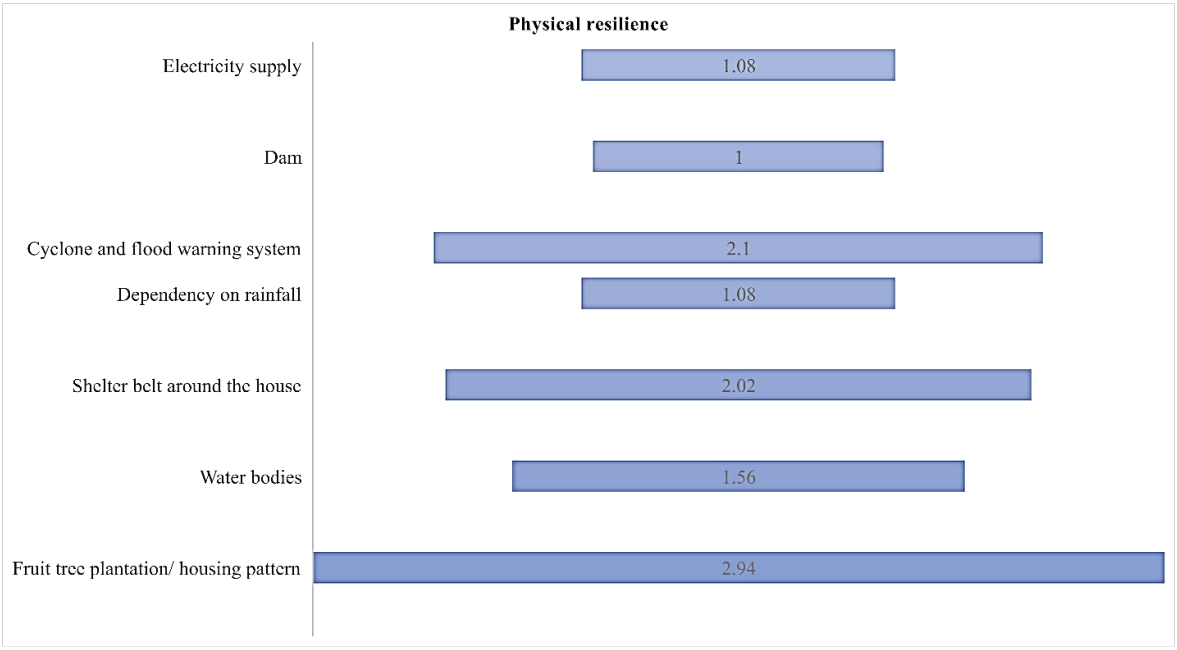

Figure 6: Physical resilience to disaster resilience of local communities in Kazirchar, Bangladesh

Overall resilience

The overall disaster resilience score ranges from 1 to 2.94. Depending on the score, disaster resilience level was divided into five categories from high (3 > 2.5), medium (2.5 > 2), low (2 > 1.5) to very low (1.5 > 1.0). Based on the resilience index the overall disaster resilience of Kazirchar village is low because of its low socio- economic (1.67), institutional (1.75) and physical (1.68) resilience values. Previous study reveals that in *Mohanpur upazila* has the highest (3.61) overall resilience because of its high socio-economic (3.68), institutional (3.63) and physical (3.53) resilience values (Habiba et al., 2011). This result reflects that the village has a low preparedness against various disasters due to poor management system by government, less knowledge about disaster, less coordination and poor collaboration between GOs and NGOs regarding disaster risk.

Conclusion

Bangladesh is frequently recognized as most vulnerable country in the world. In Bangladesh, southwestern coastal districts, especially Barishal, has been experiencing the worst impacts of recurring natural disasters. Consequently, this study is intended to know the community resilience in response to various disasters in Kazirchar village of Muladi Upazila in Barishal, Bangladesh. Primary data were collected through a well-structured questionnaire survey, interviewing the key informants and focus group discussions. Assessing the indicators of socio-economic, institutional, and physical dimension, the overall disaster resilience of Kazirchar village was low because of its low socio- economic (1.67), institutional (1.75) and physical (1.68) resilience values. The study identified that lack of education and awareness, low income, poor existence of GOs and NGOs activities have made the village people vulnerable to disaster from the socioeconomic, institutional, and physical points of view. Although number of NGOs are working on disaster risk reduction and building resilience among the local communities in Kazirchar, but this is still far away from the expectation. It is expected

that this study will be act as a reliable source of information for the taking natural disaster management initiative in this area as micro-level and formulating relevant policies to address the coping strategies against adverse effects of natural disasters in southwestern coastal areas of Bangladesh in broader sense. Finally, we suggest that fostering the socio-economic status, sound institutional set-up and strong physical arrangement can make more natural disaster resilient the local communities of Kazirchar village.

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