# Disaster Risk Reduction and Management Mechanisms for School-Aged Children in Flood and Landslide Vulnerable Areas in the Province of Bukidnon

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*Abstract*

This study assessed the disaster risk reduction and management mechanisms of schools in the province of Bukidnon, analyzed the adequacy and gaps of the disaster risk reduction and management mechanisms implemented in schools, and proposed a model of school-based disaster risk reduction and management network. The findings showed that the five priority actions established by the Hyogo Framework for Action on which the Department of Education Manual was anchored were not substantially achieved. Moreover, the DRRM mechanisms on disaster prevention, disaster mitigation, and disaster preparedness were fairly adequate, while disaster preparedness was somewhat adequate. Based on the findings, an integrated model of school-based disaster risk reduction and management (SBDRRM) network of vulnerable communities was proposed emphasizing a bottom-up approach, three-focal point system representing the susceptible areas under the school divisions of Bukidnon, Malaybalay and Valencia, multisectoral collaboration, and inclusion of DRRM in school curricula.

*Key Words*: disasterprevention, mitigation, preparedness, response, recovery, reconstruction

## *Introduction*

Disaster risk reduction and management is a development priority in calamity-prone areas such as Bukidnon. Risk and vulnerability analyses are, at present, generally focused on the general population. The study attemptedtoassess the existing disaster risk reduction and management mechanisms, particularly for school-aged children within the local government level.

In disasters or emergencies, the vulnerability of school-aged children to risks like illness and trauma is prevalent. Consequently, they require special care and attention of schools and stakeholders who need to offer safety and shelter to these children displaced by disasters. Prevention, mitigation, preparedness, response, and rehabilitation are primary procedures that a school and its stakeholders may employ before, during, and after the occurrence of a disaster to protect and preserve school children.

While it is true that vulnerability and hazards are not dangerous if taken separately and only become risk and disaster factors when they unite, risks can still be reduced or managed. Measures can be employed to ensure that hazards will not result in disasters. On the other hand, risk management is needed for disaster prevention to ensure sustainable

development so that people can lead a good, healthy, and happy life without creating damage to the environment.

Risk management includes identifying health and safety hazards, determining the probability of their occurrence, estimating their potential impacts to the schools and the communities at risk, enumerating and implementing the risk reduction measures like hazard mapping, vulnerability analysis, potential losses estimation, and strategic disaster prevention/mitigation development.

Existing risk reduction and risk management measures need to be assessed to find out if these are adequate to promote hazard/disaster awareness, manage impacts, and help all school communities within the Province of Bukidnon reduce the risk of threats from natural and human-made/induced disasters or address the gaps in their implementation.

However, the sustainability of the Disaster Risk Reduction and Management Program requires monitoring, evaluation, and proper coordination of all government and non-government agencies; hence the establishment of a Disaster Risk Reduction and Management Network is very important in Bukidnon.

These gaps prompted the researchers to assess the disaster risk reduction and management mechanisms of schools in the province of Bukidnon; analyze the adequacy and gaps of the disaster risk reduction and management mechanisms implemented in schools; and propose a model of school-based disaster risk reduction and management network. It is hoped that this study will inform various school stakeholders located in disaster-prone areas in the three divisions of Bukidnon, Valencia and Malaybalay.

*Review of Literature*

Research shows that disaster risk reduction-related initiatives must take into consideration the most vulnerable segment of the population—the school-aged children. This development priority is a focal component within the revised UNICEF Core Commitments to Children in Emergencies (2009), ASEAN Safe Schools Initiative (ASSI), and the Safe Schools Program of the Department of Education. However, a review of the literature reveals a dearth of local research studies on DRRM mechanisms for school children.

One of the most recent studies in school-based DRRM in the Philippines was conducted by Catangui (2020). Utilizing a descriptive research method, her study determined the DRRM capability of the public schools in Polangui, Albay. Her study revealed that the schools did not carry out the enabling environment for disaster, safe learning facilities, disaster management and risk reduction. Along this vein, the study determined gaps in the DRRM capabilities of schools in the areas of educational facilities designed for areas of evacuation, disaster health and environment provision, responsive disaster preparedness plans and activities, coordination and networking of stakeholders, community involvement, and extra-curricular activities responsive to DRRM. The offshoot of the study was a proposed framework for evaluating, planning, and implementing the schools' DRRM concentrating on three pillars which include Pillar 1, Health Learning Facilities; Pillar 2, School Emergency Management; and Pillar 3, Emergency Risk Reduction in Education.

Mamon (2019) determined the views of the senior high schools from Las Piñas regarding the implementation of the Comprehensive School Safety Framework, a directive from the Department of Education to all schools in the country. The study showed that the students believe that their school was in a safe location and that the design and construction of their school buildings are resilient. The findings of the study further revealed that DRR contingency planning, provision of first aid kits, conduct of school maintenance program, establishment of early warning system, and creation of evacuation plans and procedures were highly evident. The data of the study also showed that DRRM was integrated in the curriculum and thereby learned by the students.

Also in the same year, Faustino et al. (2019) evaluated the effectiveness of schools' DRRM program and determined the problems encountered by the implementers. The implementation of the program was found to be very satisfactory as assessed by both the students and the school personnel. Moreover, the problems encountered by the implementers of the DRRRM program include the insufficient safety gears, medicine kits/go bags/survival kits, and the rather small evacuation centers that are inadequate to cater to large numbers of evacuees among others.

In 2018, Comighud (2018) assessed the status of implementation of public schools DRRM in Negros in the areas of disaster prevention and mitigation, disaster preparedness, disaster response, and disaster recovery and rehabilitation and the school heads' capability to respond during hazards. The study revealed that the DRRM program in public schools was well implemented and that head of the public schools were very capable to respond to hazards during disasters.

In the same year, Lopez et al. (2018) assessed the level of compliance of schools in terms of the DRRM program in Buenavista Bohol. The study determined the compliance of schools in the aspects of safe learning facilities, school disaster management, and disaster risk reduction in education. This quantitative research revealed that schools had moderately complied with the DRRM mandate. The study also revealed the problems encountered by schools in the implementation of the DRRM program that included inadequate training materials, and the lack of training among the DRRM teams.

In a qualitative research, Marcher (2014) analyzed how DRR strategies were integrated during the education sector response, recovery, and rehabilitation after Typhoon Haiyan (Yolanda). At the school level, the study revealed that most schools struggled with reconstruction due to insufficient resources that left little capacity for DRR strategies. This case study also showed the tragic consequence of the lack of knowledge about natural hazard and preparedness. It also emerged in the study that the implementation strategies and national policies at the local level remains incomplete and a work in progress. Moreover, the response and rehabilitation process following the disaster was strongly influenced by political factors and power relations within the affected areas. There were also organizational and coordination issues during the post-disaster stage. Additionally, the challenges that the people from the Leyte experienced at all fronts, education sector most especially, included the lack of financial capability that limited the implementation of the risk reduction (RR) actions on community level.

*Framework*

This study is anchored on the Hyogo Framework for Action (2005) on disaster risk reduction management that stipulates fundamental principles emphasizing collaboration, early warning, local knowledge, local resilience, and preparedness. In terms of collaboration, disaster risk management must be undertaken by all government and non-government organizations across levels to address the issues of disasters and calamities. Executive Order No.159, series of 1968, stipulates that disaster control organizations be established in all government units. Heads of departments, bureaus, offices, agencies, and corporations are mandated to institute this necessary measure. The mandate was further reinforced by Presidential Decree No.1566 of 1978, that underscored the urgent need to direct, control, and coordinate all resources to mitigate the impact of both natural and human-induced hazards. Strategies may include dialogues and cooperation among disaster experts, technical and scientific specialists, planners, and stakeholders.

The second principle maintains that early warning is relayed to individuals and groups to shield them from the effects of disasters. This principle entails providing information regarding the existence, prevention, and

mitigation of disasters. Government agencies like the Philippine Atmospheric, Geophysical, Astronomical Services Administration (PAGASA), Philippine Institute on Volcanology and Seismology (PHILVOCS), and National Disaster Coordinating Council (NDCC) are tasked to provide warnings to the general public. Subsequently, the suspension of classes is declared. Administrative Order No. 196 (2007) empowered the secretary of the Department of National Defense, and concurrent chairman of the National Disaster Coordinating Council to suspend classes in coordination with the Local Government Units (LGUs), Department of Education (DepEd) and the Commission on Higher Education (CHED).

Another guiding principle holds that local knowledge is crucial to disaster reduction. This necessitates information dissemination campaigns on essential concepts for all hazards, their causes, preventive measures and consequences. As specified in DepEd Memorandum No. 55, Series of 2007, it is imperative to mainstream these concepts in the school system through curricular integration and capability-building activities. Other strategies include providing information on disaster risks and means of protection, especially in disaster-prone areas, developing or strengthening community-based disaster risk management programs, and coordinating with the local media in disaster risk reduction awareness activities.

To reduce the causal risk factors, there is a need to build local resilience in school communities. Measures include locating/ relocating schools away from hazard-prone areas, such as flood plains, earthquake fault lines, etc., following standards for resilience for building schools and facilities to withstand the impacts of hazards; conducting reforestation and protection of wetlands; and, implementing the provision of Clean Air Act.

At the core of disaster reduction management is the level of preparedness. This principle requires that school communities should develop, plan, allocate resources, and establish procedures to save lives and prevent damage to school wards, and properties. Preparedness activities may include development and regular testing of contingency plans; appropriation of the calamity fund to support preparedness; development of coordinated approaches in all levels for effective disaster preparedness; regular dialogues and efficient coordination with various disaster response groups; drill exercises like earthquake drill, fire drill, and evacuation drills.

Applying the Hyogo Framework to the current study, the disaster risk reduction and management mechanisms was examined using the bottom-up process, i.e., addressing the DRRM for school-aged children at the school and barangay levels. Various DRRM initiatives have been undertaken at the national and international levels, but they do not involve the local education authorities and local officials. Moreover, the DRRM projects are mostly focused on the general population and less on school-aged children who have been identified as the largest group in the populace most vulnerable to disaster risks (UNICEF, 2011). Given the children's susceptibility during calamities, the UNDR underscores that child protection must be a priority before, during, and after a disaster (UNDR, 2011).

To corroborate this assertion, the study examined the DRRM mechanisms for school-aged children across three phases: pre-disaster, during disaster, and post-disaster. This is further illustrated in the diagram below.

Figure 1 shows that disaster risk reduction and management is a comprehensive process involving the monitoring and evaluation of mechanisms implemented throughout the disaster event. Disaster risk reduction is the systematic process of analyzing and managing the causal factors of disasters through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land, and the environment and improved preparedness for adverse events. Disaster risk

management is another systematic process involving the use of administrative directives, organization and operational skills and capacities to implement strategies, policies and improved coping capacities. It aims to avoid, lessen, or transfer the adverse effects of hazards through activities and measures for prevention, mitigation, and preparedness as well as response, and reconstruction.

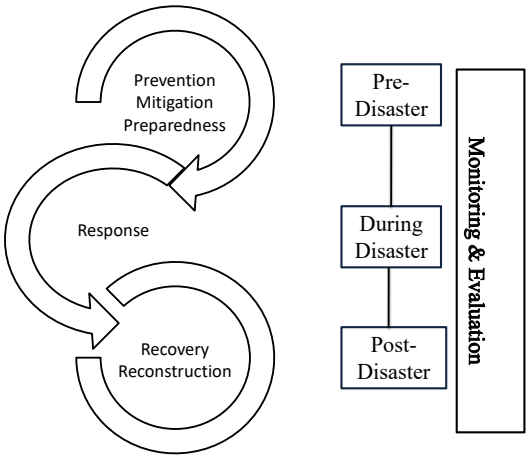



*Figure 1.* Disaster risk reduction and management mechanisms.

The first phase (pre-disaster) entails mechanisms on prevention, mitigation, and preparedness. Disaster prevention is the outright avoidance of adverse effects of hazards and related disasters. These include tree planting, School Mapping Exercise (SME), information dissemination campaign, developing or strengthening DRRM networks, capability training for school stakeholders, and the like.

Equally important is disaster mitigation, which aims at lessening or minimizing the adverse effects of hazards and related disasters. Mechanisms may be categorized into structural mitigation mechanisms and non-structural mitigation measures. Structural mitigation mechanism includes locating or relocating schools away from high-risk areas, constructing disaster-resistant school buildings and structures, implementing building codes, and physical modification. Non-structural mitigation mechanisms entail land-use planning/zoning, risk mapping, environmental protection regulations, insurance programs, and community awareness programs.

Another pre-disaster is preparedness which entails the readiness of the schools, barangays and communities to respond effectively and constructively to disasters to minimize the negative consequences for lives, and properties. It involves the knowledge and capacities developed by the school, barangay, and significant groups to effectively anticipate, respond to, and recover from the impacts of imminent or current hazard events or conditions in the local community. Mechanisms include the issuance of timely and effective early warning, contingency planning, the reserve of equipment and supplies, provision of communication systems, shelter facilities and evacuation plans, the efficiency of DRRM networks of emergency responders, and other related mechanisms.

The second phase (during disaster) is disaster response management which involves undertaking activities to deal with the effects of a disaster event. These may include search and rescue, evacuation, medical assistance, provision of basic needs, clean-up, temporary repairs and restoration of services, damage assessment and identification of priorities for recovery, and mobilization of recovery resources.

For the post-disaster phase, recovery and reconstruction are undertaken. The former refers to decisions and actions taken after a disaster with a view of restoring or improving the pre-disaster living conditions of the affected community (Jha et al., 2010). The latter refers to the restoration and improvement of facilities, livelihood and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. Mechanisms may include replacement of damaged physical structures, restoration of local services and infrastructures, improving disaster resilience programs.

*Objectives*

1. Assess the existing disaster risk reduction and management mechanisms of schools' stakeholders in the province of Bukidnon.
2. Analyze the adequacy and gaps of the disaster risk reduction and management mechanisms implemented in schools.
3. Formulate a model of school-based disaster risk reduction and management network.

*Expected Outputs*

1. Characterization of disaster risk reduction and management measures/mechanisms
2. Identification of adequacy/gaps of disaster risk reduction and management measures/ mechanisms
3. Proposed model of school-based disaster risk reduction and management network

*Methodology*

The study utilized a descriptive-evaluative design to ascertain the disaster risk reduction and management mechanisms in terms of their adequacy and gaps. This study focused on the disaster risk reduction and management mechanisms employed by schools within the barangay level in flood- and landslide-prone municipalities and cities in Bukidnon. These included elementary and high schools located in the barangays of Quezon, Kibawe, Impasug-ong, Malaybalay City and Valencia City. Figure 1 shows the geographical location of the schools in Bukidnon, where the study was conducted.

The participants represented the diverse stakeholders: Barangay Disaster Reduction and Management Team, key barangay officials, principals, teachers, parents, and students in elementary and high schools situated in the barangays of these municipalities, and cities. The instruments included an interview questionnaire, DRRM indicator specifically for school-aged children aligned with the Hyogo Framework for Action, and existing DRRM guidelines, plans and reports for schools, and Barangays.

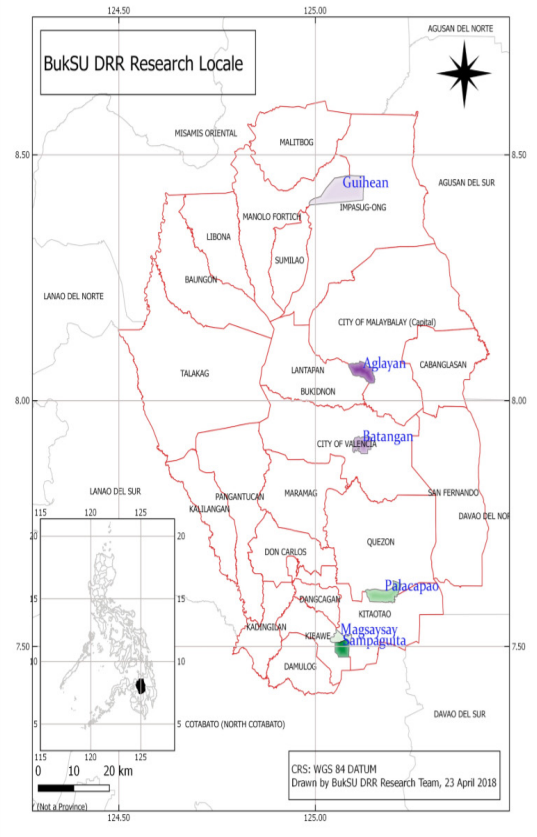



*Figure 1*. Base Map of the Research Locale in the Province of Bukidnon.

The unit of analysis was the DRRM mechanisms employed by the identified schools in barangays vis-à-vis the Hyogo Framework for Action. Specifically, mechanisms on disaster prevention, mitigation and preparedness, response and recovery/reconstruction, and analysis of adequacy and gaps.

*Results*

*Disaster Risk Reduction and Management Mechanisms of Schools' Stakeholders in the Province of Bukidnon*

Natural hazards cannot be stopped from happening but the damages they cause can be reduced if people institute prevention and mitigation measures. Taking measures to avoid an event turning into a disaster is prevention, which includes planting trees to prevent soil erosion, landslides, and drought. On the other hand, measures that reduce vulnerability to certain hazards are mitigation which includes for instance practices and standard designs to ensure that school buildings are constructed in risk-free school sites, houses and hospitals can withstand earthquake or a typhoon. Prevention and mitigation in schools begin with knowing which hazards and risks the school is exposed to, meeting with all stakeholders in education and making plans to reduce those hazards and risks, and implementing plans to reduce vulnerabilities.

Table 1 shows the extent of achievement of schools' stakeholders on school-based DRRM program Priority Action 1, which ensures that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.

As shown in Table 1, the participants have assessed this action as "not substantially achieved." However, the item on "the existence of policy and legal framework for disaster risk reduction with decentralized responsibilities and capacities in the education sector at all levels" is seen as "substantially achieved." This finding can be attributed to the mandate as directed in DO 21, s. 2015 where strategies have to be undertaken to ensure that disaster risk reduction and management is a national and local priority. The other items are "not substantially achieved" due to budgetary constraints for its implementation.

Table 1.
Extent of Achievement of Schools' Stakeholders Progress of School-Based DRRM Program Priority for Action 1

| *Priority for Action 1* | Existence | | Extent of Achievement | | |
|---|---|---|---|---|---|
| | Yes | No | Mean | SD | QD |
| 1.1. Policy and legal framework for disaster risk reduction exists with decentralized responsibilities and capacities in the education sector at all levels. | 85 | 7 | 3.46 | 0.83 | *Substantial achievement* |
| 1.2. Resources are available to implement disaster risk reduction plans and activities at all administrative levels. | 79 | 14 | 2.33 | 0.64 | *Relatively small or incomplete* |
| 1.3. Community participation and decentralization are ensured through the delegation of education authorities at the local levels. | 85 | 9 | 3.12 | 0.71 | *Not substantial achievement* |
| 1.4. A national multi-stakeholder platform for disaster risk reduction is functioning in the education. | 74 | 20 | 2.87 | 0.66 | *Not substantial achievement* |
| OVERALL | | | 2.94 | 0.71 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

Table 2 presents the extent of achievement of schools' stakeholders on school-based DRRM program for Priority Action 2 on identifying, assessing, and monitoring disaster risks to schools, and enhancing early warning for all learning environments.

Table 2.
The Extent of Achievement of Schools' Stakeholders Progress of School-based DRRM Program Priority for Action 2

| *Priority for Action 2* | Existence | | Extent of Achievement | | |
|---|---|---|---|---|---|
| | No | Yes | Mean | SD | QD |
| 2.1. National and local risk assessments based on hazard data and vulnerability information are available to education authorities and school. | 83 | 10 | 2.87 | 0.70 | *Not substantial achievement* |
| 2.2. Systems are in place to monitor, archive and disseminate data on school structural, infrastructural and environmental vulnerabilities. | 80 | 12 | 2.88 | 0.77 | *Not substantial achievement* |
| 2.3. Early warning systems for major and local hazards reach schools, and schools have the opportunity to participate in early warning systems. | 78 | 15 | 3.14 | 0.74 | *Not substantial achievement* |
| OVERALL | | | 2.96 | 0.74 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

The table shows that all the items are assessed as not "substantially achieved". The non-substantial achievement of the first item in Table 2 is consistent with the result of the study conducted by Catangui (2020). In her study, the absence of data such as school's updated danger map and risk profile was found to be one of the deficiencies in public education institutions in Polangui, Bohol. The weaknesses and capacities including data of school vulnerabilities are critical information of schools for risk analysis. Risk assessment is a highly technical procedure, hence, in her study, the researcher recommended that the School Planning Team may begin identifying the natural and human-induced hazards the school can face to begin with. The result of the present study therefore is consistent with those schools in other areas in the country.

Table 3 shows the extent of achievement of schools' stakeholders of school-based DRRM program for Priority Action 3, which is on the use of knowledge, innovation, and education to build a culture of safety and resilience through curricular and co-curricular activities in schools.

Table 3.
Extent of Achievement of Schools' Stakeholders Progress of School-Based DRRM Program Priority for Action 3

| *Priority for Action 3* | Existence | | Extent of Achievement | | |
|---|---|---|---|---|---|
| | Yes | No | Mean | SD | QD |
| 3.1.Educational materials on DRRM are available and accessible to teachers, students and other stakeholders for localization and contextualization. | 74 | 20 | 2.63 | 0.71 | *Not substantial achievement* |
| 3.2. School curricula, education material and relevant trainings include disaster risk reduction and recovery concepts and practices. | 75 | 19 | 3.19 | 0.80 | *Not substantial achievement* |
| 3.3. Research methods and tools for multi-risk assessments and cost benefit analysis are developed and strengthened for the education sector. | 67 | 26 | 2.64 | 0.71 | *Not substantial achievement* |
| 3.4. Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities, including child-centered and child-led elements. | 80 | 14 | 2.77 | 0.63 | *Not substantial achievement* |
| OVERALL | | | 2.81 | 0.71 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

This priority is assessed as "not substantially achieved." Though the law provides policies for Action 3, the participants have observed that these policies have to be implemented with proper coordination among the agencies and government units involved. Despite the non-substantial achievement in this area, the Department of Education is continually mainstreaming the DRR concepts and practices into its curriculum at the secondary level particularly in the Grade 7 social studies and natural science subjects through a centralized and competency-based approach grounded

on strong governmental commitment in advancing DRR practices in the educational system (UNESCO and UNICEF, 2012). This explains the highest mean value in the indicator on school curricula, education material and relevant trainings include disaster risk reduction, and recovery concepts and practices for Priority Action 3. The study conducted by Padernal and Borja (2016) revealed that the curricular enhancement of DepEd is effective in disseminating information concerning disaster reduction to high school students.

Moreover, the Department of Education forged linkage with Save the Children movement in developing DRR curriculum materials for integration in different grade levels. With the partnership formed with this movement, there have been promising innovation in the education sector including the informal leadership development through summer day camps and the engagement of students in informal leadership roles in risk reduction and response-preparedness (Save the Children 2007-2013).

Table 4 shows the extent of achievement of schools' stakeholders on school-based DRRM program for Priority Action 4 on reducing the underlying risk factors.

As presented in Table 4, the Priority for Action 4 has been assessed by the participants as "not substantially achieved," although a greater number of the respondents indicated that policies and plans are in place for this action. This result may be attributed to the fact that more efforts are still needed in identifying hazard-prone areas contributory to people's exposure to disaster. This factor is due to the little amount of resources allocated to disaster risks assessment which is an essential activity in addressing the underlying causes of people's vulnerabilities (NDRRMP 2011-2028). Current practices in post-disaster reconstruction and relocations of schools have not ensured that better and safer structures are built on safe locations. The engineering and land use practices have not been risk-sensitive as well (NDRRMP 2011-2028).

Table 4.
The Extent of Achievement of Schools' Stakeholders Progress of School-based DRRM Program Priority for Action 4

| *Priority for Action 4* | | Existence | | Extent of Achievement | | |
|---|---|---|---|---|---|---|
| | | Yes | No | Mean | SD | QD |
| 1.1 | DRR is an integral objective of environment related policies and plans, including site selection, design, construction and maintenance of schools. | 85 | 6 | 3.37 | 0.79 | *Not substantial achievement* |
| 1.2. | School disaster management policies and plans are being implemented to reduce the vulnerability of children in and out of school | 86 | 7 | 3.39 | 0.95 | *Not substantial achievement* |
| 1.3 | Educational continuity plans are in place to reduce disruption of the school year, and protect individual attainment of educational goals | 83 | 10 | 2.92 | 0.68 | *Not substantial achievement* |
| 1.4 | Planning management of school facilities incorporates DRRM elements including processes in the education Sector | 86 | 7 | 3.12 | 0.81 | *Not substantial achievement* |
| 1.5 | Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes. | 79 | 13 | 2.86 | 0.68 | *Not substantial achievement* |
| 1.6 | Procedures are in place to assure that every new school is a safe school | 84 | 8 | 2.98 | 0.64 | *Not substantial achievement* |
| | OVERALL | | | 2.97 | 0.70 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

Table 5 shows the extent of achievement of schools' stakeholders progress on school-based DRRM Program for Priority Action 5 on strengthening disaster preparedness for effective response at all levels.

Table 5.
Extent of Achievement of Schools' Stakeholders Progress of School-based DRRM Program Priority for Action 5

| *Priority for Action 5* | Existence | | Extent of Achievement | | |
|---|---|---|---|---|---|
| | Yes | No | Mean | SD | QD |
| 5.1 Strong policy, technical and nstitutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place in the education sector. | 85 | 8 | 2.77 | 0.63 | *Not substantial achievement* |
| 5.2 Disaster preparedness plans and contingency plans are in place at all administrative levels in the education sector and regular training drills and rehearsals are held to test and develop disaster response capacity programs. | 82 | 1 | 3.06 | 0.69 | *Not substantial achievement* |
| 5.3 Insurance and contingency mechanisms are in place to support effective response and recovery when required. | 75 | 17 | 2.76 | 0.58 | *Not substantial achievement* |
| 5.4 Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews. | 82 | 12 | 2.79 | 0.44 | *Not substantial achievement* |
| OVERALL | | | 2.84 | 0.58 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

The items for Priority Action 5 as shown in Table 5 are assessed by the participants as "not substantially achieved." The NDRRMP (2011-2028) stressed that much of what have been highlighted in many instructional, education, and communication materials are on preparedness and response without due attention to prevention and mitigation. The Priority for Action 5 underscores the strengthening of preparedness for effective response at all levels which means that all aspects of the school-based DRRM must be equally reinforced but the result of this study tells otherwise as evident in non-substantial achievement of the indicators under the Priority for Action 5.

Table 6 is the overall extent of achievement of the five priority actions of school-based DRRM program based on Hyogo's framework.

Table 6.
Overall Extent of Achievement of Priority Actions of School-based DRRM Program

| Priorities for Action | Extent of Achievement | | |
|---|---|---|---|
| | Mean | SD | QD |
| *Priority for Action 1* | | | |
| Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation | 2.81 | 0.71 | *Not substantial achievement* |
| *Priority for Action 2* | | | |
| Identify, assess and monitor disaster risks to schools and enhance early warning for all learning environments | 2.96 | 0.74 | *Not substantial achievement* |
| *Priority for Action 3* | | | |
| Use knowledge, innovation and education to build a culture of safety and resilience through curricular and co-curricular activities in schools | 2.81 | 0.71 | *Not substantial achievement* |
| *Priority for Action 4* | | | |
| Reduce the underlying risk factors | 2.97 | 0.70 | *Not substantial achievement* |
| *Priority for Action 5* | | | |
| Strengthen disaster preparedness for effective response at all levels | 2.84 | 0.58 | *Not substantial achievement* |
| OVERALL | 2.87 | 0.68 | *Not substantial achievement* |

Legend: 5.00-4.21, Comprehensive achievement; 4.20-3.41, Substantial achievement; 3.40-2.61, Not substantial achievement; 2.60-1.81, Relatively small or incomplete; 1.80-1.00, No achievement at all

Generally, the extent of achievement of priority actions of school-based DRRM program is "not substantially achieved." The policies and guidelines for Priority Action 1 to Priority Action 5 are all in place as mandated in the DRRM Manual for DepEd; however, the challenge is on its implementation, coordination among the units involved at different levels, and budget allocation for the resources needed and empowerment of the stakeholders in carrying out their roles and responsibilities.

### *Adequacy and Gaps of the Disaster Risk Reduction and Management Mechanisms Implemented in Schools*

Table 7 shows the extent of adequacy of the disaster risk reduction and management mechanisms implemented in schoolsin terms of disaster prevention mechanisms.

Table 7.
Extent of Adequacy in Terms of Disaster Prevention Mechanism

| | DRRM Mechanisms | Existence | | Extent of Adequacy | | |
|---|---|---|---|---|---|---|
| | Pre-Disaster Stage (Disaster Prevention ) | No | Yes | Mean | SD | QD |
| 1. | Tree planting | 81 | 12 | 3.30 | 0.71 | Fairly Adequate |
| 2. | School Mapping Exercise (SME) | 89 | 3 | 3.50 | 0.68 | Adequate |
| 3. | Mainstreaming disaster risk reduction concepts in the curriculum | 85 | 5 | 3.21 | 0.74 | Fairly Adequate |
| 4. | Preparation of disaster preparedness modules through multimedia | 67 | 23 | 2.77 | 0.73 | Fairly Adequate |
| 5. | Quarterly conduct of earthquake and fire drills | 89 | 4 | 3.74 | 0.97 | Adequate |
| 6. | Information dissemination campaign | 83 | 9 | 2.95 | 0.79 | Fairly Adequate |
| 7. | DRRM networking | 74 | 18 | 2.40 | 0.72 | Somewhat Adequate |
| 8. | Capability training for stakeholders | 65 | 28 | 2.21 | 0.45 | Somewhat Adequate |
| | OVERALL | | | 2.83 | 0.73 | Fairly Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

It is noted that the "Quarterly conduct of earthquake and fire drills" and "School mapping exercise" as "adequate" as assessed by the stakeholders among the strategies for Disaster Prevention Mechanism. School Mapping Exercise is mandated for each school as well as the quarterly conduct of earthquake and fire drills. These strategies are being regularly implemented by schools because these are also regularly monitored by the authorities. Moreover, since 2002, annual three-day workshop on earthquake and volcano hazard awareness and disaster preparedness for public schools teachers of Metro Manila is conducted by the Philippine Institute of Volcanology and Seismology (UNISDR, 2011 in UNESCO and UNISCEF, 2012). Nevertheless, in other regions and provinces in the country, earthquake drills are the only exercises that are conducted regularly in schools as this is a mandate from the national government. Exercises and drills related to other types of disasters such as landslides and flash floods are not given due attention in schools.

On the other hand, "Tree Planting," though mandated, however, requires a longer time to coordinate with other agencies for its implementation. It takes time to request for seedlings and the appropriate location where to plant the trees. These processes also need more time to be approved by the concerned authorities.

"Mainstreaming disaster risk reduction concepts in the curriculum" is done by offering DRR as a subject for senior high school. The integration of DRR concepts is also done in some subjects but has to be monitored and evaluated in terms of its extent. The preparation of disaster preparedness modules through multimedia requires the training, expertise, and budget. Teaching and learning about DRR is the primary approach to help increase the knowledge and information of the students and the community as well as hazards and what to do when hazards strike (UNESCO and UNICEF). The teachers are claiming that they need to have training, and financial support for them to be able to prepare modules on DRRM. "Information dissemination campaign" requires time and budget allocation for pamphlets and other information resource materials to be developed. On the other hand, "DRRM networking" requires common/ available time for stakeholders' consultation, meetings and other networking activities. "Capability training" for stakeholders also require budget allocation and common time among stakeholders.

Table 8 shows the extent of adequacy of the disaster risk reduction and management mechanisms implemented in schools in terms of disaster mitigation mechanisms.

As can be seen in the table, "Locating/ relocating schools away from high risk" is assessed as adequate by the stakeholders as one of the strategies for disaster mitigation mechanisms. This finding is because it is a requirement before school buildings are constructed. The area for the school building has to be away from high-risk areas. The area is first evaluated by the concerned authorities before it will be approved as the location of a specific school building. The other strategies/ areas are assessed as fairly adequate and somewhat adequate by the stakeholders. This can be due to budgetary constraints (like constructing disaster-resistant school buildings, implementing building codes, land-use planning/zoning, risk mapping and

community awareness programs). For other strategies, bureaucracy, and red tape are involved in the processing of such activities (like environmental protection regulations, physical modifications of structures, and issuance of insurance programs).

Table 8.
The Extent of Adequacy in Terms of Disaster Mitigation Mechanism

| | DRRM Mechanisms | Existence | | Extent of Adequacy | | |
|---|---|---|---|---|---|---|
| | Pre-Disaster Stage (Disaster Mitigation) | No | Yes | Mean | SD | QD |
| 1. | Locating/relocating schools away from high risk areas | 53 | 28 | 3.41 | 0.80 | Adequate |
| 2. | Constructing disaster-resistant school buildings and structures | 56 | 35 | 2.88 | 0.57 | Fairly Adequate |
| 3. | Implementing building codes | 71 | 20 | 2.76 | 0.71 | Fairly Adequate |
| 4. | Physical modification of structures | 71 | 18 | 2.42 | 0.72 | Somewhat Adequate |
| 5. | Land-use planning/ zoning | 69 | 20 | 2.67 | 0.71 | Fairly Adequate |
| 6. | Risk mapping | 83 | 8 | 3.07 | 0.72 | Fairly Adequate |
| 7. | Environmental protection regulations | 71 | 18 | 2.32 | 0.51 | Somewhat Adequate |
| 8. | Insurance programs | 48 | 40 | 2.12 | 0.59 | Somewhat Adequate |
| 9. | Community awareness programs | 78 | 12 | 2.98 | 0.67 | Fairly Adequate |
| | OVERALL | | | 2.62 | 0.62 | Fairly Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

Table 9 presents the extent of adequacy of the disaster risk reduction and management mechanisms implemented in schools in terms of disaster preparedness mechanisms.

The table "Shelter facilities and evacuation plans" is assessed by the stakeholders as adequate; this is accordingly identified beforehand, and provided with the help of the LGU to ensure the safety and protection of the community who will be affected. Though contingency planning is required for DRRM, this is not usually made promptly due to time constraints and sometimes overlooked when there seems to be no possible occurrence of typhoons or earthquakes.

Table 9.
The Extent of Adequacy in terms of Disaster Preparedness Mechanism

| | DRRM Mechanisms | Existence | | Extent of Adequacy | | |
|---|---|---|---|---|---|---|
| | Pre-Disaster (Disaster Preparedness) | No | Yes | Mean | SD | QD |
| 1. | Issuance of timely and effective early warning | 75 | 18 | 2.45 | 0.44 | Somewhat Adequate |
| 2. | Contingency planning | 78 | 14 | 2.71 | 0.56 | Fairly Adequate |
| 3. | Supplies and equipment reserve | 66 | 27 | 2.49 | 0.45 | Somewhat Adequate |
| 4. | Provision of communication systems | 74 | 18 | 2.25 | 0.48 | Somewhat Adequate |
| 5. | Shelter facilities and evacuation plans | 81 | 11 | 3.56 | 0.53 | Adequate |
| 6. | DRRM networks of emergency responders | 77 | 15 | 2.44 | 0.47 | Somewhat Adequate |
| | OVERALL | | | 2.69 | 0.48 | Fairly Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

The other strategies are assessed as somewhat adequate. "Issuance of timely and effective early warning" is usually overlooked because the occurrence of typhoons and other calamities cannot easily be predicted and the means of communication is not yet well established in remote areas. There is also a problem with the allocation of budget for "supplies and equipment reserve; provision of communication systems"; and in "establishing DRMM networks of emergency respondents." Identification of shelter areas and exit from hazardous areas is a major function of the DRR Coordinator and has to be coordinated with the barangay together with other local government units.

Table 10 presents the extent of adequacy of the disaster risk reduction and management mechanisms implemented in schools in terms of Mechanisms During-Disaster Stage.

Table 10.
Extent of Adequacy in Terms of Mechanisms During-Disaster Stage

| DRRM Mechanisms | | Existence | | Extent of Adequacy | | |
|---|---|---|---|---|---|---|
| Response (During Disaster Stage) | | No | Yes | Mean | SD | QD |
| 1. | Search and rescue | 73 | 17 | 2.94 | 0.72 | Fairly Adequate |
| 2. | Evacuation | 78 | 14 | 2.74 | 0.35 | Fairly Adequate |
| 3. | Medical assistance | 73 | 18 | 2.86 | 0.54 | Fairly Adequate |
| 4. | Provision of basic needs | 71 | 21 | 2.50 | 0.54 | Somewhat Adequate |
| 5. | Clean-up | 80 | 12 | 2.82 | 0.47 | Fairly Adequate |
| 6. | Temporary repairs and restoration of services | 65 | 25 | 2.54 | 0.40 | Somewhat Adequate |
| 7. | Damage assessment and identification of priorities for recovery | 72 | 19 | 2.79 | 0.67 | Fairly Adequate |
| 8. | Mobilization of recovery resources | 75 | 16 | 2.79 | 0.65 | Fairly Adequate |
| OVERALL | | | | 2.73 | 0.55 | Fairly Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

The fairly adequate DRRM mechanisms during the disaster stage may be due to lack of coordination among the units and agencies that are supposed to be involved, lack of training from the participants at school level (and those that compose the DRRM council), community and LGU level. Many agencies could be tapped in DRRM activities like in the clean-up drive, provision of medicine, restoration of damaged structures, etc. However, the UNDRR (2019) Status Report of Disaster Risk Reduction in the Philippines reported that inter-LGU collaboration/cooperation remains a challenge to be addressed in the country at present especially during disaster. Coordination and cooperation on DRRM in the country has not been considered as effective (Marcher, 2014) for three reasons. First, there is difficulty in terms of DRRM coordination at the different levels of government. Second, there is an intricate and bureaucratic cooperation between local and non-governmental organizations where permissions are required from local officials for every project to be undertaken. Third, there is a very complex collaboration between different organizations, donor agencies and other actors where each pursue their own approaches. The same difficulties are also observed within the education sector where cooperation on strategies for DRR is difficult to get.

Table 11 shows the extent of adequacy in terms of post-disaster stage mechanisms.

Table 11.
Extent of Adequacy in Terms of Post-Disaster Stage Mechanisms

| DRRM Mechanisms | | Existence | | Extent of Adequacy | | |
|---|---|---|---|---|---|---|
| Recovery & Reconstruction (Post Disaster Stage) | | No | Yes | Mean | SD | QD |
| 1. | Replacement of damaged physical structures | 49 | 41 | 2.40 | 0.48 | Somewhat Adequate |
| 2. | Restoration of local services and infrastructures | 52 | 37 | 2.42 | 0.54 | Somewhat Adequate |
| 3. | Improvement of disaster resilience programs | 60 | 29 | 2.08 | 0.40 | Somewhat Adequate |
| 4. | Monitoring and evaluation | 71 | 20 | 2.21 | 0.47 | Somewhat Adequate |
| OVERALL | | | | 2.28 | 0.47 | Somewhat Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

The extent of adequacy in terms of post disaster stage mechanisms is assessed as somewhat adequate by the stakeholders. Replacement of damaged physical structures, restoration of local services and infrastructure, improvement of disaster resilience programs, and monitoring and evaluation entails a great amount of budget allocation for its implementation. Campilla (2016) posited that the recovery management during post-disaster stage is the most crucial since financial allocation for every victim of disaster is highly needed. He declared that schools will find the recovery stage difficult to manage due to the absence of funds on hand. In the local government level, there are budgeting mechanisms in place to allocate for DRRM but the challenge is in accessing the funding to support early recovery efforts such as

restoration of critical infrastructures, delivery of services, and support for livelihoods (UNDRR, 2019). If LGUs find the finances as a challenge during post-disaster stage even if budgeting mechanisms are in place, the school is no doubt facing the same dilemma as there is no budget given to school administrators for disaster recovery purposes. The budget for schools has to come from the national government. Processing of the conduct of these activities also involves bureaucracy and red tape.

By far, the greatest challenge that the Philippines encountered that tested the limit of the country's DRRM mechanisms was the typhoon Yolanda also known as typhoon Haiyan. Macher (2014) revealed in her study that a great number of schools after that disaster have to be rebuilt and reconstructed but the challenge was on the lack of resources and available funding for rehabilitation. She declared further that the main challenge for action on DRR in the education sector in the country is the enormous lack of financial resources. Inequality in terms of support received from NGOs, LGUs, foreign aids and the like have also been observed after the disaster where some schools received little support while others received more. During recovery and reconstruction, it can be construed that post-disaster support can sometimes have political implications.

The above reasons presented in Tables 7 to 11 may have attributed to the overall result as the "fairly adequate" extent of DRRM mechanisms, as presented below in Table 12.

Overall, it can be seen that the Dep-Ed DRRM has a low-resource capacity in terms of mechanisms available across three stages. While this is so, an unanticipated finding lies in the extent of adequacy of measures in the post-disaster stage. The comparative data show that it obtained the lowest mean implying that the post-disaster response is given less emphasis than the pre-disaster response. Marcher (2014), on her assessment of schools after the typhoon Haiyan (Yoalnda) revealed several factors why post disaster stage can be challenging in times of disaster. Her study foregrounds the lack of adequate physical and financial resources and political involvement in decision making as significant factors to the difficulty in rehabilitation and recovery.

Table 12.
Overall Extent of Adequacy of DRRM Mechanisms

| DRRM Mechanisms | Extent of Adequacy | | |
|---|---|---|---|
| | Mean | SD | QD |
| Pre-Disaster Stage (Disaster Prevention ) | 2.83 | 0.73 | Fairly Adequate |
| Pre-Disaster Stage (Disaster Mitigation) | 2.62 | 0.62 | Fairly Adequate |
| Pre-Disaster Stage (Disaster Preparedness) | 2.69 | 0.48 | Fairly Adequate |
| During Disaster Stage | 2.73 | 0.55 | Fairly Adequate |
| Post Disaster Stage | 2.28 | 0.47 | Somewhat Adequate |
| OVERALL | 2.63 | 0.57 | Fairly Adequate |

Legend: 5.00-4.21, Very Adequate; 4.20-3.41, Adequate; 3.40-2.61, Fairly Adequate; 2.60-1.81, Somewhat Adequate; 1.80-1.00, Inadequate

The result is contrary to the typical DRRM framework, which emphasizes post-disaster response through relief and humanitarian aid provision (APCiCT-ESCAP, 2011). This finding implies that DepEd is becoming cognizant of the more proactive approach by taking a pre-disaster orientation raising its stakeholders' capacity to prevent, mitigate, and prepare albeit fairly adequate.

*Discussion*

The non-substantial achievement of the Priorities for Action 1-5 and the inadequacy and gaps in terms of school-based DRRM mechanisms all point to the same factors that include lack of financial and physical resources, lack of proper coordination and partnership, bureaucratic and political administration, and the lack of proper and adequate training among teachers in the education sector. The lack of financial resources in the implementation of DRRM program was also identified as a challenge in the study of Marcher (2014) especially during post-disaster stage. She declared that months

after the typhoon Yolanda, the government was on the hard road to reconstruction and in need of billions of pesos for rehabilitation (National Economic Development Authority, 2013, in Marcher, 2014). Most often, after disasters, schools will have difficulties in raising funds for school building repairs and reconstruction because in the first place, the ability of the country to bounce back after disaster is limited because there is not enough resources for countless urgent needs in post-disaster stage.

On the other hand, the lack of coordination among stakeholders during disaster stage are also evident in countless instances that the country has experienced disaster, and schools are not an exempt. The National Disaster Management Center (2018) emphasizes the importance of collaboration and partnership between key stakeholders in school-based DRRM. The collaboration and partnership shall be between a wide range of stakeholders from emergency management and education sectors, private sectors, non-governmental organizations, and community-based organizations to effectively implement disaster resilience education to the children and public. Working together as partners will increase the capacity of producing greater and successful results in the implementation of DRRM program in schools. All actors in DRRM have to build partnerships at all levels to contribute to the implementation of the priority for actions and school based mechanisms (Hyogo Framework, 2015).

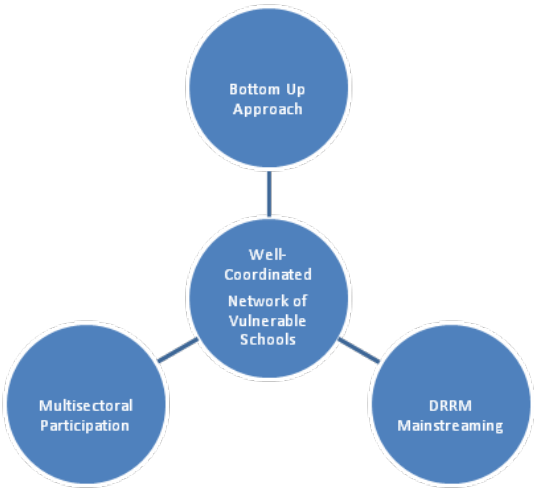
In terms of governance, the system in the Philippines is too complex. Marcher (2014) mentioned that at times, DRR is often seen a separate sector at the local level and not cross sectoral resulting to non-inclusion of DRR strategies and not properly budgeted in sectoral plans. Additionally, activities, priorities, and projects before, during, and after disasters have to pass several offices before its approval which results to delay on their implementation.

The lack of training among the teachers in terms of concepts and principles of DRRM is wanting in the Department of Education. For instance, although there are DRRM coordinators in schools, only limited numbers are sent to trainings due to budgetary constraints. After the training, the coordinators could not cascade what they have learned due to time constraints. With the DRRM initiatives already conducted and implemented, the Department of Education still believe that further enhancement of the capacity of teachers remain a vital strategy to pursue in the country (UNESCO and UNICEF, 2012). The study of Lopez et al. (2018) on the level of compliance with the risk reduction and disaster preparedness program among public secondary schools in Buenavista, Bohol, Philippines revealed that schools had a good compliance level on disaster preparedness. However, some problems were encountered such as inadequate training materials and lack of training among the school disaster risk reduction management teams among public secondary schools in Buenavista, Bohol, Philippines. A need was seen to continue the conduct of disaster preparedness training and seminars as well as allocate budget to finance the publication and dissemination of training materials of the program for distribution to schools. The Hyogo Framework (2015) stressed that dissemination of relevant knowledge and information on hazards, vulnerabilities, and capacities would substantially reduce disaster for this would make people become informed and motivated towards a culture of disaster prevention and resilience.

### *A Proposed Model of School-based Disaster Risk Reduction and Management (SBDRRM) Network of Vulnerable Communities*

Based on the findings, an integrated model of school-based disaster risk reduction and management (SBDRRM) network of vulnerable communities is thus proposed. Whereas the existing practice reveals a top-down approach controlled by the DepEd Central Office formulating and cascading the policies, programs and activities through its DRRM manual, the proposed model posits

PPAs executed within the in-situ context, i.e., the identified schools in areas susceptible to calamities across the three stages of disaster management. This model is illustrated in the following diagram:




The novelty of this model lies in the bottom-up approach planning, management, and maintenance of the DRRM program for DepEd. The non-substantial achievement of the five priority actions implies that the implementation of the program must be decentralized and strategic concentrating on those schools within the flood- and landslide-prone areas and considering their existing measures, thereby strengthening their capacities to address gaps or inadequacies which they have identified. This approach can be done by organizing a network composed of three focal groups of at-risk areas under the divisions of Bukidnon, Malaybalay, and Valencia. The SBDRRM network can pool resources to implement priority actions responsive to their vulnerabilities. A bottom-up approach also emphasizes the collaboration of multiple stakeholders involving the affected communities, LGUs, DepEd- SBDRRM, CDRRM, PDRRM and NDRRM, NGOs, and media to strengthen disaster management with a strong school-based implementing agency at the core. This entails mainstreaming of DRRM in curricular and co-curricular programs, projects, and activities across levels in basic education. This model hopes to elevate the DRRM discourse from an event-based reaction to a proactive process-based action following an upward development direction.

*Conclusion*

In conclusion, while the policies on disaster risk reduction and management are in place, there was a lack of implementation due to bureaucracy, budgetary constraints, and the lack of coordination among the concerned stakeholders. This implies that there is a need to strengthen the existing DRRM policies and initiatives by taking a strategic approach that increases the capacities of the vulnerable communities.

*Recommendations*

On the basis of the results and conclusion, the researchers would like to recommend that further study be conducted on disaster risk reduction management following the Sendai Framework which is the successor instrument to the Hyogo Framework for Action utilized in this study. Subsequently, the Department of Education needs to update its DRRM Manual based on the said framework and customize the processes and guidelines appropriate to the specific disasters/calamities that schools experience in their respective locales. A SDDRM network among at-risk areas may be established in the three divisions of Bukidnon, Malaybalay and Valencia to ensure the implementation of the new framework. Finally, a series of school-based retooling activities on Sendai-driven DRRM program may be conducted.

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