



# Unveiling the Disaster Risk Management Practices and Challenges of Ata Mandaya Tribe in the Hinterland of Panabo City

Boyeth C. Pelone<sup>a\*#</sup> and Florie Ann Fermil<sup>b#</sup>

<sup>a</sup> Department of Disaster Resiliency and Management, Institute of Leadership, Entrepreneurship and Good Governance, Davao Del Norte State College, New Visayas, Panabo City, Philippines.

<sup>b</sup> Department of Social Science, Institute of Leadership, Entrepreneurship and Good Governance, Davao Del Norte State College, New Visayas, Panabo City, Philippines.

## Authors' contributions

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

## Article Information

DOI: 10.9734/AJESS/2022/v29i430708

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/87776>

**Original Research Article**

**Received 03 April 2022**  
**Accepted 07 June 2022**  
**Published 16 June 2022**

## ABSTRACT

The hinterlands of Panabo City in Davao del Norte are home to some Indigenous peoples. The unfamiliar Ata Mandaya tribe in this area survived extreme climate changes in the past decades and seems disaster-adaptive and resilient, hence, their indigenous knowledge of disaster risk management begs for critical and academic explorations. This qualitative study aimed at exploring their disaster risk management practices and the challenges encountered. An in-depth interview was conducted on forty-three (43) members of the Ata Mandaya community purposively selected by their tribal leader. Data gathering procedures were rigorously carried out such as seeking approval from the City Mayor's Office, Office of National Commission on Indigenous People, tribal leaders, and Barangay officials. The disaster risk management practices were essentially explored based on the four thematic areas of disaster risk management namely: prevention and mitigation, preparedness, response, and recovery and rehabilitation. The study revealed that Ata Mandaya has learned and practiced both traditional and modern yet informal disaster risk management to remain resilient and adaptive despite varying disasters affecting their community. However, some of this indigenous knowledge and practices were slowly eroded due to the defined factors such as

<sup>#</sup> Faculty;

\*Corresponding author: Email: [boyeth.pelone@dnsc.edu.ph](mailto:boyeth.pelone@dnsc.edu.ph);

climate dynamics, market integration and technological advancements, and cultural integration leading to the loss of interest of young Ata Mandaya generations to adapt such traditional practices.

*Keywords: Ata Mandaya; disaster risk management; practices; challenges; cultural integration.*

## 1. INTRODUCTION

Indigenous peoples account for 16% of the entire Philippine population and are among the poor and vulnerable sectors of society. Aside from being deprived due to socio-economic conditions characterized by high illiteracy and unemployment rates, they are also among the most affected by natural disasters. For many years, these groups of people experienced natural disasters like floods, typhoons, and drought which may have caused significant loss of lives, damaged property, and destroyed sources of their livelihood [1]. They often received limited access to services and assistance for they are found in geographically isolated and disadvantaged areas resulting in them becoming particularly at risk of resorting to negative coping strategies that need the government's attention.

Despite they are often inhabited in smaller communities, however, they were able to understand their environment and practice risk reduction and management strategies leading them to survive the varying social and ecological dynamics. These practices evolved within their communities and have been enhanced and passed down over generations. Despite these advantages, still they were at particular risk from the effects of natural disasters because of climate variability and many others [2]. Thus, it is imperative to document their disaster risk management practices and how they were able to survive the challenges and adversities brought by disasters.

## 2. METHODOLOGY

### 2.1 Research Locale and Demography

Barangay Sindaton is situated at approximately 7.4396, 125.5842, on the island of Mindanao, Philippines. It is one of the hinterland barangays in the City of Panabo, Davao del Norte that is inhabited by a group of indigenous people. Elevation at these coordinates is estimated at 52.4 meters or 171.9 feet above mean sea level. Its population as determined by the 2020 Census was 4,312 individuals. This represented 2.06% of

the total population of Panabo City. The household population of the barangay in the 2015 Census was 3,396 broken down into 779 households or an average of 4.36 members per household. The population grew from 1,866 in 1990 to 4,312 in 2020, an increase of 2,446 people over 30 years. The latest census figures in 2020 denote a positive growth rate of 5.15%, or an increase of 916 people, from the previous population of 3,396 in 2015 [3].

### 2.2 Data Collection

Approval was sought from the Commission's Provincial for Indigenous Peoples, the Barangay Sindaton Council, and the Panabo Tribal Association to conduct an in-depth interview with forty-three (43) members of the Ata Mandaya tribe who were selected based on in-depth identification by a tribal leader. Informed consent was obtained, which was read and explained in the native language. Participants were passionately asked to use their language allowing them to freely communicate their ideas. Furthermore, the research was conducted amidst the global health crisis due to the COVID-19 pandemic, thus, minimum health protocols implemented by the local government were strictly followed.

### 2.3 Data Analysis

Interviews were audio-recorded and then transcribed. Using thematic analysis, data were coded based on the themes that emerged. To ensure the quality of the derived conclusion, we ask an independent quality auditor to study the data. Then we ascertained the consistency of our interpretations.

## 3. RESULTS AND DISCUSSION

The Indigenous peoples in Barangay Sindaton are originally composed of two dominating tribes, Mandaya and Ata Manobo. Accordingly, the dominant Mandaya tribe married some of Ata Manobo and they called the new generation Ata Mandaya. Thus, as to classification of tribe, Barangay Sindaton is dominantly composed of Ata Mandaya. The tribe is headed by its leader

Datu Isagani Concian, who served the tribe for more than five decades. He became a tribal leader through appointments from elders who belong to his clan. Accordingly, appointment to such a position is based on their traditional qualifications such as strong character and commitment, bravery, and ability to handle serious threats and problems that the tribe may face.

Barangay Sindaton strongly recognized the presence of the Ata Mandaya community in the area. Every year, they were given recognition for their traditional practices and culture through the presentation in Fiesta and Araw ng Barangay. Also, Indigenous People Mandatory Representative (IPMR) was appointed at the barangay council to act as the chair of the committee on indigenous peoples for the creation of resolutions and ordinances that benefit the civil, economic, social, and cultural rights of the tribe. According to the Tribal Association Leader in Panabo City, Bae Merlinda B. Aranar, Indigenous People in the communities of Panabo City do not have ancestral lands and do not cover any ancestral domains.

### **Indigenous Knowledge System**

Indigenous knowledge system has evolved as part of human existence and survival, especially by indigenous communities [4] and explored and integrated into the field of disaster risk reduction and management associated with climate change and other environmental problems [5]. Through time, the system was formed and developed in a community with common beliefs and aspirations and with an understanding of how individuals interact with their local environment which has imbibed and formed part of their delicate lives [6]. It was generally regarded as a significant catalyst to sustainable development due to its connection to resource management and conservation.

According to Mutasa [7] indigenous knowledge is useful in decision-making by local communities as this can predict the occurrence of disasters and lead people to be aware and prepare for its possible impact. Local people are experts in their community and through the years continuously enriching their capabilities and experiences to understand their environment well. Therefore, their capabilities can be relied upon to help their communities to reduce risks and prevent and mitigate the possible effects of a disaster [8].

### **3.2 Disaster Risk Management of the Ata Mandaya**

Like non-indigenous people, the Ata Mandaya implemented several strategies of disaster risk reduction and management that include having a planned meeting place for family members, designing activities to strengthen their homes or reduce risk or damage to their property, and preparing emergency supplies to take in case the family leaves their homes. These actions integrate their traditional practices with that the modern ways of management of disaster risks. Moreover, the Ata Mandaya also relied on the local government in terms of the provision of support and basic services when a disaster comes. They received assistance such as cash or “*ayuda*”, non-cash such as food, grocery items, and medicine from the local government. In addition, they acquired services such as spiritual support and services to boost the morale and psychological facets of their lives.

Furthermore, the Ata Mandaya trusted their tribal community to support them when a disaster occurs. The most common support they received is the sense of unity within the tribe and even outside of the tribe like the “Bayanihan” system. This action consists of the provision of information, communication, and direct support from the various people in the community. In short, they developed strong social networks and cohesion not only among IP members but also among non-IP members of the community. This social network is the connectivity among individuals or groups for perpetual sharing of material and non-material resources and it is one of the good indicators of the resilience of a community to any external disturbance like a disaster. Consequently, this study explored the disaster risk management practices of the Ata Mandaya tribe using the four thematic areas in disaster risk reduction and management namely: prevention and mitigation, preparedness, response and recovery, and rehabilitation [9].

#### **3.2.1 Disaster Prevention and Mitigation**

Prevention and mitigation measures are the initiatives that the community acts and implements to prevent a disaster from happening and to reduce the impact when it comes. The Ata Mandaya in Barangay Sindaton has practiced varying measures to prevent and mitigate different disasters which are manifested in the themes below.

**Table 1. Emerging themes and core ideas under disaster prevention and mitigation**

<b>Emerging themes</b>	<b>Core Ideas</b>
Respect all things found in nature and consider disaster as part of it	<p><i>“since birth, we were taught to respect all things that surround us”</i></p> <p><i>“Nature provides us our needs, thus, we have to take care of it”</i></p> <p><i>“ When we abuse nature, resources will be affected, trees lost, it can no longer support us” “Disasters are the ways on how nature takes a revenge on mankind”</i></p>
Read the landscape and interpret where to build houses	<p><i>“We consider selecting a safer place before constructing houses”</i></p> <p><i>“Spirits are found everywhere, thus, we are careful not to disturb them when we build structures”</i></p> <p><i>“Once you disturbed them (“spirits”) intentionally or not, we will suffer sickness and even death”</i></p>
Plant trees around houses and near water bodies	<p><i>“Trees helped us survive”</i></p> <p><i>“Tribal community and barangay officials reminded us to grow fruit trees”</i></p> <p><i>“Trees protected us from intense heat of the sun, strong wind, and floods”</i></p>
Attend capacity building to improve disaster awareness, understanding, and preparedness.	<p><i>“ We were invited by the local officials to attend training on disaster management offered by them”</i></p> <p><i>“ We also attended training as advised by our tribal leader”</i></p>

**Respect all things found in nature and consider disaster as part of it:** The Ata Mandaya tribe passionately treated nature with high respect and they committed themselves to take care of it with a strong sense of stewardship. They learned from their ancestors how to protect and manage the environment to ensure that the resources would continue to be available for generations to come [10]. Also, they believed that it is possible if they could take or use only what was needed and that they should not waste anything. This sustains knowledge that when nature is abused, resources are over-extracted and depleted, which can result in disastrous events such as changes in climate that may result in a lot of climatic issues such as typhoons, floods, and drought.

**Read the landscape and interpret where to build houses:** They practiced reading the landscape and interpreting where to build or not to build houses or any structures. Like Blaans of Cotabato [11]. Ata Mandaya believed that they should be careful in choosing a place where to build their houses. They make sure that the place is not within the path wherein bad spirits are living because when it happens, the family that settles therein might experience bad luck like being attacked by diseases and calamities. They respect what nature has as they consider disaster as punishment of nature due to overuse and mismanagement of resources.

**Plant trees around houses and near water bodies:** For Ata Mandaya, trees are essential for economic activities and spiritual well-being. Also, forests for them are considered sacred and serve as spiritual sanctuaries. Traditionally, they viewed it as the haven of spirits that are present in nature they offered live animals like chickens. They believed that these spirits blessed them with good fortune and healthy life. However, at present times, very few trees are found in the area due to the activities of the big firm logging industry in the late 1980s, and the illegal cutting of trees by the small-scale farmers ruined the forest that supported them before.

**Attend capacity building to improve disaster awareness, understanding, and preparedness:** This is one of the conventional practices of disaster risk management that the Ata Mandaya tribe was adapted to. They thrived in a small community immersed with non-indigenous people groups and they were encouraged to attend and participate in activities initiated by their local government. As mentioned by the tribal leader, Barangay Sindaton through City Disaster Risk Reduction and Management (CDRRMO) has conducted capability building on disaster awareness. He believed that this training offered to them can help them face and manage any disasters. This can intensify capability and build a culture of resilience especially in dealing with various disasters.

### 3.2.2 Disaster Preparedness

United Nations International Strategy for Disaster Risk Reduction [12] defined disaster preparedness as the knowledge and capacities developed by communities and individuals to effectively anticipate, respond, mitigate and recover from the impacts of likely, imminent, or current hazard events on vulnerable populations. It is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery. Consequently, the Ata Mandaya tribe practiced their traditional way of preparing for disasters and at the same time adopted and implemented unconventional preparedness mechanisms making them resilient and highly adaptive to varying disturbances that they encountered throughout their lives.

**Observe the unusual appearance and changes in a cloud pattern:** Like other IP communities, Ata Mandaya in Barangay Sindaton practiced observing weather conditions like the unusual appearance and sudden change of clouds from light to dark or called “dag-um”. It was learned from the participants that the presence of dark clouds is symbolic of heavy rains coming which may have the potential to result in flooding in the area. This traditional observation was also practiced in Northeast India [13] that when clouds are thick and black and are arranged perpendicular to the orbit of the sun, it symbolizes that rain is approaching. Consequently, this traditional knowledge helped them to prepare for the possible coming of strong rain that may result in flooding.

**Observe the behavior of certain animal species like turtle doves, dogs, and chickens:** According to the Ata Mandaya, the unusual movements and sounds created by these animal species mean there are possible impending

disasters that may come in the community. Plenty of studies have shown that some animals can sense major changes in the weather. Birds, for instance, are known to be sensitive to air pressure changes, and often hunker down before a big storm.

**Listen and consult their respected tribal leaders:** Additionally, Ata Mandaya in Barangay Sindaton is led by their tribal leader Datu Concian who acts as the head of the tribe. He is responsible to mediate and settle the conflict between and among communities, or with the government. He also resolves conflicts, disputes, and crimes within the tribal community. Moreover, despite their strong support and respect for their tribal leader, still they obeyed barangay ordinances and coordinated with local barangay officials for their tribal activities in the community.

**Listen to local news on TV and radio:** Despite the traditional disaster preparedness measures observed, the tribe has also adopted modern measures of disaster risk management such as listening to the radio and watching television to gather information about weather conditions. Some of them even acquired mobile phones where they search for daily local and international updates. Similar to other tribes in other areas in modern times, the tribe in Barangay Sindaton, has already adapted to digital technologies like televisions, computers, and mobile phones for expressing their unique perspectives, maintaining their cultures and livelihoods, and even preparing themselves for incoming disasters through news and advisories. This conventional source of disaster risk information among IP communities helped them understand better the outside world, however, diminished their original culture and traditions in different aspects including indigenous disaster risk management.

**Table 2. Emerging themes and core ideas under disaster preparedness**

<b>Emerging themes</b>	<b>Core Ideas</b>
Observe the unusual appearance and changes in a cloud pattern	<i>“ it is one of our indicators that when the clouds darken, it is a sign that a heavy rain comes’ “We rely upon this kind of forecasting since before and we found it effective”</i>
Observe the behavior of certain animal species like turtle doves, dogs, and birds.	<i>“ Animals detect the coming of an earthquake by making unusual sounds” “Birds flock from trees before a heavy rain come”</i>
Listen and consult their respected tribal leaders	<i>“ We always listened and depend on the advice of our tribal leader if what to do”</i>
Listen to local news on TV and radio.	<i>“ Some of us listened to news from radio and television”</i>

**Table 3. Emerging themes and core ideas under a disaster response**

<b>Emerging themes</b>	<b>Core Ideas</b>
Coordination with local officials for relief and subsidies	<i>"We relied on local officials for the relief services especially after the disaster when we were all helpless"</i>
Ask for support from families and friends and vacate immediately to relatives in safer places	<i>"Evacuate to our relatives who have safer places"</i>
"Bayanihan" system among tribal members.	<i>"Helping each other is always there"</i> <i>"We shared foods, water, and other needs with our neighbors and relative who were victims of the disaster"</i>

**3.2.3 Disaster Response**

These are actions taken during or immediately after a disaster to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. The Ata Mandaya tribe has implemented several actions and strategies in disaster response that are presented in the following themes below.

**Coordination with local officials for relief and subsidies:** During a disaster, the tribal leader in coordination with the Barangay officials sees to it that the tribal community can be able to receive relief and subsidies in a form of cash assistance, food packages, and other necessities. The LGU ensures to assess the vulnerabilities of the area and its constituents, instill basic knowledge of natural disasters, and conduct an information and education campaign (IEC) on disaster response.

**Ask for support from families and friends and vacate immediately to relatives in safer places:** It was recognized that strong family relationships are essential for individual, family, and community well-being, as well as providing long-term benefits to broader society. This is certainly true in the indigenous community, although there are considerable differences in the structures of their families and their functional dynamics. This explains why a tribal community

asks for support first from their clans and relatives during the time of emergency. They are known for having a strong relationship with all members of the tribe, the reason why they considerably helped each other and even let them stay in their houses for safety.

**"Bayanihan" system among tribal members:** "Bayanihan" system implied the spirit of support and understanding among Ata Mandaya members in the community, especially during times of disasters. The Bayanihan spirit was remarkable in the indigenous communities where people are bound with a strong kinship. Indigenous people believed in helping their members in any possible way they can do to extend a helping hand. Each of the tribal members builds trust within the community. It means that community members' assumption of one another benevolence and their belief that they may rely on one another to take action to assist those in their social entity [14].

**3.2.4 Disaster Recovery and Rehabilitation**

The rehabilitation and recovery focus on rebuilding the affected communities, restoring livelihoods, effectively preventing the recurrence of disasters, and harnessing conditions for future development. In this study, the Ata Mandaya in Barangay Sindaton has implemented actions relating to recovery and rehabilitation which include the following themes.

**Table 4. Emerging themes and core ideas under disaster recovery and rehabilitation**

<b>Emerging themes</b>	<b>Core Ideas</b>
Search for alternative income sources	<i>" We will not stick to our usual livelihood." We will find other sources of income just to feed our family especially when there is a calamity or disaster"</i> <i>"We strategies to feed our family"</i>
Coordinate the local officials for rehabilitation support	<i>" Our tribal leader guides us and brings our needs to the local officials"</i>
Revive the farm crops	<i>" We tend to save our crops after a disaster"</i> <i>" It was really painful seeing our crops heavily damaged by a flood"</i>

**Search for alternative income sources:**

Disasters are shown to have a significant negative, but the short-lived impact on local economic activity. A vulnerable community like a tribal community is somehow affected by disasters and made more susceptible to economic loss, hunger, and poverty. Thus, one of the priorities raised by the Ata Mandaya is to have a diverse source of income among its constituents. Diversity of income protects them from sudden potential shocks, promotes sustainability, and adds resilience to individuals.

**Coordinate the local officials for rehabilitation support:**

During the recovery phase, it is the responsibility of the state to take care of its constituents and provide them the basic needs such as food, water, medicine, clothing, and others. Victims of disasters lack the resources and capability to recover and reorganize themselves, especially the indigenous peoples. Thus, the coordination with the local officials in times of disaster is one of the recovery and rehabilitation phases mentioned by the participants. The tribal leader first coordinated with the local officials, reporting their needs such as food, medicine, water, and clothes. They believed that despite the strong relationship that binds them, still they need support from the local government to guide them in the process of healing from the tragic event they encounter.

**Revive the farm crops:** In the Ata Mandaya community, the impacts to agriculture due to disasters include damage to crops and destruction of farmlands and other agricultural facilities. They need to learn how to prepare and recover from disasters that come on their way. As it takes time, effort, and monetary resources, thus, they tend to revive farm crops and lands depending on the available resources they had, and the rest of it was coordinated with the government for possible assistance.

**3.2.5 Challenges in disaster risk management of Ata Mandaya**

Despite the traditional knowledge and practices that made the Ata Mandaya resilient and highly adaptive to the ever-changing patterns and processes of the community, they also encountered adversities and challenges that affect their delicate lives.

**Climate dynamics:** The Ata Mandaya observed that the pattern of climatic conditions has changed over time. According to them, they

knew when is the best time to do outdoor activities, plant and harvest crops, and undergo extreme activities outside their community. However, they observed that the climate today has changed which affects their traditional pattern of doing outdoor activities such as subsistence farming. The seasons where they relied most on their planting and harvesting activities variably changed. The traditional knowledge in disaster prevention and mitigation, preparedness, response, and recovery to their daily living as well as to their livelihood may no longer be reliable and effective due to climate variability.

**Market integration and technological development:**

Traditional knowledge of disaster management is gradually eroded due to a change in the social-ecological context which highlights the utility of science and technology. In the case of the Ata Mandaya tribe, their tribal leader admitted that most of their collective knowledge on disaster management is dramatically eroding due to the influence of modern technology and social media. The intrusion of the technology into the Ata Mandaya community created a market for the dissemination of fresh ideas and new voices while slowly fading the original and traditional ones. The present generations of the tribe are no longer aware of these knowledge assets because these practices are no longer transmitted to younger members of the family. He added that the younger generations of the tribe are no longer interested to learn the traditional knowledge and cultural practices including disaster risk management.

**Cultural Integration:** The Ata Mandaya is hardly influenced by non-indigenous peoples thriving in the place. Their indigenous cultures including that of traditional disaster risk management are at risk of being eroded. The fact is that these people are deprived and often lack the influence to protect their ways and identity against the interests of the superior non-indigenous group. Although this tribe is located in the hinterland, still they were exposed to and vulnerable to the effect of urbanization and market-driven activities in the lowland area. They were not capable to compete in increasing modernization thus they need to adapt to the culture of the dominant groups to sustain their lives, otherwise, the local government should find an immediate answer to address the need of this delicate and vulnerable community.

**Table 5. Emerging themes and core ideas under disaster recovery and rehabilitation**

<b>Emerging themes</b>	<b>Core Ideas</b>
Climate dynamics	<p><i>“There was an observable change in the climate today as compared to past years”</i></p> <p><i>“ Even during the hot season, sudden strong rain comes”</i></p> <p><i>“The weather is no longer detectable as compared before”</i></p> <p><i>“The sudden change of weather destroys our regular daily activities on the farm”</i></p>
Market integration and technological advancements	<p><i>“ Due to developments in our community, we also tended to adapt to such changes”</i></p> <p><i>“Our young people were heavily influenced by technology such as mobile phones and computers”</i></p>
Cultural Integration	<p><i>“ We were influenced by other people who are not from our group”</i></p>

#### 4. CONCLUSION

We concluded that the Ata Mandaya tribe in the hinterland of Panabo City practiced both traditional and modernized ways of disaster risk reduction and management to adapt to the underlying impacts of natural disasters. These adaptation mechanisms contain significant and unique characteristics that originated within the community, were embraced by their ancestors through time, and were embedded in a community’s culture as a means of survival. However, some of this knowledge and practices were slowly eroded due to some reasons such as climate dynamics, market integration, technological development, and cultural integration with non-indigenous peoples inside and outside the community leading to a gradual loss of its original identity and weakening the interest of indigenous peoples’ younger generations to adopt and assimilate such precious cultural knowledge.

#### CONSENT

As per international standard or university standard, Participants’ written consent has been collected and preserved by the author(s).

#### ETHICAL APPROVAL

Approval was sought from the Commission's Provincial for Indigenous Peoples, the Barangay Sindaton Council, and the Panabo Tribal Association to conduct an in-depth interview with forty-three (43) members of the Ata Mandaya tribe who were selected based on in-depth identification by a tribal leader.

#### ACKNOWLEDGMENTS

The authors are indebted to Davao del Norte State College for funding this research.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. UN High Commissioner for Refugees (UNHCR) (2011). Age, Gender and Diversity Policy; 2011. Available: <http://www.refworld.org/docid/4def34f6887.html>.
2. Cuaton GP, Su Y. Local-indigenous knowledge on disaster risk reduction: Insights from the Mamanwa indigenous peoples in Basey, Samar after Typhoon Haiyan in the Philippines; 2020. Available: <https://doi.org/10.1016/j.ijdr.2020.101596>
3. Philippine Statistics Authority; 2020. Available: <https://psa.gov.ph/content/2020-census-population-and-housing-2020-cph-population-counts-declared-official-president>
4. Dube E, Munsaka E. The contribution of indigenous knowledge to disaster risk reduction activities in Zimbabwe: A big call to practitioners. *Journal of Disaster Risk Studies*; 2018. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles>
5. Hiwasaki L, Luna E, Syamsidik R. Shaw Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. *International Journal of Disaster Risk Reduction*. 2014;10:15–2. Available: <http://dx.doi.org/10.1016/j.ijdr.2014.07.007>



6. Kamarulzaman NH, A/L KN. Vaiappuri S, Ismail NA, Mydin MAO. Local Knowledge of Flood Preparedness: Current Phenomena To Future Action. *Jurnal Teknologi*. 2016;78(5). Available:<https://doi.org/10.11113/jt.v78.8246>
7. Mutasa M. Knowledge apartheid in disaster risk management discourse: Is marrying indigenous and scientific knowledge the missing link?, *Jambá: Journal of Disaster Risk Studies*. 2015;7(1): Art. #150, 1–10. Available:<https://doi.org/10.4102/jamba.v7i1.150>
8. Kumar V. Role of Indigenous Knowledge in Climate Change Adaptation Strategies: A Study with Special Reference to North-Western India. *Journal of Geography & Natural Disasters*; 2014. DOI:10.4172/2167-0587.1000131
9. Republic Act No. 10121. An Act Strengthening the Philippine Disaster Risk Reduction and Management System, Providing for the National Disaster Risk Reduction and Management Framework and Institutionalizing the National Disaster Risk Reduction and Management Plan, Appropriating Funds Therefore and for Other Purposes; 2010.
10. Syafwina. Recognizing Indigenous Knowledge for Disaster Management: Smong, Early Warning System from Simeulue Island, Aceh. *Procedia Environmental Sciences*. 2012;20(2014): 573 – 582. DOI: 10.1016/j.proenv.2014.03.070
11. Espesor JC. Indigenous Knowledge of Disaster Management and Environmental Conservation of the Blaán Tribe in the Riparian Zone of the Calminda Watershed; 2014.
12. United Nations International Strategy for Disaster Reduction. Updated Terminology on disaster risk reduction; 2015.
13. Chinlapianga M. Traditional knowledge, weather prediction, and bioindicators: A case study in Mizoram, North-eastern India', *International Journal of Traditional Knowledge*. 2011;10(1):207–211
14. Saja AM, Melissa T, Ashantha G, Abdul M. An inclusive and adaptive framework for measuring social resilience to disasters. *International Journal of Disaster Risk Reduction*; 2018. DOI: 10.1016/j.ijdr

© 2022 Pelone and Fermil; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/87776>*