



Integrating the Local and Indigenous Knowledge (LiNK) of Barangays Dolo and Manzana in Local Disaster Risk Reduction and Climate Change Adaptation Planning

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Abstract

Philippines is known to be frequented by an average of 20 typhoons a year aside from being a host to other natural and human-induced hazards. This puts the country at great risk to myriad disasters, which disproportionately affects the most vulnerable communities. Given the current imperative across all levels of advocacy and engagement to harness and build on local capacities, the need to integrate and mainstream local and indigenous knowledge or LiNK gains more credence now more than ever. This study is primarily aimed to integrate the local and indigenous knowledge (LiNK) of residents of two coastal barangays in San Jose, Camarines Sur in local disaster risk reduction and climate change adaptation planning. The study made use of focus group discussions (FGDs) in Barangays Dolo and Manzana in San Jose, Camarines Sur to determine the LiNK in their communities then documenting, validating, and integrating the latter with scientific data at the local level through a process termed “Local knowledge and practices Inventory, Validation, and Establishing Scientific Knowledge (LIVE Scientific Knowledge)” but with some modifications on it. The researchers found out that most LiNK observed and documented by the community members have corresponding scientific explanations and can be considered as “precursory signs” of tropical cyclones. After the community validations, it was affirmed that the knowledge and practices handed down by their ancestors are credible and beneficent to them especially during disasters. Despite the presence of DRRM technology, these indigenous practices serve as a lasting legacy passed down from generation to generation.

Subject Areas

Sociology

Keywords

Climate Change, Disaster Risk Reduction, Integration, Local and Indigenous Knowledge, Planning

1. Introduction

Hit by an average of 20 typhoons each year, the Philippines is a low middle-income country that is highly vulnerable to various natural hazards such as floods, volcanic eruptions, earthquakes, landslides, and drought (Climate Change Risk in the Philippines: Country Fact Sheet, 2017) [1]. The country also ranked the fifth most affected by extreme weather events between 1996 and 2015 with losses amounting to 2.7 billion US Dollars (Global Climate Risk Index, 2017) [2]. Given the prevalence of socioeconomic vulnerabilities, the most vulnerable communities bear the brunt of the disasters in the country, particularly those located in geographically isolated and disadvantaged areas such as coastal communities. The record showed that 62% of the population who live in coastal zones are affected by hydro meteorological hazards (DENR, 2001) [3]. With a coastline of more than 18,000 kilometers covering a coastal water area of 266,000 sq. kms., communities along the shoreline are highly dependent on coastal and marine resources as their source of livelihood (“Oneoceanorg.com” n.d.) [4], thus highlighting the need to increase and improve their adaptive capacities in a manner that enables and helps them foster resilience at the community level.

Given the current imperative across all levels of advocacy and engagement to harness and build on local capacities, the need to integrate and mainstream local and indigenous knowledge or LInK gains more credence. However, local knowledge is still often dismissed as “inferior to scientific knowledge”, as it is not founded on scientific data nor validated through standard technical processes used by scientists (Mercer J., Kelman I., Taranis L. and Suchet-Pearson, S., 2010) [5].

In 2010, the enactment of the Philippine Disaster Risk Reduction and Management Act or RA 10121 institutionalized and required the active engagement and participation of vulnerable sectors and marginalized communities, also highlighting the need to integrate local and indigenous knowledge into local DRRM planning processes. The landmark law institutionalized better sharing and mainstreaming of best practices at the local and *barangay* levels by ensuring that disaster risk reduction and climate change measures are “gender responsive, sensitive to indigenous knowledge systems, and respectful of human rights (Philippine DRRM Act of 2010) [6]”. Moreover, RA 10121 has institutionalized the inclusion and mainstreaming of LInK under Section 2: “Ensure that disaster risk reduction and climate change measures are gender responsive, sensitive to indigenous knowledge systems, and respectful of human rights.”

In recent years, the call for integrated, community-based, and sustainable strat-

egies toward addressing the impacts of climate change and disasters have gained more ground not only at the national but also at the regional and global levels. Mercer, J. Kelman, I., Taranis, L. and Suchet-Pearson, S. (2010) [5] stated the significance of “increased utilization of knowledge of the local people” in mitigating hazards and reducing disasters in local communities. In the same light, Smit and Wandel (2006) [7] noted that some developing countries are employing “bottom-up approaches” and investing in “indigenous knowledge in developing DRR initiatives applicable to their situations.” A sense of “security and communal belonging” is reported to have been felt by the local people in Africa when they share and impart the knowledge indigenous to their culture. This signifies that when indigenous structures and mechanisms such as the latter are nurtured and sustained, it will be much easier to facilitate active and meaningful participation of the stakeholders at the community level, particularly the most vulnerable and at-risk sectors.

This research is in line with the National Disaster Risk Reduction and Management Framework (NDRRMF) of the Philippines as part of the National Disaster Risk Reduction and Management Plan (NDRRMP) of 2011-2028. The framework (**Figure 1**) depicts the “comprehensive, all-hazards, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management” with the overall goal of attaining “safer, adaptive, and disaster-resilient Filipino communities toward sustainable development (National DRRM Plan, 2011) [8]”. It starts with recognizing risk factors such as hazards, exposures, vulnerabilities, and capacities. The process flows into a cycle of key components: Prevention & Mitigation to avoid or lessen disaster impacts; preparedness to organize and ready responses; response to minimize disaster effects during and immediately after an event; and Rehabilitation & Recovery to rebuild and improve post-disaster conditions. The diagram highlights the importance of integrating disaster risk reduction and climate change adaptation into planning and implementation, suggesting a dynamic and ongoing process of managing disaster risks. Furthermore, the plan “recognizes the importance of culturally-sensitive risk reduction measures at all levels. People’s vulnerability to disasters as well as their capacities to adapt to the changing realities are more often than not, related to the cultural and indigenous practices. By being sensitive to the indigenous practices and local knowledge, DRRM approaches will become more effective and more easily understood and embraced by the people”.

This framework underscores the need to invest time and resources in the four thematic areas (disaster prevention and mitigation, preparedness, response, rehabilitation and recovery) as well as climate change adaptation and mitigation to be able to implement DRRM and CCAM programs, projects and activities that are proactive and can help reduce loss of life and damage to social, economic and environmental assets [NDRRMP, 2011]. To better establish the significance of the four thematic areas of DRRM, the following outlines the key activities per pillar:

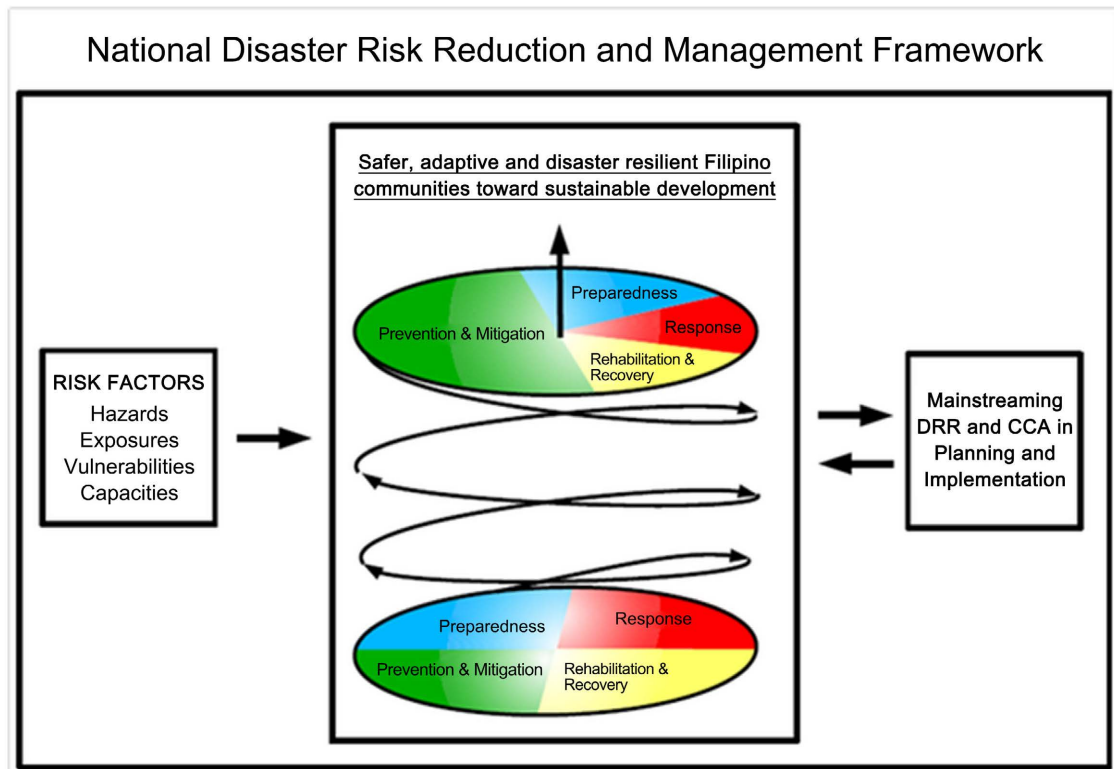


Figure 1. National DRRM Framework for 2011-2028 (NDRRMP, 2011) [8].

Disaster Prevention and Mitigation activities aim to “avoid hazards and mitigate their potential impacts by reducing vulnerabilities and exposure and enhancing capacities of communities” (National DRRM Plan, 2011) [8]. Examples of such activities are the establishment of Early Warning System, increasing disaster resilience of infrastructure systems, and conduct of community-based and scientific risk assessments.

Disaster Preparedness activities include simulation exercises or drills, Basic Life Support (BLS) Trainings and Contingency Planning, aim to “establish and strengthen capacities of communities to anticipate, cope and recover from the negative impacts of emergency occurrences and disasters” (National DRRM Plan, 2011) [8].

Disaster Response activities, on the other hand, are those that aim to “provide life preservation and meet the basic subsistence needs of affected population based on acceptable standards during or immediately after a disaster” [NDRRMP, 2011]. The conduct of Damage and Needs Assessment (DANA), management of evacuation and provision of psychosocial support are all considered a response activity.

Disaster Rehabilitation and Recovery activities aim to “restore and improve facilities, livelihood living conditions organizational capacities of affected communities, and reduce disaster risks in accordance with the ‘building back better’ principle” (National DRRM Plan, 2011) [8]. This includes strengthening of economic activities, mainstreaming DRRM and CCA in local development plans

and retrofitting and strengthening of infrastructures.

LInK, based on UNESCO's programme on Local and Indigenous Knowledge Systems (LINKS), is defined as the "understandings, skills, and philosophies developed by societies with long histories of interaction with their natural surroundings. For rural and indigenous peoples, such knowledge informs decision-making about fundamental aspects of day-to-day life (UNESCO, undated)". Communities foster and develop this body of wisdom and knowledge by observing and monitoring weather patterns, behavior of insects and animals, notable changes in biodiversity, and activities of celestial bodies.

Before the establishment of scientific databases and bodies of scientifically validated data, communities relied on LInK or local and indigenous knowledge to monitor, assess, and evaluate the changing climate and weather patterns. This has helped them plan and set up indigenous adaptation, mitigation, and preparedness measures, efficiently reducing losses and damages based on their local context and situation.

LInK has been the fundamental basis of communities for monitoring, assessing, and addressing the disaster risks to which they are exposed, helping them develop indigenous ways to prevent or mitigate the impacts of hazards not only to their households but also to their livelihoods.

Thus, it is pivotal for agencies and structures at the national, local, and community levels to institutionalize, mainstream, and integrate LInK in all planning processes, ensuring its efficient assimilation and validation in scientific knowledge bases, as it is only through the effective and efficient mainstreaming of LInKS in the socio-political infrastructure that communities will be empowered to better document, practice, and integrate their local and indigenous wisdom in all disaster prevention, mitigation, preparedness, response and recovery measures, strategies, and activities.

2. Objectives of the Study

This study is primarily aimed to integrate the local and indigenous knowledge (LInK) of residents of two coastal barangays in San Jose, Camrines Sur in local disaster risk reduction and climate change adaptation planning. More specifically, it has the following objectives: 1) to identify and document the existing local knowledge and practices of community members from Barangays Dolo and Manzana, 2) to validate the existing local knowledge and practices of community members, and 3) to develop Information, Education, and Communication Materials for Disaster Risk Reduction.

3. Materials and Methods

The study made use of focus group discussions (FGDs) in Barangays Dolo and Manzana in San Jose, Camarines Sur to determine the LInK in their communities then documenting, validating, and integrating the latter with scientific data at the local level through a process termed "Local knowledge and practices Inventory, Validation, and Establishing Scientific Knowledge (*LIVE Scientific Know-*

ledge)” but with some modifications on it (see **Figure 2**). Focused group discussions (FGDs) are a qualitative research tool where a moderator leads a targeted conversation with a small group to explore their perceptions and opinions on a specific subject. This method is useful for understanding group norms and behaviors, informing survey design, or interpreting quantitative data. FGDs leverage the group’s interaction to elicit rich, detailed insights.

LIVE Scientific Knowledge involves five (5) phases namely: Preparation, Data Gathering, Analysis and Validation, Science Integration and Popularization and Utilization.

Preparation Phase

This phase includes the orientation/training for the local researchers and the proponents. Part of the preparation was an ocular visit and inception meeting with the Local Government Unit of San Jose, Camarines Sur as the main partner and beneficiary of this research. Data-gathering tools were then developed putting into consideration the local culture thus employing the local dialect in the tools and in the actual conduct of the research.

Data Gathering Phase

Inception meeting with the Barangay Officials of Dolo and Manzana commenced after this research proposal has been finally approved. In the said meetings, target interviewees for the KII and participants for the FGD were identified. The objectives of the fieldwork were clearly discussed. Primarily, the data-gathering process aimed at coming up with the inventory of the local knowledge and practices of community members of Barangays Dolo and Manzana which are directly related to DRR/CCA.

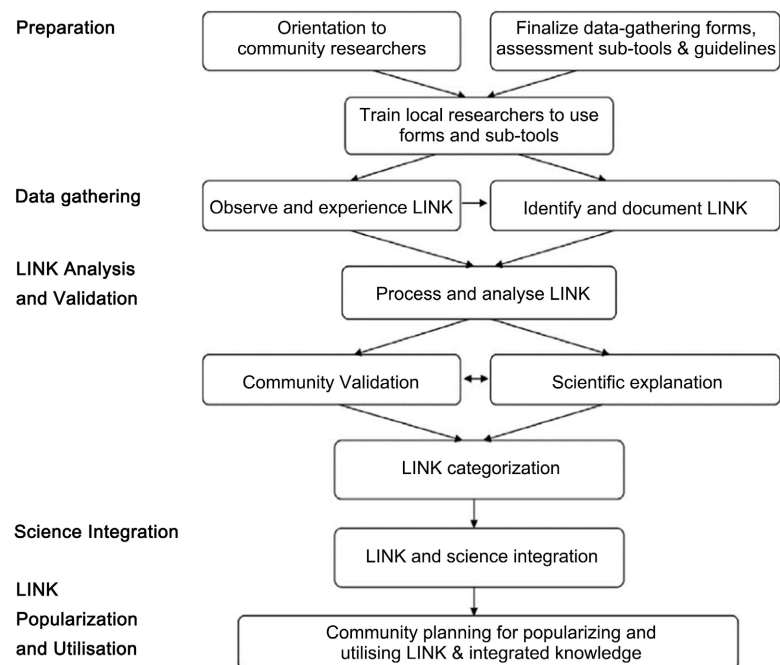


Figure 2. LIVE Scientific Knowledge (Source: Hiwasaki, L., Luna, E., Syamsidik and Shaw, R., 2014) [9].

LinK Analysis and Validation Phase

KII and FGD results were categorized based on the respondents' observation of celestial bodies (sun, moon, stars), animal behavior and their observation of the environment such as wind, plants, clouds, etc. These are all considered as directly related to hydro-meteorological phenomenon. Hence, observation and practices related to their material culture and traditional and faith-based beliefs were also gathered.

The provision of scientific explanations to the LInKs was originally designed to bring together scientists from different fields to have a group discussion in the analyses of the collected data. Due to time constraint and availability of the targeted scientists, the researchers conducted an individual interview with Animal Scientists, Meteorologist and Entomologist who generously shared their expertise in their field.

The findings were presented to the two communities for validation. The participants of the KII and FGD, together with the barangay officials of Dolo and Manzana were enjoined to be involved in the said activity. This aimed to provide venue for discussions and proper dissemination of information based on science.

The Scientific Integration Phase as well as the LINK Popularization and Utilization Phase was not performed because it will be part of the Extension Activity.

4. Results and Discussion

From the interviews and the tabulated KII, results exhibit the following observations:

- Questions regarding the effectivity of the LINK were not well answered or the respondents would just say the LINK is no longer observed or practiced especially in terms of observation of the celestial bodies and environment. What remains is the devotion to the tradition of the Catholic church where all the respondents still believe and practice the rituals and observe the tradition. The influence of modern technology and social media is referred to as the reasons why most of the present generation or the youth no longer believe in the LINK. On the other hand, beliefs in quack doctors or albularyo remain intact as they still bring their patients (mostly children) for a hilot or “santiguar” before going to a doctor.
- One (1) among the ten (10) respondents said that she did not even transfer the knowledge to their children.
- The observations of the nature and celestial bodies are mostly observed by the fisher folks. The traditional way of fishing is still being observed. Thus, the LINK directly related to hydro meteorological hazards and climate change are being observed by the fisherfolks.
- The frequency and effectivity of the LINK could not be exactly determined by the KII participants. The same uncertainty goes with the number of people in the barangay who still observe and believe in the LINK except for the religious or faith-based rituals and practices.

From the KII responses, FGD participants validated each LINK giving additional LINK observed or being practiced. As the FGD went through different

groups or sectors, more and more LINKS were observed with variations. Example: ants going up or rushing inside the house were signs that heavy rain or flood is coming. Other group would say snails do the same.

Same as the KII results, more practices related to traditional and faith-based beliefs were shared during the FGD. From the gathered results of both KII and FGD, the researchers focused on the Category related to the observations to Celestial Bodies and Animal Behavior which have direct link to DRR/CCA. The matrixes below (**Table 1**) show the gathered responses during the Focused Group Discussion conducted in Brgy. Dolo and Manzana.

Table 1. Responses of participants during the focused group discussions.

Responses	Translation
<i>Mga tanga nagraralaog, Nagsasarakat sa harong</i> (<i>may paabot na uran o baha</i>)	Ants coming inside and up the house mean heavy rains to follow
<i>Nagsasarabat-sabat na panganod</i> (<i>maraot na panahon</i>)	Convergence of clouds across the horizon as an early sign of bad weather
<i>Milky way, nagbabalagbag, ginaod ni Noah</i> (<i>maraot na panahon</i>)	
<i>Wild animals, nagbabaraba hali sa bukid</i> (<i>may paabot na maraot na panahon</i>)	Wild animals coming out from the mountain/forest as a warning for an upcoming bad weather
<i>Pag naggigilid ang lumod (dolphin) o butanding</i> (<i>makusog na alon, maraot na panahon</i>)	Dolphins and whale sharks getting nearer to the shore mean big waves and bad weather
<i>Naglulubid na mga walo-walo</i> (<i>may paabot na maraot na panahon</i>)	Spiraling sea snakes means there is an upcoming bad weather
<i>Pag may bulangiw na putol</i> (<i>may maraot pang panahon</i>)	Disconnected rainbow means weather is not yet good
<i>Paglupad nin gamgam</i> <i>Pasiring sa sirangan</i> (<i>may paabot na bagyo</i>)	Birds flying eastward means typhoon is coming
<i>Pag nagbalyo ang bulangiw sa tinampo</i> (<i>maraot na panahon</i>)	Rainbow crossing a street would mean bad weather
<i>Mga peste sa amihan</i> (<i>senyales kan maraot na panahon</i>)	Pests in the rice fields as a sign of bad luck
<i>Full moon, sayap o black shadow</i> (<i>mauran pagkaaga</i>)	Black shadow in the full moon as a sign that there will be rain in the next day
<i>Bituonnanagtaid</i> (<i>maraynasenyales</i>)	Two stars nearing to each other is a good sign
<i>Pag patugdok ang mga dahon nin niyog</i> (<i>may maraot na panahon/bagyo</i>)	Coconut leaves in downward position means typhoon or bad weather is coming
<i>Paglupad nin pato</i> (<i>may paabot na bagyo</i>)	Ducks flying high signals an incoming typhoon
<i>Pag luwas kan mga layug-layug</i> (<i>dakul dilis pagkaaga</i>)	Coming out of moths signals that there will be lots of anchovies or “dilis” in the next day
<i>Eclipse</i> (<i>dae dapat magluwas si mgabados maski si mga hayop na bados ta pwedeng magadan si aki sa tulak o maagas</i>)	Eclipse can cause miscarriage for pregnant women and animals
Additional from Women FGD: <i>Pag nagsal-ak/nagbare an mga kahoy</i> (<i>maraot na panahon</i>)	Branches of trees breaking or bending means bad weather

Continued

<i>Nagsasarakat na omang/garu kuhol sa harong (mauran, baha)</i>	Snails going up means rain or flood is coming
<i>Pag nagkutak an manok nin matangang banggi (may daragang mabados)</i>	Cackling of chicken in the middle of the night signals that a lady in the nearest house will get pregnant
Additional from Fisherfolks: <i>Daku lna bituon (uran)</i>	Scattered stars mean rain is coming
<i>Dakul na tutubi (dakul dilis pagkaaga)</i>	Huge number of dragonflies coming out means lots of “dilis” in the next day
<i>Elderly: Sadit na sayap (drought)</i>	Small moon shadow means drought
<i>Saradit na panganud (dae naghiihiro) = maray magtanom nin kamote</i>	Small clouds in stable position, good time to plant sweet potato
<i>Aninipot, pag nagalog sa harong (mauran)</i>	Fireflies coming inside the house means rain is coming
<i>Alinsasayaw/Muromaria pag Naghagidhid sa daga (maraot na panahon) *Alinsyawon na gamgam</i>	Swiftlets (birds) flying at low level signals a bad weather
<i>Mga balagon sa bukid, nagtatao nin direksyon</i>	Vines in the forest give direction
Additional: <i>Pag nagdadaguldol asin kilat mayong maabot na maraot na panahon Pa gang duros hali sa sirangan maray an panahon, pag hali sa hilaga baragyuhon</i>	
<i>Pa gang kuhol naghahanap nin “shell” niya para safe siya- may maabot na maraot na panahon</i>	
<i>Pag maribok an dagat/alon dae madagos an bagyo Pag nagsarabat sabat an hanging habagat saka amihan, makusogon kaiyan an bagyo pero patapos na</i>	
<i>Pag maribok ang bakasakapag ang talinga kang baka nakatindog- may paabot na maraot na panahon</i>	
<i>Pag ang gamgam na KANAWAY—nagtitiponsatahawtapos nag iikotikot—may maraotnapanahonnaabot</i>	
<i>Pag dakol ang ulod saka mga insekt0-dakol ang dilis pagkaaga</i>	
<i>Habang nagbabagyo, nagturaok ang manok, mapundo na ang bagyo</i>	
<i>Pag ang daguldol hararom ang tanog, matatamaan kami sa barangay kan bagyo pero kapag harani ang tanog kan daguldol, harayo ang bagyo sa barangay</i>	
<i>Pag tuninong na maray an palibot bago magbagyo, makusog ang bagyo na maabot</i>	
<i>Pag nag form nin dalan an mga bituon,mainit pagkaaga (iyo daa ito an inagihan ni Noah)</i>	

Legend: Animal Behavior ; Celestial Bodies .

Using the categorization process as shown in **Table 2**, the LINK observed in the community were then presented to the experts for scientific explanation and

analysis. Scientists from the Central Bicol State University of Agriculture (CBSUA) were consulted and engaged in an interview regarding the LINK listed above. Likewise, a meteorologist from PAGASA has been consulted regarding celestial bodies and even animal behavior.

Professors from the Animal Science Department of CBSUA have shared their analyses on the animal behavior being observed in the community. An Entomologist from the Department of Agriculture and Natural Resources also gave her views on the behavior of insects mentioned in the LINK. Meanwhile, the Agro-Meteorological Station of PAGASA has documented widely observed LINKS with scientific explanation and can be considered as “precursory signs” of tropical cyclone. The matrix below (Table 3) shows the LINK observed with the corresponding scientific meaning:

Table 2. Categorization of local knowledge (LINK) on disaster risk reduction (DRR) and climate change adaptation (CCA) and its relationship to scientific validation (Source: Hiwasaki, L., Luna, E., Syamsidik and Shaw, R., 2014) [10].

I	II
LINK which can be scientifically explained/validated and related to DRR and/or CCA	LINK which cannot be scientifically explained/validated but related to DRR and/or CCA
III	IV
LINK which can be scientifically explained/validated but not related to DRR and/or CCA	LINK which cannot be scientifically explained/validated and not related or relevant to DRR and/or CCA

Table 3. LInK observed by the participants with corresponding scientific explanation.

LInK	Scientific Meaning
Ants coming inside and up the house mean heavy rains to follow	This is valid and widely observed; Insect can sense the moist before rain and/or flooding
Convergence of clouds across the horizon as an early sign of a bad weather	This is a precursory signs of tropical cyclone
Wild animals coming out from the mountain/forests signals an upcoming bad weather	This is a valid observation but most unlikely seen at this period of time due to forest degradation and even extinction of wild animals Animals tend to secure themselves from threats
Dolphins and whale sharks getting nearer to the shore mean big waves and bad weather	This event is a usual observation in the volcanic eruption when the environment is getting hotter Relation with the weather could not be determined. Chasing for their foods are the usual reason why they are seen near the seashore. Most of the times, lots of “dilis” and “balaw” are nearing the seashore to keep themselves safe
Spiraling sea snakes means there is an upcoming bad weather	Possibly, due to the sea temperature There is no direct observation. Possibly, a reaction to the unusual movement of water. Animals Adapt to their environment
Disconnected rainbow means weather is not yet good	There is no scientific evidence, rainbows normally comes after the sun
Birds flying eastward means typhoon is coming	Birds fly along with the wind direction, there is no direct relation with cyclones
Rainbow crossing a street would mean bad weather	There is no scientific basis for this
Pests in the rice fields as a sign of bad luck	Insects like humid/warm environment; this should be studied thoroughly because of the changing climate
Black shadow in the full moon as a sign that there will be rain in the next day	Black shadow is actually clouds; it is widely observed

Continued

Two stars nearing to each other is a good sign Coconut leaves in downward position means typhoon or bad weather is coming	Not related to weather There is no scientific bases
Ducks flying high signals an incoming typhoon Coming out of moths signals that there will be lots of anchovies or “dilis” in the next day	This is widely observed. Animals tend to secure themselves from threats There is no relation or scientific basis on this Having wings is part of the life cycle of an insect; insects are mostly nocturnal and normally attracted to lights Possibly, the breeding season of “dilis” falls into the same period of breeding of these insects thus the community’s observation <i>*This analysis was affirmed by the entomologist</i>
Eclipse can cause miscarriage for pregnant women and animals Branches of trees breaking or bending means bad weather	No scientific explanation More of earthquake causing chicken eggs to crack due to shaking Cannot be explained by science but can be possible if widely observed by the people in the community
Snail-like insects going up and/or coming inside the house means rain or flood is coming Cackling of chicken in the middle of the night signals that a lady in the nearest house will get pregnant	Looking for dry area (especially during hatching); valid observation There could be a snake or anything near the chicken which causes a threat
Scattered stars means rain is coming	Clear skies during night time shows a good weather
Huge number of dragonflies coming out means lots of “dilis” in the next day	Same explanation with the moths Depends upon the season
Small moon shadow means drought Small scattered clouds in stable position signals a good time to plant sweet potato	No clear explanation from meteorology Clear skies predicts good weather
Fireflies coming inside the house means rain is coming Swiftlets (birds) flying at low level signals a bad weather	There is no scientific basis for this. Insects are mostly nocturnal and they are normally attracted to lights (same as moth) Bats and birds fly lower before the storms due to decreasing air pressure. The closer to the ground they fly, the less the pain on their ears
Combination of thunder and lightning means an end to a bad weather Wind coming from the east brings good weather Wind blowing from the North brings typhoon Snails looking for their shell to keep themselves safe means bad weather is coming Louder sounds of waves means there will be no typhoon The intersection of northeast (amihan) and southwest (habagat) monsoon means super typhoon will soon to end	No clear explanation from the experts Consistent northwestern wind direction signals a typhoon Animals tend to protect themselves from threat The periodic arrival of swells on the shore is a precursor to a typhoon
Cows having loud sounds and ears are in upward position signals an incoming bad weather Cackling of chicken during typhoon signals the end of typhoon	For female cows, this is sign of being “in heat” Male cows usually look for female during “in heat” <i>*this is also called cocking ears</i>
Thunder with deep loud sounds means typhoon would hit our community while thunder being heard near means typhoon is far from our place When the environment is so peaceful before a typhoon means the incoming typhoon is strong Stars forming a line in the horizon means a hot weather for the next day. Believed to be Noah’s way	Widely observed; a sort of “thank you” or a sigh for the peaceful environment No clear explanation from the experts

The scientific analyses have been presented to the community for validation. Participants of KII and FGD were enjoined to the said activity. Barangay officials and other sectors also took part in the discussion affirming most of the findings. For them, the knowledge and practices handed down by their ancestors remain intact and widely used for their own benefit especially during disasters. Despite the presence of the technology and a relatively advanced disaster preparedness measures, these indigenous practices serve as legacy from generation to generation.

5. Conclusion and Recommendation

The two communities (Dolo and Manzana) are still rich with indigenous knowledge related to DRR and CCA and can be explained by Science. Thus, these practices are considered to be valuable factor in community's resilience to disasters.

The proponents of this research strongly recommend the following:

- Implement development and/or extension activities such as the production of community-based IEC materials on local knowledge for hydro-meteorological hazards and climate change.
- Consider those LINKs which can be scientifically explained/validated and related to DRR and/or CCA during the crafting and updating of the Contingency Plan and Barangay DRRM Plans of the community.
- Raise awareness of the community people, especially the youth sector of the result of this study to be able to contribute to their resilience through educational programs, youth-led workshops, and community service projects.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] (2017) Climate Change Risk in the Philippines: Country Fact Sheet. <https://www.climatelinks.org>
- [2] Kreft, S., Eckstein, D. and Melchior, I. (2017) Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2015 and 1996 to 2015. Global Climate Risk Index 2017. <https://germanwatch.org/en/12978>
- [3] DENR (Department of Environment and Natural Resources, Philippines) (2001) Philippine Coastal Management Guidebook Series No. 1 Coastal Management Orientation and Overview. Cebu City: Department of Environment and Natural Resources.
- [4] <http://www.oneocean.org>
- [5] Mercer, J., Kelman, I., Taranis, L. and Suchet-Pearson, S. (2010). Framework for Integrating Indigenous and Scientific Knowledge for Disaster Risk Reduction. *Disasters*, **34**, 214-239. <https://doi.org/10.1111/j.1467-7717.2009.01126.x>
- [6] Philippine Disaster Risk Reduction and Management Act of 2010
- [7] Smith, B. and Wandel, J. (2006) Adaptation, Adaptive Capacity and Vulnerability. *Global Environmental Change*, **16**, 282-292.

<https://doi.org/10.1016/j.gloenvcha.2006.03.008>

- [8] National DRRM Plan, 2011-2028. National Disaster Risk Reduction and Management Council.
- [9] Hiwasaki, L., Luna, E., Syamsidik, and Shaw, R. (2014) Local & Indigenous Knowledge for Community Resilience: Hydro-Meteorological Disaster Risk Reduction and Climate Change Adaptation in Coastal and Small Island Communities. Jakarta, UNESCO, 60 pp.
- [10] Hiwasaki, L., Luna, E., Syamsidik and Shaw, R. (2014) Process for Integrating Local 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*, **10**, 15-27.
<https://doi.org/10.1016/j.ijdr.2014.07.007>