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Engaging Local Knowledge for Disaster Risk Reduction

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ABSTRACT. Disaster risk reduction and management (DRRM) programs have largely utilized knowledge from engineering and the physical sciences. The cultural dimensions of disasters, of which local knowledge is a part, have been neglected in the past. Recently, however, experiences of how cultural groups have exhibited resilience in the midst of potentially devastating hazards have shown the value of local knowledge to disaster risk reduction and mitigation. This paper aims to bring to the attention of DRRM planners and program implementers the value of incorporating local knowledge in their work. Referring to local knowledge as ways in which cultural groups have adapted to their environment, this paper delves into the various instances in which people have used local knowledge to understand and interpret their world and, ultimately, how such knowledge have helped them adapt to hazards. However, it is also pointed out that the incorporation of local knowledge in disaster risk reduction programs can be a daunting task. Recommendations have been forwarded to allow for a more efficient means of using local knowledge in disaster risk reduction. Among these notable recommendations is to view disaster risk reduction programs as part and parcel of broader human development programs that would address not just hazards but people's vulnerabilities as well.

KEYWORDS. local knowledge · disaster risk reduction · risk · culture

Introduction

On 26 December 2004, a 9.0 magnitude earthquake struck off the Indonesian island of Sumatra and triggered a tsunami that killed thousands of people in the Indian Ocean coastal communities. The tsunami affected coastal communities in eighteen countries and island states including Thailand, Indonesia, India, Sri Lanka, Malaysia, Maldives, Seychelles, Madagascar, Mauritius, Myanmar, Tanzania, Somalia, Kenya, Oman, Bangladesh, Reunion Islands (French), South Africa, and Australia (Department of Earth and Space Sciences 2014). Many more countries lost its citizens in the tsunami, particularly those who were spending the Christmas holidays in beach resorts in several

of the countries affected. All in all, 300,000 people were estimated dead; over 5 million individuals were affected, including more than a million rendered homeless. Such was the devastation that resulted from the hazard.

In the aftermath of the tsunami, amidst narratives of grief and suffering, narratives of survival emerged. Stories of how the indigenous peoples like the Moken and the Simeulueans survived the tsunami with minimal casualties are of interest here. The Moken are known to be the nomadic sea gypsies of Thailand and have traditionally occupied the Surin Islands (Arunotai 2007). The Simeulueans are the traditional inhabitants of the Simeulue Regency of the Aceh province of Indonesia located 150 kilometers off the western coast of Sumatra. Both groups have local knowledge about tsunamis that saved not only their lives but of the people with whom they had been interacting at the time that the tsunami struck.

The story of the Moken involves a particular lore that has been part of the Moken oral tradition. This is the *Legend of the Seven Rollers and the Laboon* or the "wave that eats people." The legend tells of several precursors to a tsunami that include a receding shoreline and the silencing of cicadas (Singh 2011). When an elder noticed these signs in the environment, he notified his neighbors and everyone scurried to safer grounds. Several of the Moken who had been serving as guides to tourists at that time brought the boats they were ferrying to areas traditionally known to be safe from tsunamis. These guides were able to save not only their own lives but the lives of the tourists they were ferrying as well (Arunotai 2008).

Similarly, the Simeulueans story of the *smong* (tsunami in Devayan language) was said to be what saved all but seven of the 78,000 Simeulueans occupying an island in Aceh (Syafwina 2014; Meyers and Watson 2008). The story of the smong emerged from the people's experience with a 7.8 magnitude earthquake that occurred on 4 January 1907. The story had been passed on through several generations through a lullaby that instructed people to move to higher places whenever an earthquake is followed by receding sea water levels. The story also tells of a tsunami or giant waves that would follow the receding of the sea and subsequently would inundate the land. Recalling the lullaby in the early morning of 26 December 2004, the Simeulueans fled to higher and safer grounds when they observed that the sea water level had receded after the earthquake.

The survival stories of the Moken and the Simeulueans brought world attention to the value of local knowledge and its contribution to resilience in the midst of potentially devastating hazards. International organizations such as United Nations Educational, Scientific and Cultural Organization (UNESCO) and humanitarian aid groups started to show interest on how people had been responding to hazards in their natural environment since time immemorial. While local knowledge had previously been explored in the context of natural resource management, disaster risk reduction, and climate change adaptation (Hiwasaki et al. 2014a), it is generally believed that the survival narratives of the Moken and Simeulueans in the aftermath of the 2004 tsunami was what brought local knowledge to the fore in disaster program and policy development and management (Baumwoll 2008). Disaster risk and reduction management (DRRM) has generally based its programs on the physical sciences such as engineering and geology, which is why the social and cultural aspects of DRRM have been hardly given any attention until recently (Mercer et al. 2012).

Drawing from the literature on the Asia Pacific region, this paper aims to contribute to further valuation of the social and cultural dimensions of DRRM, particularly through local knowledge. In the region, Southeast Asia and Oceania are parallel in many respects. Such parallelisms have been articulated by Belwood (2007). Materials on South Asia are also incorporated into the paper to better illustrate the concepts presented herein. I have also included some of the findings from recently concluded research work on the affected communities of super typhoon Yolanda (internationally known as Haiyan) as well as findings from my other field research involvements to complement information from the literature review.

Defining Local Knowledge

The literature has provided numerous terms that refer to localized ways in which groups of people have adapted to elements within their physical and social environments. In the field of ethnoscience, the terms used include, among others, local knowledge, indigenous knowledge, folk knowledge, traditional knowledge, peoples' science, indigenous and traditional knowledge, and, more recently in the United Nations Educational, Scientific and Cultural Organization publications, local and indigenous knowledge systems. Local knowledge has been seen as broader in scope compared to indigenous knowledge

whereby the latter is said to be included in the former (Burgos et al. 2011). This paper considers the various terms used in the literature invariably. Other authors have investigated human interaction with specific meteorological and geologic phenomena using methods in the social sciences, which have led to the development of more specialized studies such as geocultures (Mercer et al. 2012), climate ethnography (Crate 2011), and social volcanology (Donovan 2010).

Thus, Wisner (2009, 1) defines local knowledge as comprising

> the totality of perceptions, beliefs, understandings, and skills that one or more members of a community uses or potentially uses to communicate about and manipulate the world. 'World' in this sense is made up of the physical and built environment and also the social, economic and political environment that affect production and consumption at the local scale.

Local knowledge was seen to be the basis for local level decision-making on daily life activities for subsistence and social interaction (Boven and Morohashi 2002).

Definitions also refer to the ways in which local knowledge was acquired. In several articles, the temporal element associated with the development of local knowledge in a particular cultural milieu was a key feature. Moreover, local knowledge is learned, in most instances, through the oral literature passed on from one generation to the next. In Mercer et al.'s article (2010), indigenous knowledge is "acquired by local people over a period of time through accumulation of experience, society-nature relationships, community practices and institutions and by passing it down through generations." Other authors view local knowledge as having developed through "advanced understanding of the local environment, which has formed over numerous generations of habitation" (Baumwoll 2008, vii). Nakashima et al. (2012, 27) referred to indigenous or traditional knowledge as "know-how accumulated across generations, and renewed by each new generation, which guide human societies in their innumerable interactions with their surrounding environment." Pareek and Trivedi (2011, 183) recognizes indigenous knowledge as based on "cumulative experience handed down from generation to generation."

A document published by the United Nations International Strategy for Disaster Reduction on indigenous knowledge and disaster has identified key features of indigenous knowledge as distinguished from other forms of knowledge. In this document, indigenous knowledge was viewed to cover

> several other important characteristics which distinguish it from other types of knowledge. These include originating within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations and subject to adaptation, and imbedded in a community's way of life as a means of survival. (Baumwoll 2008, vii)

Another important feature is that indigenous knowledge is dynamic and not static. Like other aspects of culture, indigenous knowledge is evolving (Gratani et al. 2011).

Ben Wisner (2009), in his keynote speech during the Side Meeting on Indigenous Knowledge Global Platform for Disaster Reduction held in Geneva on 17 June 2009, provided several important features of local knowledge. In his speech, he outlined these features:

a. It is social.

b. Local knowledge is not entirely traditional nor passed on through several generations as is.

c. Local knowledge is opportunistic and incorporates outside specialist knowledge.

d. Hybridized or local knowledge mixed with outside specialist knowledge is a phenomenon that is increasing.

e. The term indigenous knowledge is limited. It is better to use the term local knowledge.

f. Within a community, local knowledge may not be known to everyone. There are certain information associated with skills specific to the roles and statuses certain individuals occupy within the community.

g. Local knowledge is gendered and age graded. Various forms of knowledge are known only to either the men or the women. Correspondingly, certain forms of knowledge are known only to elders.

h. Local knowledge is a source of power and status. Those who possess specialist knowledge are respected and their counsel is sought. Hence, they can be very powerful in their communities or villages.

i. From an outsider's perspective, local knowledge may not appear to be sound or valid.

j. Local knowledge may be tacit knowledge.

Cultural knowledge may very well be another term that could be used in place of local knowledge, indigenous knowledge, or local and indigenous knowledge systems. Knowledge is cultural. Local knowledge is situated, understood, and practiced in a specific way within a specific cultural area at a specific point in time. The paper also points to the importance of situating such knowledge in its own cultural context without which knowledge—or aspects of it—would lose its meaning. Local knowledge, indigenous knowledge, or local and indigenous knowledge systems does not preclude adaptation or radiation to other cultural areas. Indigeneity and locality of knowledge rejects notions of purity, hence the emphasis on knowledge being dynamic and responsive to change. Indeed, local knowledge falls within the broad field of ethnoscience.

This paper, however, dwells on local knowledge in the context of disasters. In the study of disaster, local knowledge incorporates knowledge that frames peoples' understanding of a hazard and their environment as well as culturally defined ways of responding to such hazards. Local knowledge reveals the worldview through which people define their problems, ways in which they look for solutions to these problems, and even what they consider as problems or solutions in their everyday lives. Local knowledge is said to have the ability to reduce risks in the face of hazards as well as to conserve biodiversity (Pareek and Trivedi 2011) particularly in an environment wherein increasing development projects and activities have contributed to the erosion of natural resources and the decline of ecosystem services.

DRRM interventions have to take these cultural frames into consideration as well as localized conceptualizations of hazards and the natural environment and the cultural meanings attached to these. Hence, local knowledge becomes a vital element in the development of DRRM interventions because it is the lens through which people perceive the world and their lives within that world.

People face threats from hazards in their everyday lives. While those living at the foot of volcanoes enjoy fertile agricultural soil for their crops, they also face the danger of lahar flows and the impact of pyroclastic material ejected by the volcano during an eruption. Those

in coastal areas live close to their fishing grounds but are also constantly at risk from tsunamis, storm surges, and flooding. Thus, through lifetimes of constant engagement with these hazards, people and their ancestors before them have developed ways to deal with these threats from nature. The ways in which people deal with the hazards have become part of their cultural repertoire in their daily life. Such ways of effectively and appropriately dealing with the hazards are part of every group's culture of disaster. It must be pointed out, however, that maladaptive responses are possible over time. These maladaptive responses may lead to population vulnerability.

The United Nations International Strategy for Disaster Reduction has found that long before the existence of modern technologies for early warning devices, and disaster response and mitigation systems, communities have already been preparing, operating and acting toward hazards in their natural environments using local and indigenous methods that have been passed on from their ancestors (UNFCCC Secretariat 2013). There have been many recorded anecdotal references to such actions and worldviews that describe how these communities are able to predict, for instance, an impending tropical cyclone, by observing the behavior of animals or by interpreting the positions of the celestial bodies. Such body of knowledge has been referred to as local knowledge and studied within the domain of ethnoscience in the discipline of anthropology. Recent research efforts on local knowledge within disaster contexts have filled gaps in existing programs to help resolve contemporary disaster concerns (Jha and Jha 2011).

Importance of Social Organization in Local Knowledge Utilization for DRRM

The way society is organized along lines of alliances or social cohesion appears to be crucial to reducing the risks and vulnerabilities of people to hazards. Normally, people will turn to those whom they trust for assistance when threatened. Moreover, risk perception is affected by social organization and values, which in turn affect people's judgments about dangers associated with a particular hazard and how they respond to it. Oliver-Smith (1996) provided that various characteristics of social life, particularly in relation to degrees of integration among other factors, elicit different responses to a hazard. Henry (2007) considers cultural institutions to be central to a society's disaster vulnerability, preparedness, mobilization, and prevention. Bankoff

(2007) underscores the value of formal and informal groups in societies in the provision of mutual assistance in times of crisis. Hence, an understanding of the way a community is organized is crucial to the development and sustainability of disaster programs. The disaster literature provides some information on how societies are organized, how such can be critical to the survival of people, and how this has helped in preparing for a hazard as well as in the post-disaster recovery period. On the other hand, the literature also provides data that show that lines of social fragmentation exist and recognizes that these contribute to failure in adapting to the hazards.

In the Philippines, in the province of Albay, the practice of *pagpapadagos* (Dalisay and Tatel 2011), reflects cultural values operational in communities, which were particularly useful when confronted with natural hazards. Houses made of sturdy materials like concrete and steel and situated in known safe areas within the community were common evacuation sites for the homeowner's relatives and neighbors. The practice of taking in neighbors and relatives during typhoons was considered as a way in which people practice the values of *damayan* and *bayanihan* or *pagtarabangan* in Bikolano language. Pagpapadagos is a mechanism through which traditional solidarity is promoted.

The Fa'a Samoa, a collective term for at least five of the indigenous institutions in American Samoa, is recognized by the Samoans as the authority in times of crisis (Rumbach and Foley 2014). The Samoans look to the Fa'a Samoa for advice and direction, particularly during critical periods such as during emergency decision making, the assignment of roles and responsibilities in times of crisis, and the establishment of recognized lines of communication between the villagers and outside agents among others. The Fa'a Samoa can be a vital link between the government DRRM program implementers and the Samoan people. It has been particularly significant during the 2009 tsunami.

Local Knowledge in Disaster Risk Reduction

Local knowledge on natural hazards and the environment have been documented in the literature on disaster risk reduction. Such knowledge cover a wide range of topics from warning signs that can be "read" from celestial bodies and animal behavior to risk reduction measures that include the use of indigenous and locally available materials for housing and for their subsistence activities. Local knowledge reflects the close engagement of people with their natural environments and resources within. A few of the cases are provided here.

Animal Behavior

In Albay, it has been observed that certain animals will suddenly come out of their natural environment and scamper about prior to the occurrence of a typhoon (Dalisay and Tatel 2011). Rats and snakes come out of holes in the fields and crabs suddenly show up on the shore. A goose, a low flying bird, that flies no higher than the roofs of houses is seen as indication that the fowl needed higher ground to avoid being caught in a flood. Such behavior of animals are deemed to be unusual as they would normally hide from humans and burrow into their hiding places. However, just before a particularly strong typhoon hit the province, these animals were seen emerging from their home-holes and moving someplace else.

Similar observations have been narrated in response to the eruption of Mayon Volcano, also in Albay. Wild boar and chickens have been seen running away from the volcano just before an eruption. Such animal signs have long been utilized as an early warning system by the residents living at the foot of the volcano (Cerdena 2008).

Dogs barking in an unusual manner and the erratic flight pattern of birds are behaviors that have been associated with the coming of tropical cyclones in Bangladesh (Irfanullah and Motaleb 2011). The behavior of ants was also observed. It is generally believed that before a hailstorm, ants climb up house walls; before a cyclone, they cross streets; but when heavy rainfall was imminent, the ants would do both. Such animal and insect behaviors were reportedly found in Bolipara as well as in other neighboring communities in Bangladesh. Similarly, the appearance of ants was also linked to the likelihood of rainfall in Rajasthan (Pareek and Trivedi 2011).

The height of the nests of birds on trees was also used as an indicator of the possible height of floods in Rajasthan (Pareek and Trivedi 2011). Normally, birds would nest on levels higher than flood waters. Such knowledge has provided people in Rajasthan information on possible safe shelters from floods.

Interpretation of Celestial Bodies

Fishers in Albay are quite particularly knowledgeable about the movement of celestial bodies, which serve as a guide for their fishing expeditions. To fishers, the condition of the sea and the weather are critical factors that determine their decision on whether to go out on a fishing expedition and also where to go. For the fishers, such decisions are a matter of life and death and all the forces of nature have

to be in their favor for a successful fishing expedition. Hence, their specialized knowledge of nature is very important to them. For instance, a foreboding sign is when one of the stars in the middle of a cluster departs from the group. This signals that a disaster at sea may occur due to unfavorable weather conditions. If the sun is redder in color than usual and when the rays pass through dark clouds, a strong storm is believed to be forming (Dalisay and Tatel 2011).

Among the An Hai, a coastal community engaged in farming in the East Ninh Thuan Province of Vietnam, knowledge on the positioning of celestial bodies has been the basis of their agricultural calendar for several generations (Ngoc Huy and Shaw 2008). Such knowledge is relayed through proverbs and folk songs. In teaching the children these proverbs and songs, the wisdom of local knowledge is transferred through generations of An Hai community members. For instance, in predicting the weather, one proverb says, "Corona around the moon, there will be a drought year; halo around the moon, rain soon" (Ngoc Huy and Shaw 2008, 80). I had encountered a similar saying while doing fieldwork post-super typhoon Yolanda in the Visayas. Apparently, the night before the super typhoon made landfall in the Visayas, a few elderly people familiar with the sign saw a halo around the moon.

In Rajasthan, ancient sutras have been known to incorporate early warning verses such as the appearance of clouds. When it is said to be "rough and small" and similar in form to inauspicious animals like camels or monkeys, drought is believed to be experienced in the coming year (Pareek and Trivedi 2011).

Plants

Like animals, plants have been used to predict the occurrence of a particular hazard. For instance, in Albay, a sign of an approaching storm is when the banana leaf suddenly falls even without a wind. When this occurs, people evacuate to safer grounds (Dalisay and Tatel 2011). In Rajasthan, the flowering and generation of new leaves of the *ficus* plant is said to indicate approaching rains (Pareek and Trivedi 2011).

Resilient Architecture

Traditional houses were designed to withstand local climate. In the Philippines, the traditional house on stilts was designed not only to provide space for farm animals, but also to keep the human occupants high and dry in case of flooding. The Philippines is visited by tropical

cyclones about twenty times a year and the possibility of flooding in several areas is imminent. Similarly, the Singas of Papua New Guinea also build their houses on stilts in adaptation to potential flooding from the Markham River (Mercer and Kelman 2008).

The Batanes islands inhabited by the Ivatans in the northern most tip of the Philippine archipelago are constantly battered by strong winds and rains not only from *anin*, or tropical cyclones, but from monsoon rains as well. Traditional Ivatan houses are designed to withstand such climate conditions (Uy and Shaw 2008; Valenzuela 2014). Different from traditional houses elsewhere in the country, Ivatan houses are constructed with boulders and mortar. The boulders are sourced from the Valugan boulder beach in Basco, Batanes. An Ivatan house is built with limestone walls two to four feet thick and topped with several layers of cogon grass as roofing material. Windows and doors are small and narrow. The wall that faces the wind does not have windows. Such house construction has long protected the Ivatans from the fiercest storms that often visit their area.

Similarly, housing construction types in Kashmir have rendered traditional houses earthquake resilient. The techniques locally known as *taj* and *dhajji-dewari* have incorporated wooden beams into the masonry of the walls as reinforcement, thus providing the walls with increased strength to withstand the tremors caused by earthquakes. Records have shown that portions of houses in the high seismic region of Kashmir that have been constructed using the taj and dhajji-dewari systems have withstood earthquakes, whereas portions of the same houses that did not use these systems have collapsed (Khan 2008).

Belief in the Supernatural

The ways people engage with the natural world, including with disasters, have always incorporated a strong belief in the supernatural. Part of local knowledge is how societies construe the occurrence of hazards and disasters that may result from these. The way people understand their world is infused with spiritual significance (Bankoff, 2004). In many instances, hazards and disasters are interpreted as violations of social, moral, and religious norms (Roncoli, Crane, and Orlove 2009) or as acts of God or wages of sin (Dalisay and Tatel 2011). This view is linked to a lack of complete control over the natural phenomenon by human beings. Cataclysmic events are believed to part of a divine plan but human beings can alter the course of events if they abide by social and religious norms. Prayers and the performance of

rituals in honor of the gods are powerful ways of coping with the disasters. Such practices were seen to strengthen the belief in the power of supernatural beings and the attribution of hazards to such beings may help people maintain the integrity of their mind and their spirit. Belief in the supernatural helps people deal with their losses in culturally defined ways (Dalisay and Tatel 2011; Pareek and Trivedi 2011) and maintain psychosocial integrity. Attribution of hazards to supernatural beings also sustains the existence of the religious beliefs and maintains cohesion among the members of the religious group. Such groups become valuable sources of support and assistance in times of disaster.

In Tiwi, Albay, the Nuestra Señora de Salvacion is a popular patron that sustains the people's devotion (Dalisay and Tatel 2011). The Virgin's popularity extends to supplications for other life yearnings. The church where her image is housed is on top of a hill that faces the sea. Legend has it that this particular location provides her with a vantage point of the sea and everything that comes toward Tiwi from the sea. Under her watchful gaze, the town is rendered safe from typhoons and lava flows from the Mayon Volcano.

In Bangladesh, animals are vital tools used in farming. There are times, though, when these farm animals get sick and die. Praying was a common response to diseases that attack farm animals (Irfanullah and Motaleb 2011). Neighbors are invited to join the affected farm animals in prayer. Rituals are also performed wherein people would dance around the carcasses of the dead animals and eat these after the dancing. It was also customary to worship in temples and donate money and necessities to the poor and the orphans that roam in these temples.

Folklore

Folklore through legends, traditional songs, and fables are ways through which the wisdom of the elders is passed on from one generation to another. It is through these interesting tales that the wisdom of generations past are narrated by parents to their children. However, the reliability of these stories have been questioned, pointing out parts that have been embellished to make these more entertaining and factual points have been changed as a result of event amalgamation or change in the belief system of the storyteller (Walsh and Nunn 2012). Nonetheless, these stories are useful because they are repositories of lessons drawn from knowledge and experience with hazards and how to effectively deal with these. Folklore is a potent medium for the

transmission of local knowledge. More often than not, local knowledge is transmitted from generation to generation through oral lore.

In Philippine folklore, several references have been made to deities that govern aspects of the environment. Such gods and goddesses are capable of unleashing their wrath to erring humans. Thus, hazards are viewed in Philippine folklore as means to regulate social behavior and instill the value of adhering to established norms (Lopez 2006). Some of the Philippine gods and goddesses of the environment one would encounter in Visayan myths include Ribung Linti (the God of Lightning), Panlinugun (God of Earthquakes), Saraganka Bagyo (God of Storms) and Lalahon (Goddess of Harvest, Fire, and Volcanos). In the Panay epic, the *Hinilawud*, flooding was mentioned in the context of punishment by the gods. Other peoples both in the Philippines and abroad also have their own folklore referring to their gods and goddesses of the environment.

Among the An Hai in Vietnam, a folk song tells of the behavior of dragonflies during rainy and sunny weather (Nguc Huy and Shaw 2008). A folk song has these lyrics: "Dragonfly flies high, sunny sky. Flies low, rain. Flies neither high nor low, cloudy sky" (Nguc Huy and Shaw 2008, 81).

In Rajasthan, ancient texts including the *Atharva Veda* and the *Arthashastra*, the latter dating back to the fourth century BC have long provided messages that teach the people how to successfully face drought and famine (Pareek and Trivedi 2011). Such texts have been in the Rajasthani folklore for generations and are still being told by elders to the younger members of the community. In this way, the lessons learned from ancient lore are being kept in the living memory of the people of Rajasthan.

The use of *kastom* or customary practices among the people of Baie Martelli, Pentocost Island in Vanuatu was reportedly valuable in preparing the people for a tsunami that occurred on 26 November 1999 (Walsh and Nunns 2012). While the local disaster management office of the island showed an instructional video on how to safely respond to the threat of a tsunami, it is believed that it was the *kastom* stories about tsunamis that actually saved people's lives. Unlike the video that was known only to a few who had the opportunity to watch it, the tsunami *kastom* was known to a majority of the people in the island. Such *kastom* knowledge eventually led them to safe evacuation areas.

The *Legend of the Seven Rollers and the Laboon* of the Moken is another example of local lore used as warning for tsunamis. The *smong* lullaby of the Simeulueans of Aceh is another example of folklore that served as disaster warnings. Proverbs, legends, epics, folk dances, and folk songs facilitate the communication of local knowledge for disaster risk reduction as these both instruct and entertain. Particularly in indigenous cultural communities with no traditional way of writing, folklore becomes the unwritten word through which the group inscribes its culture and the identity of its people. It is also the vehicle through which local knowledge is transmitted intergenerationally.

Challenges and Recommendations in Mainstreaming Local Knowledge in DRRM

Local knowledge and its value in addressing hazards at the local level have been recognized by both international and national organizations and agencies. The Intergovernmental Panel on Climate Change in its Fifth Assessment Report recommends the sharing of local knowledge as an action that can contribute to the development of communities (Carabine and Lemma 2014).

Recognition of the importance of local knowledge in saving lives is provided by the Philippine DRRM Act or RA 10121, legally known as "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 Therefor and For Other Purposes." Section 2 (j) of the said act provides that all government agencies and offices should "ensure that disaster risk reduction and climate change measures are gender responsive, *sensitive to indigenous knowledge systems* and respectful of human rights" (RA 10121; emphasis added).

The United Nations International Strategy for Disaster Reduction came up with a policy note that provides guidance to government and non-government institutions as well as education authorities for the mainstreaming of indigenous knowledge in DRRM (Shaw et al. 2009). The policy note identified entry points that could be utilized by DRRM decision makers to get local knowledge into their agenda. Priority thematic areas were identified, which include mountain ecosystems, coastal zones, river basin management, water service management, and housing, where an existing body of local knowledge

already exists and can be harnessed for DRRM. A seven-point action agenda was also provided in the policy note, which covers the establishment of a resource group for indigenous knowledge and DRRM, documentation and research on indigenous knowledge and DRRM, education, policy advocacy, setting up of an enabling environment, identification of change agents, and lastly, determination of special focus areas such as gender, urban risk, climate change adaptation, and food security, among others.

In practice, however, there appears to be an evident gap in the use of local knowledge in DRRM. Hence, there is a need to bridge this gap. There are, however, challenges to the effective and sustained use of local knowledge in disaster risk reduction and management efforts both by government and civil society. Some of these challenges are outlined below. Some recommendations on how to deal with these challenges are also provided. The recommendations that follow were based on my own assessment of local knowledge's place within the current practice of DRRM in the Philippines. Perspectives of other disaster scholars are cited within the text.

A Holistic Development Strategy

Local knowledge is holistic whereas disaster risk reduction programs usually focus on addressing the hazard alone. Disaster risk reduction programs have to be part of a holistic development strategy that addresses other life concerns of people. DRRM programs have to be linked to environmental programs as well.

People do not live compartmentalized lives. As such, people view hazards as invariably linked to other aspects of their daily living. People experience threats from hazards and they respond to these threats taking into consideration their broader life contexts. In local settings, people engage with hazards in environments in which they live and confront many other life concerns such as poverty, violence, and lack of livelihood opportunities. It is the same environment in which they work, raise their children, and rejoice in their success in life's endeavors. Hence, efforts to deal with any of these concerns also have to consider the challenges that people confront with other aspects of their lives. Risk perception is, likewise, influenced by such concerns (Cannon et al. 2014). People often try to strike a balance in managing their risks and vulnerabilities.

Disaster risk reduction programs, however, focus on mitigating the physical impacts of hazards on lives and properties (Hiwasaki et al.

2014b). Often, such programs involve engineering and technological solutions for hazard mitigation. Local knowledge, on the other hand, takes into consideration the broader social, cultural, political, and economic contexts within which people carry on their lives. People's understanding of the nature and origin of hazards are intertwined with other aspects of their lives. Moreover, DRRM intervention specialists are usually outsiders not privy to local knowledge and often do not take such contexts into consideration in the development of these programs. Therefore, a holistic understanding of the life concerns and worldviews of people may contribute to a more contextualized DRRM program, providing the potential for greater success.

Disaster programs have to consider the broader context in which people understand and engage with hazards if programs aim for sustainability. Policy formulation should be able to reflect an understanding of the impacts of hazards within the broad context of different sociocultural and economic conditions. Moreover, hazards impact people from various socioeconomic classes differently. This contextualized understanding would lead to disaster risk reduction programs that would be more suited to the specific situations of vulnerable populations and better address specific needs.

It is also important to contextualize intervention programs within the larger processes at a global scale, which may include industrial development, resource use regulations, and flows of goods and services that may intensify the impacts of hazards on local communities. People recognize that part of the increasing vulnerability of people to hazards is caused by the state of degradation of their environments as a result of unsustainable economic activities. They also recognize that environmental degradation could be the result of human activities such as indiscriminate tree cutting (Dalisay and Tatel 2011). In this light, DRRM programs have to incorporate or be part of environmental programs that will also promote the conservation and sound management of natural resources. For the long term, disaster risk reduction interventions have to be designed as a development strategy that also addresses people's vulnerabilities to disasters in a holistic manner. Community resilience to disasters can happen only under conditions when people's livelihoods are sustainable.

Validating Local Knowledge

Validating local knowledge may be useful in reinforcing specific local knowledge and its integration in DRRM programs but this may not

work all the time. Validation has to be done with caution if this is to be done at all.

In many instances in the past, local knowledge has been considered secondary to Western science and technology (Hiwasaki et al. 2014a, 2014b; Gratani et al. 2011). In many instances, one would encounter scholars and DRRM program implementers referring to some local knowledge as "mere superstition." This view on local knowledge has set back its use in DRRM. Such attitudes toward local knowledge, however, have shifted in the recent years. The value and contribution of local knowledge in the development of science and technology has been recognized. Validation are being undertaken to facilitate the integration or harmonization of local knowledge with science and technology. For instance, in the Wet Tropics World Heritage Area of Australia, scientific validation of fish poisons built confidence among elders about their own knowledge and increased their confidence in their negotiations with government on their involvement in the co-management of their traditional estates (Gratani et al. 2011).

While there were research efforts to "scientifically" validate some of the widely held forms of local knowledge, it is also recognized that results or even the process can be contentious and may result in conflict between the local knowledge bearers and the researchers who are working on the validation. First of all, not all local knowledge can be validated at the moment. It is a challenge for the scientists to develop appropriate methodologies for validating various forms of local knowledge. Second, people do not feel the need to validate their local knowledge, which has been part of a tradition that is being practiced, and has already been tried and tested for generations. Third, validation needs to take into account the broader cultural context in which local knowledge is situated, which is actually not usually done. Agrawal (2002) posits that validation of local knowledge reduces it to specific aspects that are relevant to the work of development planners. Thus, local knowledge is taken out of the context in which it finds relevance and is effective. Lastly, validation poses the danger of pushing further the divide between indigenous knowledge and modern science and technology by highlighting the differences (Agrawal, 1995).

Sustainability of Local Knowledge

The sustainability of local knowledge may be challenged under changed natural and built environments. Local knowledge has the capacity to adapt and innovate as well as assimilate elements from outside

communities to enhance community resilience against hazards. On the other hand, local knowledge may remain consistent in the midst of a changing environment. Under such conditions, the reliability of local knowledge may be compromised.

Local knowledge developed through time equips people in a given environment with the know-how to survive hazards. But environments change through natural anthropogenic forces. A changed environment will more likely pose new threats to people. Under changing environments, the relevance of local knowledge may be challenged (Roncoli, Crane, and Orlove 2009; Nakashima et al. 2012). Local knowledge that evolved in previous environmental conditions may have to be adjusted and reconstituted. This is essential, particularly in relation to climate change and industrial development whereby people experience hazards of a frequency and intensity that they have not previously experienced. The resilience or enduring quality of local knowledge is when it is able to adapt and evolve. Local knowledge bearers have the capacity to innovate and learn from experiences. There is "hybrid" knowledge or knowledge that incorporates traditional local elements with elements introduced from outside the community. "Hybrid" knowledge characterizes the dynamic nature of local knowledge and the community's level of interaction with other communities. Culture contact has facilitated the integration of local culture and elements of culture brought in from outside. In many cases, emerging "hybrid" knowledge appears to benefit the community.

In a Tikopian village in southwest Pacific, where only a few of the residents are able to receive storm warnings from radio messages, traditional message runners would relay warnings received by those who had radios to the rest of the village residents in their local language. The combination of the radio, a technological innovation introduced into the village, and the traditional message runners had been quite effective in preparing the people for the impacts of a tropical cyclone in December 2002 (Mercer et al. 2010).

Frequent encounters of the Ivatan of Batanes in the Philippines with tropical cyclones have led to the development of what they call the *pilatun* or the *orakula* (Rede-Blolong, 2004). These are based on the Western astrological horoscopes. The pilatun or orakula is a divinational astrological horoscope consulted by households in Batanes to schedule their livelihood activities. The pilatun uses the Western horoscope wherein the astrological signs are determined by the dates of birth of individual family members. Agricultural livelihood activities of each family member are determined by their astrological birth signs.

Wisner (2010) presents some challenges on the use of "hybrid" local knowledge emanating from disparate power relations between bearers of local knowledge and those coming from outside the cultural community. In the past, "hybrid" knowledge has been utilized to force government regulations on cultural groups, which has led to their exclusion and displacement. This has brought about distrust and suspicion on people outside the cultural community who try to incorporate local knowledge and practices in development programs.

Climate extremes have brought about weather patterns that people may not have experienced before. In the Philippines, super typhoons have been experienced in areas that were not within the living memory of residents. This poses challenges to the relevance of local knowledge in these areas. Doing fieldwork among people affected by super typhoon Yolanda in selected villages in Eastern Samar, Philippines, several of my informants shared their experiences vis-a-vis their knowledge of the environment prior to the typhoon. A few of the elders in the affected villages were able to observe the signs that used to inform them of a coming typhoon. However, they also narrated that while some of the signs were present, such as the halo around the moon, one sign that confirmed the coming of a typhoon was not present. Apparently, the day before super typhoon Yolanda's landfall, the sky had been clear and the sun shone brightly when local knowledge would have them expect a cloudy day as a precursor to a severe storm.

Local Knowledge and the Younger Generation

The younger generation, especially those residing in urban areas, may exhibit waning interest in local knowledge for predicting the weather. Nowadays, they rely more on the forecasts aired over the radio and the television or those posted on social media channels.

Doing fieldwork communities affected by the super typhoon Yolanda, I found out that very few of the community folk still knew of local knowledge, particularly in the urban areas where the people are composed of migrants coming from various provinces of the country. As many of my informants had pointed out, only the elderly in the villages still possessed such knowledge. The youth no longer found such knowledge relevant or important. Perhaps exposure to more modern lifestyles and the mass media had contributed to their lack of interest in learning the traditional ways that had once been the basis of their elders' resilience to hazards. Eventually, local knowledge will no longer be used. In this light, revitalization of knowledge that people

still find relevant in present situations needs to be done. Herein, schools can be instrumental in popularizing local knowledge among the youth. Class modules and activities can be incorporated in the curricula to impart local knowledge among students. Social media and the mass media, which are both so much a part of the younger generation's life, can bridge this gap as well. The institution of disaster-related courses in universities that bring together holistic perspectives from engineering, physical sciences, and the social sciences is a step toward this goal. Such courses may be implemented at both the undergraduate and the graduate levels. In the University of the Philippines Diliman campus, one such course is currently being implemented by the College of Engineering under the University's General Education program. Similar courses could be instituted at the basic education level as well as the graduate level to reach DRRM practitioners who are pursuing post-graduate degrees.

DRRM fairs and exhibits hosted by academic institutions as well as science and technology societies and organizations showcasing the good practices, including the integration of local knowledge and physical sciences and engineering in DRRM, can be implemented. Relevant student and community projects can be exhibited in these fairs. These fairs can be set up not only in schools but in town centers as well. Such activities are expected to raise people's awareness.

Contextualizing Local Knowledge

Local knowledge evolved as specific cultural responses to daily life challenges of a group of people in a specific place and time; therefore, its application on a broader scale may need some contextualization to suit other locales and cultures.

It is recognized that local knowledge has evolved under specific conditions in one culture. Such lessons may find application in other cultures. However, a generalized broad application of local knowledge may require a contextualized understanding of the local cultures from which these have been developed. Local knowledge may not be readily applicable in other culture areas (Kloppenberg 1991). Simply enforcing the adoption of lessons from local knowledge that has proven to be successful in stemming disasters in a specific time and place may turn out to be disastrous in another.

Limits in Sharing Local Knowledge

People coming from one cultural group may hesitate to share their local knowledge with others outside their group.

In many cultural communities, some local knowledge may not be readily shared with people from outside. "Secret" or "taboo" knowledge known only to a select few in the cultural community may be kept to protect the group from exploitation by outsiders and from biopiracy. In my own fieldwork experience among the Aetas of Zambales, I have been informed about supposedly potent herbs and traditional medicinal plants that they have been using for ages. They hesitated to disclose the names of such plants, however, saying that once they divulge the names of these plants to persons outside their cultural group, these plants would lose their efficacy. Hence, access to such knowledge may be a challenging undertaking. Furthermore, ethical considerations as well as community informed consent procedures have to be respected if research and use of the knowledge is to be undertaken at all. Legal instruments on intellectual property rights have to be comprehensive enough to protect the rights of cultural communities over their local knowledge.

Local knowledge is sex differentiated and age graded. These distinctions have to be considered in the use of local knowledge in DRRM programs.

Not everyone in a cultural community has access to all forms of local knowledge. In many indigenous cultural communities, knowledge is specific to the sex and age group of the members (Wisner 2010). There are certain things that are known only to women or to men. Also, there are things made known only to people when they reach an age that is culturally significant (Mercer et al. 2012). This may pose further challenges to the study of local knowledge.

Impact of Global Forces on Local Knowledge

Global forces have marginalized communities economically. Thus, communities that have adhered to local knowledge in their subsistence activities have adopted novel ways to compete with global economic forces and negotiated local knowledge in the process of adapting.

Mataw fishing has long been practiced by the Ivatan of Batanes. *Mataw* fishers have occupied positions of prestige in their communities. Mataw fishing incorporates a system of belief and practices that ensures sustainable fishing in Batanes with regulations concerning fishing and

off-fishing seasons as well as the number of fish that may be caught. In a more recent fieldwork in Batanes, however, I learned that Taiwanese commercial fishing vessels have visited the Mataw fishing grounds more frequently and depleted the fish stock in these areas. This resulted in overfishing, which adversely affected the yield of traditional Mataw fishing. One Mataw fisher narrated in one of my field visits that he and some of the other Mataw fishers he knew have started to negotiate in terms of the schedule and the amount of fish catch they are allowed under the traditional system. He contended that they needed to do this in order to survive. Such a phenomenon is likely to occur in other areas as well. Herein, one can get a glimpse of how local knowledge is reshaped by economic and political opportunities and constraints. Such a scenario reflects broader geopolitical and socio-economic issues that the Philippines in general is facing today. A more vigilant coast guard and the stricter enforcement of fisheries and environmental laws are necessary. Moreover, policies and programs for the conservation of traditional artisanal fishing techniques as well as the incorporation of economic and symbolic incentives for the artisanal fishers need to be implemented, especially since these techniques are more protective of the environment.

Cultural and Historical Sites

Disasters can be particularly devastating to cultural heritage sites that bind and give meaning to the lives of people in cultural communities. DRRM planners should endeavor to implement programs for the protection of significant cultural and historical sites against different forms of hazards.

Local knowledge may also be linked to heritage and cultural sites that are valuable to cultural communities. Place attachment is characteristic of indigenous cultural communities. DRRM programs have to be mindful of this and incorporate measures to ensure that such sites are protected against hazards. Destruction of heritage sites could greatly reduce the value and significance of local knowledge to their bearers. Local knowledge is intangible cultural heritage that is often linked to tangible cultural heritage, such as temples and sacred grounds. Appropriate legislature has to be in place for their protection.

Stakeholders' Participation

When people are not involved in planning for appropriate actions in the event of an impending hazard, they may not appreciate nor

participate in efforts that put them out of harm's way. Hence, it is important to engage the participation of various sectors of stakeholders in the planning of DRRM programs.

DRRM program planners and implementers have to engage in a dialogue with people and adopt a contextualized understanding of their life ways and concerns. In the dialogue process, the voices of the people have to be given value. This makes the program planning process more participatory and inclusive; it empowers communities because people are given the opportunity to determine their futures through the DRRM programs that were intended for them in the first place. This also contributes to greater sustainability of the programs and diminishes the distrust that some communities have on development specialists who come from outside.

The Need for Further Studies

While much is now known about the link between local knowledge and DRRM, much still needs to be discovered considering the challenges previously mentioned. Hence, there is a need to continue studies on local knowledge and its promotion in the context of DRRM.

It is imperative to continue the study of local knowledge in various cultural contexts, as well as their dynamism in changing environments. Cultural context is integral to understanding local knowledge (Agrawal 1995). Moreover, there is a need to look into how global development processes, including the politics of international aid, impact on people's values (Henry 2007), local knowledge, and resilience to disasters. It is important to understand how and why, in some instances, aid could potentially erode the values and knowledge that have kept people resilient to hazards.

It is recognized that local knowledge is sustained and relevant only so far as the bearers of the knowledge recognize its relevance and effectiveness and continue to practice and transfer these to the younger generation. When cultural communities change and when individuals join the diaspora, the tendency to abandon local knowledge and traditional ways and adopt more modern and acculturated lifestyles is greater. Herein, intergenerational transfer of knowledge can be quite challenging. Knowledge is not separate from identity. It is deemed important to nurture the link between people and their cultural roots and to continue to value the knowledge that is part of their culture. However, when cultural communities decide that change in certain

aspects is inevitable and is best for their development, their local knowledge need not be lost. Continuing research to document cultures can be done. Perhaps this can be undertaken by community members themselves or in partnership with academic institutions or agencies and bodies concerned with cultural affairs.

Summary and Conclusions

Hazards are part of environments and people have long adapted ways and means of dealing with these in their everyday lives. They have developed knowledge and skills about their environments that have kept them resilient in the midst of these hazards. Part of the local knowledge that has helped people maintain their resilience could be gleaned in local knowledge about animal behavior, celestial bodies, plants, architecture, and beliefs in the supernatural and in folklore. The literature has shown that local knowledge is a valuable resource for community resilience and disaster risk reduction in the face of natural hazards.

Yet even as the value of local knowledge in resilience against hazards and in disaster risk reduction is recognized, some challenges in its sustainability have been identified. Understanding local knowledge and how it works in community resilience entails an understanding of the community's social organization, belief systems, and other social, cultural, economic, and political forces that give structure and meaning to the community. Knowledge shapes and is shaped by all of these. Thus, extracting one aspect of local knowledge from its cultural context as what is often done in attempts at validating its "scientific merits" may be prove to be untenable. Moreover, the sustainability of local knowledge may be challenged under changed social and physical environments. In many cases, the resilience of local knowledge can be gleaned from its ability to adapt to such changes. In the end, however, some forms of local knowledge may lose its relevance as already evident among the youth in some communities. Negotiations are also evident in the face of global economic forces. Herein, the need to continue the study of local knowledge in various cultural contexts as well as its dynamism in the face of an evolving ecosystem is seen to be vital. To bring local knowledge into the discourse on community development, the participation of community members in the planning and execution of community programs is essential. They are, after all, the owners of the knowledge.

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