Integrating Local Knowledge into Disaster Risk Reduction : Current Challenges and Recommendations for Future Frameworks in the Asia-Pacific

Yunjung Shin

Division of Risk Management and Societal Safety
Lund University, Sweden

Riskhantering och samhällssäkerhet
Lunds tekniska högskola
Lunds universitet

Lund 2017

Integrating Local Knowledge into Disaster Risk Reduction : Current Challenges and Recommendations for Future Frameworks in the Asia-Pacific

Yunjung Shin

Peter Månsson

Lund 2017

Integrating Local Knowledge into Disaster Risk Reduction : Current Challenges and Recommendations for Future frameworks in the Asia-Pacific

Yunjung Shin

Number of pages: 56
Illustrations: 06

Keywords
local and indigenous knowledge, disaster risk reduction, climate change adaptation, community resilience, community-based DRR, Asia-Pacific.

Abstract
The agenda of integration of local and indigenous knowledge (LINK) with disaster risk reduction (DRR) programmes has gained momentum since 1970s. Notwithstanding the incremental attention to LINK, researchers in this field agree that successful integration of local knowledge is difficult and the processes with such aims are not carried out fully and effectively. The purpose of this study is to provide practitioners, policy-makers and researchers with useful advice for full integration of LINK into DRR policies, programmes and education. The study explored current practices and examined challenges that arise in processes for integrating LINK with DRR by conducting literature review and eight expert interviews. The findings revealed that trust between local communities and implementing organisations, empowering the marginalized, institutional capacity and dissemination of LINK over generations are critical factors that help achieve the effectiveness and sustainability of such initiatives. Among these factors, institutional capacity showed strong connection with the others regarding lack of institutional arrangements and underfinancing. The study emphasizes the importance of enhancing institutional capacity by mainstreaming the agenda of integrating local knowledge in long-term national and local disaster risk reduction plans as well as diverting the funding from central to local institutions as one of the suggested steps to develop future frameworks in the Asia-Pacific.

Riskhantering och samhällssäkerhet
Lunds tekniska högskola
Lunds universitet
Box 118
221 00 Lund

http://www.risk.lth.se
Telefon: 046 - 222 73 60
Telefax: 046 - 222 46 12

Division of Risk Management and Societal Safety
Faculty of Engineering
Lund University
P.O. Box 118
SE-221 00 Lund, Sweden
http://www.risk.lth.se
Telephone: +46 46 222 73 60
Fax: +46 46 222 46 12

Acknowledgement

Until the completion of this work, the researcher has received considerable supports and assistance from many individuals throughout the process.

I would like to express my sincere gratitude to

… my supervisor, Mr. Peter Månsson for providing me with guidance, invaluable remarks, understanding and encouragement throughout the process of this study.

… my eight interview participants, who were willing to share their ideas and insights from their valuable experiences in community resilience projects for this research.

… Mrs. Jenny Jörgensen, who hugely contributed to identifying interview participants through her wide networks.

… all distinguished teachers of the DRMCCA Master's programme, especially Mr. Magnus Hagelsteen and Mr. Markus Abrahamsson for offering me a marvellous opportunity for great personal growth and excellent learning experience- I have been truly happy to be one of your first students!

... all my peers who I have interacted with for the last two-year journey, for sharing their brilliance and enthusiasm with me, which extremely motivated and inspired me for interdisciplinary collaborations.

… all my dear friends, not only for their immense support in proofreading this work, but also for constantly reminding me that there is a life outside this work.

… the Government of the Republic of Korea, for their generous financial support during my Master's studies.

… my family for giving their unlimited love and support along the path to follow my dream and for being always there for me. – This work is dedicated to you.

This work would not be the same without you.

Abbreviations

APAC	Asia-Pacific
CADRI	The Capacity for Disaster Reduction Initiative
CCA	Climate Change Adaptation
CS CBDRR	Community-based Disaster Risk Reduction
DRR	Disaster Risk Reduction
IEC	Information, Education and Communication
IFRC	International Federation of Red Cross and Red Crescent Societies
IPBES	The intergovernmental Platform on Biodiversity and Ecosystem Services
LINK	Local and Indigenous Knowledge
LINKS	Local and Indigenous Knowledge Systems
MoSTE	Ministry of Science, Technology and Environment, Government of Nepal
PNG	Papua New Guinea
SIDS	Small Island Developing States
SOPs	Standard Operating Procedure
SFDRR	Sendai Framework for Disaster Risk Reduction
UCL	University College London
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations Office for Disaster Risk Reduction

Table of Contents

Chapter 1. Introduction

In light of an increased recognition of integrating local and indigenous knowledge (LINK) with disaster risk reduction (DRR), this study seeks to understand and explore various barriers that affect the process to integrate LINK with DRR. The purpose of the study is to provide practitioners, policy-makers and researchers with useful advice when seeking to integrate LINK with DRR policies, programmes and activities.

1.1. Background

The idea that local knowledge and practices can improve disaster preparedness, response and recovery has gained momentum due to considerable evidence accumulated in the past decades. When Baie Martelli, Pentecost Island in Vanuatu was threatened by tsunamis in 1999, a remarkable survival rate (five fatalities out of a threatened population of about 300 people) was ascribed to indigenous knowledge (Walshe & Nunn, 2012). In the aftermath of the 2004 Indian Ocean earthquake and tsunami, there has been an upsurge of interest in knowledge that contributed to the survival of indigenous communities during the disaster (Meyers & Watson 2008; Rungmanee & Cruz 2005). Dekens (2007) has reviewed literature on local knowledge in various discipline and Shaw et al. (2008) have compiled case studies of traditional knowledge on disaster risk reduction in the Asia-Pacific (APAC)[1]. These studies showed how human response and adaptation to natural hazards has advanced considerably in the context of less developed countries. This directly challenged the mainstream scientific view which had downplayed the potential of indigenous knowledge (Dekens, 2007). Globally, the importance of local knowledge in disaster risk reduction (DRR) is clearly recognized in the Sendai Framework for Disaster Risk Reduction (SFDRR). The framework calls for governments to collaborate with community members including the indigenous people to design DRR policies and strategies (UNISDR, 2015). More specifically, it acknowledges that local knowledge and practices should be used to "complement scientific knowledge in disaster risk assessment" and

[1] APAC region consists of the whole of Asia as well as the countries of the Pacific Rim (Retrieved from https://en.oxforddictionaries.com/definition/us/asia-pacific). This region varies in size depending on context, but it typically includes much of East Asia, South Asia, Southeast Asia, and Oceania. The geographical scope the study focuses on here is mainly centered on South-east Asia and Oceania.

to “develop policies, strategies and plans” for DRR at regional and national levels (UNISDR, 2015, p. 15).

In recent years there has been an explosion of research on this topic in the APAC, one of the most vulnerable parts of the world (Adger et al., 2011; Bridges & McClatchey, 2009; Kelman, Mercer & West, 2009). In the first decade of the 21st century, the region accounted for 200 million casualties and 70,000 people affected from natural hazards, which represent 90% and 65% of the global total, respectively (UNESCAP, 2012). The World Risk Index 2016 included Oceania and Southeast Asia as the global hotspots for a high disaster risk (Garschagen et al., 2016). Communities in the region are extremely vulnerable to disasters, which are caused by natural hazards such as earthquakes, tsunamis, droughts, landslides, floods and cyclones in combination with socio-economic factors such as poverty, inequality as well as political and institutional conditions (Oliver-Smith, 2009). Lying in the high risk zone, diverse communities across the APAC have been using LINK as their own adaptive strategies to the impacts of climate change as well as to sustain their livelihoods. It is widely recognized that factors such as livelihood, social class or status, gender and poverty are important constituents of both vulnerability and capacity during disasters (Moench & Dixit, 2004; UNFCCC, 2013). As such, the idea to take socio-economic and cultural aspects into account whilst formulating DRR policies has gained massive support among researchers and practitioners in this field.

Notwithstanding the incremental attention to local knowledge, researchers in this field seem to agree that the process of integrating local knowledge and practices is not carried out fully and effectively (Mercer, Dominey-Howes, Kelman, & Lloyd, 2007). Furthermore, LINK has yet to be widely integrated in DRR activities and commonly used by communities, scientists, and policy-makers (Hiwasaki, Luna, Syamsidik & Shaw, 2014; Adger et al., 2011), which demonstrates the need to investigate possible challenges that undermine successful implementation of such initiatives.

1.2. Aim of the study and research questions

The present work aims to provide a set of hands-on advice on the development of new frameworks for integrating local knowledge in DRR-activities in the APAC region. By doing so, the study ultimately contributes to creating a better environment for both indigenous and scientific communities during the integration practice. With these aims, the study focuses on answering the following research questions:

1. *What are the challenges in the integration of LINK with DRR as well as conditions that contribute to such challenges in the APAC region?*
2. *How can the possibility to integrate LINK with DRR in the APAC region be improved?*

Chapter 2. Local knowledge in the APAC

In this chapter, the concept of local and indigenous knowledge will be described, exploring its definitions, characters, components and value.

2.1. Definition and character of local knowledge

While no precise definition exists, numerous attempts have been made to define the concept of local and indigenous knowledge. According to UNESCO's program on Local and Indigenous Knowledge Systems (LINKS), local and indigenous knowledge refers to "understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings" (Hiwasaki et al., 2014). The intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) defines indigenous and local knowledge as "the multi-faceted arrays of knowledge, knowhow, practices and representations that guide societies in their innumerable interactions with their natural surroundings" (MoSTE, 2015). To synthesize definitions found in relevant literature, local and indigenous knowledge can be understood as *'a body of different types of knowledge and practices of societies accumulated through a continuous interaction with their natural surroundings'* (Brokensha et al., 1980; Fernando, 2003; and Sillitoe, 2000).

The term local and indigenous knowledge (LINK) is in this paper used as analogous to terms such as: local knowledge, indigenous knowledge, traditional knowledge, traditional ecological knowledge, indigenous technical knowledge, farmers' knowledge, folk knowledge. Despite different connotations and reference groups each term has to a certain extent, they often share "sufficient meaning to be utilized interchangeably in many contexts" (Nakashima et al., 2012, p.30; Berkes, 2012; Nakashima & Roué, 2002). For the sake of convenience, this paper mainly uses 'local knowledge' as a term to refer to the above concepts as it extinguishes contentions on various definitions of 'indigeneity' as well as does not necessarily connote a 'traditional' component which sometimes become a constraint on its development.

Indigenous knowledge is developed and acquired locally but is also dynamic in nature, continually influenced by both internal creativity and experimentation, and by contact with external systems (Flavier et al., 1995). The interplay between people and places has given rise to a diversity of knowledge systems that simultaneously are traditional and adaptive (ICSU, 2002; Berkes, 2012). One of the core elements of the concept lies in the continuity and succession of such knowledge and practice that evolves over time, acquired through years of experiences of local people and passed on from generation to generation (Mukhopadhyay, 2010). Another feature of local knowledge is that it is often gendered (Berkes, 2012). Although men and women share knowledge, they also hold differing knowledge sets in relation to the roles granted by society and in production (Nakashima et al., 2012). Rocheleau (1991, p.2) commented that "half or more of indigenous ecological science has been obscured by the prevailing 'invisibility' of women, their work, their interests and especially their knowledge".

2.2. Types of local knowledge

By and large, local knowledge systems can be trisected into what people know (knowledge types); what people do (practices); and believe in (beliefs, values, and worldviews). They are interrelated and influence one another constantly, contributing toward disaster preparedness or not (Dekens, 2007). Hiwasaki et al. (2014) further classified local knowledge and practices into five different categories based on acquisition methods: (a) observations of animal behaviour; (b) observations of celestial bodies; (c) observations of the environment; (d) material culture; and (e) traditional and faith-based beliefs and practices. They attempted to deliver a scientific explanation to observed local knowledge in coastal communities in Indonesia, the Philippines and Timor-Leste (Appendix 1). Sithole (2015) included a livelihood perspective among the categories in the field work in Papua New Guinea:

- perceptions and interpretations of meteorological, climatic and other environmental patterns and phenomena (e.g. prediction of storms based on observations of the sky, sea and wind);
- livelihood sustainability and coping practices (e.g. livelihood diversification before/after shocks);

- prevention, mitigation and survival strategies (e.g. temporary evacuation to higher ground, construction of houses using local materials, short and long-term migration); and
- individual and collective recovery mechanisms based on social, cultural and belief systems (e.g. rituals and ceremonies).

2.3. Value of local knowledge in DRR

Historically, attitudes towards local knowledge in relation to disaster management have shifted from denial, in favour of "advanced geophysical knowledge and technical systems"; to romanticism, through the stereotype of "primitive people in harmony with nature"; and today, growing acceptance (Ouariachi-Peralta & Fakhruddin, 2014, p.1; Dekens, 2007, p.3, 23).

A multitude of practices adopted in many indigenous communities in the Asian-Pacific region have shown a "deep understanding and ability to cope with disasters" (Battista & Baas, 2004; Quarantelli, 1978). The importance of local and indigenous knowledge in DRR became evident during the Indian Ocean Tsunami in 2004 as it turned out that varied communities and individuals reacted to the disaster in different ways. The communities and individuals who held indigenous knowledge regarding tsunamis were able to survive from it. For example, from traditional folk tales the Moken community in Thailand recognized signs such as unusual behaviour of animals and a low tide as indications for a tsunami. Thanks to such local knowledge, this community escaped from the sea towards protective areas (Arunotai, 2008). In contrast, many other communities including migrants and tourists, failed to identify such signs and were not able to evacuate the danger zone. This showcases how local actors can utilise their knowledge for effective early response.

In addition, since local people deploy local resources, applying local knowledge in DRR activities can also meet cost-effectiveness by decreasing dependency on external aid (Dekens, 2007; Ouariachi-Peralta & Fakhruddin, 2014). In addition, local knowledge can assist in improving government policies and encouraging participation of affected communities in policy making (Mercer et al., 2009; Pareek & Trivedi, 2011; Khailani & Perera, 2013). The UNISDR finds the long-term benefit of mainstreaming local knowledge in disaster risk reduction as follows (Shaw, Uy & Baumwoll, 2008):

- Transferring various local strategies against natural hazards to other communities with similar situations.

- Facilitating understanding of local context by using local knowledge in project implementation.
- Offering a successful model for DRR education from the transmission of local knowledge through the generations.
- Encouraging participation and empowerment of the affected community to take the leading role in disaster risk reduction activities.

In spite of the successful stories and advantages, it should not be overlooked that local knowledge and practice is a part of local culture and customs, which does not always have an appropriate or sustainable effect on disaster risk reduction in practice. A wide range of examples show that in some situations culture has acted as a barrier for effective DRR activities (Kulatunga, 2010; Oliver-Smith, 1996). Sometimes it might entail damages to the environment or increased risk to communities, obstructing a timely evacuation in initial response. According to the views of anthropologists, cultural factors influence behaviour of people when facing a hazard (Oliver-Smith, 1996). That is, during a hazardous situation, "people not only consider the danger that they could encounter, but give a priority for factors like social values, religious believes, traditions, and attachment to a location" (Kulatunga, 2010, p.4).

For example, in Bangladesh, the custom of "purdah" can prevent women from accessing vital information about hazard forecasts, since they are not allowed to visit markets for early warnings where radio warnings are heard or interact with men for information sharing (Howell, 2003). In Indonesia, during the Merapi volcano's eruption, some communities refused to evacuate their villages and move to a safer places until they got instructions from their "cultural leader" (Lavigne et al., 2008). Instead, they followed the Mbah Maridjan or "gate keeper" insisting that they had to pacify the spirits' "brewing anger" (Ouariachi-Peralta & Fakhruddin, 2014). When the burning clouds of ash descended, many inhabitants who followed this culture were killed (Rachel, 2010; Sagala et al., 2009). Hence, it is necessary to critically examine the potential benefits as well as drawbacks of integrating traditional beliefs, practices and culture in programs that seek to reduce disaster risks.

Chapter 3. Methodology

The following section presents and elaborates on the methods of data collection and analysis employed in this study. While investigating the research question, the author adopted a

qualitative research approach, because it does not study a fixed and uniform reality, but rather many forms of reality constructed through meanings, experiences and social actions of people (Creswell, 2003). These are important features to this study because the integration of local knowledge with DRR might be understood differently in various contexts. Hence, the author of this study aspired to explore the topic through gaining insight and ideas from the experience of practitioners. The study was undertaken in two-phases: a literature review and semi-structured interviews.

3.1. Literature review

A critical review of academic literature was conducted in order to identify a list of challenges arising during an integration of LINK with DRR. By applying the criterion of having at least three reliable sources confirming that a challenge is relevant for the process, the study achieved triangulation in information collection. The sources for the literature review were retrieved from the Scopus database, allowing access to a significant amount of peer-reviewed academic literature for interdisciplinary studies (Elsevier, 2017). This was complemented by another well-regarded academic database, ScienceDirect, to gain access to studies not detectable in the other engine. The following search string was used to attain a comprehensive list of sources.

('indigenous knowledge' OR 'local knowledge' OR 'community-based' OR 'community-led' OR 'community-driven' OR 'traditional knowledge' OR 'traditional ecological knowledge') AND ('disaster' OR 'climate')

Based on the findings of the literature review, a set of thematic areas were formulated, which served as the main guide for the interview structure presented below.

- Theme #1: *'Trust building between communities and external scientific bodies'.*
- Theme #2: *'Engagement and empowerment of the marginalized in communities'*
- Theme #3: *'Utilisation and popularisation of local knowledge'*
- Theme #4: *'Transmission of LINK over generations'*

3.2. Semi-structured interview

Interviews were carried out with eight international experts to obtain an understanding of what becomes a challenge during the process of integrating LINK with DRR. The respondents were identified through a purposeful selection[2] (Bernard, 2006, p. 189; Blaikie, 2000, p. 205) where having in-depth experience from initiatives to incorporate local knowledge with DRR was an important criterion. In addition, a snowballing method was applied where interviewees provided contacts to other potential respondents. Sampling was performed according to the following procedures: contacting personal connections of the author within international development organizations that have been involved in relevant projects (i.e. National Societies within the Red Cross/Red Crescent movement) and contacting researchers who published academic literature on the topic.

The respondents consisted of four men and four women, and the ages of the respondents ranged from late twenties to early sixties. The interviewees held 2 to 25 years of relevant experience in community-based DRR in the context of local knowledge with various organizations ranging from governmental agencies, universities, to the Red Cross Movement. The interviews were arranged in English via Skype and recorded with approval of the informants. If necessary, the author exchanged documents where respondents filled in answers on a prepared list of questions and returned it electronically.

The interviews were semi-structured meaning respondents were asked a set of prepared questions (Appendix 2) with the possibility of being asked additional questions, depending on initial responses. As new knowledge emerged, the phrasing of questions was adjusted when necessary. This flexibility allowed the improved capture of complex processes and a better understanding of participants' perceptions and experiences through in-depth deliberation (McNabb, 2008). In addition, respondents were given the opportunity to discuss challenges that were not identified in the literature. Thus, the literature review was complemented by additional primary data. The analysis of interview findings followed two steps: 1) identifying keywords

[2] "The purposive sampling technique, also called judgement sampling, is the deliberate choice of an informant due to the qualities the informant possesses. It is a nonrandom technique that does not need underlying theories or a set number of informants. Simply put, the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience" (Tongco, 2007, p. 147; Bernard, 2002; Lewis & Sheppard, 2006).

and core messages from transcriptions; 2) charting the core interview findings for predefined themes with different categories of general stance of interviewees, background and hindrance factors for each challenge and recommendations. After combining the findings from both interviews and literature, recommendations were inferred for the design of initiatives to better integrate local and indigenous knowledge with DRR.

Chapter 4. Literature Review

To better understand the procedure of integrating local knowledge in DRR and investigate potential challenges arising along the way, it is helpful to look into methodologies adopted in the region. Through the literature review, the author identified three essential frameworks for integrating LINK with DRR-practices developed in the APAC region during the last decades. This chapter reviews and discusses the development, strengths and weaknesses of these methodologies based on the author's own interpretation of these frameworks.

4.1. Framework analysis

The following frameworks were selected since they are considered concrete and systematic in describing different aspects of LINK or in presenting different stages required for LINK integration. They all address how local knowledge is related to meteorological hazards and were built upon each other in the APAC region, meeting the geographical and socio-economic context of the paper. While it is noted that these are not the only methodologies developed or implemented in the APAC for such aim, they are arguably the most pertinent work for the domain of this research.

4.1.1. Dekens (2007): Framework for Local Knowledge on Disaster Preparedness

Dekens (2007) made a substantial first step towards the integration of DRR science and indigenous knowledge by introducing a comprehensive framework for the collection and analysis of indigenous knowledge related to disaster preparedness (Appendix 3).

Strengths	➢ lays a theoretical foundation for subsequent frameworks especially on the data collection

	➢ allows a comprehensive understanding of LINK through a systematic examination on the various aspects of local knowledge (e.g. components, background, influencing factors for development, its effect, existence /dissemination form of local knowledge and practices)
Weaknesses	➢ fails to be developed into a methodology by which local knowledge and practices can be integrated and utilised alongside scientific knowledge.

4.1.2. Mercer et al. (2010): Framework for Integrating Indigenous and Scientific Knowledge for Disaster Risk Reduction

Mercer et al. (2010) presented a procedure framework demonstrating how local and scientific knowledge can be integrated to reduce community vulnerability to environmental hazards in the context of small island developing states (SIDS) (Appendix 4). The framework was developed through a participatory research in the three rural communities in Papua New Guinea (PNG) affected by landslides, flooding and volcanic eruptions[3].

Strengths	➢ assists community members in identifying changing vulnerability patterns over time and encourages a proactive response to address their own vulnerability (Mercer et al., 2014). ➢ enables communities themselves to develop new integrated coping strategies combined with local and scientific knowledge to deal with potential future hazards. ➢ was designed and carried out whilst retaining an ownership of indigenous communities.

[3] The development of the framework emerges from the participatory work within three rural communities in Papua New Guinea (PNG), namely Kumalu (population 565), Singas (population 296) and Baliau (population 297). Situated in Morobe and Madang Provinces, these communities have been affected, respectively, by landslides and flooding, and by flooding and volcanic eruptions (Mercer et al., 2010).

Weaknesses	➢ lacks a thorough explanation of how local knowledge can be integrated with scientific knowledge. ➢ the discussion on the application of integrated strategies is absent ➢ puts little attention to involving other relevant stakeholders, e.g. local government, local NGOs, research institutions and so forth, which can allow communities to broaden their access to a variety of strategies and can cooperate in the implementation of those new knowledge.

4.1.3. Hiwasaki et al. (2014): Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction in coastal and small island communities

The framework was developed through action research [4] in coastal and small island communities in Indonesia, the Philippines and Timor-Leste related to hydro-meteorological hazards. The simplified process of the framework entails the following stages: Preparation, Data Gathering, LINK Analysis and Validation, Science Integration and LINK Popularization and Utilisation (Appendix 5).

Strengths	➢ Introduces a plan to disseminate integrated local knowledge for use by scientists, practitioners and policy-makers, ➢ presents a 'scientific criteria' for integration of local knowledge by giving scientific explanations for each local knowledge. ➢ provides wider viewpoint on local knowledge and practices by categorizing LINK based on its relations to science as well as in light of DRR and Climate Change Adaptation (CCA)**.**
Weaknesses	➢ blocks the opportunity to develop improved strategies beyond the realm of local knowledge for future adaptation.

[4] Participatory action research entails involvement of key community members in the full process. It also involves training and mentoring of local community researchers to enable them to do the research and go through the process on their own (Hiwasaki et al., 2014)

4.2. Key aspects and hindrance factors in the LINK integration

Despite existing frameworks and feasible plans as described above, the integration of LINK with DRR policies often faces numerous obstacles. This chapter discusses key aspects that should be considered as prerequisites and hindrance factors for the successful integration of LINK. From the literature review, four sets of key aspects and hindrance factors are identified, respectively.

4.2.1. Key aspects 1. Trust building between communities and outsiders

When carrying out development initiatives with a goal to integrate local knowledge and practices with science, engaging communities should be prioritized to establish a solid foundation for the subsequent steps. In this initial stage of building relations between local people and outsider groups, it is crucial to ensure that communities consider such projects to be helpful for them in adapting to disaster risks (Mercer et al., 2010). When Mercer et al. (2010) visited Kumalu in Morobe Province in PNG, the first discussion was held with community elders to ensure such a proposed initiative would assist the community in adapting to climate risks and identifying potential strategies to cope with their vulnerability. Integration of the two knowledge systems requires a great deal of participation of local communities (MoSTE, 2015). Building trust and rapport, and ensuring awareness of communities about their own vulnerability, is an essential primary step upon which the success of integration depends (Mercer et al., 2010). It is commonly emphasized among researchers that integrating different types of knowledge systems is a long-term process that requires the building of mutual trust and relationships (Hiwasaki et al., 2014; MoSTE, 2015), confidence (MoSTE, 2015), partnership of respect (Cronin et al., 2004) and the commitment of all stakeholders involved (Hiwasaki et al., 2014). This is enabled by open communication and close relationships between communities and external scientists and researchers (Hiwasaki et al., 2014). However, experts often face problems of building trust with communities due to communication issues and incompatibility of knowledge systems as explained in the following.

Hindrance factors 1. Distrust between communities and external bodies

The great diversity of languages in the APAC region makes it difficult for implementing organisations to fully communicate with local communities. According to Dekens (2007), outsiders' incapability of speaking local languages is ascribed to the underrepresented interests

of local people. Along with the language barrier, distrust in scientific bodies lessens communities' willingness to cooperate with external scientific organisations. For instance, Cronin et al. (2004) witnessed that, due to faulty early warnings that misled communities over time, outside scientific knowledge has lost its credibility from villagers in Ambae, Vanuatu while conducting a research on participatory volcanic hazard management (Esau 1997). As a result, villagers in the community showed poor reception toward an operational plan for volcanic eruptions that was developed by an external body (SPDRP, 1997).

In parallel with the community distrust in scientific bodies, the staunch belief that conventional or scientific knowledge is 'superior' prevails among scientific communities derived from the legacies of colonialism. Development practitioners and scientific communities have underestimated the value of local and indigenous knowledge for many years. Often, local and indigenous knowledge, along with their practices, has been ignored by international aid agencies as well as by national and regional governments (Dekens 2007). Agrawal (1995) denunciates the current practice of archiving local knowledge outside of its context instead of enabling the poor to exercise control over their knowledge. Most times, those who document indigenous knowledge are often western-educated or are otherwise outsiders. Chambers and Richards (1995, cited in Ellis & West 2000, p. 6-7) argue that "although development practitioners easily use jargon, such as empowerment and participation, they have not changed their attitudes towards rural people and still undervalue local knowledge".

Furthermore, the differing nature of the two knowledge systems prevents both scientific and local communities from understanding the dynamics of each knowledge system, which makes it difficult to build new integrated strategies from them. To build bridges across the indigenous and scientific divide, it is essential to mutually understand the cultural, material and epistemological basis of each knowledge system (Agrawal, 1995). Materer et al. (2001) demonstrated why such an understanding was vital and described the cultural incompatibility of local communities and external organisations through different approaches to interpreting rainfall patterns: "Actual rainfall data did not correspond to how the villagers remembered the production year. In statistically high rainfall years, locals defined drought by rainfall variability, locality and timing and not as the amount of rainfall received in a year" (Materer et al., 2001, p.10).

4.2.2. Key aspects 2. Full participation of communities

The Asian Development Bank (2012) views that participation enables support and ownership by a range of stakeholders, improves project processing, quality during implementation, and strengthens sustainability of development results. Among other stakeholders, involvement of communities, the beneficiary of the initiative, in the integration of LINK with DRR has been recognized as a key issue for facilitating the participatory process (Ouariachi-Peralta & Fakhruddin, 2014). In order to identify complete local knowledge and practices and ensure sustainability of projects, participation from all community members should be encouraged, regardless of their educational level or social position (Ouariachi-Peralta & Fakhruddin, 2014). It is thus of utmost importance to incorporate minority groups and less vocal parts of communities, e.g. the elderly, the poor, women and children (Mercer et al., 2010; Hiwasaki et al., 2014).

There are sound reasons to involve the poor and the marginalized in each stage of LINK integration. First of all, disaster risk reduction is essentially linked with poverty reduction (Dekens, 2007). It has been common practice to investigate local knowledge about disaster preparedness from a livelihood perspective, which means that disaster risk reduction cannot be detached "from other cross-cutting issues of development, such as poverty reduction, local control of land and material resources, and equitable participation through empowerment" (Jigyasu, 2002, p.321). It has been widely recognized that research should broaden its analytical scope to the realm of sustainable development such as livelihoods, poverty, governance, equity and natural resource management, moving away from compartmentalization of disciplines. (UNEP, 2004; Van Aalst & Burton, 2002; Sudmeier-Rieux et al., 2006). Second, coping strategies and practices in one community may differ from one social group to another depending on "occupation, physical ability, ethnicity, gender, class and age, as well as their family history, skills, and/or specific gifts" (Dekens, 2007, p.49), which adds another rationale for incorporating the marginalized group. Facilitating participation of the marginalized as a new knowledge holder is therefore fundamental to collecting a wide range of knowledge and practices from different groups and contextualizing a community in terms of livelihood and vulnerability.

Hindrance factor 2. Power relations within communities

People are not equal in access to, and benefits from, knowledge and information (Dekens, 2007). According to Thrupp (1989, p 16), "certain members of a community control more information than others which gives them power and privilege." Local power dynamics reflect hierarchies within a community, which even influences the way local knowledge is presented to external agencies. Mosse (2000) argues that local knowledge is often 'planning knowledge' because it is brought up by dominant groups in a community and this shapes development project interests. Khan (1991) provides a detailed example through a case study conducted in Northern Bangladesh on how the local elite influenced NGO decisions to locate flood shelters and control access to the shelters. As a result, the shelters were neither placed in the best locations for vulnerable people nor in terms of hazard risk (Twigg, 2001). This example illustrates how local power groups involve in and drive projects in ways that are favourable to their own interests to maintain their authority (Mosse, 2000).

Also, Cronin et al. (2004) reported how traditional power groups within a community could influence the motivation of a women's group in Ambae Island, Vanuatu. Due to the tradition that decisions are made by high-ranking males in the community, the women's group considered that they would be isolated from the decision-making body for community warnings and evacuations. Also, they raised a concern that "whatever suggestions and plans they made would be overlooked, as would their role in any disaster management decisions" (Cronin, 2004, p. 665). It was tragic that participants in Ambae seemed well-aware that they would return to their original societal roles after the project, despite the attempt for open communication and a reversal of power hierarchies (Cronin, 2004). As Agrawl pointed out (1995, p. 431), "How knowledge is generated, organized, stored, disseminated presupposes certain relationships of power and control". Power relations may thus become an obstacle equally to disseminating and capitalizing upon local knowledge within a community.

4.2.3. Key aspects 3. Utilization and popularization of LINK

As mentioned earlier, many scholars agree that, despite the growing recognition, local and indigenous knowledge has yet to be featured prominently in environment, climate change and disaster-related policies (Sithole, 2015; Hiwasaki et al., 2014; Mercer et al., 2010). A substantial number of works initiated for the integration of LINK with DRR managed to document local knowledge and practices. However, few sources reached a level to utilise and popularize the findings to make them accessible at local or central administrative levels, which might be

instrumental for LINK integration (Mercer et al., 2010; Shaw et al., 2008). A study carried out in three local communities in Nepal reported that "unfortunately only a small number of programs run by government agencies and development organizations focus on integrating LINK in a meaningful way" (Government of Nepal, 2011, p. 67). In addition, there is a tendency to replace locally built structures using local and indigenous knowledge, (such as traditional bridges, trails, trekking routes and irrigation schemes), with modern and "engineered" techniques, as opposed to creatively combining both knowledge systems. This may lead to a limited potential for innovation around local technology and perpetuates dependencies on "western technology and practices", which call into question the sustainability of such interventions (MoSTE, 2015).

Hindrance factors 3. Limited institutional capacity

The poor institutional capacity of local organizations and administrations is an impediment to the effective integration of LINK in DRR activities. Institutional capacity pertains to "the internal policies, systems and strategies, arrangements, procedures and frameworks that allow an organization to operate and deliver on its mandate" (CADRI, 2011, p. 10) and encompasses the followings: quality of leadership, a present organizational structure and its relevance to institution's present mandate, ability for innovative change, implementation, financing, as well as human resources and monitoring (Bhagavan & Virgin, 2004).

The capacity of local institutions is partly affected by power imbalances between different administrative levels within a country. Local participation seems to build better on a politically decentralized environment and it involves complex processes of power and resources redistribution between central and local government. The application of local knowledge within DRR policies and programmes thus may face institutional challenges from asymmetric power structures. In authoritarian regimes[5], participatory approaches in support of local knowledge can be seen as a threat to the national authority and political structures (Thrupp, 1989). Under such political structures, natural hazards and disaster management tend to be conceived primarily as issues of national defence that often are managed at the central level.

5 Japan, Philippines, Taiwan, Thailand, and South Korea are considered democracies; Indonesia is considered ambiguous while all other East Asian governments (Brunei, Cambodia, China, Laos, Malaysia, Myanmar, North Korea, Singapore, and Vietnam) are seen as authoritarian. (Revised Modernization Theories, Legitimate Authoritarianism, Bibliography. Retrieved from http://science.jrank.org/pages/7514/Authoritarianism-East-Asia.html on [2017.02.27])

In addition, it is common to find local governments with a low financial independence rate in countries with a centralized power (Ryu, 2011). This makes it difficult for local institutions to take the lead in disaster risk management as well as to hire qualified staff (Ouariachi-Peralta & Fakhruddin, 2014), which indirectly has an impact on people's participation, since their voice might not be channelled effectively (Kusumasari et al., n.d). Since the nature of the institutional ability is closely linked to the power relations, political structure and resource distribution of a society, local governments and institutions are not able to avoid being influenced by an 'enabling environment'[6]. It determines the interaction between organizations and government units, private sector and civil society. This is because all the component of the enabling environment "governs the mandates, priorities, modes of operation and civil engagement across different parts of society" (CADRI, 2011 p. 10).

4.2.4. Key aspects 4. Transmission of LINK over generations

The function of local and indigenous knowledge is not limited to forecasting and monitoring hazards. The knowledge of how to deal with hazards is often embedded in and transmitted through songs and stories that are passed from generation to generation. Faith-based beliefs, traditional rituals, legends and songs usually cannot be explained by science, but help communities build their resilience. For example, people can find peace and maintain stability with prayers and beliefs during turmoil (Hiwasaki et al., 2014). Those beliefs and rituals form social capital for community resilience by providing psychological comfort and inner strength. Such local and indigenous knowledge also contributes to increased awareness of a community of possible hazards, which often results in increased preparedness. Hence, it is necessary to maintain these practices for the next generation as long as they are sustainable and relevant (Dekens, 2007).

Hindrance factors 4. Cultural globalization

However, it becomes more and more difficult for older generations to transmit such local knowledge to the next generations in modern society. The effect of globalization has brought behavioural changes in the way of life in communities, especially influencing young

[6] The enabling environment pertains to the broader system within which individuals and organizations function that can either facilitate or hamper their existence and performance. Capacities at the level of the enabling environment relate to such things as policies, legislation, institutional arrangements, leadership, political processes and power relations and social norms, e.g. values, incentives, motivation, trust, legitimacy, transparency (CADRI, 2011 p. 9-10).

generations on how people perceive their own resources and knowledge. (Iloka, 2016; Dekens, 2007). The younger generation tends to disregard their own resources and knowledge because of the growing exposure to global influences and the pressure of modernisation and cultural homogenization (Dekens, 2007). As they are exposed to foreign media content, the ultimate change occurs in their character and attitudes, adapting their lifestyles around them (Daramola & Oyinade 2015). Thus, an influx of foreign culture through western media prevents the transmission of social values, norms, cultures, and beliefs from old generation and limits young generation's interaction with former generation in communities. Parker & Handmer (1998) argue that personal networks are dispersing because of modern information technology, which makes it hard to obtain traditional knowledge. Ultimately, an intergenerational gap becomes huge, leading to a failure in passing down the indigenous knowledge to the next generations (Langill, 1999).

4.3. Formulation of thematic areas for interview

With the challenges and associated hindrance factors analysed above, a set of thematic areas are formulated that will serve as a main guide for the interviews. The following thematic areas were constructed based on the assumption that each thematic area becomes a challenge in either the overall process or a particular stage of attempts to integrate LINK with DRR.

- Theme #1: *'Trust building between communities and external scientific bodies'.*
- Theme #2: *'Engagement and empowerment of the marginalized in communities'*
- Theme #3: *'Institutional capacity and power balance'*
- Theme #4: *'Transmission of LINK over generations'*

Chapter 5. Interview Findings

During 10-03-2017~08-04-2017, eight in-depth, semi-structured interviews were conducted with international experts who have closely interacted with local people in community-based DRR/CCA projects in the Asia-Pacific (Appendix 6). In this section, the interview results will be displayed and deliberated in regard to the research questions, "what challenges do actors in

the integration of LINK with DRR face and what conditions contribute to such challenges?" and "what actions can be taken for better practice?". First, key interview findings will be illustrated in a chart schematizing the overall interview data. Following this, interview data will be discussed in detail with quotations from interviews incorporating pre-identified challenges as well as new ones arising during the interviews.

5.1. Interview findings overview

The overall question that guided the interviews was "how do findings of literature review correspond to the views of practitioners and what measures can be considered to overcome such challenges". The chart in Appendix 7 illustrates the general stance of respondents which denotes the level of agreement to each thematic challenges as well as examples of how these challenges materialize in reality. It also provides background and factors ascribed to such challenges, and finally presents recommendations for better practices along with the new challenges identified from interviewees' experience.

5.2. Thematic areas

- ***Challenge 1. Trust building between local communities and external scientific bodies***

There was a strong agreement among the respondents that trust building between local communities and scientific bodies is a significant challenge in community-based DRR/CCA projects. In practice, it was discovered that trust is an important aspect on multiple scales beyond the predefined realm between local communities and scientific communities of implementing organizations; but also between local authorities or even with other communities. A researcher with considerable insight to local knowledge expressed that: "communities are not likely to trust persons or messages which they see as external or alien – whether these are scientific messages from a person in a place of authority or even from other communities, which may have different knowledge to them". However, the most frequent form of distrust was seen to occur between local and scientific communities.

A variety of factors were identified which are ascribed to distrust between two parties as follows: **distrust in western science and technology; negative previous experience; neglected**

community priorities; lack of participation and empowerment; hesitance to accept new technologies; applying old paradigm to communities.

To begin with, external bodies face the rooted distrust of local communities in the western scientific approach based on technology. When a respondent visited a community in Lakhimpur district of Assam in India to implement the project titled 'community based early warning', the community's first impression was "Are you god? How can you predict and forecast in advance of the onset of flood waters? No one in the community took us seriously". In Bangladesh, inaccurate early warnings contributed to the mistrust of communities in western scientific bodies. People do not follow early warning systems because of their repeated bitter experiences in the past. A respondent from the British Red Cross described in detail the loss of communities after following early warnings: "…they followed an early warning system and accordingly they left their house and moved to a safe place but there was no cyclone. After the signal was over, when they went back to their home they can find many things are missing from their houses. Someone has taken their chicken and other livelihood and household assets. That motivates them not to go to safe evacuation places although there is a signal."

Moreover, a lack of consideration for communities' priorities and livelihood concerns exacerbated communities' distrust in external bodies. A researcher pinpointed that "perhaps most importantly of all (reasons for mistrust), these projects come into the community and didactically pass down directives which totally neglect the priorities of the communities such as education or poverty and the cycle of mistrust continues."

In parallel with communities, mistrust of scientific bodies in traditional knowledge is exemplified in the following statements of a respondent: "many policy makers and academics I have spoken to are still stuck in the old paradigm that they need to somehow educate local communities about their environment, and they reject the idea that traditional knowledge can offer value." The respondent further illustrated a vicious cycle of community-driven initiatives where community ownership is challenged by old ideas of external implementing organizations, which leads to distrust: "…even though many projects say they are 'community based', they are simply applying old ideas in communities. There is a lack of participation and ownership in the project either upstream (in the conception or design) or downstream (in the implementation) and as a result, there is mistrust".

Although there were no clashing opinions about the fact that trust becomes a key success factor of integration, several respondents pointed out that it could be eliminated if taken into account

carefully in the beginning. A researcher who conducted a case study on the integration of local knowledge with DRR policies in Bantul, Indonesia expressed that "it (trust building between communities and scientific bodies) can be challenging depending on how much time and effort you put on it.". The respondent further demonstrated the need to spend time with communities before starting a research to forge bonds with them and, in doing so, utilizing support of locals can be a good entry point: "I had the help of an Indonesian student assistant from the university who spoke their dialect and was familiar with their circumstances, worldviews and values helping to interpret the information gathered, so there were not significant communication barriers with the local communities".

This suggests that trust is not built in one day, meaning that such initiatives need to be designed with enough time frame and maintained 'culturally sensitive' in collaboration with local people who can help bridge external bodies with local communities. Also, during this process, it is of utmost importance that communities' priorities and expectations are well-addressed for the design of project activities.

In line with an effort to assimilate with local people and understand their culture and priorities, rationalizing the choices of interventions is also important since local communities are often reluctant to accept new approaches. A practitioner from the Australian Red Cross in Vietnam shared the experience in a climate-smart community-based disaster risk reduction (CS CBDRR) project in the Mekong delta from 2013-2015: "As part of the project, climate-resilient livelihood options were identified with strong participation of the communities. Most of them were the adapted ones from traditional models to be more resilient to climate change. However, in the implementation of these livelihood options, there was still hesitation of the communities in adopting these new livelihood options". This happened because there was a certain level of risk of following the new livelihood models. The communities at first didn't fully trust that the new models would be successful because if not, it would cost them financially.

Two measures were suggested by respondents to deal with communities' reluctance to new approaches. A practitioner from the IFRC Bangladesh suggested that "If you show them an impact-oriented practical example and prove (the usefulness) in front of them, then they (the communities) will accept it. They always do not disagree with technology. They use smartphones. It depends how you present new things." By explaining positive effects of technology-based interventions, communities are offered an opportunity to understand the benefits of projects and to extinguish hostility against new and technical approach.

A practitioner from the British Red Cross reaffirmed the importance: "To work with community people it is important to get them in our trust so that they can realize whatever things the project is doing it is for the betterment of them or it will bring good things for them in future." Ultimately, implementing bodies need to ensure that communities themselves are fully aware of the purpose of projects so that they can trust and 'work together' with implementing bodies as a 'partner' who help enhance their capacity and reduce their vulnerability to climate impacts.

- ***Challenge 2. 'Engagement and empowerment of the marginalized in communities***

The majority of interviewees agreed that there is a great difficulty in engaging and empowering marginalized groups during the integration processes. They all shared a view that marginalized groups are highly vulnerable to disaster risks because they are often neglected in communities in many ways, e.g. isolated from early warnings, contingency planning and decision-making processes. A respondent who conducted a research on participatory decision making in Indonesia observed how communities complained about inadequate opportunity given to them to participate during the process: "participation was merely a consultation or information sharing, and very often just through representatives, without reaching levels of joint decision making and control". Likewise, a practitioner who conducted community resilience projects in Bangladesh revealed that "They (the marginalized) never participate in discussion making process, although powerful people, local elite and all the better-off household have the voice. Socially marginalized groups are neglected." Although many community-led DRR initiatives often set the goal to have the most vulnerable groups at the heart of the process, the marginalized are often excluded from major decision-making processes.

There was also a consensus among respondents that this phenomenon is partly explained by power relations within communities and conflicts between social roles depending on gender, ethnicity, age and class. The responses concerning who to consider as 'marginalized' within a community varied from the poor to women to the disabled to the youth. The following factors were identified that attributed to an underrepresentation of the marginalized group: **poverty; religious beliefs and convention; attitudes of other community members; hierarchical-bureaucratic structures of governments.**

First of all, they struggle with daily livelihood, which predisposes them to economic challenges and hinders their ability to be present in the public forum. A respondent from the Australian Red Cross in Vietnam pointed out "they are often behind other members of communities in

terms of socio-economic or political status". Another respondent further explained the reason for a diminished participation of those people: "They are very poor, they never come to the frontline to talk, so always we get the opinion from the civil society representatives and powerful groups who are from better-off household".

At the same time, they are significantly influenced by social pressure, constraining their voice, following 'traditional convention' or 'social order' of communities. In some contexts, patriarchal social order is found to prevent the participation of the marginalized. As one respondent put, "… it really is a challenge particularly [for] women, the elderly and disabled who are not often a party to the traditional knowledge, and are not part of the traditional leadership structures in the often-patriarchal structures. Furthermore, this includes the youth which often choose not to participate".

The convention where people judge others based on their social status generates a certain form of power dynamics in a community, which influences the attitudes of members of communities toward the marginalized. The response of a practitioner from the Australian Red Cross suggests that a conventional approach of development to simply provide equitable participation for everyone does not work successfully in practice: "their confidence level to participate in social activities tends to be low. Besides, the attitude of other people towards them tends to further their marginalization. In a program or activity, even if it is designed to ensure equity for everyone to participate, the marginalized still participate less because of these reasons". This demonstrates that there needs to be a change in the attitudes of other community members towards the marginalized to fully integrate them into the process and secure sustainability of their participation within a community.

Finally, governmental structures were identified as an external factor to hinder the equitable participation of all community members. One respondent pointed out that "true participation is not being promoted in practice by many governments because they are organized around hierarchical-bureaucratic structures and guided by strict mandates and a priori-rules".

To tackle challenges derived from the power dynamics of communities, many practitioners shared the view that a solution should come from the 'inside' rather than outside of communities based on a mutual understanding of different groups of a community. To guarantee a sustainable participation of the marginalized, it requires a change of social recognition and reconstruction of power dynamics within communities. Therefore, it is necessary to induce community members themselves to recognize the need to involve the marginalized groups. A respondent

pinpointed the importance of giving ownership to communities in the process: "it is clearly not enough to say 'you need to include these groups'. This needs to be led by the communities themselves". Then, a desirable role expected for external bodies in this regard would be providing an opportunity for communities to understand and identify differences among the constituent members. A staff from the Australian Red Cross stated that "I think activities that help different groups to understand each other better are necessary".

In line with the activities to understand the different vulnerability of community members, a gender-sensitive perspective should also be expanded. A pitiful example found from Bangladesh communities vividly demonstrates the importance of gender-sensitive approach in disaster risk reduction: "In a Muslim community, women need to cover themselves with a burka[7] and grow long hair which is very difficult to handle during cyclones. When they evacuate, long cloth (sari) is not properly managed and their long hair is not tied. Because of it, when they are running, it makes it difficult for them to move fast and even sometimes, their long hair gets caught in some bamboo and other trees, making them fall on women and they die." (Interview with a practitioner from the British Red Cross, Bangladesh)[8]. It was found that social customs coupled with a lack of awareness of women led to a disproportionate impact on women during disaster.

Finally, as a measure to counter a hierarchical government structure that is already set, making better use of participatory structures at community level can be considered. A respondent shared a practical example from a village in Indonesia: "Pokmas is a community committee existing at the sub-village level in areas prone to natural hazards to discuss issues related to DRR, such as housing reconstruction livelihood security or *gotong royong* activities". These networks, meeting once or twice a month according to the Java calendar, are enacted horizontally and include representatives of each family.

- ***Challenge 3. 'Local institutional capacities and power balance'***

[7] A long, loose garment covering the whole body from head to feet, worn in public by many Muslim women. English Oxford Dictionaries. Retrieved from: https://en.oxforddictionaries.com/definition/us/burka. [12.04.2017].

[8] When a cyclone hit Bangladesh in 1991, more than 70% of the casualties were women. The main reason was no early warning system in place and limited safe evacuation place which was far from their houses. Another critical reason was lack of awareness among women in communities. Because of social customs, women in Bangladesh wear a long dress, 'sari' and tend to keep long hair, which prevents them from moving as fast as men during evacuation.

There was a consensus among the informants that maintaining institutional capacity and power balance is one of the determining factors in integrating LINK and often becomes a challenge during the implementation. Interviewees discussed how institutional capacities materialize in practice and what compose them in a wide scope. A respondent referred to poor institutional capacity of local government as "a barrier to implement DRR policies" and argued that "it is important to enhance the capacity of local government institutions to implement DRR Policy".

Understanding of institutional capacity among the informants was largely divided into that of 1) local government and that of 2) locally-based institutions, e.g. community-based organization, grass-root organizations and NGOs. From the interviews, a variety of factors were identified as contributing to the poor institutional capacity at local level and power imbalance: **lack of resources and time; shortage of professional manpower; power struggle between central and local governments.**

In terms of local authorities, deficiency of funds as well as of professional staff experienced in disaster management was seen as an obstacle to utilizing LINK within communities. A respondent who researched this topic stated that "despite good intentions from the local government, a lack of human and financial resources makes it very difficult to engage with communities and foster their aspirations and interest, as acknowledged by government officials themselves". For example, in India, there is a *Gaon Bura*[9] who supervises and make decisions of all important activities happening at the village level. A respondent stated that "sometimes it becomes practically difficult for him to handle situations all alone". Depending on the context of each local community, the institutional capacity at a community level can be extremely limited.

Another respondent shared the same opinion on this shortage expressing that "they (local governments) don't have the resources or time to do the locally based, small scale interventions" and brought up the problem caused by a mismatch of scales frequently seen in LINK initiatives: "instead, they produce one-size-fits-all approaches". Since the resilience of community happens on quite a small scale and is often intangible, the local government advocates for one-size-fits-all policy because of economy of scale.

Such low capacity of local governments can be explained by an asymmetric power structure between central and local government. A majority of the respondents agreed that power

[9] Gaon Bura refers to a village headman. He is a one man army, the sole authority, rather the government representative at the grass-root level.

imbalance between central and local governments contributed to a diminished local capacity. A respondent gave a practical example from his/her recent study undertaken in Indonesia: “the lack of resources can be influenced by barriers in the decentralization process in Indonesia, such as reluctance from central government to lose control and lack of transparency and accountability at the local level”. Another respondent added that power imbalance is “always an issue” in implementing the process and “they like to handle everything by their own and believe that locally driven [initiatives] reduce their power”. A respondent experienced in action research for LINK integration pointed out “it is very important to recognize that the government sometimes does not even want what is best for the community”. This shows the potential unwillingness and inaction of governments when other priorities conflict with the benefit of communities. One of the greatest challenge in development is that there is no enabling environment for change and capacity building even from the top of a society (personal discussion with Dr. Carlos A. Villacis).

As a prerequisite to overcome the challenge associated with power relations, many respondents’ opinions converged on a devolution of power to a local and community level. A respondent argued that “power should be disseminated from central to local” and “community driven or participatory approach never threatens the central or local government”. Another respondent shared the view while recognizing the complexity surrounding this problem: “I suppose the solution is to return power to enact DRR/CCA and the ownership of knowledge to the communities while recognizing the issues and conflicts inherent in community”

As concrete measures to enhance the capacity of local governments, it was suggested to increase budget allocations in local governments and local agencies for disaster risk reduction. The financial support needs to reach community level in order to enhance the participation of communities and groups at the grassroots level. Moreover, developing transparent communication channels was suggested when delivering important information from a central to community level. A practitioner from the British Red Cross in Bangladesh) stressed the importance of information exchange and argued that “sharing information from top to bottom is important to overcome such challenges, so that both parties should know their roles and responsibilities and what they are doing. A communication strategy should be developed considering different tiers from central to community”.

Furthermore, many respondents proposed an expansion of local capacity beyond the level of local governments in cooperation with locally-based organizations. A respondent (Kamrup district of the state of Assam, India) highlighted the need to strengthen local capacity

"…through the involvement of more and more non-governmental agencies, who will be a partner with the local governments in the implementation of schemes" and further emphasized "the involvement of young and active youths in the community".

- ***Challenge 4. Transmission of LINK over generations***

Most of the respondents agreed that transmission of local knowledge within and over generations has been a challenge in the long-term integration process, generating a huge gap between generations. One respondent described "the biggest challenge I have struggled with in my experience of applying and using LINK is the perceived need by the young people in the community to become more western and scientific. This clashes with the more traditional components of the community who say the opposite". Another respondent supported this, adding that "the old practices of cultivation, food habits, use of herbal medicines are no longer prevalent in the new generations".

Transmission of local knowledge mainly involves two phases: 1) dissemination of local knowledge and practices from old to next generations; 2) acceptance of local knowledge from young generations. In contrast to the findings of literature review, there was little grasp on the first phase of dissemination where old generations today have difficulty in interacting with young generations and passing down their knowledge due to dispersed networks, while the second was dominantly accounted for during the interviews.

Influence factors on the transmission of LINK over generations were identified as: **cultural globalization; attitudes and preference of youth; poor documentation of local knowledge (due to technological incapacity and nature of local knowledge).**

First, many respondents shared the view on the impact of globalization in shaping the attitudes, values and worldviews of young generations. The following response from a respondent reflects how the changed value of the youth can be a barrier in the transmission of local knowledge across generations: "definitely, cultural globalization might affect … to the reception of the local knowledge and practices by the younger generation since their change in social values might create difficulties to interpret that information". Another respondent who investigated local knowledge in Vanuatu revealed that "in the Pacific especially, trying to use traditional knowledge as an aspect of DRR, the young people rejected this knowledge as the old way of doing things, and suggested that awareness of risk could or should come instead from technology or government". The respondent expressed concerns over such trend stating that "It

has certainly reduced the traditional knowledge of young people, and in some respects their ability to respond".

There was also a different perspective on the documentation of local knowledge; some viewed that poor documentation can be attributed to the current level of development of technology while others found the cause to be limited policy actions that incorporate the nature of local knowledge. A respondent argued that the challenge of transmission of local knowledge is "…primarily because of the lack of practice of the documentation of events" and specified the reasons such as "the lack of technical know-how, the poor penetration of software technologies to the village areas". On the other hand, another respondent looked at the reason rather from the dynamic and transformative nature of local knowledge. A respondent exemplified an anecdote about interviewing local NGOs as part of a research ion policy making for local knowledge integration. They expressed concerns over the sustainability of documenting LINK due to the current limitation of policies: "how to identify all kinds of local wisdoms for mitigating disasters if local wisdom is dynamic and changes over time? That would mean that the policies need to be dynamic too in order to monitor local knowledge". This indicates another major consideration that needs to be given in the design of frameworks for LINK integration: monitoring and evaluation of related policies on a regular basis.

In the discussion of solutions to this challenge, there was a common opinion among the respondents that there needs to be an integration of local knowledge with other forms of knowledge in handing down the legacy of the former to the next generations. A respondent from the IFRC, Bangladesh asserted that "[we need to] encourage people to use both indigenous coping strategies and modern technology and to document good and bad impact of both". Another respondent stressed that "LINK should not be fetishized above all else", proposing that "[we need] to consider all knowledge forms" and "to communicate the value of traditional cultures and knowledge while accepting and acknowledging that communities may not want to keep all elements of local knowledge".

The reason is, a mere continuation of traditional practices might not be the way communities want to develop themselves in the next decade. As foreign culture deeply permeates into indigenous communities, people become more and more receptive to foreign culture and modern technology. A researcher who has gained considerable insight on this matter addresses the notion of 'self-determination' in the face of such phenomenon in communities:

"If we identify traditional knowledge as resilience incarnate in a community, then surely we are saying that traditional practices should be continued. But this is almost never what the communities themselves want. They want Facebook and iPhones, and who are we to deny them development in the direction they want. This is the dark side of resilience from traditional knowledge in that it can encourage 'lock-in' rather than positive change."

Another respondent from the Assam state government in India underlined community ownership and empowerment as a key value for the future transmission strategy of communities: "popularization and sincere practice of the social values, culture and beliefs among the youths of the community with an assurance of empowering them to lead their society and the community. In this regard, the significance of ensuring full community participation and ownership is reaffirmed in transmitting local knowledge to next generations. A respondent stated as follows while recognizing the difficulty of this: "it is very hard to do, but DRR will not fully work unless the communities are in the driving seats".

Another suggestion centered around the popularization strategies, e.g. integration of local knowledge into the school curriculum. A respondent suggested to design "educational programs in formal education that connect with the social and communication paradigm of the younger generations might contribute to tackle this issue".

5.3. New challenges

Participants were given a question on other challenges that they have experienced beyond the scope of the four thematic areas created for interviews.

First, communication problem with indigenous communities and access to remote villages were mentioned. A respondent said, "commuting to the far-flung areas has always been a hindrance because of the absence of all-weather roads". The communication problem is seen to derive from the distrust of a community because of the lack of shared vision on a proposed scheme. The challenge is slowly being overcome as "by building confidence among the participants in the community, we arrange exposure tours for them and let them see the world with their own eyes".

Second, the question was brought up regarding how to treat damaging or negative traditional knowledge which may foster communities' vulnerability. At the same time, the respondent

added “struggling with how to account for the fact that some traditional and cultural practices are damaging”.

Third, funding was raised as a prerequisite for being able to effectively integrate LINK with DRR. A respondent put “there is always a fund crunch in such initiatives. As a result, we are unable to cover the major percentage of the community population. This is where we need the intervention of the central government”.

Chapter 7. Discussion

This chapter discusses an essential prerequisite for better integration practice and reflects on the stigmatization dilemma of the marginalized in development initiatives. Following this, a long term approach to LINK integration with DRR and limitations of research are presented.

7.1. Building institutional capacity as an entry point

Among other measures suggested by informants in the previous chapter, improving institutional capacity can be considered central to addressing the set of challenges identified in this paper. Particularly in regards to lack of institutional arrangements and underfinancing, institutional capacity is linked with all other challenges, granting access to better integration of LINK with DRR. For example, increasing activities for community trust building and equitable participation is often challenged by limited timeframe and financial resources of implementing organizations and/or local governments. One way to increase community trust is to undertake pilot projects to convince communities of the applicability of planned activities (Interview with a staff from the Australian Red Cross in Vietnam). However, in many cases, it cannot be realized due to the relatively short project duration and limited financial resources.

Furthermore, it is in general low political will that undermines the chances of involving local people and integrating their knowledge in disaster risk reduction, which makes it imperative to mainstream the agenda of ‘integration of LINK’ in long-term national and local disaster risk reduction plans. Nonetheless, stipulating the value of LINK and its integration in DRR schemes should be preceded by having proper national and/or local DRR strategies in place. The Sendai framework for disaster risk reduction aims to “substantially increase the number of countries with national and local disaster risk reduction strategies by 2020” (UNISDR, 2015, p.35), which shows still many countries are not fully equipped with basic DRR institutions and require ongoing development pathways. Therefore, it will be extremely challenging to foster the new

vision of LINK integration before establishing fundamentals of national DRR policies from which new visions can be developed. One possible pathway can be to run capacity building activities in parallel for creating relevant institutional frameworks through policy advocacy while securing more local-targeted funding for projects.

7.2. Genuine empowerment of the marginalized

We have examined the importance of involving marginalized groups into the integration processes in order to reduce their vulnerabilities and share their valuable knowledge developed to adapt to disaster risks with other groups of a community. However, one of the dilemma facing development practice during the course is involving them as a 'poorer' part of a society, which inevitably entails stigmatization of those groups as 'the poor' and 'the marginalized'. Although many development agencies recognize the need to include the marginalized in integration process based on basic principles of development, it is often the case that measures are designed as temporary and symbolic activities rather than involving them through the course of the process. In addition, few works are done that aim at effectively reducing their vulnerability and enhancing capacities to better deal with disasters. Thus, it is indispensable to develop a substantial mechanism to reduce the influence of their social status as the marginalized during the process. This can be possibly enabled by applying a true 'empowerment' principle beyond mere 'involvement' activities. For example, favourable conditions should be created for them to fully participate. Not just inviting them to a community talk or trainings, possible factors that hinder the marginalized from participating (e.g. livelihood, social pressure) need to be identified and extinguished in advance. Along with eliminating initial barriers for participation, it is important to set a rule of discussion for them to be able to make their voice fully heard within a community (e.g. giving turns to every group). By shifting the focus toward these groups from involvement to empowerment, there is a potential to help the marginalized groups take further steps from where they remain and break the fear to make their voice within a community.

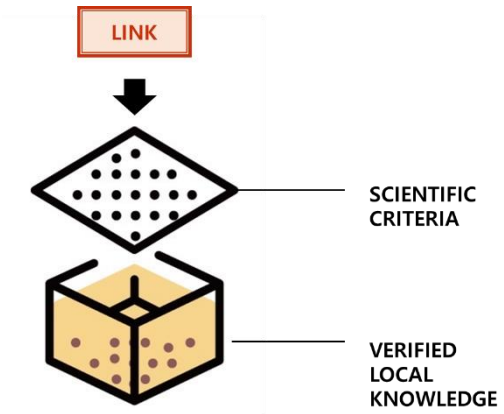
7.3. Future direction for LINK integration with DRR

As no knowledge is made in a vacuum, local knowledge also evolves and transforms by interacting with other types of knowledge including scientific knowledge (Cruickshank, 2005). Experts in this field recognise that using local knowledge for DRR and CCA should not be

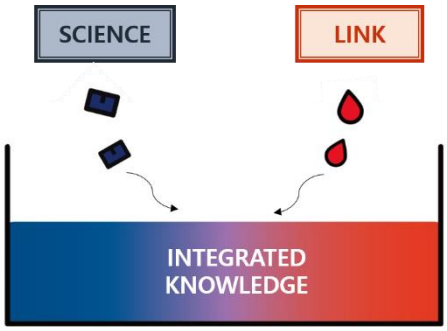
considered panacea (Hiwasaki et al., 2014). As mentioned earlier in this paper, traditional rituals and beliefs helped the survival of communities building social capital but at times pose a great threat to communities themselves increasing risks. Considering the growing severity and vagaries of disaster impact, it has become harder to combat these risks solely by traditional knowledge that were exclusively developed by local communities. To better prepare communities for future stresses and shocks, improving local knowledge is needed by incorporating it with other types of knowledge, e.g. global and scientific knowledge etc. (Dekens, 2007; Hiwasaki et al., 2014; Kelman et al., 2009). This will complement the weaknesses of existing local knowledge in coping with increasing and unpredictable patterns of disasters as well as accommodate preferred needs of communities in dealing with their vulnerabilities in the future.

In pursuing this goal, we end up facing one important question: 'what would be the most desirable approach to enable this?' Respondents from the interviews expressed that current projects to integrate LINK with DRR are rather donor-oriented and therefore subject to a 'one-size fits-all approach. The application of this approach simply entails an extraction of local knowledge based on scientific criteria, so far from inventing advanced integrated strategies to help communities adapt to future hazards in the long term (Figure 2).

Figure 2. Visual interpretation of different approaches to LINK integration with DRR.



Validation of LINK by scientific criteria (Based on Hiwasaki et al., 2014)



Development of integrated knowledge combined with scientific and local knowledge (Based on Mercer et al., 2010)

As shown in the figure 2, LINK validated through scientific criteria does not create added value

in the integration process whereas the other go through mixture, transformation and advancement of knowledge while developing into integrated strategies appropriate for future hazards. Thus, rather than a mere validation of local knowledge according to standardized scientific criteria (Hiwasaki et al., 2014), a more desirable approach would guide communities themselves to identify and compare both traditional and scientific strategies to develop integrated strategies for potential future hazards.

The individual merits of both scientific and local strategies need to be assessed in order to determine their future viability in reducing community vulnerability. Mercer et al. (2010) suggested four criteria used to assess the viability of each strategy from past and present. These included; a) sustainability; b) cost; c) equitability; d) stability. Through this scrutinization, communities are expected to identify the most beneficial strategies for them to deal with their vulnerabilities. Above all, ultimately, communities should be at the centre of decision making about an appropriate strategy as they are most aware of their situation, resulting in an integration of the most successful indigenous and scientific strategies to reduce community vulnerability to environmental hazards.

7.4. Limitations

Despite the efforts to triangulate data from literature and to complement secondary literature with primary data, certain limitations were identified in the methodology and the resulting outcomes.

The external validity of the study is limited due to the context-specific nature of local and indigenous knowledge associated with the socio-economic environment in play. An indigenous strategy that worked in a community in the Samoan Islands might not be successful in Bangladesh. Likewise, what becomes a challenge in one community might not have the same effect elsewhere since local knowledge should be understood, in a broader frame, as based on the political and socio-economic context as well as the nature and size of communities. Thus, it is important to note that the challenges addressed in this paper are not the only examples found in the APAC, but should be understood as representative due to their frequency and generally-perceived significance in the field.

In addition, there were several issues deriving from the selected sampling method. First, a substantial gap in the quality of data collected from the interviews was perceived between

respondents who have worked with local communities in DRR activities in general and those who have in-depth experience particularly regarding local knowledge. Due to the limited availability of experts who have first-hand knowledge on this topic, it was difficult to gain thorough insights for each thematic challenge from all the participants.

Moreover, the limited timeframe and scale of research made it difficult to draw out insights from community members. The study chose to address experts' perception of reality, which diminishes the role of the interpretation of the other side, communities in the APAC. However, being a non-field based study using internet-based communication, identifying and securing contacts of indigenous community members involved in relevant projects was extremely challenging. It was also considered that interviews with experts represented a valid source of understanding reality in these communities as experts normally conduct baseline-studies as well as monitor the progress of their intended efforts in the targeted communities. Thus, these limitations arguably did not have a significant effect on the overall validity of the research conclusions.

Chapter 6. Recommendations

In this section, a set of recommendations is provided with proposed activities and direction for future frameworks that aim to integrate local knowledge with disaster risk reduction in the Asia-Pacific. The recommendations are derived from the interviews as well as best practices presented in relevant literature. Also, each recommendation is categorized into predefined set of challenges that will offer a useful guideline in dealing with those challenges.

[Trust building between communities and scientific communities]

1. ***Lay stronger emphasis on initial community engagement and reflect community priorities in project design.***

For successful trust building with communities, implementing organizations can effectively target appropriate stakeholders who can help attain trust from communities based on their long-term relationship. The suggested steps for initial engagement are as follows: (1) Contact local authority first (e.g. local government entity, local disaster management agency). (2) Organise a meeting with community representatives, (e.g. community chief, spiritual leader, elder, community committee (if applicable). (3) Explain the purpose of the intervention and convince

local communities of the intended direction while exchanging opinions on their priorities and livelihood concerns. It is more effective to start from a higher level and then move to communities and further to the marginalized groups since otherwise, communities may create barriers to scientific communities (Interview with a staff from British Red Cross). Second, communities' priorities should be communicated during initial community engagement and reflected in project activities. Tailoring projects to the needs of communities is an essential component in building trust [10] (Interview with researcher at UCL) since "household preparedness and survival potential appear to be very much dictated by economic and social circumstances" (Howell 2003, p 4). Moreover, allocate sufficient time for trust building, e.g. by spending time with local people to understand their culture and lifestyle before starting a research (Interview with a researcher at University of Granada).

✧ *Key to success*: making the best use of local support

In the initial phase of a community engagement, it is important to actively employ local mediators to bridge a gap between local and scientific communities. They are well aware of local context as well as proficient in local language, which can help to break the barrier between the two parties. For instance, a research conducted by Cronin et al. (2004) can be referred to as a good example of local mobilization where they recruited local facilitators based in each exercise location. They could communicate in Bislama and easily develop a rapport with village groups.

[**Mechanism for full participation]**

2. Design and organize "understand our community better" activities.

To enable an equitable participation from all corners of beneficiary groups and secure sustainability of interventions, international experts in this field agree that each group of a community first needs to understand each other better (Interview with a staff from Australian Red Cross). Thus, it is necessary to create activities where different groups of a community have a chance to get to know each other better, by openly talking about their different lifestyles and social status. While doing so, varied groups of a community can share a wide range of

[10] This iterative and reflective process of development intervention in project design is in line with a 'theory of change', which highlights the possibility of multiple unimagined routes existing from activities to a project goal (Bakewell & Garbutt, 2005).

coping strategies adapted through their own means of livelihood. Through this process, community members are expected to recognize the need to involve every part of a community in initiatives for common goals of communities in long term.

✧ *Key to success*: Measures to encourage participation from the poor

The following measures can be considered for those who cannot afford to come to meetings because of the impact this has on their livelihood: compressing trainings, running evening sessions and providing in-kind incentives for attendance (IFRC, 2015).

3. Expand a gender-sensitive perspective in frameworks

To raise awareness about and reflect gendered needs in project activities, implementing organizations can organize gender-disaggregated talks and pave the way for cooperation with male groups in a community (interview with a staff from the British Red Cross). In the design of a project, implementing organizations can arrange gender-disaggregated talks where each gender group identifies their vulnerability during and after disasters separately. Then, researchers communicate the vulnerability identified from one group with the other group. It is significant to involve both genders in discussion since in gender-sensitive perspective, change will never be made without the understanding and cooperation of the other. In carrying out such activities, it is important to make sure that those activities are carefully designed based on the thorough understanding of a target community. This is because one gender group may show a sign of discomfort and lack of confidence while discussing directly with the other gender group due to the alienation from each other.

In parallel with gender disaggregated talks, researchers can discuss with male groups how males can support women and be part of DRR programmes. For example, “awareness raising campaigns can be carried out in cooperation with male groups for women to better understand disaster risks and how they impact their family life” (interview with a staff from the British Red Cross).

4. Deploy community decision-making mechanism

In order to accommodate different needs of the varied sub-groups of a community, making a better use of participatory structures at community level can be considered. Participatory decision-making bodies may counter the bureaucratic and hierarchical structure of governments and allow a community to take a leading role in managing their own assets and coming up with solutions for their own problems. Such form of ‘self-governance’ (Ostrom, 1999) would

contribute to making solutions more sustainable in that communities themselves can devise rules and direction that will govern the way their local knowledge is documented, developed and disseminated within and across generations.

If there is no such existing structure at village level, development organizations can attempt to create a new community decision making body specifically for disaster risk reduction. A respondent from the IFRC, Bangladesh gave an example of a decision-making body at community level: "We organized projects where everyone can participate together to build social bondage and cohesion. We formed a community disaster management committee composed of the people a community selected". The impact was notable at the completion of the projects: "people were well blended with those who they had not used to sit together and we came up with the solution of the problem".

[Institutional capacity and power balance]

5. Stipulate the need for local knowledge and participation of local communities in the National and Local Disaster Risk Reduction Framework

Hiwasaki et al. (2014) stressed that processes for integration would be more successful "if local and national government entities (…) enact policies to promote local and indigenous knowledge and research on such knowledge as priorities in their disaster risk reduction and climate change adaptation strategies". To enable governmental support in such initiatives, the agenda of 'integration of local and indigenous knowledge' should be mainstreamed in the national framework for disaster risk reduction of countries where initiatives are carried out. In the framework, the importance of local knowledge in disaster risk reduction needs to be acknowledged as well as the need to actively engage local communities and institutions in DRR projects. In line with the national frameworks, local governments can prepare a Local Action plan for DRR which further specifies basic rules and methods for promoting indigenous knowledge and practices through multiple channels. For example, the Action Plan needs to solicit the participation of local people, as a knowledge holder, to the extent of decision-making instead of one-time consultation or information sharing.

6. Collaborate with and increase direct funding to local actors

Development agencies should actively work with local civil organizations, NGOs or research agencies that already have similar experience of integrating local knowledge in DRR at community level. Local civil society actors are physically proximate to local communities and typically have substantial comparative advantages in terms of understanding the local needs and providing culturally appropriate responses. In addition, they may have far higher levels of acceptance, mutual trust and accountability towards the populations they serve (IFRC, 2015). A respondent during interviews also underlined that "NGOs can respond better to local people's priorities and building on local capacities since they operate at grassroots level with communities". In the initial stage of the process, programme coordinators may include activities to build partnerships with local actors to get assistance in project implementation such as training and orienting communities about project frameworks.

However, power relations between central and local government and indirect funding via central government from donors undermine effective resource mobilization at local level. In strengthening institutional capacity at local level, it is necessary to change the current state of funding that remains marginal and mediated by 1) increasing budget allocations of local governments for implementation of disaster risk reduction policies (Ouariachi-Peralta & Fakhruddin, 2014) and 2) converting the direction of funding for DRR development from donors directly to local NGOs and research institutes (IFRC, 2015).

[Promotion of local knowledge in DRR and dissemination across generations]

7. Promote and popularize local knowledge in DRR policies, programmes and education.

For dissemination of local knowledge across generations, the knowledge should be kept vibrant and alive in communities. Documentation-oriented practice dominant in this field should further broaden its scope into promoting and popularizing local knowledge. In order to make better use of LINK, central and local government need to closely work together to develop policies and programmes that connect LINK with DRR. One of the interview respondent in charge of DRM in local government suggested holding "tripartite dialogues where local and central governments distribute work and play their parts". It was emphasized "to see if there is no duplicity of the work and creating confusions among the community".

Based on this collaboration, a wide range of activities can be carried out at both national and local level: 1) integration of LINK in school curricula in appropriate subject areas; development

of a variety of Information, Education and Communication (IEC) materials; holding community forums or campaigns to raise awareness of people in indigenous knowledge; utilising traditional forecasting or early waring methods in the local SOPs (Standard Operating Procedure) and preparedness plans (Sithole, Naser & Guadagno, 2015). For example, in Vanuatu, UNESCO launched a pilot project[11] to assist Vanuatu in redesigning science curricula to incorporate key elements of indigenous knowledge that continues to thrive in the archipelago.

8. Monitor local knowledge on a regular basis.

As local knowledge is not static, monitoring local knowledge is inevitable to keep a close track of newly adapted strategies for documentation. Although it would be ideal to conduct the process every time a local government revises disaster risk reduction or climate change adaptation plan, considering high costs associated with this regular exercise, processes could be abbreviated for such purpose (Hiwasaki et al., 2014). Such an iterative process will ultimately contribute to increased resilience of communities by documenting local knowledge and practices that evolve over time according to changing environment and climate. Furthermore, project evaluation should be followed after a project implementation in light of key indicators such as, popularization of knowledge to communities; improved community resilience; dissemination of local knowledge over generations etc.

9. Categorize and valorise knowledge that is not scientifically explained.

Common concerns were detected during interviews regarding how to treat the knowledge that does not accord with the realm of science. So far, the focus of integration was rather on validating local knowledge by scientific (Hiwasaki et al., 2014) criteria instead of trying to approach the knowledge in a bigger epistemic frame of their culture and wisdoms. Traditional beliefs, faith and religion constitute a big part of local knowledge which is significant in strengthening communities' resilience (Dekens, 2007), although they are difficult to integrate with science. Categorizing local and indigenous knowledge as below (Figure 1) can make it possible to valorise the local knowledge and practices that cannot be explained by science, and enables us to understand that this knowledge is a body of knowledge in itself, different from scientific knowledge (Hiwasaki et al., 2014). As such, LINK should not be judged solely by

11 UNESCO carried out a pilot project in Vanuatu to incorporate local knowledge in school curricula in consultation with the Vanuatu Ministry of Education, the Vanuatu Environment Unit, the Vanuatu Cultural Centre, and in partnership with the Centre National de la Recherche Scientifique (France).

scientific parameters, but also assessed by another system appropriate to the context and social impact.

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

Figure 1. Categorization of local and indigenous knowledge (LINK) on disaster risk reduction and climate change adaptation (CCA) and its relationship to scientific validation (Hiwasaki et al., 2014).

Chapter 8. Conclusion

The aim of this study was to reflect upon challenges arising during the process to integrate local knowledge with disaster risk reduction in the Asia-Pacific and to contemplate on how initiatives with this aim may be improved. A literature review and expert interviews on current practice in LINK integration confirms that trust, empowering the marginalized, institutional capacity and dissemination of LINK over generations are critical factors that help achieve the effectiveness and sustainability of such initiatives. To better deal with challenges occurring during the process, implementing organisations may consider increasing initial community engagement activities for sound trust building with local communities, organize activities that facilitate understanding between different groups of local populations and perform capacity building activities in parallel to enhance relevant institutional capacity to compose favourable enabling environment. In addition, integrated strategies should be popularized through DRR programmes and education while regularly monitoring local knowledge for necessary updates.

Local knowledge holds significant value in that it has sustained the life of local and indigenous communities in adapting to recurrent natural hazards over generations. Nonetheless, the severity of disasters coupled with ever-intensifying climate change can no longer be fully managed by local knowledge. In this circumstance, a desirable role of development agencies for sustainable practice for LINK integration would be to accommodate the needs of communities in future development and guide them towards integrated strategies that reduce vulnerability. Above all, the ultimate goal of initiatives to integrate LINK with DRR would be to train communities to be fully prepared to utilise their knowledge for their own disaster risk reduction strategies, with an initial help of implementing organizations. To achieve this goal, this research seeks to add to the existing body of research by providing hands-on insights on current challenges and practical recommendations for future frameworks that will be developed in the next decades in the APAC region. Having this research as an input, subsequent studies can be undertaken to validate the identified set of challenges and recommendations with the target groups of interventions (i.e. the local communities themselves). Also, a long-term longitudinal research can be planned to reflect upon the practice of international development organisations in LINK integration by examining their programme management based on the findings of this research.

References

Adger, W. N, Barnett, J. Chapin, III. F. S. & Ellemor, H. (2011). This must be the place: under representation of identity and meaning in climate change decision-making. Glob Environ Polit 2011; 11(2):1–25.

Agrawal, A. (1995) 'Dismantling the Divide between Indigenous and Scientific Knowledge'. In Development and Change, 26(3): 413-439

Bakewell, O., & Garbutt, A. (2005). The use and abuse of the logical framework approach. Stockholm: Swedish International Development Cooperation Agency (Sida).

Battista, F. & Baas, S. (2004). The Role of Local Institutions in Reducing Vulnerability to Recurrent Natural Disasters and in Sustainable Livelihoods Development, in *Consolidated Report on Case Studies and Workshop Findings and Recommendations*. Rural, Rome.

Berkes, F. (2012). Sacred ecology, third edition. New York, USQ: routledge. quoted in MoSTE, 2015.

Bernard, H.R. 2002. Research Methods in Anthropology: Qualitative and quantitative methods. 3rd edition. AltaMira Press , Walnut Creek, California.

Bhagavan, M. R., & Virgin, I. (2004). Generic aspects of institutional capacity development in developing countries. Stockholm: Stockholm Environment Institute.

Blaikie, Norman W H, (2000). Designing social research: the logic of anticipation, Polity Press, Cambridge, UK; Malden, MA.

Brokensha, D., D.M. Warren & O. Werner. (1980) Indigenous Knowledge Systems and Development. University Press of America, Lanham, MD.

Bridges K & McClatchey W. (2009). Living on themargin: ethno-ecological insights from Marshall Islanders at Rongelap Atoll. Glob Environ Change 2009; 19(2):140–6.

Cadag, J. R. D., & Gaillard, J. C. (2012). Integrating knowledge and actions in disaster risk reduction: the contribution of participatory mapping. Area, 44(1), 100-109.

CADRI. (2011). Basics of capacity development for disaster risk reduction. Geneva: Capacity for disaster reduction initiative.

Creswell, J. H. (2003). Research Design. Qualitative, Quantitative, and Mixed Methods Approaches. London: SAGE.

Cronin, S. J., Gaylord, D. R., Charley, D., Alloway, B. V., Wallez, S., & Esau, J. W. (2004). Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu. Bulletin of volcanology, 66(7), 652-668.

Daramola, I., & Oyinade, B. (2015). Impact of Cultural Globalization on Africa. The Role of Western Media. International Journal of Education and Research. Vol. 3 No. 3 March.

Dekens J. (2007). Local knowledge for disaster preparedness: a literature review. Kathmandu: International Centre for Integrated Mountain Development (ICIMOD); 2007.

Ellis, D. & West, P. (2000). *Local History as "Indigenous Knowledge": Applications for Conservation and Development in Papua New Guinea.* Paper for the ASA 2000 Conference on Indigenous Knowledge and Development. Retrieved from http://www.asa2000.anthropology.ac.uk/ellis/ellis.html

Elsevier, (2017), About Scopus. Retrieved from https://www.elsevier.com/solutions/scopus on [2017.03.31].

Esau J. W. (1997). Volcanic alert levels and emergency evacuation plans for Vanuatu. Proc Workshop on Volcanic hazards and Emergency Management in the South Pacific, Port Vila, Vanuatu, 24–28 February 1997, p 15.

Fernando, J.L. (2003) 'NGOs and production of indigenous knowledge under the condition of Post-modernity'. The Annals of the American Academy. 590. pp. 54–72.

Flavier, J.M., A. de Jesus & C. Navarro. (1995). 'The regional program for the promotion of indigenous knowledge in Asia'. In D.M. Warren, L.J. Slikkerverr and D. Brokensha (eds.) The Cultural Dimension of Development: Indigenous Knowledge Systems. Intermediate Technology Publications, London. pp. 479–87.quoted in Mercer et al., 2010.

Garschagen, M., Hagenlocher, M., Comes, M., Dubbert, M., Sabelfeld, R., Lee, Y. J., ... & Pott, S. (2016). World Risk Report 2016.

Government of Nepal (2011). *Climate change policy of Nepal*, Kathmandu: national Planning commission, Government of Nepal.

Hiwasaki, L., Luna, E., Syamsidik & Shaw, R. (2014) 'Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities', *International Journal of Disaster Risk Reduction*, 10, pp. 15–27. doi: 10.1016/j.ijdrr.2014.07.007.

Hiwasaki, L., Luna, E., Syamsidik, Shaw, R., Mercer, J. (2012). 'Capacity-building to Strengthen Resilience of Coastal and Small Island Communities against Impacts of Hydro-Meteorological Hazards and Climate Change'. Final report for APN project. Project Reference Number: CBA2012-15NSY-Hiwasaki

Howell, P. (2003) Indigenous Early Warning Indicators of Cyclones: Potential Application in Coastal Bangladesh. London: Benfield Hazard Research Centre, UCL

ICSU (2002). Science, traditional knowledge and sustainable development. Series on Science for Sustainable Development, (4). Paris, France: International council for Science and the United Nations Education, Scientific and Cultural Organisation.

Iloka, N.G., 2016, 'Indigenous knowledge for disaster risk reduction: An African perspective', Jàmbá: Journal of Disaster Risk Studies 8(1), a272. http://dx.doi. org/10.4102/jamba.v8i1.272.

Jigyasu, R. (2002). Reducing Disaster Vulnerability through Local Knowledge and Capacity. The Case of Earthquake Prone Rural Communities in India and Nepal. Unpublished PhD thesis, Department of Town and Regional Planning, Faculty of Architecture and Fine Art, Norwegian University of Science and Technology, Trondheim, Norway.

Kelman, I., Mercer, J., & West, J. (2009). "Combining different knowledges: community-based climate change adaptation in small island developing states". Participatory Learning and Action Notes, no. 60, pp. 41-53. Free in English and Arabic at http://pubs.iied.org/G02812.html.

Khailani, D. K., & Perera, R. (2013). Mainstreaming disaster resilience attributes in local development plans for the adaptation to climate change induced flooding: A study based on the local plan of Shah Alam City, Malaysia. Land Use Policy, 30(1), 615-627.

Kulatunga, U. (2010). Impact of culture towards disaster risk reduction. International Journal of Strategic Property Management, (4), 304-313.

Kusumasari *et al.*, *Local Government Capability in Managing Disaster: Evidence from Bantul, Indonesia* (Monash University, Australia, Undated).

Langill, S. (1999). *Indigenous Knowledge. A Resource Kit for Sustainable Development Researchers in Dryland Africa,* People, Land and Water Programme Initiative. Ottawa: IDRC. Available at: http://idrinfo.idrc.ca/archive/corpdocs/114518/ikkit.pdf

Linkenback-Fuchs, A. (2002). Cultural Strategies for Risk Adjustments in Mountains. Paper presented at the Asia High Summit 2002, May 6-10. Kathmandu, Nepal.

Lewis, J.L. & S.R.J. Sheppard. (2006). Culture and communication: can landscape visualization improve forest management consultation with indigenous communities? Landscape and Urban Planning 77:291–313.

McNabb, D. E. (2008). Research Methods in Public Administration and Nonprofit Management. Quantitative and Qualitative Approaches. New York: M. E. Sharpe.

Mallapaty, S. (2012). Snakes and folk tales meet science in disaster warning. ⟨http://www.scidev.net/global/earth-science/feature/snakes-and-folk-tales-meet-science-in-disaster-warning.html⟩; [accessed 14.01.17].

Materer, S., Valdivia, C., & Gilles, J. (2001). Indigenous Knowledge Systems: Characteristics and Importance to Climatic Uncertainty, Working Paper AEWP 2001-3. Colombia (USA): Department of Agricultural Economics, University of Missouri. Available at http://dass.missouri.edu/agecon/research/workingpapers/index.php

Mercer, J., Dominey-Howes, D., Kelman, I., & Lloyd, K. (2007). 'The potential for combining indigenous and western knowledge in reducing vulnerability to environmental hazards in small island developing states'. *Environmental Hazards*. 7 (4). pp. 245–56.

Mercer J, Kelman I, Lloyd K, Suchet-Pearson S. (2008). Reflections on use of participatory research for disaster risk reduction. Area; 40(2):172–83.

Mercer, J., Kelman, I., Taranis, L. & Suchet-Pearson, S. (2009) 'Framework for integrating indigenous and scientific knowledge for disaster risk reduction', *Disasters*, 34(1), pp. 214–239. doi: 10.1111/j.1467 7717.2009.01126.

Meyers, Koen & Puteri, Watson. (2008). "Legend, Ritual and Architecture on the Ring of Fire." in *Indigenous Knowledge for Disaster Risk Reduction: Good Practices and Lessons Learned from Experiences in the Asia-Pacific Region*, edited by R. Shaw, N. Uy, J. Baumwoll. Bangkok: United Nations International Strategy for Disaster Reduction (UNISDR) Asia and Pacific.
Moench, M., & Dixit, A. (2004). Adaptive capacity and livelihood resilience: adaptive strategies for responding to floods and droughts in South Asia. Institute for Social and Environmental Transition (ISET).

Mosse, D. (2000). *People's Knowledge, Participation and Patronage: Operations and Representations in Rural Development*. Paper presented at the ASA 2000 Conference on Indigenous Knowledge and Development. Available at http://www.asa2000.anthropology.ac.uk/mosse/mosse.html.

MoSTE (2015). Indigenous and Local Knowledge and Practices for Climate Resilience in Nepal, Mainstreaming Climate Change Risk Management in Development, Ministry of Science, Technology and Environment (MoSTE), Kathmandu, Nepal.

OECD (The Organization for Economic Cooperation and Development). (2001). OECD *handbook on information, consultation and public participation in policymaking* (OECD, Paris).

Oliver-Smith A. (2009). Sea level rise and the vulnerability of coastal peoples responding to the local challenges of global climate change in the 21st century. Intersections: interdisciplinary security connections. Bonn: UNU Institute for Environment and Human Security (UNU- EHS).

Ostrom, E. (1999). Self-governance and forest resources. CIFOR Occasional Paper No.20. Bogor, Indonesia, Bogor, Indonesia, CIFOR. CIFOR. 15p.

Ouariachi-Peralta, T., & Fakhruddin, S. H. M. (2014). Integrating local knowledge in disaster risk reduction policies: A case study for Indonesia. Asian Journal of Environment and Disaster Management (AJEDM) - Focusing on Pro-active Risk Reduction in Asia, 06(01), 13–37. doi:10.3850/s1793924014000297

Pareek, A., & Trivedi, P. C. (2011). Cultural values and indigenous knowledge of climate change and disaster prediction in Rajasthan, India.

Parker, D.J. & Handmer, J.W. (1998). 'The Role of Unofficial Flood Warning Systems'. In Journal of Contingencies and Crisis Management, 6(1): 45-60.

Quarantelli, E.L. (1978). *Disasters: Theory and Research.* Sage, London and Beverly Hills.

Rocheleau, D. 1991. Gender, ecology and the science of survival: stories and lessons from Kenya. Agricultural and Human Values, 8(1): 156–65.

Rungmanee, S., & Irwin, Cruz. (2005). "The Knowledge That Saved the Sea Gypsies." *A World of Science* 3(2):20–23.

Rumbach, A., & Foley, D. (2014). Indigenous institutions and their role in disaster risk reduction and resilience: Evidence from the 2009 tsunami in american samoa. Ecology and Society, 19(1) doi:10.5751/ES-06189-190119

Ryu, C. H., (2011). A study on the fiscal structure and financial risk of local government. *KAPA.*

Shaw R., Uy, N., & Baumwoll, J. editors. (2008) Indigenous knowledge for disaster risk reduction: good practices and lessons learnt from Asia-Pacific region. Bangkok: UNISDR Asia and the Pacific.

Sillitoe, P. (2000) 'Interdisciplinary experiences: working with indigenous knowledge in development'. Interdisciplinary Science Reviews. 29 (1). pp. 6–23.

Sithole, W., Naser, M., & Guadagno, L. (2015). Indigenous knowledge for disaster risk reduction: documenting community practices in Papua New Guinea. International Organization for Migration and National Disaster Centre. Retrieved from: http://www.preventionweb.net/publications/view/47809

SPDRP (South Pacific Disaster Reduction Program). (1997). Operational support plan: Ambae volcano. UNDP-South Pacific Office Suva, Fiji, p 20.

Sudmeier-Rieux, K., Masundire, H., Rizvi, A., & Rietbergen, S. (eds). (2006). Ecosystems, Livelihoods and Disasters. An Integrated Approach to Disaster Risk Management, Ecosystem Management Series No 4. Gland and Cambridge: IUCN, CEM, CARE, IWM.Thrupp, L.A. (1989). 'Legitimizing Local Knowledge: From Displacement to Empowerment for Third World People'. In *Agriculture and Human Values*, 6(3): 13-24.

Tongco, M.D.C. (2007). Purposive sampling as a tool for informant selection. Ethnobotany Research & Applications, 5:147-158.

UNEP (United Nations Environment Programme). (2004). Meeting of Coordinators of the Project on Capacity-Building through Partnership and Information and Communication Technology for Using

Indigenous Knowledge for Nature Conservation and Natural Disaster Management in Africa. Meeting report, Nairobi, Kenya, 3-4 November, 2004

UNISDR (United Nations Office for Disaster Risk Reduction). (2015). Sendai Framework for Disaster Risk Reduction 2015-2030. Retrieved from: http://www.unisdr.org/we/coordinate/sendai-framework. [Accessed 14.05.17].

UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific). (2012). Statistical year book for Asia and the Pacific 2012. Available online from: ⟨http://www.unescap.org/stat/data/syb2012/index.asp⟩; [Accessed 09.01.17].

UNFCCC (United Nations Framework Convention on Climate Change). (2013). Best practices and available tools for the use of indigenous and traditional knowledge and practices for adaptation, the application of gender-sensitive approaches and tools. Technical paper; FCCC/TP/2013/11.

Van Aalst, M., & Burton, I. (2002). The Last Straw. Integrating Natural Disaster Mitigation with Environmental Management (with Examples from Dominica, the Dominican Republic and St. Lucia), Working Paper Series No. 5. Washington DC: World Bank.

Walshe, RA & Nunn, PD. (2012) Integration of indigenous knowledge and disaster risk *reduction: A case study from Baie Martelli, Pentecost Island, Vanuatu*.

Appendices

Appendix 1. Scientific explanations of selected local and indigenous knowledge documented in Indonesia, Philippines and Timor-Leste (Hiwasaki et al., 2014)

Local and indigenous knowledge	Description	Scientific explanation
Observation of the sky and the environment to predict *Angeen Badee* (strong winds and high waves) Documented in Aceh, Indonesia	Observation of dark towering clouds at the horizon, and their upward movement from winds, in combination with position of beehive in a tree, calm sea-weather during transition period (according the traditional calendar) and rancid smell from the sea	The cloud formation and movement is *Cumulus nimbus* (Cb.) cloud type. This cloud is also part of indication of cyclone effects generated around the Indian Ocean and the Andaman Sea. The rancid smell is an indication of over-evaporation process at the sea-surface. This is also an indication of massive clouds formation process that can accumulate large water volume that can later produce high rainfall.
Observation of the environment to predict and prevent landslides Documented in Covalima, Liquiça, and Viqueque, Timor-Leste	When sacred trees (*Ai lulik*: such as teak, bamboo and Beechwood) are cut, and sacred stones (*fatuk lulik*) are destroyed or removed, there will be landslides.	When forests are destroyed or stones are removed, springs will dry up from evaporation because there are no leaves (canopy strata) to cover the spring, and when in rainy season there is no infiltration of water into the land, the physical structure of soil is fragile when there are no stones and tree roots to secure the ground, thus landslides will occur.
Observation of the environment to predict typhoons Documented in Rapu-rapu Island, Philippines	Branches of trees (such as gmelina, talisay, pili, marukbarok, tamarind, santol, narra) and banana leaves fall to the ground even when there is no strong wind. Two days after such observation is made, heavy rains, storm surges or strong winds will hit the community.	The banana is characterized as having the weakest structure. As the temperature decreases, the plants' ability to make chlorophyll stops. Further the synthesis of a plant hormone called auxin also stops. This causes the cells at the junction of the petiole and the twig to weaken and sooner or later the joints break and leafs fall to the ground.
Planting of coastal forest (*Uteun Pasie*) to prevent and mitigate impacts from high waves and strong winds, and coastal erosion Documented in Aceh, Indonesia	Coastal forest around the sandy beach area where several rows of different species of trees, bushes and smaller vegetation grow along the seashore. The coastal forest is managed by coastal community through *Panglima Laot* (traditional fishermen organisation) organisation.	The forest can effectively reduce the wind velocity blown from the coastal area. When the wind comes from the sea, it brings saline vapour that can also create corrosive effects on metal components around the villages. *Uteun Pasie* absorbs the saline vapour.
Food preservation mechanism to prepare for long periods of storms Documented in Rapu-rapu Island, Philippines	Dig a hole in the ground and place root crops such as cassava inside the hole and fill it with soil. The stored root crop is prevented from rotting and can last up to a month, thus providing food security during long periods of storm.	Root crops grow underground and this practice is a natural way of preservation.
Sacred ceremony to apologize to nature after a natural hazard such as landslides Documented in Covalima, Liquiça, and Viqueque, Timor-Leste	*Monu ain ba lulik* held by traditional leader or elder to apologize for taking stones, sand, trees, killing snake, etc. and promise not to do it again. First, an animal (chicken or pig or dog) is killed, and its blood is spread to the affected area with betel nut and betel leaf. Then, trees are replanted in sacred places such as around water sources, river banks, the beach and on upland or hills.	The ceremony reinforces respect for nature and to ensure villagers follow the sacred rules, if not, they will get the nature's curse and disasters will occur. Disasters provide an opportunity for social cohesion, respect for nature, and awe for nature. Such ceremonies contribute to a form of resilience.

Appendix 2. General interview guide

Thank you very much again, for participating in my research. Your contribution will be greatly acknowledged in my thesis. Before we getting into the discussion, could you briefly explain about your current position in your organization and your experience in community-led DRR or local knowledge integration with DRR?

1.1. I have identified four challenges in the integration of LINK with DRR. First of all, *trust building between communities and scientific bodies.* Have you experienced in the previous research or projects such a trust issue becomes a challenge during the process?

1.2. If so, what was the cause behind it and why do you think that happen?

1.3. I will give you some reasons that contribute to this challenge. Do you have any relevant experience on this? First, scientific communities barely change their attitude on rural people and underestimate LINK despite they are using the jargon such as empowerment and ownership. Second, communities' distrust in external scientific bodies due to communication barriers and wrong information such as inaccurate early warnings. Third, the nature of two knowledge systems are difficult to be incorporated.

1.4. What do you think can overcome/counter such challenge? Do you have any recommendation to consider to tackle on this?

2.1. Have you experienced *'full participation of communities incorporating the marginalized'* becomes a challenge during the process?

2.2. If so, what was the cause behind it and why do you think that happen?

2.3. Do you think power relations within a community and conflicts between social roles depending on gender, ethnicity, age, class, can partly explain this phenomenon? For example, often the decisions are made by the power groups of a community that often women and other marginalized groups are hesitant or demotivated to participate.

2.4. What do you think can overcome/counter such challenge? Do you have any recommendation to consider to tackle on this?

2.5. If it is expected to be seen a lot of divides and conflicts within a community due to heterogenous community composition, do you think it will be more effective to conduct such a research in more 'homogenous communities' (sharing the same religion, beliefs and

ethnicity etc. even though there still exist some gaps in social status), as an entry point?

3.1. Have you experienced *poor institutional capacity of local government and other local organizations* can be a barrier to implementing DRR policies with such aim? If yes, what do you think influences local capacity and what are the components of such capacity?

3.2. Also, do you think *a power imbalance between a central and local government* partially contributes to a lack of local capacity? (e.g. the tendency that authoritarian regime sees locally driven initiatives and participatory approach as a threat to their authority, deficiency of local budget due to a centralized political structure).

3.3. What do you think can overcome/counter such challenge? Do you have any recommendation to consider to tackle on this?

4.1. Now, the final challenge. Have you faced a challenge regarding *the transmission of local knowledge across generations*? Please share your experience

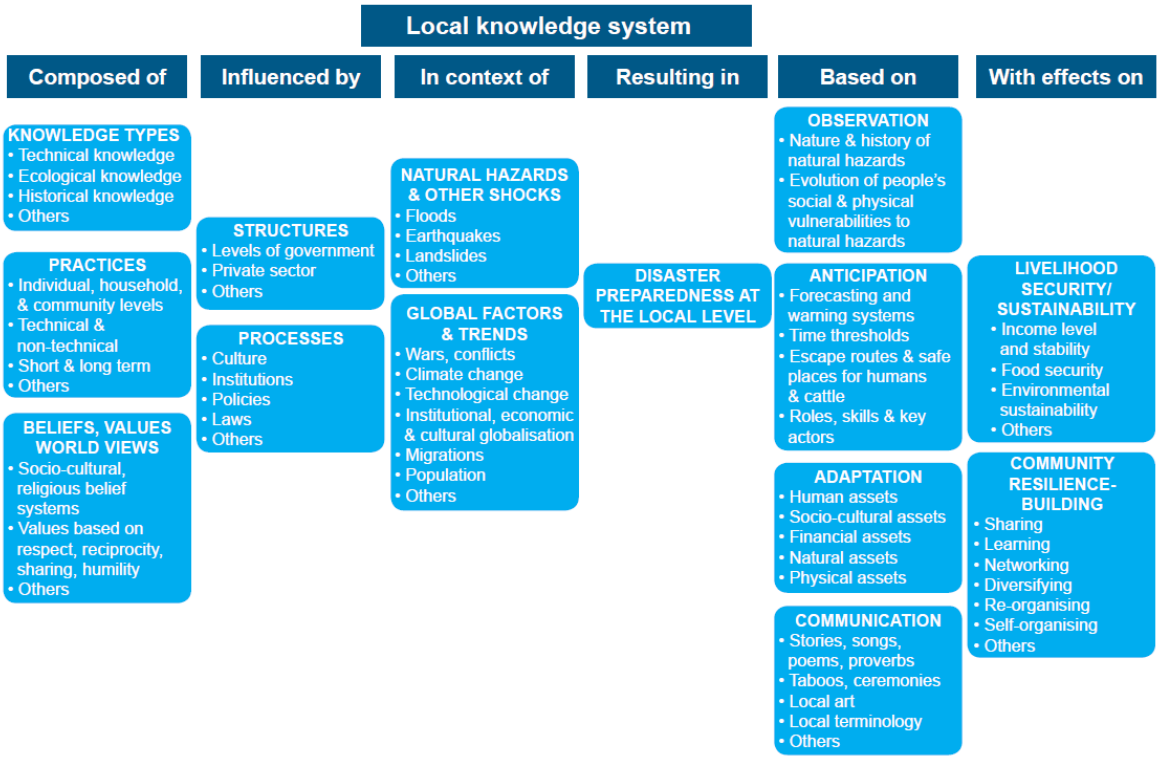
4.2. Influx of foreign culture invaded the transmission of social values, norms, cultures, and beliefs of the old generation and limit young generation's interaction with the old people in communities. How do you think this cultural globalization affect the dissemination of the local knowledge and practices to the next generation?

4.3. What do you think can overcome/counter such challenge (encouraging the participation/motivation of the youth in such projects)? Do you have any recommendation to consider to tackle on this?

5. Can you tell me other challenges that have not been discussed so far but significant during the process?

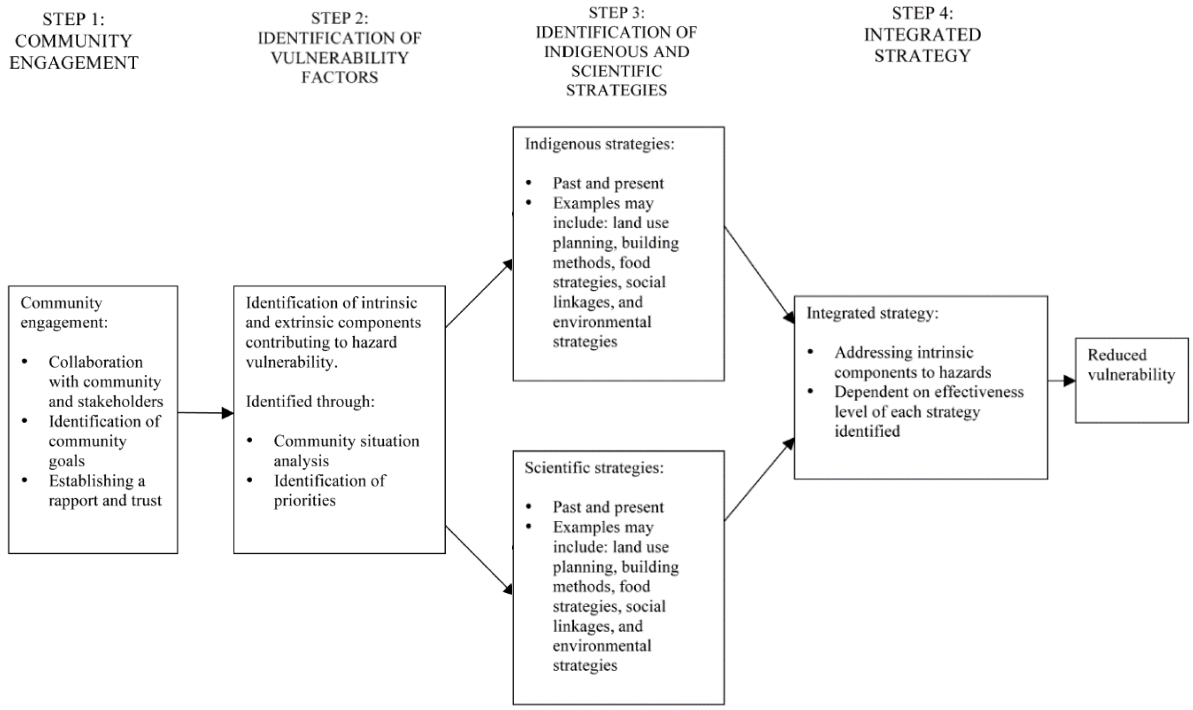
6. What kind of projects did you refer to when answering the questions? (The name and location)?

Appendix 3. Framework for Local Knowledge on Disaster Preparedness

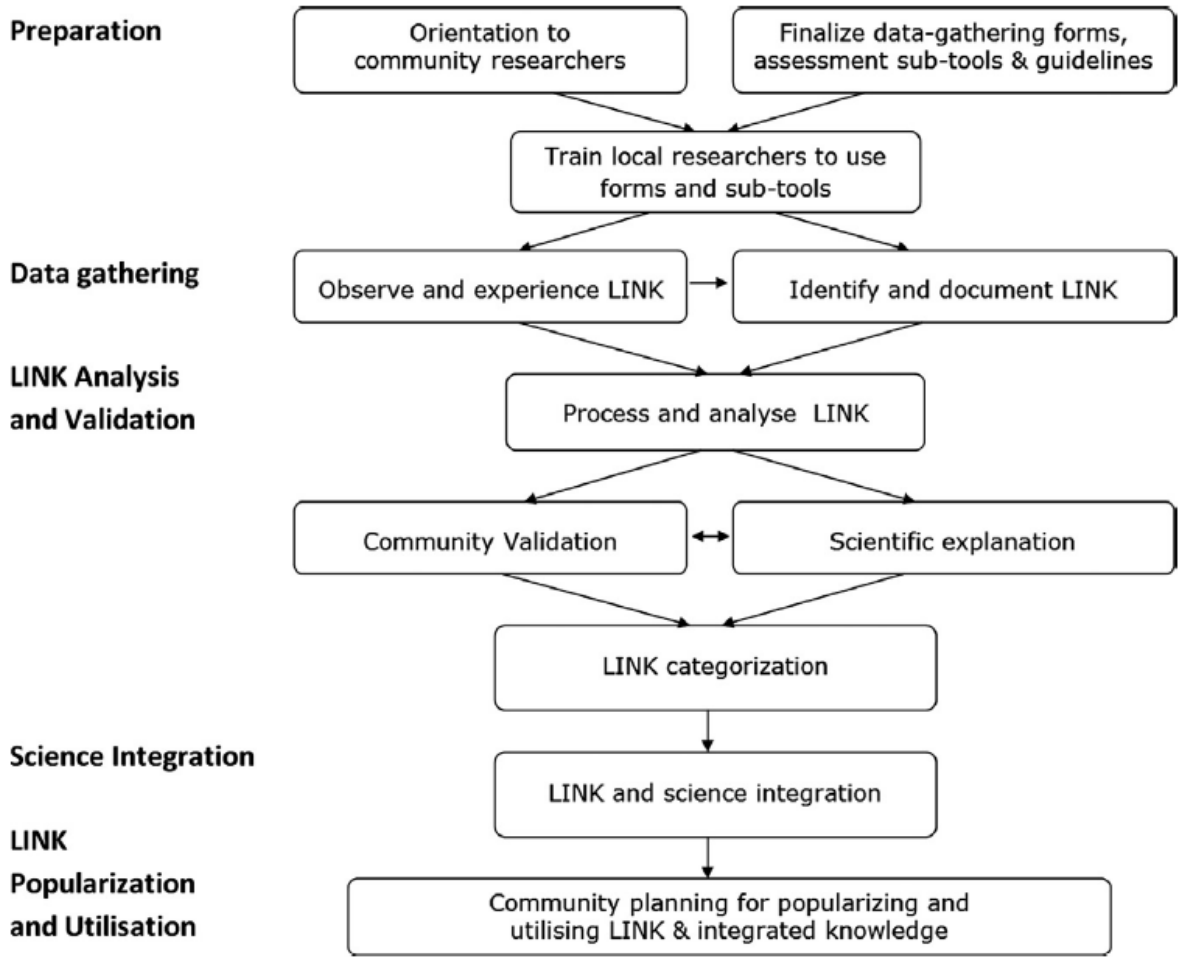


Adapted from DFID (1999) & Ellis (2001) livelihood framework, and Gardner & Dekens (2007)

Appendix 4. Process framework integrating indigenous and scientific knowledge



Appendix 5. Framework for LIVE scientific knowledge (Hiwasaki et al., 2014)



Appendix 6. Overview of interviews conducted

No. Interviews conducted	Organization and Duty station	Position/ division.	Relevant experience	Interview Date
1.	British Red Cross, Bangladesh	Senior Programme Manager	8 years	10/03/2017
2.	IFRC, Bangladesh delegation	Senior. Manager, Resilience and Partnership & Resource Development	6 years	16/03/2017
3.	King's College London/ University College London, U.K.	Researcher, PhD candidate	7 years	22/03/2017
4.	Australian Red Cross, Vietnam	Program Manager	5 years	27/03/2017
5.	University of Granada, Spain	Researcher, PhD Candidate	2 years	29/03/2017
6.	Assam State Disaster Management Authority, India	District Project Officer	15 years	03/04/2017
7.	Australian Red Cross, Myanmar	Country Manager	20 years	07/04/2017
8.	GEM (Global Earthquake Model)	Regional Project Manager and Strategy Coordinator	25 years	08/04/2017

Appendix 7. Interview findings overview

Challenges	General stance/examples	Background/ hindrance factors	Recommendation for better practice
Challenge #1 ***'trust building with local communities'***	**Strongly agree (6/6)** • local communities - scientific communities • local communities - other communities • local communities - local authority	[Distrust from communities] • Negative experience from the past (e.g. inaccurate early warnings) • Neglected local priorities • Lack of participation and empowerment throughout the process • Hesitance to accept new technologies [Distrust from scientific bodies] • Sense of superiority • Applying old paradigm to communities • Neglect the epistemic frame of wider knowledge and culture, which leads to misappropriation of local knowledge	• Actively employ local support and resources in initial contact with communities • Build rapport with community members by spending some time with them in the early-phase of research • Count on a mediator who understands both communities and external bodies • Convince communities of projects' objectives by logically present them
Challenge #2 ***' Engagement and empowerment of the marginalized'***	**Strongly agree (5/6)** • Women, the elderly, the disabled, the youth, the poor	• Poverty, poor education, economic opportunity, less power and voice • Patriarchal social order • Disconnection from governments and other stakeholders • Hierarchical-bureaucratic structures of governments guided by strict mandates	• Programme activities that help different groups of communities understand each other better • Identify specific gaps between different groups and find out specific solutions • Include gender-sensitive approach in vulnerability understanding activities, (e.g. gender-disaggregated talks, cooperation with male groups, awareness raising campaigns etc.)

Challenge #3 ***'Institutional capacity and power balance'***	**Strongly agree (6/6)** • Local government • Locally-based institutions, (e.g. community-based organization, grass-root organizations and NGOs)	[Institutional capacity] • Lack of resources and time; shortage of professional manpower • Lack of transparency and accountability at the local level	• Return power to enact DRR/CCA and the ownership of knowledge to communities • Increase budget allocations in local governments and agencies for disaster risk reduction
		[Power relations] • Power struggle between central and local governments • Reluctance from central government to lose control	• Collaboration between local governments and local community organizations and NGOs • Developing a transparent communication channel from central to local and community level
Challenge #4 ***'Transmission of LINK over generations'***	**Strongly agree (5/6)** • Dissemination of local knowledge and practices from old to next generations • Acceptance of local knowledge from young generations	• Cultural globalization. • Attitudes of youth to prefer western and scientific approach • Poor documentation of local knowledge: lack of technical know-how, poor penetration of software technologies to the village areas / dynamic nature of LINK	• Integration of local knowledge with other forms of knowledge • Give ownership and self-determination to communities in deciding a direction for future transmission • Integration of local knowledge into the school curriculum