International Journal of Disaster Risk Reduction 11 (2015) 47–59

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Local people's perceptions of climate change and related hazards in mountainous areas of northern Thailand

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ARTICLE INFO

Article history:
Received 16 September 2014
Received in revised form
7 November 2014
Accepted 21 November 2014
Available online 25 November 2014

Keywords:
Drought
Flooding
Hazards
Landslide
Mae Chaem
Perception

ABSTRACT

This study investigates the perceptions of local people on climate change and related hazards in Yang Luang Village (YLV), which is located in the mountainous region of the Mae Chaem basin in northern Thailand. Furthermore, this study examines the differences between the perceptions of local people and scientific observations in this area. Both quantitative and qualitative methods were used, and the data were collected from various sources. Results show that nearly 45% of households have personally perceived climate change, mainly in the form of increasing rainfall, decreasing number of rainy days in the last two decades and of extremely late rainfall in recent year's rainy season. A comparison of locals' perceptions and climatic observations shows that local people have correctly perceived rainfall changes, which have largely influenced the experiences and perceptions regarding climate-related hazards. More than 70% of households have perceived droughts and floods impacts on their livelihoods but have not completely understood their causes. They have correctly perceived the landslide resulted from increasing amounts of rainfall. However, they are unaware of increasing landslide trends, flood hazards and the associated potential risks. The results are helpful to assess the needs in terms of actions and information to facilitate climate-related hazard management at the local level in Thailand. Hazard awareness campaign, training and early warning system are necessary for breaking the low perception of potential hazards in YLV. Moreover, a hazard management strategy without waiting for proof of a trend coming from reviews of the climate science is essential.

1. Introduction

Climate change is a reality, and it is occurring at an unprecedented rate [1,2]. Scientific evidence indicates that climate changes, mainly rainfall changes, are increasing the risk of extreme climatic events (such as droughts and floods) and the compounding of events (for example, heavy rain leading to landslides and soil erosion) around the world [3]. When such events can adversely affect elements of human systems, they assume the characteristics of a hazard. Moreover, the Intergovernmental Panel on Climate Change (IPCC) demonstrated a medium confidence that droughts and floods would intensify in the 21st century due to reduced rainfall and/or increased evapotranspiration and heavy rainfall, respectively, during some

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http://dx.doi.org/10.1016/j.ijdrr.2014.11.002
2212-4209/

seasons and in some regions. Regarding landslide, it is very likely that heavy rainfall will affect landslide in some regions around the world. For example, an increase in total rainfall or an increase in the frequency or magnitude of severe rainstorms (> 100 mm h^{-1}) could cause more frequent debris flows by mobilizing unconsolidated, regolith and by raising pore water pressures [3]. It could lead to deep-seated slope failure in the Caribbean, Central America, Europe, Indonesia, the Philippines, and Japan [3,4], and slope instability and shallow landslides in Thailand [5]. The above climate-related hazards may result in immense and long-lasting impacts on the livelihoods of individuals, communities, and the environment.

Southeast Asian countries such as Thailand are already experiencing climate change and an increasing frequency of climate-related hazards, such as droughts, floods and landslides, which have resulted in substantial impacts in many areas [6–8]. The mountainous area of northern Thailand is not exempt from these hazards. Among others, the landslide events that occurred in Wang Chin (2001), Mae Chaem (2002), Maeramad (2004), Lablae (2006), and Si Satchanalai (2006) claimed many lives, destroyed many houses and resulted in severe economic losses [9–11]. The Thai Meteorological Department (TMD) [12] reported that Thailand (including the northern mountainous areas) faced the impacts of drought in 1967, 1968, 1977, 1979, 1986, 1987, 1990, 1991, 1992, and 1993. Furthermore, the greatest flood recorded in Thailand struck the Chao Phraya Basin (CPB) in 2011 and caused tremendous damage in northern and central Thailand, resulting in more than 800 casualties and approximately 35 billion US$ in losses [13]. Because climate change is a trigger for extreme rainfall events and related hazards, obvious concern exists regarding how climate change will influence hazards in the future. In this regard, the latest flood that occurred in 2011 in the CPB alerted scientific communities. Consequently, several climate change projection and impact assessment studies have been conducted. For example, studies were conducted by Champathong et al. [14] and Kotsuki et al. [15]. These studies have provided a wealth of information regarding future climate change and its potential impacts on water resources in the CPB. However, on its own, such information cannot provide conclusive information for improving hazard management and decision-making at a local level. Climate change, related hazards, and their impacts will most likely be regionally and locally uneven [16]. Moreover, climate extremes are rare and interact with more local (physiographic) factors. Thus, each single event (hazard) tends to have a unique character [17]. To develop appropriate policies and responses, it is important to anticipate the nature of expected changes and to understand how climate change and its related hazards are perceived, experienced and interpreted by local people [18].

Local people live close to nature and build up an intimate and intuitive understanding of the environment over long periods of time. Local perceptions of climate change derive from daily interactions with the environment and dependence on weather conditions to ensure sustenance [19]. Therefore, the perceptions of local people can reflect local issues [20]. In addition, these perceptions reveal the actual impacts of climate change and its related hazards on the lives of people, especially for local factors that cannot be easily estimated through models. Therefore, this study aims to provide insights regarding the perceptions of local people toward climate change and its related hazards at the ground level in the mountainous areas of northern Thailand. However, in some instances, there is a possibility of misleading personal experience or misperception leading to risks of hazards being misjudged. For example a perception study conducted in riverside urban areas of Hanoi revealed that local community have not perceived the risk of catastrophic flood event needed for effective policy implementation despite regular flood experiences. Moreover, the scientific observation showed a possible increase in rainfall magnitude, frequency and higher chances of future catastrophic floods in that area. A difference between the local perceptions and scientific observations informed the need to educate the community leaders and community for disseminating right information to help community gain appropriate perception of flood risk [21]. Likewise, Bradford et al. [22] also compared local perceptions to scientific observations. It helped to identify key issues pertaining to the role of public perception and awareness in flood risk management and make recommendations to improve the social dimension of flood risk management plans in Europe. Investigating local perceptions and gap between perceptions and observations is found highly relevant in hazard management and decision making. Furthermore, this study aims to examine the differences between the ground experiences (local people's perceptions) and scientific observations of climate change and its related hazards by comparing available physical datasets or their derivatives (scientific literature). For this purpose, Yang Luang Village (YLV), which is located in the mountainous Mae Raek Basin (MRB), a sub-basin of the Mae Chaem Basin (MCB) in the Upper Chao Phraya Basin (UCPB) of northern Thailand (Fig. 1a–c), was selected as the study area. This study contributes to the local knowledge of climate change and its related hazards in Thailand. Furthermore, it helps identify the needs in terms of actions and information to give, which reduce the effect of potential natural hazards in the mountainous areas of northern Thailand.

2. Methodology

2.1. Study area

The YLV lies 5 km west of Mae Chaem city in the MRB (Fig. 1b and c). Many villages in northern Thailand have suffered from different climate-related hazards, such as droughts, floods and landslides. However, YLV has suffered from all three hazards, with the most serious of these hazards including a landslide in 2002, flooding in 2011 and drought in 2012. Approximately 900 people live in YLV and agriculture is their main source of livelihood. Climate change, mainly rainfall change and drought, has direct impacts on rainfall dependent agricultural livelihoods. Local people's experiences of various climate-related hazards strongly influence their perceptions, which is very important to be studied for hazard management.