Gender Vulnerability and PAR Model Assessment in the Post-Disaster Period: A Case Study from the 2014 Chiang Rai Earthquake, Thailand

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Abstract

This study analyzes gender-based vulnerability during the post-disaster period in the epicenter of the 2014 northern Thailand earthquake in Saikao, Phan district, Chiang Rai province. Blaikie's Pressure and Release Model (PAR) was adapted to include core determinants of gender vulnerability for conceptualizing gender-based risk in the post-earthquake context. The gender vulnerability approach is crucial for achieving gender equality to reduce future disaster-related risks and deepen community resilience. The research applied qualitative analysis in an exploratory case study to examine dimensions of gender vulnerability developed from Blaikie's PAR Model in the post-disaster period of the 2014 Chiang Rai earthquake. Data were collected from stakeholder engagement interviews and affected women as key informants. The results show that three elements of gender vulnerability (root causes, dynamic pressure, and unsafe living conditions) were found among the affected women. The root causes involved gender stereotyping and women's double burden, adding the affected women's workload and hampering their economic empowerment in the post-disaster recovery. Dynamic pressure was observed in the local government's policy-related disaster management response, which had not integrated gender-based assessment thoroughly into strategic plans and actions. Furthermore, the affected local women resided in unsafe living conditions, where houses were constructed using low-quality building materials without sufficient reinforcement. The study concludes that implementing gender-based assessment into disaster management governance would decrease women's vulnerability and increase their capacity to achieve effective disaster risk reduction to strengthen Thailand's sustainablilty and resilience.

Keywords: gender vulnerability, Blaikie's PAR Model, post-earthquake, resilience, Chiang Rai

Introduction

In terms of international tectonics, Thailand is situated between the Indian and Eurasian plates. Chiang Rai in the north has the potential for earthquakes because of its geographic position between two active earthquake zones: the faults of Myanmar and Phayao. Myanmar's faults are consistent with intraplate earthquakes in the Himalayas that have hosted earthquakes up to M8 (Morley, 2001). Chiang Rai historically has had a relatively low rate of seismic activity. However, the earthquake at Phan district on May 5, 2014 produced nearly 1,000 aftershocks occurring until April 12, 2015, as reported by regional and temporary seismic networks. The earthquake damaged many buildings in neighboring provinces, including Chiang Mai, Tak, Nan, Phayao, Phrae, Lampang, Lamphun, and Mae Hong Son (Jintaprasat, 2016). In Chiang Rai, the quake resulted in several collapsing structures, large surface cracks, and liquefaction. One woman died in this earthquake, and dozens were injured.

The Hyogo Framework for Action, the 2005-2015 global blueprint for disaster risk reduction, identifies community engagement and gender-sensitive risk assessment. Gender analysis is one of its cross-cutting principles. The international community has drawn up policies and realistic recommendations for national governments to integrate gender into disaster risk management. In their study of the rehabilitation of disasters around developed countries, Enarson and Chakrabarti (2009) found evidence that the gender context has barely been discussed and is frequently lacking in the disaster restoration process. Enarson (2000) found that gender inequality and women's subordination are the root causes of women's vulnerability in disasters. For example, social restrictions on women's autonomy may restrict

access to lifesaving knowledge, accommodation, or relief supplies. Ariyabandu and Wickramasinghe (2003) assert that the delivery of services to women in a post-disaster setting is urgent because many institutions fail to provide the facilities according to their needed post-disaster reconstruction.

This research offers an understanding of integrating the gender dimension into disaster management governance from a case study of the 2014 earthquake in northern Thailand. It analyzed the governance framework that operated in the country and how it was implemented to benefit women. The study aims to determine the vulnerability of women in the post-earthquake period and explain how some disaster recovery policies and practices implemented at that time have been efficacious, while problems still exist because the root causes of gender insecurity have not been eliminated. Blaikie's Pressure and Release Model (PAR) is applied to explain key vulnerability determinants for gender inequalities among women as a vulnerable group in Chiang Rai. Gender-based analysis is then adopted as a technique for fostering gender equity to improve the society's resilience, particularly during the post-disaster timeframe.

Methods

This study used qualitative analysis based on Blaikie's PAR Model in an exploratory case study to investigate different aspects of gender vulnerability in Chiang Rai province after the 2014 earthquake. Data were obtained through a study of texts and relevant literature, as well as semi-structured field interviews with a purposive snowball sampling method for data collection. This method was applied to specifically provide community-based data and access to susceptible populations that dealt with and experienced the 2014 Chiang Rai earthquake recovery process. For this research, Saikao sub-district in Phan district was chosen as the research location because it was part of the major epicenter of that earthquake.

Gender vulnerability during the catastrophe could be described in terms of physical, social, and economic dimensions (Yumarni et al., 2014). Population selection was then made in a linear snowball sampling process in which the target groups were adult females impacted by the 2014 Chiang Rai earthquake. After community members who were willing to be interviewed were identified, ten affected women were chosen as key informants. The interview focused on elaborating primary gender-based vulnerability dimensions to embed gender viewpoints into post-disaster recovery activities. The interviews revealed perspectives among affected local women to assess the following demographic characteristics of the participants: age, gender, occupation, income, education, caregiver status, and previous earthquake experiences. The interviews were conducted twice, on May 25 and June 8, 2020. This research was also supplemented by a document analysis of national reports, provincial/local development strategies, and documents in Thailand about disaster management, as well as in-depth interviews with policymakers at the Sub-district Administration Office (SAO) of Saikao. The interviews included questions about governmental awareness, understanding of procedures, emergency management, and local government officers' preventive actions.

Blaikie's Pressure and Release Model (PAR) Model

Vulnerability resides at the core of risk conceptualization and the conventional PAR model by Piers Blaikie. According to the model, vulnerability is a core component of risk, and risk does not occur without vulnerability. Thus, vulnerability can be roughly described as a feature of exposure and extended to individual, environmental, social, or even technological systems (Ewald, 1991). The evolution of vulnerability starts with several root causes. Consequently, the model points toward a variety of specific dynamic pressures in a country's culture. Finally, it continues to what are considered unsafe conditions, as illustrated:

Risk = Hazard x Vulnerability

The PAR model is developed from the conventional conceptualization of risk as a feature of both hazard and vulnerability. Thus, disaster occurs not only because of natural threats, but also in conjunction with existing vulnerabilities.

The conventional PAR model describes three phases to explain risk progression: root factors, competitive stresses, and dangerous conditions (Blaikie et al., 1994).Under the model, each phase in the increase of vulnerability builds on the previous step(s) and contributes to an increase in strain on the whole structure. Together with the existence of hazards, these moves contribute to disaster danger, as depicted in Figure 1 below.

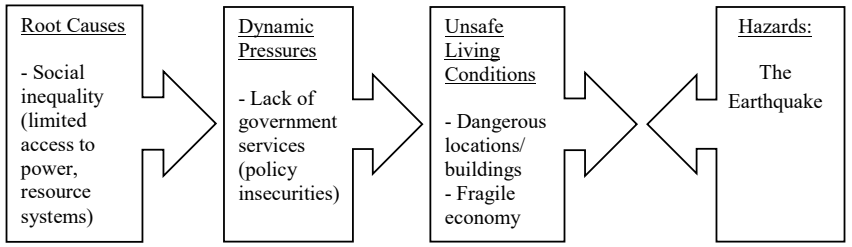

Figure 1 Pressure and Release Model (PAR)
Adapted from Blaikie et al. (1994); Yumarni et al. (2014)

Vulnerability and its progression, in this context, are the products of the multiplicative elements of root causes, dynamic pressures, and unsafe conditions. According to Hammer et al. (2019), the initial PAR model's root causes include limited access to influence, institutions, and capital, as well as aspects of both the political and economic systems. These root factors may contribute to dynamic pressures, including a lack of preparation and lack of local funding. From this, dynamic pressures are emerging structures that may contribute to high friction and, consequently, to dangerous conditions in unsafe environments, including ecological fragility. Consequently, the PAR model suggests vulnerability as a critical component of risk, so that that in order to reduce the risk, it is important to identify vulnerabilities and

respond to the assessment to achieve comprehensive community resilience.

Literature Review

Gendering Disasters and Vulnerability

Gender is a social concept of the division of responsibilities, functions, and duties between men and women defined by society based on attributes deemed desirable for each gender according to the society's standards, traditions, beliefs, and customs (Mosse, 1996; Hafidz, 1995). Some research works have attempted to address gender viewpoints, strategies, and procedures of disaster recovery as two different elements, but the two topics are deeply interrelated. Gender influences the social realities through which natural disasters arise (Enarson, 2012). Yumarni and Amaratunga (2015) found that disasters arising from either natural or human-induced hazards are gender-built because of unequal social interactions between men and women, adding to women's vulnerability in disaster situations. Gender disaster impacts are not only intensified by biological variations between men and women, but are also characterized by imbalances and gender disparities in policy, social economy, and culture that increase the risks of women (Siahaan and Tambunan, 2017). Disasters tend to strike women because they are especially vulnerable to disaster-related threats, and because of their livelihoods they are expected to experience higher rates of mortality, morbidity, and economic loss (UNDP, 2013).

Narieswari et al. (2014) argued that one thing that has to be taken into account in the emergency strategy is knowing that the same disaster might have different effects on different demographic groups due to the population's vulnerability to disasters. While research has indicated that women are the most disadvantaged group in society (Enarson, 2012), thus far little focus has been paid to the post-disaster issues of gender inequality. Gender dynamics and cultural backgrounds mean that women and men have distinct roles and duties, as well as unequal access to various social, economic, and political opportunities

in both the home and in society. Murtakhamah (2013) further clarified that there are many forms of vulnerable circumstances faced by women under disasters: biased stereotypes (labeling women as a frail and feminine category); subordination (neglecting basic needs of women); marginalization (creating distance/gap for women to access information, economic opportunities and political power); women's double burden (assigning double roles to women as both home caretaker and breadwinner), and gender-based violence against women.

Building Disaster Resilience Communities

The need to integrate gender into post-disaster recovery has been emphasized by many studies supporting the building of disaster-resilient communities (Enarson and Chakrabarti, 2009; Amaratunga and Haigh, 2011; Ariyabandu and Wickramasinghe, 2003; Goonesekere, 2006; and Enarson, 2000). The urgent need for gender consideration in disaster management has been demonstrated in recent studies, and its significance has been stressed in developing disaster-resilient societies (Amaratunga and Haigh, 2011). There are typically three main steps in dealing with extreme natural disasters: evacuation and recovery, rehabilitation, and restoration (Alexander, 2000).

In their study of disaster restoration around developed countries, Enarson and Chakrabarti (2009) found evidence that women's problems are not taken into account seriously and that they are frequently excluded from the disaster rehabilitation process. Nakagawa and Shaw (2004) concluded that the missing link to disaster recovery is social capital. The study identified social capital as a function of trust, social norms, engagement, and networking. Thus, post-disaster recovery mechanisms should be viewed as growth opportunities by revitalizing the local economy and enhancing living standards and livelihoods. The aftermath of a major catastrophe will provide a window of opportunity to institutionalize gender issues in disaster management, as the local community becomes more focused on recovery and better at shielding itself from potential disaster threats (UNDP, 2013). Therefore, the lens of gender is a critical tool for achieving gender equity, especially in the

post-disaster context, to reinforce the community's resilience (Enarson, 2012).

Governing Disaster in Thailand

The initial creation of Thailand's extensive national DRR structure was triggered by the Indian Ocean earthquake and tsunami event of 2004. At the time of the catastrophe the only disaster-related laws that existed in Thailand were the 1979 Civil Defense Act and the 1999 Fire Prevention and Suppression Act. The Department of Disaster Reduction and Mitigation (DDPM) in the Ministry of the Interior, created in 2002, was the government's principal agent for the management of DRR activities. However, the body was not completely in service because it lacked legislative mechanisms (Kitagawa, 2020). Before the establishment of global strategic plans by the Hyogo Framework for Action, Thailand formally implemented the 2007 Disaster Prevention and Mitigation Act, as a law enabling government agencies in national, provincial, and local areas to cope with hazards that occur (Wongsa, 2011). The new Disaster Prevention and Mitigation Act 2007 was implemented as national legislation in disaster management operation, terminating the 1979 Civil Defense Act and the 1999 Fire Prevention and Suppression Act and stipulating the Prime Minister's National Disaster Prevention and Mitigation Committee.

The National Disaster Prevention and Mitigation Plan 2010-2014 was developed as a national framework outlining operational plans for more efficient disaster management compliance with its Disaster Prevention Mitigation Act 2007. It consists of three parts: 1) Disaster Management Principles, 2) the Catastrophe Countermeasure Process, and 3) the Technology Hazard Management and Countermeasure Method. The National Disaster Prevention and Mitigation Plan 2007 provided and clarified disaster management arrangements, including several types of catastrophes in terms of policy directives, operating procedures, and coordination procedures. The Regional Disaster Prevention and Mitigation Committee and the Metropolitan Committee of Bangkok were both formed at the local

level, allowing local government officials to take responsibility for disaster risk management (Tanaka, 2009; Kitagawa, 2020). In compliance with the 2007 Disaster Prevention and Mitigation Act, the Department of Disaster Prevention and Mitigation (DDPM) was designated as the central national disaster management body to deal with three types of catastrophe: 1) man-made and natural catastrophes; 2) disasters arising from air raids during wartime; 3) catastrophes caused by sabotage or by terrorist acts. There are 18 DDPM regional centers across the nation, including one in Chiang Rai province.

Results and Discussion

Gender Vulnerability Assessment in Chiang Rai Province

The PAR Model describes three types of gender vulnerability linked with root causes of dynamic pressure and increases as it hits unsafe conditions. Based on the PAR framework, it states that the root causes of gender vulnerability are social inequalities that hinder women's access to control of power, systems, and assets. As the root cause is critical, it influences the dynamic pressures caused by the absence of gender-based frameworks in terms of gender-based policies, skills, and training. The degree of vulnerability increases with unsafe conditions, mainly where women live in hazardous locations (prone to natural disasters) and unstable housing structures and under vulnerable economic circumstances, such as low-income levels and dependency primarily on male partners.

In the usual rural family in Chiang Rai province, women are mainly responsible for household labor, such as cooking food and cleaning the house. Following the damage to houses and public facilities caused by the earthquake, women's vulnerability also increased. For example, when food and water became scarce, women appeared to decrease their food consumption before their partner or children did. Women took on positions to oversee temporary evacuation and fast relief from rescue authorities as the houses collapsed. As women have more domestic responsibilities than men, women in hazardous situations

have little access to (distant) information sources, so they are not interested in decision-making that may not meet their need for survival steps, which ultimately may lead them to worse circumstances. After emergencies, women affected by disasters were still more likely to encounter significant job changes. After the earthquake, the number of women in poverty also surged because women laborers in manufacturing and small and medium scale industries lost their jobs and financial earnings.

The Root Causes of Gender Vulnerability among Local Women

The PAR Model explains three forms of gender vulnerability that correlate from point 1 (root causes) to point 2 (dynamic pressures), and from point 2 (dynamic pressures) to point 3 (unsafe conditions). As vulnerability encounters hazards (the earthquake), it increases critical challenges in women's disaster risks. Based on the PAR Model, the root causes of gender vulnerability lay in social inequality, which becomes part of the root causes for gender vulnerability because it limits women's access and control to power, structures, and resources. As the root causes are embedded in everyday life, they give rise to and affect the dynamic pressures caused by gendered institutions due to gender-based policies and gender-based skills, training, and job opportunities. The vulnerability level increases with the presence of unsafe conditions, mainly when women live in a dangerous location (prone to natural disasters) and/or unsafe building structures, and under fragile economic situations, such as low income, and/or living dependently mainly on their spouse.

According to Narieswari et al. (2014), one factor that needs to be included in the crisis strategy is to be mindful that the same hazard might significantly affect various demographic classes differently due to gender disparities. Yumarni et al. (2014) explained that gender vulnerability could be interpreted in terms of different dimensions, such as physical dimensions (people with disabilities, pregnant women, older women), social dimensions (homeless women, abuse against women, widows with dependents, women in the household),

and economic dimensions (women with debt pressures and women lacking productive assets). In Saikao, the research site, ten affected women as the key informants in the study were categorized as a vulnerability group through socio-demographic details, as shown in Table 1.

Table 1 Gender dimensions and socio-demographic information of affected women in the study

Key Informants	Age (Years old)	Marital status	Monthly income (Thai Baht)	Educational background	Occupation
Affected Woman 1	Over 50	Married	≤10,000	Elementary school	Agriculture
Affected Woman 2	41-50	Widowed	≤10,000	Elementary school	Agriculture
Affected Woman 3	41-50	Married	10,001 - 20,000	Bachelor's degree	Housewife
Affected Woman 4	Over 50	Married	≤10,000	Elementary school	Agriculture
Affected Woman 5	41-50	Married	≤10,000	Senior high school	Self-employed
Affected Woman 6	Over 50	Never been married	≤10,000	Elementary school	Agriculture
Affected Woman 7	41-50	Married	≤10,000	Bachelor's degree	Self-employed
Affected Woman 8	Over 50	Divorced	≤10,000	Elementary school	Agriculture
Affected Woman 9	41-50	Married	10,001 - 20,000	Bachelor's degree	Housewife
Affected Woman 10	41-50	Divorced	10,001 - 20,000	Senior high school	Agriculture

Table 1 shows the variables of gender vulnerabilities (physical, social, and economic) that were found among affected women in Chiang Rai. They included women over 50 years of age, living alone (widowed, unmarried, never married), with a monthly income under 10,000 THB, with the highest schooling at the elementary school level, and employed in seasonal agriculture. The affected women were economically marginalized and took longer to recover.

Murtakhamah (2013) explained the vulnerable circumstances that affected women under catastrophic situations: stereotyping, subordination, marginalization, double pressures, and gender-based violence. According to the study's interviews, when the 2014 earthquake occurred, the affected women in Saikao experienced stereotyping and double burdens. The interviewees' responses to stereotyping can be summarized from three primary kinds of evidence in Table 2, as follows:

Table 2 Local women's experience of stereotyping during the 2014 Chiang Rai earthquake

Items	Number	Percentage
1. They had to call for support from a man to protect them.	5	50 %
2. They had to wait for orders about where to go or what to do.	5	50 %
3. They had to wait for people to come and distribute aid/ assistance.	5	50 %

Table 2 shows that 50 percent of the affected women experienced stereotyping because they had to ask for support from men, wait for orders about where to go or what to do, and wait for the distribution of aid/assistance. In rural areas of Chiang Rai province, traditional gender roles are firmly in place and, consequently, women waited for men's orders according to the stereotypical expectation that they would be responsible in the domestic environment with nurturing tasks and handling the family home. By contrast, male persons are expected to be more logical, analytical, and prominent in the public domain. Likewise, interviewees' responses to the double burden can be summarized from three primary pieces of evidence seen in Table 3, as follows:

Table 3 Local women's experience of double burdens during 2014 Chiang Rai earthquake period

Items	Number	Percentage
1. After the earthquake, they were responsible for taking care of injured persons in the community's family and people.	9	90 %
2. They had to support the communal kitchen and manage their own family.	7	70 %
3. They had to continue earning money for their family and take care of the household.	7	70 %

Table 3 shows how double burdens occurred in the post-disaster period. Most interviewees (90 percent) considered women to be responsible for domestic activities, such as taking care of injured people in the family and in the community. Furthermore, 70 percent of women experienced other two types of double burdens, such as supporting the communal kitchen and managing the household for their own families. There was a gender-based separation of labor at home, mainly in caring roles and duties, with the women holding multi-layer job positions. Traditional gender roles put additional pressure on the affected women during recovery in the post-disaster periods, but there was no gender-based support for female victims. As Ariyabandu and Wickramasinghe (2003) point out, there is an immediate need to assess gender-based vulnerability in post-disaster times since institutions fail to provide facilities to meet the needs of affected women in post-disaster recovery.

Dynamic Pressures from the Local Government

Sakao sub-district has three target development strategies: agricultural advances, progressive education, and resilient society. In Thailand, with its centralized bureaucracy, local development strategic actions are derived from the central vision of the Ministry of Interior, the leading organization for dealing with suffering and facilitating social justice with effective integration of local management and creating opportunities for people to have a stable, prosperous, and sustainable livelihood.

Hence, based on the Ministry of Interior's vision, there are several strategic development issues that have become the primary concern of Saikao (Saikao Local Government, 2020), as shown in Table 4 below.

Table 4 Development strategies of Saikao local government

Strategy 1	Strategy for Infrastructure Development	1.1) Construct, improve, and maintain roads, bridges, inlets, sewers, drainage pipes, etc. 1.2) Improve the water supply system in the village to meet standards 1.3) Provide lighting throuhout the area on roads and in houses 1.4) Improve and thoroughly develop communication systems 1.5) Develop water resources in agriculture
Strategy 2	Economic Development	2.1) Develop and promote careers for people 2.2) Promote and support major agricultural products as economic crops 2.3) Promote marketing and safety standards 2.4) Promote employment and support various fund groups 2.5) Promote and develop tourism 2.6) Promote safe agriculture 2.7) Transfer agricultural technology 2.8) Promote processing to add value to agricultural products
Strategy 3	Educational, Religious, and Cultural Development	3.1) Promote and develop up-to-date knowledge sources and develop awareness of information and communication for sustainable development 3.2) Create an environment for teaching and learning among teachers and students 3.3) Create good hygiene in educational institutions and child development centers 3.4) Promote and develop education 3.5) Develop and promote religious, arts, and cultural activities.
Strategy 4	Social and Human Resource Development	4.1) Build good physical and mental health 4.2) Provide social welfare services and assistance to those in need 4.3) Promote exercise and sports 4.4) Promote and develop people's livelihoods to follow good values 4.5) Organize staff and volunteer patrols in security areas during festivals to ensure the safety of life and property 4.6) Promote community organization, training, and education in terms of responsibility about problems and solutions in various areas 4.7) Organize campaigns to prevent and solve drug problems

Table 4 Development strategies of Saikao local government (cont.)

Strategy 5	Natural Resource and Environmental Development	5.1) Create awareness of natural resources and environmental management 5.2) Maintain waste treatment and disposal 5.3) Establish a wastewater treatment system and treat degraded soils 5.4) Develop landscapes
Strategy 6	Management development strategy to strive for excellence	6.1) Promote supporting organizations and social development networks in both the public and private sectors 6.2) Promote and develop personnel and organizational management to ensure the readiness of work

The six development strategies were then implemented as the development policy of the SAO. It consists of the following twelve missions and six strategies: 1) improve and develop infrastructure and public utility systems to meet the standards; 2) promote and develop education and technology systems, religion, and culture; 3) promote the health and well-being of the people; 4) promote the occupations of the people; 5) develop the capacity of people and communities to be strong and self-reliant; 6) strengthen people's security in life and property; 7) improve and develop systems for waste disposal, environmental protection, and wastewater; 8) maintain natural resources and the environment; 9) promote safe and non-toxic agriculture; 10) establish a sound management system; 11) organize natural disaster prevention systems; and 12) promote democracy. Nevertheless, gender has not yet been mainstreamed into the local government development strategies and policy, especially under disaster situations.

Disaster management is also concerned with the structure (vertical relationship) and adherence to standard operating practices focused on applicable regulations or regulations introduced by the government in disaster management programs. At the time of the 2014 earthquake in Chiang Rai, in compliance with the Disaster Prevention and Mitigation Act 2007 and the strategic actions of local government, the Chiang Rai provincial governor formed an Emergency Operations

Center (EOC) to command and monitor the region affected locally under his authority (Suwanmolee, 2016). In Phan, the local government implemented conventional crisis management that applies to institutional monitoring and orders during an emergency. The Disaster Prevention and Mitigation Act of 2007 allows the Department of Disaster Reduction and Mitigation (DDPM) to administer the tasks and initiatives with the province, district, and the municipality as the main actors.

Based on the interviews, it was found that in Phan district, all agencies and social elements were responsible for providing disaster relief assistance in one form or another, based on their capability and dedication. Moreover, the existing disaster policies were in force and deemed appropriate since the local government would provide help, redress, and examine the harm caused by the disaster. However, while Chiang Rai already has a robust disaster response and recovery framework, the strategy in practice has struggled. The problem was at the local level of government, which lacked personnel with gender-based knowledge.

The most important issue when a disaster occurs is protecting those who are vulnerable-women, children, and the elderly. These vulnerable people should be assisted first, and transferred from areas that could get damaged to safer places or evacuation sites. Technically, the 'safety first' ideology was prioritized to help women in areas of danger. Women were mainly assisted first for their health safety, which was usually a physical concern. Nevertheless, there was no other dimension to protect women from sexual harassment or physical or verbal abuse.

Moreover, the gender-based disaster recovery strategy in Phan district is hampered by the scarcity of workers with gender-based expertise and skills. There are not enough workers to support all facets of the disaster mitigation service in the local authority system. An integral component in rehabilitation following a disaster is the number and suitability of staff. Moreover, assistance to women is seen as the responsibility of men. Women have commonly been stereotyped as the fragile/weak sex, and men as the strong ones to handle crises. However,

the ways in which women's specific needs arise and vary from those of men have not been explicitly defined or emphasized. After an earthquake, there should be different assessments of the needs of men and women, but not a difference in assistance. In the Chiang Rai case, the local authorities brought the women to a relocation area that was isolated from the men and took care of them in the ways that women need and deserve. However, the concern was that there were not enough workers to provide gender-based assistance.

Unsafe Living Conditions

Many houses in rural areas in Chiang Rai province were constructed without sufficient reinforcement using low-quality building materials that resulted in more casualties and destruction than would usually be expected from a medium to large earthquake. The traditional house in the affected rural area is a single-story building, constructed of unreinforced clay brick/block masonry in cement or lime mortar with no particular framework link between the timber roof system and the masonry walls. Reinforced concrete framing structures with half-brick masonry infill walls have been used in rural and urban areas in Chiang Rai over the past few decades. Many women were victims of the wake of the 2014 Chiang Rai earthquake, as the major cause of the house destruction was fragile material characteristics due to weak roof-to-wall and wall-to-foundation anchoring. Women were trapped and buried beneath their toppled houses and buildings. In the kitchen section of the building, situated in the backyard near the wells, walls of clay bricks were typically found. As women were not used to moving quickly, they could not avoid the collapse of the timber roof's materials. Moreover, their domestic role contributed a higher probability that women would stay in the kitchen, which had been built at a low standard.

Titaya (2016) pointed out that Thailand provided an acceptable policy in Ministerial Regulations B.E. 2550 (A.D. 2007) stipulating that Thailand's tall buildings (15 meters or higher) must be built to withstand more than a magnitude six earthquake. This regulation is based on earthquake resistant design of structures able to stand up to a magnitude

of seven. However, the regulations do not cover individual households, where most women live, or temples. Piyawat and Ornthammarath (2019) analyzed future building damage assessments, land use management, and seismic risk mitigation planning in Chiang Rai province. The study found that the damage probability of building structures within fault rupture zones in most Thai rural areas is two times that of buildings with engineered structures. Thus, it is crucial to consider appropriate disaster planning and disaster risk reduction in the future.

Conclusion

Vulnerability is a core component of disaster risk. After the 2014 earthquake in Chiang Rai, it was found that the vulnerability of local women was perceived to be higher than before because of knowledge of the likelihood of earthquakes. Using Blaikie's Pressure and Release Model (PAR), this research explained three elements of gender vulnerability linked with the root causes of dynamic pressure and unsafe living conditions: 1) gender stereotyping and women's double burden which limits their access to and control of power, 2) structures, and 3) resources. The dynamic pressure as found in implementing disaster management response and recovery has not mainstreamed gender-based perspectives into strategic plans and actions because the local government lacked personnel and competent human resources. Most women are still living in unsafe living conditions because Chiang Rai is located in an area with a history of several medium to large-scale earthquakes, and there is a possibility that in future years earthquakes will again occur there.

Recommendations

To reduce the disaster impacts on vulnerable women living in Chiang Rai, the article recommends that the government at the local level conduct gender-based vulnerability assessments that comprehensively cover consideration of root causes, dynamic pressures, and unsafe living

conditions. Although women's participation in national socio-economic development is essential for Thai society, women remain unequal partners. Thus any benefits they receive are disproportionately low in relation to the development process because women's roles are often stereotyped by social values. Integrating gender perspectives into disaster governance will empower local women so that they can participate in building a resilient and sustainable society in Thailand.

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