



# Accumulation of vulnerabilities in the aftermath of the 2015 Nepal earthquake: Household displacement, livelihood changes and recovery challenges



Lulu He<sup>a,\*</sup>, Jonathan C. Aitchison<sup>a</sup>, Karen Hussey<sup>b</sup>, Yongping Wei<sup>a</sup>, Alex Lo<sup>c</sup>

<sup>a</sup> School of Earth and Environmental Sciences, Faculty of Science, The University of Queensland, St Lucia 4072, Queensland, Australia

<sup>b</sup> Centre for Policy Futures, The University of Queensland, St Lucia 4072, Queensland, Australia

<sup>c</sup> Department of Geography, University of Hong Kong, Hong Kong 999077, China

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## ABSTRACT

Vulnerability refers to conditions which increase the susceptibility of a community to the impact of hazards. This study applies the concept of vulnerability to a disaster fact in order to demonstrate why people are vulnerable and how the vulnerability plays its role in impeding the recovery from disaster impacts. We advance with a framework depicting that the 2015 Nepal earthquake perpetuated the vulnerabilities of rural households. At the study area Barpak VDC, 82 displaced households from five temporary shelter sites were interviewed with a semi-structured questionnaire. Documents from the VDC office and district government were reviewed. With a descriptive approach to processing data, our study finds that vulnerability of these households have accumulated over time: (i) The pre-earthquake disadvantages poorly prepare them for adapting to disasters and adversely militate their recovery; (ii) The immediate impacts of the earthquake including asset loss and damage, and livelihood interruptions deprived households of vital entitlements that could have been relied on for recovery; and (iii) The temporary relocation rises challenges of people's health and permanent residence, which further exacerbates the vulnerability. Synthesis of these conditions is subsequently manifest in the ultimate adversity to recover from the earthquake impacts, generating a risk that people may become more disadvantaged in the future. Data suggest that successful recovery from the earthquake demands more comprehensive reconstruction tasks than solely rebuilding houses, and that a community-centered approach should be incorporated in the overall government reconstruction policy aiming at building local capacity in order to minimize vulnerability in the long term. This study revealed circumstances at the onset of recovery after a disaster event in a lower-income and landlocked nation, which can be used as a reference for disaster management in developing countries in the Himalayan region where is prone to natural hazards.

## 1. Introduction

On April 25, 2015, an earthquake with 7.8 magnitude hit central Nepal, followed by an aftershock with 7.3 magnitude on 12 May 2015. This calamity caused massive destruction and loss to the country. Nationwide, 35 out of 75 districts were affected, 600,000 houses were completely destroyed, and 2.6 million people were displaced from their homes [22]. Nepal is one of the most vulnerable countries to disasters including earthquakes, landslides, floods, avalanche and glacial outburst [15,23,27,5–7]. Internationally, it is classified as a third-world country with the Human Development Index (HDI) at 0.558, ranking 144 in the world ([30], p. 198). With the dense population, hazard incidents in Nepal oft bring profound effects on people's safety and

wellbeing [19]. Research has proved that people in poorer countries are more susceptible and at greater risk from natural hazards than people in rich countries [26,33]. Mitchell et al. [21] point out that seismic events pose great challenges to disaster risk reduction due to its intensity and lack of warning. Further, massive earthquakes cause significant changes in the built environment and render numerous communities uninhabitable through direct impacts and subsequent hazards [17]. The Gorkha earthquake has profound influence on the society in Nepal, which is shown in research by Adhikari et al. [3] differentiating impacts of the earthquake on public health into immediate (e.g., power outage), intermediate (e.g., poor sanitation at and long-term, e.g., the disregard of physical and psychological supports) stages.

The concept of vulnerability was applied to understand challenges

\* Corresponding author.

E-mail addresses: [lulu.he@uq.edu.au](mailto:lulu.he@uq.edu.au) (L. He), [jona@uq.edu.au](mailto:jona@uq.edu.au) (J.C. Aitchison), [k.hussey@uq.edu.au](mailto:k.hussey@uq.edu.au) (K. Hussey), [yongping.wei@uq.edu.au](mailto:yongping.wei@uq.edu.au) (Y. Wei), [alexloyh@hku.hk](mailto:alexloyh@hku.hk) (A. Lo).

perceived by earthquake-affected people in Nepal in coping with and adapting to the impacts of earthquakes, particularly with respect to people's capacity to re-establish their livelihoods. Vulnerability refers to conditions determined by physical, social, economic and environmental factors or processes, which increases the susceptibility of a community to the impacts of hazards [13,2] defines vulnerability as susceptibility to harm, powerlessness, and marginality of both physical and social systems. Wisner and Luce [32] note that it is not the system of production *per se* but the persons and households in the system are vulnerable due to the lack of resources to mobilize, recover livelihoods or rebuild following disasters. Cutter et al. [9] propose Social Vulnerability Index (SoVI) to measure vulnerability, in which eight types of factors for vulnerabilities are considered: personal wealth, age, density of built environment, economic dependence, housing stock and tenancy, race, ethnicity, occupation and infrastructure dependence. Cutter et al. [9] suggest the term “place-vulnerability”, introducing an approach to understanding vulnerability as the amalgam of biophysical and social vulnerability conditions at particular areas. In the context of natural disasters, there is a nexus between vulnerability and resilience. In socio-ecological systems, vulnerability is related to resilience, and both should be considered as properties of the system [11]. Resilience is a system's strength to adapt to the adversity and develop afterwards [1]. Turner et al. [29] propose an expanded explanation on vulnerability in human-environment system which included resilience into vulnerability framework. They consider exposure (frequency, magnitude and duration), sensitivity and resilience as components of vulnerability, thus these factors are metrics to assess vulnerability.

It is increasingly recognized that the pre-disaster context, the immediate impacts of disasters and the early response to disasters (*i.e.* evacuation practice) combine as a whole determining the vulnerability of disaster-affected population. As such the Sendai Framework broadens the scope of vulnerability [14]: *In the recovery phase following disaster events, it is necessary to develop capacities that reduce disaster risk in the short, medium and long term, which also should be applied to temporary settlements for people displaced by disasters.* The vulnerability framework proposed by Turner et al. [29] considers the paired relationship between human system and environment system which are two main components of sensitivity. Ingram et al. [12] apply this framework with the concept of a time series involving prior to, upon and after the disaster event to identify components of vulnerability over short- and long-term following a tsunami incident.

Premised on the concept that vulnerabilities encompass both pre-event and post-event conditions, this study aims to understand the interaction between a seismic event and the human system in earthquake-hit areas in Nepal. Pre-disaster conditions, disaster aftermaths and the emergency response (*e.g.*, temporary relocation) are considered to contribute to the vulnerability of people affected by earthquakes. To a point, vulnerability in the aftermath of disasters refers to adversity impeding their recovery from earthquake impacts. This study will advance knowledge on disaster risk reduction in Nepal by identifying problems that need to be addressed in the recovery process and illustrating the necessity of designing a resilience-oriented reconstruction approach.

## 2. Methods

### 2.1. The study area

The case-study location is Barpak Village Development Committee (VDC) with a population of 7732 people in Gorkha District (Fig. 1). In the earthquake, 1346 out of 1380 houses were completely destroyed, and 72 people lost their lives.<sup>1</sup> Barpak was selected for field

investigation because: 1) It is a densely populated VDC which was expected to provide abundant information concerning earthquake impacts on local residents; 2) It is an economically fairly average VDC (*i.e.*, not among the poorest areas within Nepal), so was anticipated to generate a pertinent view of the earthquake impacts; and 3) Five villages were displaced immediately following the earthquake, which is expected to provide enriching information on population resettlement induced by disasters. The field survey was conducted in Barpak VDC in January and February of 2016 when it was 10 months after the earthquake.

### 2.2. Data collection

Data for this research was collected via a combination of multiple methods: interviews with the displaced households, meetings with local leaders, and participant observation. At first, a semi-structured questionnaire in English was employed to collect data on socio-economic conditions of relocated households, especially with respect to: 1) Pre-earthquake disadvantages such as demographic characteristics, farming pursuance, and employment of family members (this part of data is subject to respondent's recollection); 2) Earthquake impacts relating to earthquake-induced damage, losses, interruptions and secondary risks in the study area; 3) Post-earthquake challenges such as living conditions and infrastructure inaccessibility at the temporary shelter sites. Questionnaire surveys were conducted with individual households and the respondent was interviewed in accordance with the questionnaire. At each shelter site, households were selected for interview on a random basis. However, respondents representing a household in the interview should be over 18 years of age. Heads of households were preferred for interview as they are considered well-informed about their family affairs. In most cases at the study location, they are breadwinners and their opinions have strong influence on their family decisions, so information offered by them was expected to reflect critical insights on their families' situation. When the head of a household was not available, the spouse was invited to participate in the interview.

While 20 households were planned to interview at each of the shelter sites, during on-the-ground investigations, some households were not available to participate in the survey. Consequently, 82 households were interviewed, accounting for 42.5% of the total 193 relocated households. The duration of each interview was about 30–50 min. Besides giving answers to questions, respondents recounted relevant experience and opinions which generated enriching information on the topics. This part of data was jotted down on the questionnaire and served as back-up information in the analysis process, some of which were cited as quote in writing this study. Upon the completion of each interview, a souvenir was offered to the respondent to express our appreciation for his/her time.

Documentary data were collected from the VDC office and the District government. Interview with VDC secretary<sup>2</sup> was conducted to gather an overview of the earthquake damage and relocation of households in Barpak. The secretary assistant and the leader of each shelter site were also interviewed. After our fieldwork in Barpak, meetings were conducted with district officials and documents on earthquake-induced loss were collected from the government. Investigations on shelter conditions, infrastructure availability and living circumstances at camp sites were conducted by the author. Each original village settlement was visited in order to obtain a perception on pre-earthquake living environment. These observational data were recorded in form of images and field notes. Participant observation was applied to observe the social and cultural context at the study area, such as caste system and gender inequality. This part of data was extensively recorded by the author in the fieldwork diary.

A field assistant with a university degree was hired for Nepali-

<sup>1</sup> Data source: *Barpak Earthquake-caused Fatality Form*, 2015; collected from the VDC office.

<sup>2</sup> In Nepal government administration system, VDC secretaries are government representatives at local communities/villages.

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