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# Exploring community resilience: A qualitative study on earthquake preparedness and response in vulnerable regions

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## ABSTRACT

**Background:** The way communities handle disasters directly influences earthquake impact reduction most significantly within regions that are easily damaged like Nepal. This research analyzes the subjective elements of preparedness and risk recognition and response approaches among Kathmandu–based communities. **Methods:** The research used questionnaire surveys to gather information from individuals representing different family sizes, methods of income and age brackets. The study analyzed several driving elements for preparedness that combine information accessibility with neighborhood safety evaluations and citizen involvement and institutional backing. **Findings:** The data indicates that homeowners showed mixed assessments regarding their house structural readiness for major earthquakes since 46.9% said their homes were strong enough while 50% remained unsure about it. The majority (75.8%) of the population used social media for earthquake information yet fewer than one-third (33.3%) were satisfied with training and nearly nine-tenths (87.9%) had not received preparedness materials. Studies found that an unsatisfactory pace of recovery occurred after disasters because 33.3% of communities needed help months later and 33.3% received no assistance. Community engagement together with traditional knowledge showed promise as potential resilience-builders yet formal disaster planning systems demonstrate minimal integration of these approaches. **Conclusion:** Research suggests the augmentation of educational campaigns about disasters should be paired with better warning alerts together with financial help for building improvements and more organized institutional cooperation. The establishment of comprehensive measures to bridge these areas will help Nepal construct resilient communities. **Novelty/originality of this article:** The research adds important knowledge to earthquake risk reduction science along with community resilience approaches that benefits policymakers through their work with disaster management agencies.

**KEYWORDS**: community resilience; disaster management; earthquake preparedness; institutional support; risk perception.

## 1. Introduction

Nepal is one of the most earthquake-prone countries in the world, with Kathmandu Valley facing significant seismic risks due to rapid urbanization and insufficient structural resilience. Despite past disasters such as the 2015 Gorkha earthquake, community-level preparedness and institutional response remain inconsistent. While studies on disaster risk reduction exist, research on localized community resilience and social preparedness

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mechanisms in Nepal is limited. This study fills that gap by exploring risk perception, institutional support, and collective action in earthquake preparedness.

Drawing from global best practices, nations like Japan and Chile have implemented robust disaster preparedness policies, integrating technological advancements with local knowledge. Nepal can learn from these models to strengthen governance frameworks and enhance early warning systems. This study aims to assess how local communities perceive earthquake risks, the effectiveness of current institutional responses, and the role of social networks in fostering resilience.

Earthquakes are severe natural calamities which produce enormous death tolls along with significant economic breakdowns together with enduring social and political complications (Cutter et al., 2008). A community's resilience capacity along with the earthquake magnitude determines how much damage results from these disasters (Aldrich & Meyer, 2015). The ability of communities to restore operations after earthquakes depends on how resilient they are as a region. Earthquake community resilience worldwide differs through various elements consisting of governance systems, economic systems, infrastructure standards, public awareness about preparedness and cultural measures for preparedness (Manyena, 2006). Many developing nations face difficulties in resource allocation and enforcement because they follow behind developed countries which have executed innovative earthquake codes and warning systems (UNDRR, 2019). The analysis of worldwide community resilience patterns demands attention because it requires examination of both leading examples and the obstacles together with prospective paths.

Japan along with the United States and New Zealand lead the world in earthquake readiness by establishing precise building blueprint regulations and developing sophisticated warning technology and conducting substantial educational programs about earthquakes (Pan et al., 2022). The national drills ShakeOut and Disaster Prevention Day serve as top examples of how communities prepare themselves for disasters in Japan and California (Tanaka, 2005). A combination of artificial intelligence systems along with geospatial technologies has led to enhanced capabilities for risk assessment combined with emergency response (Yamada et al., 2020). The 2011 Great East Japan Earthquake exposed system capabilities as well as vulnerabilities especially in tsunami readiness (Suppasri et al., 2013).

Countries like Turkey as well as Mexico and Chile together with China have improved their earthquake tolerance through better construction rules and emergency response measures (Zhang et al., 2022). Public compliance together with enforcement challenges continue to present problems according to Işık et al. (2022). Turkey's Disaster and Emergency Management Authority (AFAD) and Chile's National Emergency Office (ONEMI) play central roles in disaster preparedness (Birkmann & Fernando, 2008). A major sad lesson from the 1999 İzmit Turkey earthquake led the country to implement substantial construction reform changes alongside emergency management system improvements (JICA, 2012). The 2023 Kahramanmaraş Earthquake revealed existing problems with both enforcement practices and infrastructure vulnerability even though recent improvements have been made (Jabbour et al., 2024).

Nepal along with Haiti and Indonesia and Afghanistan encounter substantial earthquake resilience challenges caused by their weak administrative systems and poor infrastructure and shortage of emergency response capabilities (Mabuhang, 2023). Earthquake forces show high vulnerability to traditional construction methods used in many built structures (Bothara & Brzev, 2011). Massive destruction became evident in the 2015 Gorkha Earthquake in Nepal because the country lacked earthquake-resistant buildings according to Dixit et al. (2015). International humanitarian aid becomes crucial for emergency responses because local resources prove to be inadequate (Cook et al., 2018).

Numerous essential research holes persist in Nepal regarding community earthquake preparedness and response specifically within Kathmandu. The 2015 Gorkha earthquake proved strong weaknesses existed in disaster readiness concepts along with governance structures and infrastructure stability. Post-earthquake research has primarily concentrated on infrastructure destruction and restoration initiatives according to Dixit et

al. (2015) and Parajuli & Takahashi (2022) but has given minimal focus to neighborhood-based preparedness and response frameworks. The adoption of building codes with proper enforcement practices proves challenging mainly in densely built-up areas including Kathmandu as demonstrated by JICA & MoUD (2016). A lack of sufficient research exists regarding the effectiveness of retrofitting policies and community-driven construction practices for the protection of many informal settlements and traditional buildings at risk (Paudyal et al., 2018). Existing local construction methods need review to reach better alignment with modern seismic protection techniques under social and economic limitations. Studies on how social capital assists disaster response remain scarce even though it functions as a key response element in Kathmandu's earthquake situations. Research shows that local communities typically take initial action as first responders during emergencies (Kalogiannidis, 2023) but the evaluation of neighborhood associations and youth groups and informal support networks in earthquake preparedness remains insufficient. Research about network operations within urban Nepalese communities would provide knowledge for building stronger community resilience. The country faces a critical weakness because it holds no accessible well-integrated earthquake early warning system for preparedness (Shrestha et al., 2021). The expansion of mobile-based disaster alerts through social media platforms during recent times has received little focus regarding their impact on the public trust and general effectiveness. Research must be conducted to test how joint utilization of digital communication strategies with indigenous knowledge leads to better time-sensitive disaster responses. Various governmental and non-governmental organizations perform infrequent and restricted-public participation disaster preparedness training and drills (UNDRR, 2020). Research about public knowledge and conduct changes regarding earthquake preparedness initiatives in Kathmandu exists in small numbers. Research should focus on tracking the long-term effects of awareness programs on response readiness among specific vulnerable demographics including low-income families, migrants and senior citizens. Research investigating the effectiveness of local-level policy implementation remains scarce in Nepal even though the country has adopted disaster management policies from the Sendai Framework for Disaster Risk Reduction (UNDRR, 2015). Multiple organizations at differing levels of government along with NGOs and neighborhood communities face ongoing challenges to cooperate on earthquake emergency preparedness (Dixit, 2018). The analysis of disaster governance strategies between different Kathmandu Valley municipalities would reveal key solutions to enhance policy enforcement and foster various sector cooperation. The advancement of earthquake preparedness and response in Nepal needs attention to these research gaps. Future research should direct efforts toward building community-based initiatives while evaluating policy execution in addition to integrating technological inventions and developing inclusive disaster risk reduction programs for Kathmandu along with other urban areas.

This study investigates community resilience together with preparedness practices against earthquakes in vulnerable regions directed toward Nepalese Kathmandu as its main subject. The research focuses on investigating how local citizens view earthquake safety risks while studying the preventive measures they use during both preparations and actual earthquake emergencies. This research aims to achieve several specific objectives. First, it examines community evaluations of earthquake risk by assessing human vulnerability, identifying how past experiences influence awareness, and determining the factors that affect levels of concern. Second, it evaluates local community preparedness strategies through an investigation of household and community readiness practices, including emergency planning, structural strengthening, and participation in disaster preparedness training programs. Third, this research assesses the role of social connections, neighborly relationships, and local advocacy in supporting earthquake preparedness and emergency response functions. Fourth, it analyzes the accessibility of earthquake-related information and the effectiveness of related campaigns by observing community responses to various information sources, including government agencies and non-governmental organizations. Fifth, the study identifies obstacles that hinder communities from enhancing their

earthquake resilience by examining structural, institutional, and economic barriers that limit effective preparedness efforts. Finally, based on the findings, this research provides recommendations to strengthen community-based strategies for disaster preparedness in earthquake-prone areas.

## 2. Methods

### *2.1 Research design and sampling strategy*

A qualitative methodology guides this investigation to study Nepalese earthquake zones especially within Kathmandu regarding community responses to seismic hazards. A standardized survey instrument collected direct responses from neighborhood residents about their readiness and knowledge together with their capabilities to bounce back. A variety of participants were chosen through selection criteria that included participants between 18-45 years old with household sizes ranging from 2 to 9 members and income from employees or traders or agricultural workers. The chosen set of selection criteria aims to gather data from participants representing various demographic circumstances because preparedness readiness differs based on household characteristics such as family size and economic status and information access.

### 2.2 *Data collection and data analysis*

This research instrument used an organized set of questionnaire questions to analyze multiple elements regarding earthquake readiness and social cohesion. Participants were asked about: The respondents reveal their understanding about earthquake dangers along with their assessment of home structure safety. The study examined various earthquake preparedness strategies implemented by individuals, including securing heavy furniture, preparing emergency kits, and participating in disaster prevention exercises. It also explored the sources of information accessed by participants, such as social media, government programs, and community-based communication channels. Furthermore, the research assessed the level of community engagement in preparedness activities, including awareness campaigns, neighborhood meetings, and emergency response training. To identify the strengths and limitations of existing preparedness programs, data were collected based on participants' actual experiences and responses. This study applied thematic analysis to study community preparedness patterns and key themes through their study responses, the analysis showed in Table 1.

Table 1. Data analysis procedure and interpretation

| Step | Description |
|---|---|
| 1 | This study evaluated all feedback to identify public perceptions regarding earthquake preparedness measures. |
| 2 | Recurring themes were identified by grouping similar responses into categories, including awareness deficiencies, funding shortages, social pressure, and levels of trust in government and NGOs. |
| 3 | The data were interpreted by analyzing factors influencing preparedness behavior, as well as the social and economic aspects affecting participant responses. |
| Outcome | The study provides insights into community resilience in Kathmandu, highlighting key elements necessary to enhance earthquake preparedness initiatives. |

## 3. Results and Discussion

### *3.1 Demography*

The community composition and vulnerability data offer useful information as to the earthquake preparedness of this community. Aging of the community; a 32.3% of the

community is within the age of 18 – 25 years while 54.8% within the age of 25 – 35 years still points to a physically capable community that is likely to participate positively in the active recovery and response to any earthquake experience. That being said, it is also necessary to mention that the older candidates at the age of 36-45 were presented only at 12.9%, which might lead to the lack of experienced decision-makers and leaders, as well as those whom are significant for managing crises and improving readiness plans.

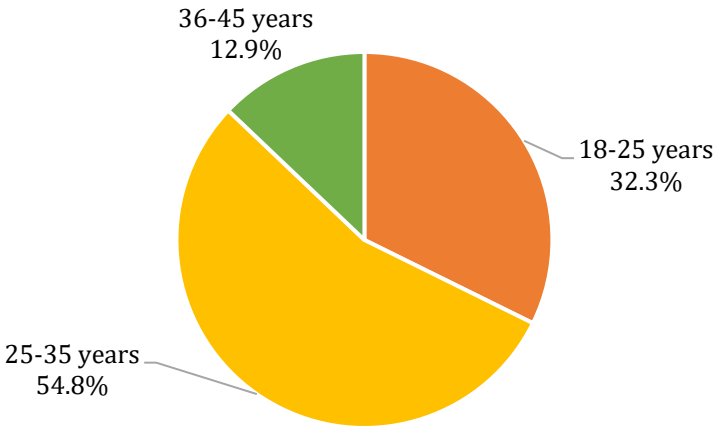


Fig. 1. Age of respondents

There is, however, other demographic factors, such as the household size that affects resilience. This means that the commonly formed families are those that house three to five individuals (58.1%), which makes most families handy in case of compulsory corona martial support in the event that their senior members succumb to the disease. Nonetheless, it can be seen that larger households are slightly more vulnerable during the occurrence of an earthquake, specifically 6-9 and more than 9 members of the households at 22.6 % and 6.5% respectively might experience additional obstacles regarding the safety of all members, including evacuation or seeking temporary shelter. Population density could also distort social-distancing measures and after an earthquake affect the ability of an individual to access supplies and other necessities.

Table 2. Demographic characteristic

| Variable | Frequency |
|---|---|
| Number of family members | |
| 5 individuals | 58.1% |
| 6-9 individuals | 22.6% |
| >9 individuals | 6.5% |
| Occupational | |
| Wage employed | 77.4% |
| Agricultural employment | 9.7% |
| Trade employment | 12.9% |
| Home ownership | |
| Own | 90.3% |
| Rents | 9.7% |

Income sources suggest that the community is majorly wage employed (77.4%) followed by agricultural employment (9.7%) and trade employment (12.9%). The absence of economic diversification, therefore, may increase susceptibility in an earthquake situation because those in wage employment can lose their incomes if industries or organizations are affected. Diversification of the economy that would consist of local commerce and farming could enhance the economy's strength due concerning the possibility of subsequent income as individuals rebuild their homes. Additionally,

percentage of home ownership is very high (90.3%) this can results to fast restoration because residents are likely to spend more to retrofit their homes in favour of earthquake resistance. A possible drawback in the ability to respond in the case of a disaster is arises from the fact that only 9.7% of the population rents an accomodation, and these might be more exposed to the risk of being displaced from their homes, or of having little control over the quality of the construction in which they live. Therefore, even though demographic characteristics of the youth, capacity to respond, and high homeownership may improve earthquake preparedness, the salaried income and expansive needs of big families are weaknesses. It has been identified that much could be done regarding preparation training, structural reinforcement and retrofitting as well as diversification of the regional economy to better face the impact of earthquakes.

### *3.2 Earthquake risk perception and preparedness*

The readiness of individuals to face earthquakes becomes primarily shaped by their beliefs about seismic risks. Earthquakes persist as a critical threat to Nepal but the majority of Kathmandu residents seem to have little direct involvement with their risk levels. People neglect such concerns because earthquakes are unpredictable occurrences and several years have passed since major seismic activity or perhaps they have developed fatalistic attitudes about natural disasters. Individuals form their preparedness actions based on their perception of risk. Time has eroded awareness about the 2015 Gorkha earthquake so Western Nepalese residents might be showing signs of becoming too relaxed with their safety. According to science societies retain high levels of preparedness when they maintain clear recollections of past disasters yet this risk awareness fades if no ongoing preventive actions are pursued (Lindell & Perry, 2012).

Individual perception of seismic risks significantly shapes the readiness of people for earthquakes. Research survey data shows that 45.5% of respondents seldom contemplate earthquake risks yet 36.4% think about it sometimes and the remaining 15.2% often consider seismic possibilities. The large number of Kathmandu residents shows little interest in worrying about earthquakes despite their continuous status as a significant threat to the area. The lack of frequent concern about earthquakes might result from unpredictable earthquake occurrences or because earthquakes have not occurred recently or because people feel natural disasters are inevitable. The way people perceive risks determines their readiness to take actions for preparedness. The awareness level raised by the 2015 Gorkha earthquake remains strong after its occurrence but could fade with time and produce a state of carelessness. The research indicates that nations with robust disaster memories demonstrate advanced preparedness measures yet findings show this preparedness weakens unless organizations maintain continuous risk intervention efforts (Lindell & Perry, 2012).

This survey reveals that fifty percent of participants are unsure about their home's resistance to major earthquakes although forty-six point nine percent feel their house is safe with only three point one percent indicating it is not safe. The high degree of uncertainty points to insufficient assessment practices as well as neglect in residential building seismic retrofitting. As Kathmandu faces high seismic risk and heavy population density the area contains numerous old buildings with no engineered structure thus raising its overall exposure to danger. Numerous building owners in Nepal keep ignorant about their structures' ability to resist earthquakes despite the National Building Code NBC introduction and post-2015 awareness campaigns. Public housing safety confidence stands much higher in Japan and Chile because these countries mandate rigorous building codes alongside routine structural evaluations (Yamamura 2014).

Survey participants specified that their motivation to prepare for earthquakes stems from these factors 66.7% are motivated by the past experience of earthquakes,18.2% are motivated due family responsibility and safety while 9.1% are due to fear of future disasters and 6.1% are motivated due to Government campaigns and warnings. People who have gone through previous disasters demonstrate stronger motivation for preparation efforts

when compared to other factors. Harrowing experiences with disasters create psychological effects which motivate people to take proactive actions (Becker et al., 2017) according to research findings. The data reveals that public preparedness programs reach only a small portion of the population because their impact stands at 6.1%. People do not feel socially pressured to practice earthquake preparedness since social pressure was rated at zero percent in this study. This reveals individuals view earthquake preparedness as something they should handle independently instead of collectively.

Research data shows that earthquake awareness differs from actual disaster readiness and institutional backing. Majority of people (45.5%) do not consider earthquakes as a concern although past experiences with disasters (66.7%) drive them to become prepared. People who have not experienced major earthquakes remain unimpressed to prepare. Social media acts as the major information provider with 75.8% influence while government public outreach programs fail to impact public knowledge at only 6.1%. The quantity of obtained information from social media indicates that awareness programs have failed or there exists a lack of trust in official sources. Of those surveyed 50% showed doubt about their home structures yet there was no visible pressure from their communities (0%) to increase earthquake readiness. Each household has to independently evaluate and upgrade their homes without receiving support from community or neighborhood projects.

The disaster preparedness initiatives within Kathmandu alongside other earthquake-prone Nepalese areas should prioritize the following set of goals to overcome identified gaps: The preparedness programs led by the government need improvement through community training sessions and interactive educational approaches and structural building inspections. Official agencies must effectively employ social media platforms since people widely use digital media to disperse accurate preparedness information and break down untrue claims. Local governments along with NGOs should initiate neighborhood resilience programs as part of their community-based preparedness agenda due to the absence of social pressure. Several homeowners lack knowledge about their house structural safety level. A national strategy combining free structural inspections with financial supports for retrofit projects alongside national building regulations enforcement would boost local resistance.

Research data shows inconsistent relations between how people perceive risks and their motivation for preparedness alongside the responses of institutions. The primary motivator for preparedness points to past experience despite social media taking control of information distribution which leads to fluctuating awareness levels. The area requires additional strong localized interventions because people remain uncertain about structural safety and show minimal community engagement. Multi-level strategies employing government policies together with community engagement and technological outreach need to be combined in order to boost earthquake preparedness and resilience in Kathmandu as well as other regions.

### *3.3 Social networks and collective actions*

The functions of social networks are essential during all phases of disasters including disaster preparedness as well as the response period and subsequent recovery stages. Modern communities display resilience through multicast action strategies that generate both resource exchanges together with organized disaster responses and emotional help networks. This research investigation discloses that communities maintain social connections yet these connections do not achieve maximum disaster preparedness goals across Kathmandu and other Nepalese vulnerable areas. The research shows that neighbors interact with each other either daily or just occasionally throughout the week. Approximately 42.4% talk to neighbors every day but 30.3% talk rarely. Steady neighborhood communication builds social capital according to Aldrich & Meyer (2015) which helps communities develop disaster-resilience. A significant disaster recovery speed comes from communities with better social bonds as observed through local network success stories post-earthquake in Japan and Haiti (Nakagawa & Shaw, 2004). The sizable

group of people who rarely talk with neighbors creates obstacles that could affect group collaboration during disaster response operations. Most people (36.4%) participated in disaster preparedness neighborhood meetings occasionally while another large group (51.5%) showed interest but never attended. The failure to participate in any regular basis was shown by 0% of residents which reveals fundamental issues with community engagement frameworks. High involvement of community members in disaster preparedness meetings raises resilience according to research which shows better knowledge transfers and strengthened team responses (Paton, 2006). The insufficient rate of regular participation implies that although people show interest there could exist barriers to their participation including insufficient outreach efforts by local authorities and time restrictions or insufficient awareness about the programs.

The level of confidence in community disaster response efforts exhibited both positive and negative feedback. Survey results indicated that 48.5% of people were somewhat confident about their community working together but 33.3% had no confidence while 6.1% did not express either way. The analysis suggests Kathmandu communities need clear disaster preparedness drills and campaign materials and social connection programs to match global adaptation standards for disaster response (Chamlee-Wright & Storr, 2011). Only 3% of respondents thought their local community had stronger resilience than other regions whereas 30.3% stated their community showed moderate improvements. People displayed uncertain views about resilience since they comprised 24.2% of the survey group while 18.2% reported they were less resilient. Research proves that communities without defined indicators for resilience experience lower collective preparedness through decreased community participation (Manyena, 2006). Coming close to resolving the perception gap through local disaster resilience programs offers opportunities to boost community confidence in preparedness abilities.

The establishment of regular contacts between neighborhood residents increases disaster collaboration along with trust levels. Local authorities together with community leaders need to make neighborhood events and preparedness programs available to promote social engagement. Municipal authorities need to boost the voluntary attendance rates at their disaster preparedness meetings. Local authorities should enable smoother meeting access through digital tools and reward community members who take part in public sessions. The low level of community confidence regarding collective cooperation requires the implementation of disaster response training which parallels the Japan Bōsai program (Shaw, 2014). The local government along with NGOs must perform open assessments of resilience vulnerabilities to effectively distribute awareness about preparedness and security measures. Enhanced social networks which include collective action will strengthen the resilience of Kathmandu-area communities along with other earthquake-prone regions.

Earthquake preparedness solutions and risk comprehension strategies form essential bases for lowering seismic impacts especially in regions like Nepal which are prone to earthquakes. The extent to which people view earthquake risks determines their preparedness actions while social background and economic status alongside access to information affect their behaviors (Paton, 2003). Research shows that people located in high-risk areas usually lack real awareness of enduring earthquake threats except when experiencing intense events (Slovic 2000). Residents in Kathmandu show limited awareness about earthquake dangers although the region stands at high risk. The belief in personal invincibility coupled with excessive optimism triggers negatives consequences for proactive disaster readiness according to Weinstein (1989). The manner through which information sources shape how people develop their prepared behaviors remains crucial. Social media served as the main information source for earthquake preparedness according to 75.8% of the participants who also relied on TV and radio along with news media (48.5%) and government programs (21.2%) and word-of-mouth feedback from family members and friends (15.2%). Schools together with NGOs and community organizations provided information to just 9.1% of the respondents. Survey results show a growing pattern similar to other disaster areas since people increasingly rely on social media to stay informed about

disasters and their behaviors (Houston et al., 2015). Studies reveal that misinformation on social media can cause readers to experience confusion while simultaneously performing incorrect preparedness procedures (Alexander, 2014). Society requires a stronger focus on verified disaster information which comes from the authorities responsible for disaster management and government agencies.

Nearly half of the respondents (46.9%) believed their house would survive a major earthquake but 50% remained unsure while 3.1% did not agree with the statement. People express this type of doubt because they lack sufficient knowledge about both building safety regulations and seismic adaptability requirements. The 2015 Gorkha Earthquake together with previous seismic events in Nepal showed that non-engineered buildings contained critical weaknesses in their structural performance (Dixit et al., 2013). The research indicates a need for better dissemination of information regarding structural inspections together with building codes in order to raise community preparedness. Past earthquake experiences drove most of the respondents who prepared for emergencies while fear of future disasters was the secondary reason at 9.1%. Family responsibility and governmental initiatives each motivated 18.2% and 6.1% of respondents respectively. According to Kunreuther (2006), people tend to display stronger preparedness behaviors when they experienced disaster directly compared to hypothetical threats. Governments should establish disaster education programs with higher community involvement to increase campaign effectiveness.

Risk perception improvements need to be the focus of awareness campaigns because respondents infrequently perceive earthquakes as dangers but they should receive historical seismic information and risk probability analysis. 2. The plan should enhance official preparedness programs and community-based education because social media serves as the primary information platform during emergencies. 3. Accessible home safety evaluations together with retrofitting programs need to be implemented since many residents remain unaware of their house's seismic resilience. 4. Using stories alongside survivor interviews and stories should appear in public preparedness campaigns to drive people to take protective actions because past experiences prove most effective for motivation.

### *3.4 Role of local knowledge and cultural practices in earthquake resilience*

The incorporation of local wisdom in modern emergency management plans through traditional cultural practices leads to improved earthquake resilience. Research findings show that among all respondents 72.7% possess at least some knowledge about traditional building practices which increase earthquake resistance capacity. The population segment which lacks awareness about these methods amounts to 27.3%. The regions of Nepal and Japan have utilized traditional seismic-resistant construction methods which include timber-laced masonry and flexible wooden frameworks since ancient times (Dujic et al., 2015). Modern engineering practices need to integrate traditional construction knowledge while making an effort to restore public understanding of these methods. Survey data indicated that traditional earthquake-focusing rituals in Nepalese communities have vanished completely because 75.8% of respondents did not witness any practices while 3% regularly took part in activities to prevent earthquakes. Environmental habits involving earthquake-folklore and sacred customs together with societal routines previously influenced both regional awareness of danger and neighborhood defensive systems (Mercer et al., 2010). Nepali indigenous communities including the Newars used to combine earthquake protection strategies into their construction framework and carry out religious ceremonies for natural disaster protection (Dahal, 2019). The practice along with transmission of traditional understanding has reduced because of modern cities and changes within communities.

Most of the respondents (69.7%) consider the inclusion of local traditional practices and cultural expressions to be vital for formal disaster preparation activities yet only 3% hold it as unimportant. The local community now recognizes traditional wisdom as an

essential part of disaster reduction strategies. Science needs to work together with local wisdom according to scholars because this approach leads to stronger earthquake preparedness through inclusivity (Shaw et al., 2008). According to the Sendai Framework for Disaster Risk Reduction (2015-2030) indigenous knowledge must be included in disaster risk policies to boost resilience (UNDRR, 2015).

Research outcomes indicate that the knowledge of traditional construction techniques directly impacts peoples' evaluation of their worth for disaster emergency readiness. Research indicates that traditional knowledge holds value to most people despite the fact that 3% of respondents view it as unimportant. Ritual-based earthquake preparedness activities are neglected since most study participants (75.8%) admitted being unfamiliar with cultural practices used for safety preparations. Local governments together with engineers and cultural practitioners need to work collaboratively for documenting indigenous methods then validating them before integrating these proven approaches into modern disaster preparedness programs. Community education workshops about earthquake-resistant traditional techniques should become the basis to revive these traditional approaches. Building codes and community resilience programs in Nepal must incorporate local knowledge because this integration will strengthen disaster preparedness specifically in Kathmandu where rapid urbanization threatens traditional construction wisdom.

The research shows that regional wisdom along with traditional customs should be incorporated into present-day disaster readiness programs. The respondents recognize the importance of traditional wisdom but because few cultural practices are actively used for earthquake preparedness advocates should push for educational efforts and stronger policy involvement. The implementation of traditional knowledge and culture will help Nepal create resilient programs that benefit the community at large.

### *3.5 Institutional supports and gaps in earthquake preparedness*

Institutions play a critical role in disaster preparedness and response, particularly in regions vulnerable to seismic activity. The effectiveness of institutional interventions significantly influences community resilience, yet gaps remain in training, information dissemination, and material support. Addressing these gaps is essential to improving earthquake resilience and ensuring communities are better prepared for future seismic events.

#### *3.6.1 Satisfaction with institutional preparedness efforts*

The survey results indicate a mixed level of satisfaction regarding earthquake preparedness training and information provided by local authorities. While 12.1% of respondents reported being very satisfied and 30.3% somewhat satisfied, a significant proportion (33.3%) expressed dissatisfaction, and 24.2% reported that they had not received any training or information. These findings align with previous studies, which suggest that public dissatisfaction with institutional preparedness often stems from inadequate outreach efforts, inconsistent training programs, and the absence of localized, actionable guidance (Tierney, 2019; Paton & Johnston, 2017). Strengthening public education and engagement initiatives can help bridge this gap and increase community trust in preparedness programs.

#### *3.6.2 Trust in institutions for earthquake preparedness information*

When asked which institutions they trust most for earthquake preparedness information, respondents predominantly favored local government agencies (39.4%), followed by NGOs or humanitarian organizations (21.2%) and community-based organizations (15.2%). Media outlets (18.2%) were also a significant source, whereas the national government was trusted by only 6.9% of respondents. This suggests that trust is

more localized, with communities valuing grassroots organizations over national-level directives. Disaster management research emphasizes that decentralized governance, where decision-making and disaster response efforts are rooted in local institutions, is often more effective in increasing community resilience (Alexander, 2018). Governments should leverage this trust by strengthening their collaboration with community organizations and local NGOs to improve disaster preparedness efforts.

### *3.6.3 Access to earthquake preparedness materials and kits*

Despite the importance of preparedness materials, 87.9% of respondents reported never having received earthquake preparedness kits from any organization. This finding highlights a critical gap in institutional efforts, as access to emergency supplies is a key factor in community resilience (UNDRR, 2020). Limited distribution of materials can result in lower preparedness levels and reduced confidence in institutional support during disasters. A more structured and inclusive approach is needed to ensure that preparedness kits and essential supplies reach the most vulnerable populations. Additionally, awareness campaigns should focus on educating communities about the importance of maintaining personal emergency kits, reinforcing both individual and collective preparedness.

### *3.6.4 Community needs and institutional gaps*

The study also explored what types of assistance respondents would find most beneficial in earthquake preparedness. The most requested supports were education and training on earthquake safety (63.6%) and early warning systems (63.6%), followed by financial assistance for retrofitting homes (54.5%) and provision of emergency supplies (54.5%). Community-based emergency drills were also identified as important (51.5%). These findings suggest that while awareness of earthquake risks exists, there is a strong demand for more proactive institutional engagement. Implementing regular training sessions, expanding financial aid programs, and integrating early warning systems into community infrastructure can significantly enhance earthquake resilience. International case studies, such as Japan's comprehensive community-based preparedness programs, demonstrate the effectiveness of integrating government initiatives with local efforts (Nakagawa & Shaw, 2004).

### *3.6.5 Interconnections and policy implications*

The gaps identified in institutional support highlight the need for a multi-faceted approach to earthquake preparedness. First, increased investment in community-level education and training programs could enhance preparedness levels (Lindell & Perry, 2012). Second, expanding early warning systems and providing retrofitting subsidies could address the structural vulnerabilities identified in the study. Third, improving access to preparedness materials and engaging community organizations in disaster planning could foster trust and collaboration between institutions and local populations (Nakagawa & Shaw, 2004). Lastly, governments should ensure more efficient coordination between different stakeholders, including NGOs, research institutions, and private-sector partners, to develop a more holistic and inclusive disaster management framework.

The findings underscore the necessity of strengthening institutional support mechanisms to enhance earthquake resilience. Addressing gaps in training, trust, and material distribution can significantly improve preparedness levels in vulnerable communities. Future policies should prioritize localized interventions, collaborative governance, and community-led initiatives to bridge the existing gaps in earthquake preparedness. By fostering stronger partnerships between local and national governments, NGOs, and community-based organizations, disaster risk reduction efforts can be made more effective, ensuring long-term resilience against future seismic events.

### *3.6 Post-earthquake recovery and rebuilding*

The absolute duration of the earthquake recovery process and rebuilding operations fixes a community's long-term ability to recover. Survey results reveal major time delays and unsatisfying assistance delivery to Kathmandu's earthquake-afflicted households and other Nepalese disaster-prone areas. Surveys show that immediate assistance was received by 3% of respondents while 33.3% received help after weeks and 18.2% waited for months before receiving any help. One-third of respondents suffered without any aid during and after the disaster. Research has previously documented post-disaster funding distribution delays as well as bureau-based inefficiencies and logistic difficulties in earthquake struck areas (Cook et al., 2018; Rufat et al., 2015) and these results demonstrate the ongoing support shortcomings in Nepal. People expressed high dissatisfaction about assistance quality since half of respondents reported no help while one-quarter received no assistance at all. Previous research confirms that marginalized groups which include low-income households frequently encounter difficulties when trying to access recovery funds and reconstruction support (Neef et al., 2018). The reconstruction activities following Gorkha earthquake in 2015 Nepal suffered from immense delays because of funding limitations and complicated procedures and unclear policies that guided aid access (Rahill et al., 2020). The National Reconstruction Authority (NRA) of Nepal made promises to provide funding and technical support for rebuilding yet the difficulties in obtaining funds stemmed from documentation problems along with tough reconstruction requirements (Sharma et al., 2018).

Additional evidence about recovery durations at the community level demonstrates how hard it becomes to manage situations. Among surveyed people less than 15% reported their communities returned to normal within six months yet 27.3% needed six to twelve months and 33.3% took over a year for complete recovery and normal operations. The data shows concern because 18.2% of respondents stated their communities still have not recovered from previous earthquake disasters. International research reveals recovery times stretch out when regions face economic challenges together with vulnerability to disasters since it becomes difficult to rebuild infrastructure with scarce financial resources (Olshansky et al., 2012; Kalogiannidis, 2023). The effectiveness of government aid programs together with international support works as a crucial determinant of how long recovery takes. Research data supports the conclusion that recovery achievements boost when authorities collaborate effectively with citizens while using efficient funding channels (Burton, 2015). The recovery efforts in Nepal following major earthquakes face significant challenges because of both political instability combined with poor coordination between humanitarian aid organizations according to Cook et al. (2018). The recovery situation demands immediate attention for developing transparent and community-based approaches to post-disaster recovery.

Recommendations for Strengthening Post-Earthquake Recovery Various actions should receive priority status to build recovery and rebuild processes. 1. The distribution process for financial support and reconstruction grants needs faster and transparent procedures to provide timely assistance to affected households. 2. Community-Based Reconstruction Approaches – Engaging local communities in recovery planning and decision-making for more inclusive and culturally appropriate rebuilding efforts. 3. Strong institutional coordination should enhance the performance of government agencies along with NGOs and international donors by preventing repetitions and distributing funds equity. 4. The initiative provides technical help for earthquake-resistant reconstruction through performance of engineering support combined with promoting improved construction methods that ensure safety during and after earthquakes. 5. The planning process for long-term resilience contains integrated disaster risk reduction elements which strengthen both preparedness capabilities and decrease vulnerability profiles. The study identifies significant shortcomings within Nepal's post-earthquake recovery practices because they need improved disaster response strategies together with enhanced institutional collaboration and strengthened monetary and professional resources. Past

earthquake experiences need to direct forthcoming policy changes that will speed up and enhance both the effectiveness and equity of disaster recovery operations.

### *3.7 Recommendations for improving resilience*

The creation of earthquake resilience demands threefold functionality through engineered structures along with institutional plans and community systems which both lower exposure to risk and improve readiness capabilities. The conclusions of this study emphasize institutional deficiencies at the same time they show that delayed recovery processes with insufficient preparation opportunities help explain decreased community resilience levels. The following series of suggestions aims to enhance the earthquake preparedness capabilities and response mechanisms and recovery protocols throughout Nepal. 1. Mere Improvements to institutional earthquake preparedness support programs The survey results reveal widespread dissatisfaction among the population regarding the preparedness actions of disaster response institutions. Most earthquake preparedness training programs run by local authorities received bad feedback from survey participants and no training was provided to 24.2% of respondents according to survey results. Moreover, only 12.1% of people surveyed marked excellent satisfaction with these training programs. To improve institutional support: Government authorities must create a system of mandatory earthquake drills that happens regularly in schools and workplaces along with communities according to Twigg (2015). The authority of the local government receives the highest trust in preparedness information according to 39.4% of respondents indicating that increased funding and specialized expertise for local municipalities will improve their preparedness efforts (Kalogiannidis, 2023). Preserving multipart communication channels is essential because different demographics obtain earthquake preparedness information through social media and government programs and media and NGOs and word of mouth (Paton & Johnston, 2017).

### *3.8 Increasing access to earthquake preparedness resources*

Earthquake preparedness suffers from restricted material supply which functions as an important obstacle to community resilience. The study results indicated that 87.9% of people never received preparedness materials from organizations. To improve access: The government together with NGOs should supply basic emergency preparedness kits that must be distributed specifically toward low-income families and properties in high-risk earthquake zones (Atando et al., 2024). The study revealed that 54.5% of people believed financial aid for strengthening buildings is crucial so the government should support programs through tax breaks or low-interest loans (Kijewski-Correa et al., 2021). Community-based emergency training at the ward level should be prioritized because 63.6% of respondents asked for earthquake safety training according to Burton (2015).

Early Warning Systems together with Response Mechanisms require enhancement. This research showed that 63.6% of people considered early warning systems as their most important concern. Abstract system alerts enable population safety because they create time for protective actions (Dallo et al., 2023). To strengthen early warning systems: The government of Nepal should immediately implement real-time seismic sensor expansions and mobile alert integration to release earthquake warnings immediately after events (Goda et al., 2019). Real-time earthquake monitoring requires local governments to work jointly with national institutions alongside NGOs and research organizations so early warnings stay accurate and provide effective actions (Neef et al. 2018). Communities must create hometown-based emergency teams which include community members properly trained in first aid and search & rescue and evacuation procedures (Ainuddin & Routray, 2012).

### *3.9 Strengthening community resilience and social cohesion*

Social networks hold essential functions for enhancing disaster resilience. Social relationships strengthened by communities lead to quicker disaster recovery rates because residents mutually share their resources and emotional support to rebuild their communities according to Aldrich & Meyer (2015). To improve community resilience: The local committees should conduct annual training and simulations since a majority of 51.5% of participants favored community-based emergency drills (Olshansky et al., 2012). Modern building regulations must incorporate traditional construction techniques like timber-laced masonry because these proven earthquake-resisting methods exist in many cultural practices (Cook et al., 2018). The process of risk mapping must be led jointly between local governments and community members to identify specific high-risk zones for developing appropriate mitigation plans (Burton, 2015).

### *3.10 Accelerating post-earthquake recovery and reconstruction*

The study revealed that 33.3% of participants needed more than one year to recuperate following past earthquakes and another 18.2% indicated their community remained nonrecovered. The delayed recovery process results mainly from bureaucratic difficulties and insufficient financial support alongside insufficient reconstruction blueprint development (Rahill et al., 2020). To improve recovery efforts: The procedure for obtaining post-earthquake financial aid needs better organization through simple guidelines and minimal documentation along with faster distribution practices (Sharma et al., 2018). Government housing reconstruction programs should extend their support to families through technical guidance to help them construct safe houses which meet seismic criteria (Olshansky et al., 2012). Local governance capacity can be enhanced when municipalities create trained personnel to lead disaster response teams for coordinating aid distribution and rebuilding monitoring as well as long-term recovery functions (Cook et al., 2018).

The findings from this study highlight urgent gaps in Nepal's earthquake preparedness, response, and recovery systems. The latest progress in earthquake-resistant construction and policy development addresses only part of the problems because Nepal faces solid challenges from insufficient training programs and poor institutional support along with prolonged recovery processes. The suggested recommendations provide necessary steps to strengthen resilience while decreasing earthquake-related risks and improving recovery results. The future development of community earthquake preparedness requires strong collaboration among government institutions and NGOs while involving academic institutions and local communities. Nepal will develop an improved disaster-resilient community when it directs efforts toward implementing early warning systems alongside earthquake-safe infrastructure along with community programs and simplified recovery frameworks.

### *3.11 Discussion*

Survey results indicate that only 15.2% of respondents frequently consider earthquake risks, while 45.5% rarely think about them. This reflects a low perception of seismic threats, potentially due to lack of recent large-scale earthquakes or misconceptions about structural safety. Social media (75.8%) was the primary information source, while government programs (21.2%) played a minimal role, indicating a gap in official awareness campaigns.

Community engagement is crucial for disaster preparedness. While 42.4% of respondents communicate daily with neighbors, only 36.4% have occasionally participated in disaster preparedness meetings, and 0% attend regularly. This suggests that social networks exist but are underutilized for coordinated preparedness efforts. Increased community-based disaster planning and engagement with local organizations could improve resilience.

The study found low levels of trust in national institutions, with only 6.9% relying on the national government for earthquake preparedness information. Local governments (39.4%) and NGOs (21.2%) were preferred sources, highlighting a trust gap at the national level. Additionally, 87.9% had never received preparedness kits, indicating that material support remains inadequate. These findings align with global studies suggesting that localized governance and decentralized disaster response models improve community trust and preparedness (Nakagawa & Shaw, 2004).

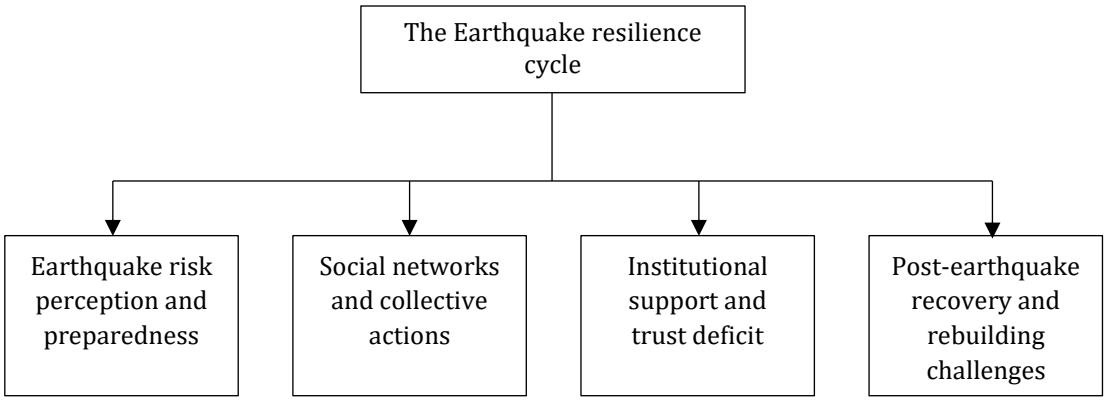


Fig. 2. The earthquake resilience cycle

Recovery timelines varied, with 33.3% of respondents stating that their communities took over a year to recover, while 18.2% reported that recovery is still incomplete. The slow aid distribution and bureaucratic hurdles in accessing reconstruction funds were key barriers. Comparative research from Japan's Kobe Earthquake (1995) and Chile's Maule Earthquake (2010) suggests that streamlined financial assistance, public-private rebuilding initiatives, and local engagement accelerate recovery efforts (Olshansky et al., 2012). Based on the description above, it can be concluded that there are several earthquake resilience cycles, as illustrated in Figure 2.

## 4. Conclusions

Experts studied earthquake resilience levels within vulnerable communities by evaluating their preparedness systems and emergency responses together with their recovery process difficulties. Younger adults and women are facing more obstacles to establish disaster resilience due to institutional support gaps and resource access limitations and recovery delays. Much progress exists in promoting earthquake-resistant buildings and awareness campaigns yet financial limitations alongside poorly trained personnel and social cohesion challenges make numerous areas still highly exposed. The survey showed that earthquake preparedness education satisfied a minority of 12.1% of participants yet 33.3% expressed negative opinions about it. Statistical data showed that 87.9% of respondents indicated total lack of access to preparedness materials which suggest restricted availability of such essential resources. Early warning systems and earthquake safety training receive support from 63.6% of participants but insufficient enough implementation exists. The existence of tight neighborhood communities contributed positively to community resilience but few residents participated in disaster preparedness meetings. This research suggests strengthening earthquake preparedness by developing education programs and enhancing warning system capabilities and supporting building retrofits and developing improved post-disaster recovery strategies. An effective disaster risk reduction program depends on institutional partnerships between national governments and nonprofit organizations with local communities. Through combined actions of technological progress and both community-driven approaches and government policy initiatives Nepal can develop resilient communities that face less disaster damage in the future. These research results supply practical recommendations to officials in both

disaster response and urban master planning alongside disaster management organizations. Future investigations need to study prolonged recovery approaches along with social economic indicators which affect earthquake readiness because they will generate sustainable risk reduction frameworks.

The study recommends several strategic actions to enhance earthquake preparedness and community resilience. First, public awareness campaigns should be strengthened through government-led education programs aimed at improving risk perception and encouraging proactive preparedness behaviors. Second, financial support mechanisms for structural retrofitting need to be expanded, including the provision of low-interest loan schemes to assist vulnerable households in enhancing building resilience. Third, the implementation of early warning systems is essential, which involves investing in seismic sensors and mobile-based alert technologies to deliver real-time earthquake notifications. Furthermore, community-based disaster drills should be intensified to improve coordination and response capacity among residents, non-governmental organizations, and government agencies. Lastly, institutional response mechanisms should be decentralized by empowering local governments and ward-level disaster management committees to ensure more rapid and effective assistance in post-earthquake situations.

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During the preparation of this work, the author used Grammarly to assist in improving grammar, clarity, and academic tone of the manuscript. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

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