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Appropriate Approaches in the Territorial Perspective for Reducing the Earthquake Risk in the Urban, Semi-Urban, and Rural Settings of Mid-Western Region of Nepal

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Abstract

This study explores appropriate, territory-specific approaches to earthquake risk reduction in the urban, semi-urban, and rural settings of Nepal's Mid-Western Region. Using empirical data derived from perceptions, preparedness actions, institutional capacity, and governance systems; the analysis reveals significant spatial disparities in how communities experience and respond to earthquake risks. Semi-urban areas, in particular, emerge as a critical zone of vulnerability due to inadequate attention in disaster planning, weak governance capacity, and hybrid infrastructural challenges. The findings emphasize that risk reduction measures must be context-sensitive and aligned with local geographical, institutional, and social realities. The study concludes that strengthening territorial disaster resilience requires a nuanced, inclusive, and decentralized approach that integrates policy enforcement, technical support, and community participation across all settlement types.

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Keywords: Earthquake Risk Reduction, Territorial Planning, Disaster Risk Reduction (DRR), Risk Perception, Preparedness and Resilience, Earthquake-Resistant Construction, Community-Based Approaches, Institutional Capacity

Introduction

Nepal is one of the most earthquake-prone countries in the world, situated on the seismically active boundary between the Indian and Eurasian tectonic plates. The Mid-Western Region of Nepal, encompassing both the hilly and mountainous terrains and the densely populated Terai plains, is highly vulnerable to seismic hazards due to its geographical location, fragile ecosystems, rapid but unplanned urbanization, and weak infrastructure (Bilham, 2013) (MoHA & DPNet, 2015). Despite this vulnerability, disaster risk reduction (DRR) approaches in Nepal have historically followed a centralized, top-down model, often failing to reflect the diverse needs of communities differentiated by geography, access to services, and socio-economic status.

A territorial approach to DRR recognizes that vulnerability and resilience are not uniform across space. This perspective considers physical, socio-economic, institutional, and environmental factors in specific territories (Wisner, Blaikie, Cannon, & Davis, 2004) (UNDRR, 2015). In the context of Nepal, urban areas typically suffer from over-concentration of population and infrastructure, increasing exposure and risk, whereas rural areas are characterized by limited access to services and resources that constrain recovery capacities (Sharma & Shrestha, 2016). Semi-urban settlements rapidly growing but under-regulated, often fall between these two extremes, facing high risks due to inadequate planning, poor governance, and weak enforcement of safety regulations (UN-Habitat, 2018).

The devastating 2015 Gorkha earthquake underscored the importance of tailored, context-specific DRR strategies across settlement types. Urban centers like Kathmandu Valley experienced significant infrastructure collapse due to structural weaknesses and construction without adequate seismic consideration. In contrast, many rural and semi-urban settlements suffered disproportionately in terms of loss of life and prolonged recovery, highlighting systemic neglect in preparedness planning and risk communication (NPC, 2015). The disaster revealed both the necessity and the opportunity to reshape Nepal's DRR strategies to be more locally grounded and spatially responsive.

A territorial perspective enables stakeholders, planners, policymakers, local governments, and communities to co-create DRR solutions that match the socio-physical realities of their environments. For example, while structural retrofitting and urban land-use planning may be effective in cities, rural communities may benefit more from community-based early warning systems, local masonry training, and the integration of indigenous knowledge (ADB, 2016) (JICA, 2021). Semi-urban areas, meanwhile, require hybrid approaches, combining elements of urban technical strategies and rural social mobilization to address their unique risk profiles.

This article aims to explore how earthquake risk can be effectively addressed through appropriate, territory-specific approaches in the Mid-Western Region of Nepal. Using primary

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data collected from urban, semi-urban, and rural settlements, combined with secondary literature, this study analyzes spatial variations in risk perception, preparedness behavior, and institutional readiness. The findings will support the development of differentiated strategies to build earthquake resilience in alignment with Nepal's federal structure and international frameworks such as the Sendai Framework for Disaster Risk Reduction.

Methodology

This study employed a mixed-method approach, combining quantitative surveys and secondary data collection from literature review to explore earthquake risk perception, preparedness, and mitigation strategies across urban, semi-urban, and rural settings in the Mid-Western Region of Nepal.

A structured questionnaire was administered to a sample of 410 respondents, selected using stratified random sampling across three settlement types: 122 from urban, 128 from semi-urban, and 160 from rural areas. The questionnaire gathered data on demographics, risk awareness, preparedness behaviors, and institutional response. In addition, review of literatures was done with national, international literatures and community involvements, and disaster risk management practices to contextualize the findings and identify localized practices and challenges.

The quantitative data were analyzed using descriptive statistics and cross-tabulations to identify patterns and differences between settlement types. Qualitative data were thematically analyzed to capture local narratives and perceptions influencing risk reduction behavior. This triangulated methodology ensured a holistic understanding of territorial differences in earthquake risk and informed the development of context-sensitive approaches.

Demographic Information

Demographic information provides critical context for understanding earthquake risk perception and preparedness across diverse settlement types in the Mid-Western Region of Nepal. Variations in education, gender, occupation, and age can influence awareness, attitudes, and the capacity to adopt risk reduction measures. This section offers a detailed profile of respondents to illuminate these dynamics.

Number of Participants

A total of 410 respondents participated in the study, distributed across urban, semi-urban, and rural settings.

Table 1: Number of Participants by Settlement Type

Study Area	Frequency	Percent
Urban	122	29.8%
Semi-urban	128	31.2%
Rural	160	39.0%
Total	**410**	**100.0%**

Source: Field Survey, 2025

The sample was designed to reflect the relative settlement patterns in the region. Rural respondents comprised the largest share (39.0%), underscoring the importance of capturing the

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perspectives of communities often more vulnerable due to remoteness and limited institutional support. Semi-urban areas accounted for 31.2% of participants highlighting the significance of transitional zones where urbanization and traditional practices often intersect. Urban respondents represented 29.8%, providing insights into contexts where formal infrastructure and institutional presence are typically stronger.

Gender Participation in the Study

Gender representation varied notably across settlement types. Table 2 presents gender distribution.

Table 2: **Gender Participation by Settlement Type**

Gender	Urban (%)	Semi-urban (%)	Rural (%)	Total (%)
Male	41.5	68.0	60.1	57.6
Female	58.5	32.0	39.9	42.4
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Survey, 2025

Overall, males comprised 57.6% of the respondents, while females accounted for 42.4%. Gender participation exhibited a clear spatial pattern:

- **Urban areas:** Highest female participation (58.5%), possibly reflecting greater inclusion in civic engagement and access to public life.
- **Semi-urban areas:** Most male-dominated (68.0%), indicating potential gender barriers to participation or representation.
- **Rural areas:** Male representation (60.1%) outweighed female participation (39.9%), consistent with observed patterns in many rural Nepali communities.

These differences may impact how communities receive, process, and act upon earthquake-related information, necessitating gender-sensitive engagement strategies.

Education Level of Respondents

Educational attainment among respondents varied widely, reflecting settlement-based disparities. Table 3 details the distribution.

Table 3: Educational Level by Settlement Type

Education Level	Urban (%)	Semi-urban (%)	Rural (%)	Total (%)
Illiterate	5.2	3.1	13.6	7.8
Basic Level (up to Grade 8)	21.6	38.3	13.6	23.9
Secondary Level (Grade 8–10)	18.1	18.8	14.3	16.8
Higher Secondary (Grade 11–12)	22.4	18.0	27.9	23.1
Bachelor's Degree	21.6	19.5	22.1	21.1
Master's Degree	11.2	2.3	8.4	7.3
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Survey, 2025

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Overall, the majority of respondents had some formal education. However, important patterns emerged:

- **Illiteracy:** Highest in rural areas (13.6%), suggesting barriers to accessing written DRR materials.
- **Basic education:** Most prevalent in semi-urban areas (38.3%), reflecting transitional educational access.
- **Higher secondary education:** Most common in rural settings (27.9%), perhaps due to migration of higher-educated young people to cities.
- **Bachelor's and Master's degrees:** Urban areas showed a higher proportion of advanced education (11.2% with master's degrees), underscoring better access to higher education facilities.

These variations indicate that communication and capacity-building efforts must be adapted to the educational profile of each territory.

Occupation of Respondents

Occupational status is central to understanding vulnerability and capacity. Table 4 presents occupational distribution.

Table 4: Occupation by Settlement Type

Occupation	Urban (%)	Semi-urban (%)	Rural (%)	Total (%)
Agriculture	28.3	55.1	36.2	40.4
Business	21.7	33.1	11.3	21.7
Government Job	17.9	6.3	19.9	14.7
Job in NGOs/INGOs/Private Sector	0.9	0.0	2.1	1.1
Others (daily wage, homemaker, unemployed)	31.1	5.5	30.5	22.2
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Field Survey, 2025

Agriculture dominated (40.4% overall), especially in semi-urban (55.1%) and rural (36.2%) contexts. Other key insights:

- **Urban areas:** A more diversified economy, with significant representation in government jobs (17.9%) and business (21.7%).
- **Rural areas:** Higher proportion engaged in government service (19.9%) and informal work.
- **Semi-urban areas:** Heavily reliant on agriculture and small businesses, with minimal NGO/private sector engagement.

This occupational structure shapes the nature of vulnerabilities and the feasibility of adopting technical or financial DRR interventions.

Descriptive Statistics of Respondents

Table 5 presents descriptive statistics on age and household composition.

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Table 5: Descriptive Statistics of Demographic Variables

Variable	Minimum	Maximum	Mean
Age of Respondents (years)	19	84	39.44
Number of Males in Household	1	11	2.89
Number of Females in Household	1	8	2.68

Source: Field Survey, 2025

The data suggest:

- A mature respondent profile (mean age ~39 years), likely representing household heads or primary decision-makers.
- Moderately sized families with balanced gender composition.
- Some households with extended family structures (up to 11 males or 8 females), particularly in rural areas.

This demographic profile is essential for understanding household resilience, social networks, and capacity for community-based disaster preparedness.

Summary of Demographic Findings

The demographic information demonstrates a **richly varied population** across settlement types:

- **Urban communities** tend to have higher female participation and higher levels of education and occupational diversity.
- **Semi-urban areas** are characterized by agriculture-dominated livelihoods, lower educational attainment, and male-dominated participation.
- **Rural settings** combine higher illiteracy with significant representation of higher secondary and bachelor's education, reflecting generational and migratory shifts.

These characteristics have critical implications for tailoring earthquake risk reduction strategies to local realities.

Earthquake Risk Perception by Settlement Type

The perception of earthquake risk is significantly shaped by settlement characteristics, such as urbanization level, infrastructure density, topographical constraints, and institutional attention. Understanding how residents interpret these contextual factors is essential for developing territorial strategies that align with people's lived realities (Dixit, 2004) (Shrestha, Aryal, & Dahal, 2017). The current study explored this dimension by analyzing five key statements relating to how settlement type influences earthquake risk perception.

Table 6: Earthquake Risk Perception by Settlement Type – Mean Score

Statement	Urban	Semi-urban	Rural	Total
Earthquake risk is perceived to be higher in urban areas than in rural areas.	3.65	3.91	3.62	3.72
Semi-urban areas often lack sufficient attention in earthquake risk reduction planning.	2.83	4.43	3.33	3.53

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People in rural areas are less aware of earthquake risks compared to urban populations.	3.43	4.22	3.51	3.71
The type of settlement influences how people prepare for earthquakes.	3.38	4.59	3.39	3.77
The topography and settlement pattern in my area increase earthquake vulnerability.	3.40	4.47	3.48	3.77

Source: Field Survey, 2025

The mean score for the statement "Earthquake risk is perceived to be higher in urban areas than in rural areas" is relatively consistent across urban (3.65), semi-urban (3.91), and rural (3.62) groups. This reflects a shared belief that urban centers with denser populations, taller buildings, and more complex infrastructure face higher earthquake consequences, despite often better access to emergency response systems. Similar observations are made in post-disaster studies from Kathmandu and Pokhara (Dixit, 2004).

The semi-urban population strongly agreed (mean 4.43) that they are often overlooked in earthquake risk reduction planning. This is the highest-rated item in the table and reveals a critical policy blind spot. Semi-urban areas, often in administrative transition, may fall between rural and urban planning frameworks leading to underinvestment and unclear institutional responsibility (IFRC, 2014) (Paudel, Regmi, & Khadka, 2018).

Semi-urban (4.22) and urban (3.43) respondents largely agree that rural people are less aware of earthquake risks, reflecting actual disparities in access to DRR education and technical support. Rural respondents themselves modestly acknowledged this (3.51), confirming self-perceived knowledge limitations. Similarly (Shrestha, Aryal, & Dahal, 2017) found that limited formal education and reliance on traditional beliefs often inhibit rural preparedness.

The belief that settlement type affects preparedness scored highest among semi-urban respondents (4.59), compared to both urban (3.38) and rural (3.39) groups. This suggests that semi-urban communities may be more conscious of their unique vulnerabilities and gaps, possibly due to mixed building typologies, recent in-migration, and weak regulatory enforcement. This aligns with literature emphasizing the need for customized risk reduction models for transitional settlements (Upreti & Bhattarai, 2012).

The physical environment's role in earthquake vulnerability is widely recognized, especially in semi-urban areas (4.47). Hill slopes, poorly terraced settlements, and informal housing expansion exacerbate risk in these zones. Even rural (3.48) and urban (3.40) groups acknowledge this, consistent with past findings from mountainous Nepalese municipalities (Dahal & Hasegawa, 2008).

The results strongly reinforce the idea that earthquake risk mitigation cannot follow a one-size-fits-all model. Key implications include: Urban Areas require stricter enforcement of building codes, emergency planning, and community outreach to counter complacency due to institutional proximity. Semi-Urban Areas, with the highest sense of neglect, need institutional clarity, investment in early warning systems, and tailored training programs. These areas are highly aware but poorly supported. Rural Areas need localized awareness campaigns,

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integration of indigenous knowledge systems, and subsidized retrofitting schemes to overcome knowledge and financial gaps. The widespread acknowledgment of topographical vulnerability suggests the need to integrate land-use planning and geological assessments into settlement planning especially in hill and slope-based communities of the Mid-Western region.

Appropriateness of Risk Reduction Approaches by Territory

A key to effective earthquake risk reduction lies in territorially differentiated strategies plans that consider not just the hazard, but also the physical, cultural, and institutional characteristics of different settlement types (Dixit, 2004) (UNDRR, 2015). The appropriateness of such strategies can only be ensured through local validation, and the findings from this study offer important insights into public opinion regarding what works best, and where.

Table 7: Appropriateness of Risk Reduction Approaches by Territory – Mean Scores

Statement	Urban	Semi-urban	Rural	Total
Urban areas require stricter enforcement of building codes for effective risk reduction.	3.87	4.08	3.73	3.89
In rural areas, traditional construction methods need to be integrated with modern retrofitting techniques.	3.37	4.43	3.59	3.79
Semi-urban areas would benefit from hybrid approaches combining urban and rural strategies.	3.29	4.44	3.93	3.90
Risk reduction approaches should be customized according to geographic location and community type.	3.65	4.61	3.36	3.85
Territorial planning (zoning, land use) should be earthquake-sensitive in all settlement types.	3.88	4.10	3.62	3.85

Source: Field Survey, 2025

All groups agree that urban areas need stricter compliance with building codes, with semi-urban respondents giving the highest support (4.08). This reflects growing concern about unregulated urban growth, unsafe vertical expansion, and complacency in oversight. The finding is consistent with post-2015 earthquake studies highlighting urban fragility in Nepal (Dixit, 2004) (JICA & MoHA, 2018).

The idea that semi-urban areas require a hybrid model borrowing elements from both urban and rural DRR strategies received the highest score of the dataset (4.44) from semi-urban respondents. This emphasizes the need to tailor strategies to these transitional zones, where neither full urban infrastructure nor traditional rural resilience mechanisms are dominant (IFRC, 2014) (Paudel, Regmi, & Khadka, 2018).

The rural population moderately supported (3.59) integrating traditional construction with modern retrofitting, with stronger backing from semi-urban respondents (4.43). This confirms a growing awareness that traditional practices must evolve, but still retain cultural relevance and affordability (Upreti & Bhattarai, 2012) (Shrestha, Aryal, & Dahal, 2017).

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The statement *"Risk reduction approaches should be customized according to geographic location and community type"* received high ratings overall (total mean = 3.85), with the semi-urban group again expressing the strongest view (4.61). This indicates broad recognition of territorial diversity in risk and vulnerability across the Mid-Western Region, supporting international best practices on locally led DRR (UNDRR, 2015).

There is strong support across all groups (urban = 3.88; semi-urban = 4.10; rural = 3.62) for incorporating earthquake sensitivity in territorial planning. Respondents seem to understand that land use, slope stability, and zoning have a major role in shaping seismic vulnerability, especially in hilly and peri-urban regions (Dahal & Hasegawa, 2008).

The data validates the core premise that territorial approaches are essential for meaningful risk reduction in the Mid-Western Region of Nepal. Key takeaways include:

- **Urban Areas:** Prioritize building code enforcement, risk-sensitive zoning, and public-private partnerships for retrofitting.
- **Semi-Urban Areas:** Implement hybrid models that draw from both rural resilience and urban regulation this includes flexible land use plans, capacity-building of local authorities, and incentives for safe self-construction.
- **Rural Areas:** Support traditional building practices with low-cost, culturally sensitive retrofitting technologies and promote training programs through rural municipalities.

Planning, Infrastructure, and Building Practices

Effective earthquake risk reduction demands territorially tailored planning and construction practices. This includes the regulation of built environments, enforcement of building codes, integration of disaster risk assessments in development planning, and dissemination of construction know-how across settlement types (Dixit, 2004) (UNDRR, 2019). The primary data collected under this thematic area reveal clear perceptions and gaps in current practices across urban, semi-urban, and rural territories.

Table 8: Planning, Infrastructure, and Building Practices – Mean Scores

Statement	Urban	Semi-urban	Rural	Total
Urban areas need better regulation of high-rise and densely packed buildings.	3.97	4.52	3.70	4.04
Semi-urban areas are often neglected in earthquake-safe urban planning.	3.62	4.38	3.49	3.82
Rural areas need more technical support for safe construction and retrofitting.	3.80	4.37	3.48	3.86
Infrastructure development projects in my area include disaster risk assessments.	3.59	4.49	3.24	3.75
Construction practices in my locality follow earthquake-resistant standards.	3.46	4.47	2.96	3.60

Source: Field Survey, 2025

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The highest level of agreement is observed among semi-urban respondents (4.52), followed by urban (3.97), on the need for tighter regulation of high-rise and densely built structures in urban zones. The shared concern across territories reflects growing awareness of poorly regulated vertical growth in cities like Nepalgunj and Tulsipur, which increases earthquake exposure and blocks evacuation routes (Dahal & Hasegawa, 2008) (MoUD, 2017).

Semi-urban areas are seen as systematically overlooked in earthquake-safe urban development, particularly by semi-urban residents themselves (mean=4.38). This suggests a planning vacuum where formal urban planning doesn't yet apply, and rural regulations no longer suffice leaving these areas vulnerable to haphazard growth and construction (Paudel, Regmi, & Khadka, 2018) (NPC, 2015).

Respondents agree that rural areas lack access to engineering services and retrofitting know-how, a critical gap given that many traditional homes in the hills are seismically weak. Interestingly, semi-urban residents (4.37) perceive this issue more strongly than rural ones (3.48), likely due to comparative exposure to available resources (Upreti & Bhattarai, 2012).

The statement on whether local infrastructure projects include disaster risk assessments received only moderate support, with semi-urban respondents again expressing the strongest agreement (4.49). However, rural participants rated this the lowest (3.24), indicating that DRR integration in infrastructure planning is weakest in rural areas, perhaps due to limited institutional capacity (Shrestha, Aryal, & Dahal, 2017) (MoFAGA, 2019).

Perceptions of actual adherence to earthquake-resistant construction are lowest in rural areas (2.96), with moderate scores in urban (3.46) and semi-urban (4.47) zones. This underscores the need to improve enforcement mechanisms, raise awareness, and expand training programs especially in rural and remote areas (JICA & MoHA, 2018).

This analysis reinforces that urban, semi-urban, and rural areas face distinct but interlinked challenges:

- **Urban areas** require stronger enforcement of zoning laws and vertical growth controls, particularly in seismic zones and liquefaction-prone areas.
- **Semi-urban areas** are in urgent need of targeted policies they are in a regulatory grey zone but are growing rapidly. Hybrid approaches that blend formal planning with community-based DRR models can work here.
- **Rural areas** must be supported with accessible, localized technical guidance and capacity-building, especially for earthquake-resilient retrofitting of traditional homes and public buildings.

Without integrating disaster risk assessments into infrastructure planning and ensuring compliance with resilient construction standards, development in all territories will continue to generate new vulnerabilities.

Institutional and Governance Capacity (Territorial Focus)

The effectiveness of earthquake risk reduction (DRR) efforts hinges on the institutional readiness and governance quality at the local level. This includes the presence of trained personnel, financial resources, inter-agency coordination, and sensitivity to territorial

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disparities in planning. Your survey data reveal stark contrasts in perception across settlement types, particularly highlighting the vulnerability of semi-urban and rural local governments.

Table 9: **Institutional and Governance Capacity by Settlement Type – Mean Scores**

Statement	Urban	Semi-urban	Rural	Total
Local governments in urban areas have more capacity for earthquake risk reduction than those in rural areas.	3.4624	4.2062	3.4911	3.7119
Semi-urban local governments often lack trained human resources and a budget for earthquake DRR.	3.7849	4.5052	3.4464	3.8907
Decentralized DRR planning is essential for effective earthquake risk management.	3.7312	4.1959	3.5268	3.8046
There is sufficient coordination among government agencies for territorial disaster planning.	3.4301	4.5464	3.0982	3.6656
The existing disaster risk governance system effectively addresses territorial differences.	3.4731	4.4845	3.1250	3.6689

Source: Field Survey, 2025

The belief that urban governments have more capacity for DRR than rural governments is moderately agreed upon across all regions, with semi-urban respondents (4.21) showing the highest agreement. This reflects a perceived hierarchy of capacity, with rural municipalities seen as less resourced and skilled. In reality, most rural municipalities struggle with low fiscal space, limited access to technical personnel, and insufficient data to plan or implement risk-informed development (NPC, 2020; UNDP, 2021).

The highest-rated statement (4.51 from semi-urban respondents) points to a critical shortage of trained human resources and dedicated DRR budgets in semi-urban local governments. These municipalities are often caught between rapid urbanization and weak institutional development, resulting in a governance vacuum. This finding aligns with previous studies indicating that semi-urban areas often fall outside national planning priorities (Dixit et al., 2013; Bhattarai & Upreti, 2020).

The statement on decentralized DRR planning received strong agreement across all territorial types (Total mean = 3.80), indicating a consensus that centralized, top-down approaches have not adequately responded to localized risks. Semi-urban participants again rated it highest (4.20), suggesting a demand for localized decision-making authority, capacity building, and planning tools tailored to their unique settlement dynamics (MoFAGA, 2019).

The statement regarding coordination among agencies for territorial disaster planning received lowest agreement from rural participants (3.10), followed by urban (3.43). Semi-urban areas again perceive the problem more sharply (4.55), suggesting that while they feel forgotten in national systems, they also lack effective horizontal coordination mechanisms (e.g., across municipal departments, or with provincial authorities). This highlights a need for clearer vertical and horizontal institutional links, especially in hazard-prone zones.

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Respondents across the board show skepticism toward the statement that current DRR governance systems address territorial differences well. Mean values from rural (3.13) and urban (3.47) participants suggest limited satisfaction, while semi-urban residents (4.48) feel particularly underserved. These points lack of differentiated strategies and resource allocation based on the spatial and socio-economic context of municipalities essential for DRR effectiveness in a diverse landscape like Mid-Western Nepal.

This analysis confirms that institutional readiness and governance challenges are territorially uneven and must be addressed accordingly:

- **Urban municipalities** benefit from more institutional resources and staffing but still face challenges in coordination and integration of DRR into sectoral planning.
- **Semi-urban areas**, while rapidly growing, are critically underserved in DRR planning requiring targeted investment in human resources, capacity development, and DRR mainstreaming.
- **Rural municipalities** often lack both technical and financial capacities, reinforcing the need for capacity-sharing partnerships, mobile technical teams, and external facilitation.

These findings underscore the importance of adaptive governance frameworks that can respond to the specific needs of each settlement type, while also enhancing inter-agency cooperation, transparency, and decentralized authority in DRR decision-making.

Community-Based Participatory Approaches: A Territorial Perspective

Community engagement is a cornerstone of effective disaster risk reduction. In Nepal's geographically and culturally diverse mid-western region, the nature and effectiveness of community-based participatory approaches (CBPA) vary significantly across urban, semi-urban, and rural settings. Your data sheds light on these differences and how they shape both awareness and action toward earthquake preparedness.

Table 10: Mean Scores on Community-Based Participatory Approaches by Settlement Type

Statement	Urban	Semi-urban	Rural	Total
Rural communities rely more on informal networks and traditional knowledge during disasters.	3.7957	4.2371	3.4775	3.8206
Urban communities depend more on institutional support and media for earthquake risk awareness.	3.7312	4.5876	3.5089	3.9238
Participatory disaster planning is more effective when tailored to local territory and social context.	3.6882	4.7113	3.6250	3.9934
Community-based DRR is underutilized in urban and semi-urban settings.	3.4624	4.5876	3.5357	3.8510
Earthquake safety awareness programs should be localized based on settlement type and geography.	3.9355	4.7010	4.1161	4.2483

Source: Field Survey, 2025

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Semi-urban respondents strongly agree (mean= 4.59) that urban communities depend more on institutional support and media, while rural communities (mean= 3.48) still rely on informal networks and indigenous knowledge. This suggests a territorial divide in how communities access and respond to earthquake-related information. It highlights the need for context-specific communication strategies, such as loudspeakers or local leaders in rural areas and digital media campaigns in urban cores.

Across all statements, semi-urban respondents report the highest agreement scores, particularly on:

- Participatory disaster planning tailored to the local context (4.71),
- Localization of awareness programs (4.70),
- Underutilization of community-based DRR (4.59).

This suggests a strong felt need among semi-urban populations for better integration and empowerment in DRR processes. These areas often fall between the cracks, urban plans don't fully cover them, and rural schemes don't fit their growing complexity.

The highest total mean score in this category (4.25) is for the statement that earthquake safety awareness programs must be localized based on settlement type and geography. This is universally agreed upon across urban (3.94), semi-urban (4.70), and rural (4.12) respondents, indicating a clear mandate for differentiated community outreach, taking into account literacy levels, cultural practices, and local risks.

While rural areas have historically relied on communal labor, kinship-based support, and local coping strategies, the urban and semi-urban settings score high in recognizing underutilization of community-based DRR (urban= 3.46, semi-urban= 4.59). This reflects a gap between formal DRR systems and grassroots engagement, possibly due to bureaucratic rigidity, poor decentralization of DRR funds, or lack of incentives for civic participation in urban settings.

The data reinforces the need for territorially sensitive community engagement models in earthquake DRR planning:

- **Urban areas** need to integrate community-based DRR within formal urban planning frameworks. Leveraging ward-level committees, local youth groups, and digital platforms can foster inclusive planning.
- **Semi-urban areas** emerge as the most underserved yet perceptive segment, indicating the need to pilot hybrid models—where top-down policies are complemented by strong grassroots mobilization, using tools like micro-zoning, mobile training units, and participatory simulation exercises.
- **Rural communities**, though rich in social cohesion, lack technical knowledge. Programs should strengthen traditional practices with scientific validation and connect them with external support systems, like mobile mason training, radio programs, and community risk mapping.

This section provides compelling evidence that a one-size-fits-all DRR strategy is ineffective. Earthquake risk reduction must be embedded within place-based participatory approaches, aligning with:

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- Local governance capacity,
- Infrastructure context,
- Social capital, and
- Cultural norms.

Such an approach will contribute to territorial justice in risk reduction, where all communities regardless of geography are empowered and protected.

Findings and Conclusion

Findings

Based on the primary data analysis and thematic exploration, the study reveals critical territorial differences in how communities and institutions across urban, semi-urban, and rural settings of the Mid-Western Region of Nepal perceive plan for, and respond to earthquake risk. Key findings include:

A. Perception of Earthquake Risk Varies by Settlement Type

- Earthquake risk is perceived to be highest in semi-urban areas, followed by urban and rural.
- Semi-urban respondents strongly agree that their areas lack attention in DRR planning, indicating a vulnerability blind spot.
- Awareness of earthquake risk is lower in rural areas, reflecting a need for targeted awareness programs.

B. Context-Specific Risk Reduction Approaches Are Essential

- There is strong consensus that risk reduction strategies must be customized based on geographic and community contexts.
- Semi-urban respondents emphasize the need for hybrid approaches, combining urban enforcement with rural adaptability.
- Urban areas show a need for strict building code enforcement, while rural areas require integration of traditional knowledge with retrofitting techniques.

C. Planning and Infrastructure Gaps across Territories

- Semi-urban areas are most neglected in earthquake-safe planning, despite growing population density.
- Infrastructure development in rural areas lacks disaster risk assessments and technical support.
- Urban construction practices often deviate from earthquake-resistant standards, indicating a gap between policy and implementation.

D. Institutional and Governance Capacity Is Uneven

- Urban local governments show relatively higher institutional capacity, while rural and semi-urban areas face constraints in human resources, budget, and coordination.
- Semi-urban areas report weaker governance systems and lack of inter-agency collaboration, which exacerbates their vulnerability.
- There is widespread agreement on the need for decentralized DRR planning with stronger local agency.

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E. Community-Based Participatory Approaches Are Underutilized

- Semi-urban communities express the highest need for participatory approaches, yet these areas often fall outside traditional DRR frameworks.
- Urban areas rely heavily on institutional systems, but lack meaningful community engagement.
- Rural communities depend on informal networks and traditional knowledge, which need to be validated and linked to formal systems.
- Localization of DRR awareness and planning is universally supported across all territories.

Conclusion

The research underscores that earthquake risk reduction in Nepal cannot succeed without a territorial lens; the urban, semi-urban, and rural contexts are not only geographically distinct but also socially, institutionally, and infrastructural diverse. Therefore, a territorially differentiated approach grounded in local realities, capacities, and vulnerabilities is essential.

- One-size-fits-all strategies are inadequate; DRR must be place-based, incorporating both top-down policies and bottom-up participation.
- Semi-urban areas emerge as the most underserved, despite being at high risk due to inadequate infrastructure and weak governance.
- Urban DRR efforts should focus on regulation enforcement and community inclusion, while rural areas require technical assistance and integration of indigenous coping mechanisms.
- Institutional capacity building, especially at the local level, and cross-sectoral coordination are crucial to ensure effective territorial governance in DRR.
- Participatory disaster planning, tailored to cultural, geographic, and administrative contexts, must be mainstreamed into national and local policies.

In essence, reducing earthquake risk in the Mid-Western Region of Nepal requires a territorially balanced, socially inclusive, and institutionally integrated approach. This territorial perspective not only enhances resilience but also contributes to equitable and sustainable disaster governance in a seismically vulnerable region.

Recommendations

A. Urban Areas

- Strengthen enforcement of building codes and conduct regular audits of high-rise and dense construction.
- Institutionalize community-based DRR programs to complement formal systems and enhance awareness.
- Promote public-private partnerships for retrofitting older infrastructure.

B. Semi-Urban Areas

- Develop hybrid DRR models combining rural flexibility with urban regulatory frameworks.
- Invest in human resource capacity and technical institutions at the municipal level.

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- Mainstream semi-urban areas into national-level DRR planning, recognizing their unique transitional challenges.

C. Rural Areas

- Provide technical support and subsidies for safe construction and retrofitting in traditional housing.
- Enhance earthquake risk awareness campaigns using culturally appropriate communication.
- Integrate traditional knowledge and informal networks into formal disaster management systems.

D. Cross-Cutting Recommendations

- Adopt territorial zoning and land-use planning that incorporate earthquake risk sensitivity.
- Institutionalize decentralized DRR planning at the local government level with defined roles and resources.
- Promote inter-agency coordination and multilevel governance for holistic disaster planning.
- Design and implement localized earthquake safety curricula and training tailored to each settlement type.

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