Urban Regeneration of Dwalkha: Purpose and Issues

Surya Bhakta Sangachhe [*], Aditi Dhakal

Abstract

Dwalkha, a heritage settlement full of values of tradition, culture, architecture, religion and tourism, was heavily damaged by 2015 Gorkha Earthquake. Starting in the early 1970 AD, its population started migrating to Kathmandu and abroad. Very few residents remained to nurture its essence. Residents began replacing traditional urban forms with modern concrete buildings. The remaining traditional buildings struggled to recovery from the significant impacts of the Gorkha Earthquake during which nearly 90% of its houses and many monuments were heavily damaged. If these facts are ignored, then the traditional vernacular architecture of Dwalkha will be lost.

Following the 2015 Gorkha Earthquake, Dwalkha developed a five-year urban regeneration plan in 2017. The proposed plan aimed to promote conservation and utilization of public spaces for community services; to stimulate local economy by promoting heritage conservation and entrepreneurship development, tourism and retail commercial activities that are compatible to heritage conservation; and to strengthen the capacity of municipality and community groups in managing urban growth and conservation of tangible and intangible cultural heritages. However, the plan remained only in paper.

The main objective of the paper is to examine the challenges Dwalkha experienced in implementing this plan, especially as it relates to preservation of heritage urban forms. The authors will explore these issues in Dwalkha through a mix of field investigation, literature review, and situational analysis. The latter will be achieved through detail earthquake damage assessment and discussion with different stakeholders.

***Key word**: Earthquake; Urban Regeneration; Cultural Heritage; Conservation*

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1. Introduction

Many cities worldwide are losing their cultural heritage. Generally, modernization is prioritized at the cost of cultural heritage (Chan, 2016) (Boussaa, 2017). Economic schemes most often erases the identity of a historic place. As a result, gentrification, population density and urban slums increase and brings an irreversible change (Boussaa, 2017) (Chan, 2016).

Urban regeneration is a process of bringing life into a deteriorating city thus growing its future potential of development (Boussaa, 2017). The degrading essence of historic town due to urbanization and industrialization together with out-migration of skilled professionals and lack of economic potentials can be protected by encouraging traditional professions, generating economic activities, conserving cultural infrastructures (thus promoting tourism) and upgrading skills of inhabitants (Parlewar, 2006).

Because of their architectural and historical identity, conservation areas are always special in nature (Mceldowney, 2006). Heritage should be conserved preserving their entire essence of authenticity. Authenticity can just be revealed, additional elements cannot add to authenticity (Assi, 2014). Awareness campaigns and public participation is highly important for urban regeneration (Dorji, 2019). Traditional forms of sustainability in the community should be a goal of urban renewal projects (Chan, 2016). However, conservation of cultural heritage has become a worldwide challenge.

Gorkha Earthquake and its subsequent effects

A 7.6 magnitude earthquake hit Nepal on 25 April 2015 at 11:56 am local time making Barpak, a historic district of Gorkha an epicenter. This catastrophic earthquake, which was followed by more than 300 aftershocks, resulted in 8,790 casualties and 22,300 injuries. Impact was clearly seen in the lives of approximately eight million people, almost one-third of the population of Nepal. Thirty-one of the country's seventy-five districts were affected. Many buildings such as private and government houses, heritage buildings, schools, colleges, hospitals, and infrastructures such as rural roads, bridges, water supply systems and even historical and cultural cities, and agricultural land faced destruction due to the earthquake (GoN, 2015) (NRA, Post Disaster Recovery Framework, 2016).

Following the Gorkha earthquake, government of Nepal prioritized reconstruction and revival of traditional settlements. The National Reconstruction and Rehabilitation Policy, 2072 mentions "Use of local materials, knowledge, skills and labor will be prioritized during reconstruction" as one of its guiding principles. Similarly, one of the six stated objectives of the policy is to "Reconstruct old settlements by maintaining their traditional characteristics and improving on them" (NRA, The National Reconstruction and Rehabilitation Policy, 2016). The Post Disaster Recovery Framework (PDRF) published by government has also mentioned that restoring urban heritage settlements will be given priority (NRA, Post Disaster Recovery Framework, 2016).

Dwalkha and impact to it due to Gorkha Earthquake

Dwalkha is a traditional Newar settlement that lies in a mountainous Dolakha district of Janakpur Zone, Province 3, Nepal, and dates to fourteen centuries. Dwalkha, which lies in Bhimeshwor Municipality, is famous for its cultural heritage, particularly the Dolakha Bhimsen temple and its traditional heritage settlement. Starting in the early 1970 AD, its population started migrating to Kathmandu and abroad. Very few residents remained to nurture its essence. According to census 2011, Dwalkha Bhimeshwor Area housed a population of around 1690 and about 338 households.

Some residents began replacing traditional urban forms with modern concrete buildings starting in 1990s. The remaining traditional buildings struggled to recovery from the significant impacts of the Gorkha Earthquake during which nearly 90% of its houses and many monuments were heavily damaged. If the trends in building construction continue during earthquake recovery, then the traditional vernacular construction of Dwalkha will be lost. Hence, there is an enormous task ahead of rebuilding, regenerating and revitalizing this traditional heritage settlement while retaining the historical, socio- cultural and vernacular architectural identity.

After Gorkha earthquake 2015, many people living in this settlement have come together and expressed their desire to conserve their heritage. People of Dwalkha requested Bhimeshwor municipality to assist in developing urban regeneration for Dwalkha. Bhimeshwor municipality requested technical assistance from the National Society for Earthquake Technology-Nepal (NSET). Hence, that formation of urban regeneration plan started in May 2016. A series of focal group discussions among NSET, Bhimeshwor municipality and residents of Dwalkha were conducted. In these discussions, locals stressed the need of urban regeneration. Some of them had even already studied the history of Dwalkha and made an inventory of existing monuments. The residents even provided the NSET team with infrastructural, social and cultural information and assisted the NSET team in surveys. With the participation of locals, technical support of NSET and interest of Bhimeshwor Municipality, the Urban Regeneration Plan of Dwalkha was formulated in 2016.

This paper discusses the development of " Urban Regeneration of Dwalkha : Purpose and Issues", the major elements of it, and the challenges Dwalkha experienced in attempting to implementing its urban regeneration plan, especially as it relates to preservation of heritage urban forms.

2. Methodology

The Urban Regeneration Plan of Dwalkha Bhimeshwor was prepared by Building Code Implementation Program in Municipalities of Nepal under NSET and Bhimeshwor Municipality with the financial assistance of United States Agency for International Development/Office of U.S. Foreign Disaster Assistance (USAID/OFDA) in 2017 AD. The plan is comprised of urban regeneration of a traditional and cultural settlement of "Dwalkha Bhimeshwor Area" through conservation, reconstruction, revitalization, restoration, capacity building and institutionalization.

Data collection was done through a census survey of households and buildings. The survey was conducted in two phases. The first phase consisted of data collection during the countrywide Detail Damage Assessment (DDA), which was conducted two months after Gorkha Earthquake 2015. A second phase consisted of data collection for urban regeneration plan in 2016 AD.

In the first phase, a structured questionnaire was used, which is attached in Annex 1. A door to door survey was conducted. Questions were asked to house owners, family members, relatives or neighbors (whoever was available during the survey). GPS and pictures of the house was also taken. Survey detail consisted of physical and technical details of the residential buildings.

In the second phase, a mixed methodology was utilized to gather information and a survey of infrastructures and monuments was performed. Width of roads was measured, and length was obtained from GIS maps. DDA of monuments were performed with minor modification in the questionnaire of the first phase. Details of monuments and infrastructure were obtained from the locals with semi structured questionnaires. Photos were taken and streetscapes were drawn with reference to the photos. Meetings were also organized at Bhimeshwor municipality office to obtain social, cultural and economic information of the area. All obtained data was mapped and verified in consecutive meetings and focal group discussions.

For both DDA and urban regeneration, NSET was invited by the Bhimeshwor municipality to perform the required tasks for DDA and urban regeneration. Survey was performed by the authors of this case study and the associate engineers, all of whom were trained by NSET especially for DDA. An authorized letter was sent with the surveyors.

3. Findings

The mix-methods survey of Dwalkha helped establish a clear understanding of its land use, architecture, and cultural practices. Analysis of the building survey found that 30% of Dwalkha is covered with built infrastructures and the remaining area is occupied by farmland, forests and open spaces. All the 338 houses in Dwalkha were surveyed among which 95% of houses were built following the traditional Newari architectural style. Most houses, 90%, were constructed using stone and mud. Only around 6% of houses were built using reinforced concrete construction. Among all, 95% of houses, were completely residential. Around half were more than 50 years old.

Besides houses, the survey documented an extensive number of heritage and cultural sites. Dwalkha consists of 63 heritages including temples, monuments, chaityas, bihars, wells etc of cultural importance. Dwalkha celebrates many historical feasts and festivals. Hence, its main streets are not just used for mobilization but also used by the chariots during festivals making them heritage routes. Hence, not only the heritage buildings, but the heritage route should also be conserved.

Detail damage assessment also showed the impacts of the earthquake. Nearly all, 95% of the houses, were damaged by Gorkha earthquake 2015 and need repair and reconstruction. As most of the buildings were more than 50 years old, and some of them have even been left empty, timely repair and maintenance of these buildings was often lacking.

Secondary data (inventory made by some intellectual locals) and door-to-door surveys helped identify socio-economic trends in Dwalkha. More than 72% of families of Dwalkha had migrated to Kathmandu and foreign cities. Most of the remaining residents were economically weak. The community seemed divided among those living in Dwalkha and those living in Kathmandu. From interviews with houseowners and municipal leaders, it was additionally clear that some traditional professions and activities were declining, which was one of the main reasons inhabitants were out migrating. Lack of economic activities and infrastructures generating income, lack of educational institutions were other significant reasons for out migration.

4. Proposal: Dwalkha Urban Regeneration (UR) Plan

Dwalkha Urban Regeneration (UR) Plan was prepared by Bhimeshwor Municipality with technical support from NSET to demonstrate revival of traditional settlement of Dolakha through a "people's process" while conserving the heritage values, stimulating economic growth and improving quality of life. A series of Focal Group Discussions (FGD) among NSET, Bhimeshwor Municipality, ward representatives of Dwalkha, elders and interested participants from Dwalkha were organized to participate the locals in the process of making the Urban Regeneration Plan. Field survey also involved information from the locals.

The first FGD was held on May 2016. A local reconstruction assistance committee was formed from among the locals, who further participated in all steps of planning and supported the technical team of NSET with necessary data. This committee also facilitated the finalizing of the boundary of UR area. The objectives of the UR plan were discussed in the FGDs and finalized objectives included all suggestions from locals. The data and information gathered were verified for any missing information in those focal group discussions. Final UR plan was presented to the residents of Dwalkha for their review and acceptance. In this way the residents participated at each stage so that they can feel a sense of belonging to the plan.

Objectives of Dwalkha Urban Regeneration Plan were:

1. Support rebuilding traditional settlement of Dolakha damaged by the earthquake in a planned and participatory manner keeping the urban fabric intact.
2. Support the rebuilding of traditional houses to make them safe and convenient while conserving local heritage.
3. Promote conservation and utilization of public spaces for community services.
4. Stimulate local economy by promoting entrepreneurship, tourism and retail commercial activities that are compatible to heritage conservation.
5. Strengthen local capacity of municipality and community groups in managing urban growth and conserving heritage in the context of a traditional town.

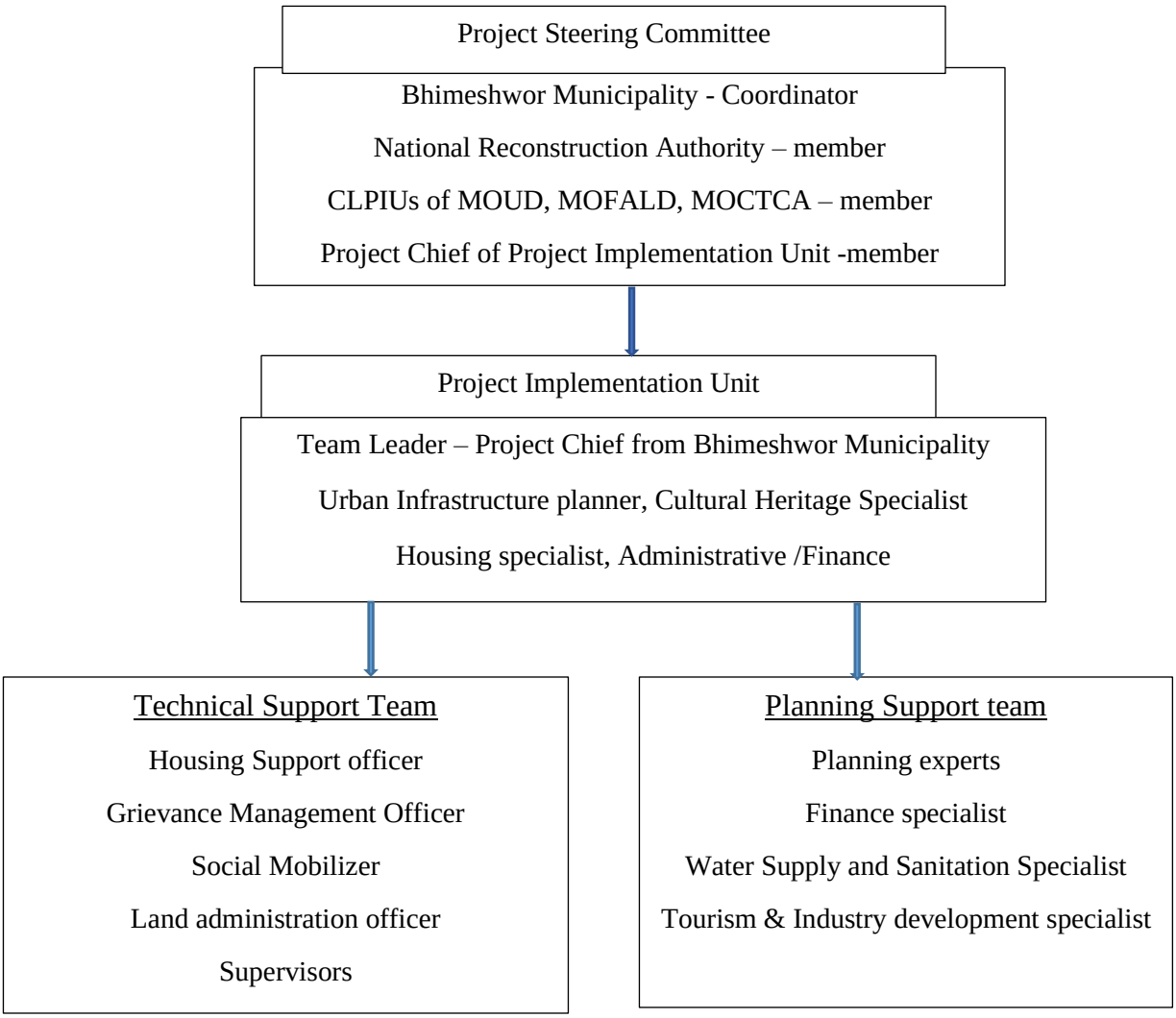
The total cost of UR of Dwalkha was estimated by the UR team of NSET as per the rate of construction of fiscal year 2015/16. The total cost of the project was estimated to be USD 3.73 million. This total did not include the total cost borne by local people to rebuild their houses or the cost of reconstruction projects undertaken by development partners, such as the Swiss Agency for Development and Cooperation, which is rebuilding several temples, stupas, and pedestrian paths. Major costs include a direct subsidy (partial grant for construction of houses provided by government) to house owners, reconstruction of public infrastructure, reconstruction of heritages and public heritage sites, socio-economic development and institutional capacity development. Approximately 10 percent of the total costs was required for technical and management support. The breakdown of the costs is summarized in Table 1.

Table 1: Cost Estimation of Dwalkha Urban Regeneration

Description of the items	Cost (USD million)
Housing Support (290 houses @ USD 5608/house)	1.63
Public Infrastructure	0.77
Heritage Conservation	0.62
Socio-economic development	0.28
Institutional capacity building	0.09
TA & management support	0.34
Total	3.73

Bhimeshwor municipality and community groups will implement the plan, under the guidance and support from National Reconstruction Authority (NRA), Ministry of Urban Development (MOUD), and Ministry of Federal Affairs and Local Development (MOFALD), and other development partners. For policy support and guidance, a project steering committee comprised of NRA, representatives of respective Central Level Project Implementation Units (CLPIU) of Ministry of Urban Development, Ministry of Federal Affairs and Local Development (MoFALD), and Ministry of Culture, Tourism and Civil Aviation (MoCTCA), and Bhimeshwor municipality will be formed.

The project will bring in experts of respective fields to support and guide the implementation of the project. A Technical Support Team will be stationed in Dwalkha. A management team will coordinate with Bhimeshwor municipality and community groups to facilitate the process of design and implementation. Community contracts and involvement of community groups will be sought in possible areas of work. The project will attempt to bring women groups, youth groups, and guthis (social groups) for smooth implementation of the project and its sustainability.



As planned in 2016, the project would be implemented over a period of five years. The first six months would be spent on preparatory works, including formulation of the steering and management teams, mobilization of local communities and consultation with local stakeholders to finalize details of the project. The second six months would focus on preparation of reconstruction and recovery plans, including housing reconstruction, neighborhood development, socio-economic development, and capacity development. The remaining three and half years would be spent on implementing the plans and regularly monitoring the progress. The final six months of the project would focus on evaluation and disseminating the findings of the project.

The complete Urban Regeneration Plan of Dwalkha can be found at Bhimeshwor Municipality.

5. Issues and Challenges created by non-implementation of Urban Regeneration Plan

The urban regeneration of Dwalkha was thus prepared including detailed information on objectives, expected outcome, human resource formation, and estimation of time and financial resources. This plan was submitted to Bhimeshwor municipality on 2017 AD, two years after the Gorkha Earthquake. However, it remained only in paper. Several factors made implementation of the conservation plan difficult.

One factor inhibiting implementation was the lack of a formal process for urban regeneration planning. There are no recorded urban regeneration projects in Nepal to date, hence there isn't a proper documented system for its institutionalization.

As the household survey showed, the society was divided along. An especially pronounced difference was between people living in and out of Dwalkha, which often translated to differences in financial status, and differences in determination regarding reconstruction. Locals urged for faster construction whereas people living in Kathmandu were more relaxed.

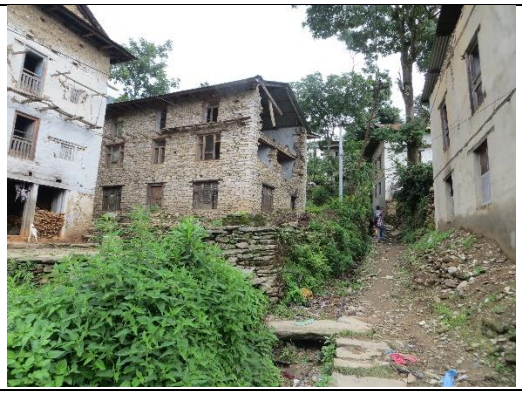
The extensive deterioration of the built environment also made implementation of a regeneration plan difficult. The tremor of April 2015 and followings aftershocks damaged 90% of traditional houses which were not maintained and were in a dilapidated condition as shown in Picture 1. Most of the concrete structures that are more recently built were intact or slightly damaged. Many residents interpreted this damage pattern to mean concrete was stronger and better construction material compared to bricks or stone masonry and timber. If this misconception is not corrected quickly, there is a fair possibility of these traditional heritage houses being replaced by concrete buildings. The effect can already be seen as in Picture 2.

Another factor is modernization which is taking over vernacular architecture. There is a desire among some people to 'modernize' the settlement with wider roads, more commercial buildings and change the land use to convert the settlement into commercial center. Therefore there is an urgent need to not only support the people who have lost their houses in the earthquake to build back better, but also to raise awareness regarding the benefits of the traditional old settlement and provide residents with the necessary support to build their communities and make them prosperous, while conserving the vernacular architecture and cultural heritage sites and building more livable and safer settlement where children and elderly can meet their needs.

Lack of awareness for the concept of conservation is another factor. The locals want their Dwalkha to be known as a heritage zone. But some of them are not aware of conserving its authentic architecture form. The construction of modern RCC buildings in Dwalkha shows that some locals lack a concept of conserving their settlement as a heritage settlement. Meanwhile the municipality knows that Dwalkha is losing its traditional architectural forms but is not forming any strict rules and regulations to stop the unplanned construction of RCC buildings. Furthermore, the reconstruction of temples has not followed conservation principles, an issue that is addressed in

the UR plan but that has not been implemented. Picture 3 shows the Pashupati temple instantly after Gorkha Earthquake 2015 and Picture 4 shows its reconstruction after earthquake.

A final consideration impacting implementation may be community capacity. It might be that neither the local authorities are capable to deliver quality control service nor are the artisans good enough to construct safer earthquake resistance buildings in vernacular architecture. Interviews with locals depicts that in the last 50 years the trend of passing the artistic professional qualities from generation to generation has been significantly reduced.



Picture 1: Traditional houses of Dwalkha damaged by earthquake

Picture 2: Traditional essence being engulfed by RCC construction

Picture 3: Pashupati Temple recently after Gorkha Earthquake 2015

Picture 4: Re-constructed Pashupati Temple

6. Conclusions and Potential Ways Forward

As the proposed plan five-year urban regeneration plan developed in 2017 aimed to promote conservation and utilization of public spaces for community services; to stimulate local economy by promoting heritage conservation and entrepreneurship development, tourism and retail commercial activities that are compatible to heritage conservation; and to strengthen the capacity of municipality and community groups in managing urban growth and conservation of tangible and intangible cultural heritages, it should be implemented effectively.

For its effective implementation urban regeneration should be institutionalized. As Local Government Operation Act 2017 provides authority to the municipalities for formation of their own development plans, municipalities can form their own urban regeneration plan. The program to develop technical and managerial capacity of the municipality should be launched and Ministry of Urban Development (MoUD) should define urban regeneration, formulate policies and develop guidelines for its implementation.

Residents of Dwalkha should develop notions of solidarity, pride and identity, and this will bind people together unite and find effective ways of implementing urban regeneration plan. Bhimeswor municipality should conduct activities to engender a sense of belonging and partnership between people.

For this people should be encouraged by providing incentives for reconstructing in traditional architecture. Furthermore, the local government should have a policy to encourage the maintenance of the vernacular buildings and discourage homeowner to let the building unattended and dilapidated. The case study shows that the unoccupied houses are not maintained timely and are more vulnerable to earthquake. Hence, economy generating activities such as home stay or small cottage industries should be encouraged in the heritage area, so that no house will remain unoccupied. Alternatively, privatSe investors could be encouraged to rebuild the houses (in partnership or in lease) and generate economy so that both the house owner and investor can benefit from it.

As some residents of Dwalkha misinterpreted the large number of damage of stone and mud masonry to mean concrete was stronger and better construction material compared to bricks or stone masonry, this misconception should be corrected quickly to conserve the traditional building typology of Dwalkha. For this, houseowner should be made aware of requirement of timely maintenance of their houses. Municipalities should take a lead partnering with NGOs to conduct awareness campaigns for disseminating importance of earthquake resistance vernacular construction technique and material for conservation. These campaigns should focus on prosperity through conservation.

Modernization should not be let to take over vernacular architecture. Municipality should conduct awareness campaigns to disseminate the benefits of conservation of traditional vernacular architecture which supports building more livable and safer settlement where children and elderly can meet their needs, and which could generate potential economic activities. Municipality should

produce architectural adaptation and rehabilitation model plans and design templates that provide ideas to modernize without losing heritage values as per Bye-Laws for Building construction in protected monument zone.

Concept of conservation should be made clear for municipal officers, political leaders and the locals. For this municipality should accept technical assistance of NGOs or academies. Study tours to the conserved towns can also impart visual knowledge.

Municipality should take a lead and partner with NGOs to assess and enhance capacity of required professionals such as masons, artisans etc. Trainings to enhance capacity of masons for earthquake resistant and safer vernacular construction techniques should be conducted. As the case study shows that the trend of passing the artistic professional qualities from generation to generation has been significantly reduced, municipality should also focus on encouraging the enhancement of such skills by promoting the vernacular architecture.

7. Acknowledgement

The post-earthquake Detail Damage Assessment on which this paper is based was carried out by NSET as a part of Public Private Partnership for Earthquake Risk Management with core funding from USAID/OFDA in 2015-16.

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Annex 1.

Building Damage Assessment Form

Inspection

Inspector ID: _____ Organization: _____ Inspection date and time: _____ Day/Month/Year: hh/mm

Building Description

Building ID _____ District _____ Tole _____

Building Name _____ Municipality/VDC _____ Ward No _____

Building contact/phone _____ Age of Building _____

Approx. "Footprint area" (sq. ft) _____ Number of Story _____

Exposure Number of Day Occupants _____ Number of Night Occupants _____

Slope of Ground ☐ Flat ☐ Moderate Slope ☐ Steep Slope

Type of Construction

☐ Adobe ☐ Stone in mud ☐ Stone in cement ☐ Brick/Block in cement ☐ Timber frame

☐ Bamboo ☐ Brick/Block in mud ☐ R.C frame ☐ Mix: _____ ☐ Others: _____

Type of Floor

☐ Flexible ☐ Rigid

Type of Roof

☐ Flexible ☐ Rigid

Primary Occupancy:

☐ Residential ☐ Hospital ☐ Government office ☐ Police station

☐ Educational ☐ Industry ☐ Office Institute ☐ Mix _____

☐ Commercial ☐ Assembly ☐ Hotel/Restaurant ☐ Others _____

Position of Building Block:

☐ Detached Building

☐ Adjoining Building in one side

☐ Adjoining Building in two side

☐ Adjoining Building in three side

Building Foot Print:

☐ Square ☐ E-shape

☐ Rectangular ☐ H-shape

☐ T-shape ☐ Multi Projected

☐ L-shape Building with Central Courtyard

☐ U-shape ☐ Others: _____

Vertical Structural Irregularity:

☐ Regular ☐ Irregular

If Irregular:

☐ Soft Storey ☐ Narrow and Tall

☐ Setbacks ☐ Heavy Overhang

Evaluation Investigate the building for the condition below and check the appropriate column.

	Damage Levels										Comments
	Extreme			Moderate-Heavy			Insignificant-Light			None	
	>2/3	1/3-2/3	<1/3	>2/3	1/3-2/3	<1/3	>2/3	1/3-2/3	<1/3		
Overall Hazards											
➢ Collapse or partial collapse	☐	☐	☐							☐	
➢ Building or storey leaning	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Structural Hazards											
➢ Foundation		☐			☐			☐		☐	
➢ Roofs/floors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
For Masonry Buildings											
➢ Corner separation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Diagonal cracking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Out of plane failure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ In-plane flexural failure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Delamination	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
For Reinforced Concrete Buildings											
➢ Joint	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Lap splice	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Columns	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Beams	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Infill	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Nonstructural Hazards											
➢ Parapets	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Cladding, glazing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Ceilings, light fixtures	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Interior walls, partitions	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
➢ Life lines (electric, water, etc)		☐			☐			☐		☐	
➢ Other _____		☐			☐			☐		☐	
Adjacent Building hazards		☐			☐			☐		☐	

General Comments: _____

Building Damage Assessment Form

Geotechnical hazards ☐ None ☐ Settlement ☐ Slope movement ☐ Liquefaction
☐ Ground fissures ☐ Rockfalls ☐ Others.....

Estimated Building Damage: Estimate building damage (repair cost ÷ replacement cost)

☐ None ☐ 0-1% ☐ 1-10% ☐ 10-30% ☐ 30-60% ☐ 60-100% ☐ 100%

Areas inspected ☐ Exterior ☐ Ground Story ☐ 1st Story ☐ Other Stories .....

Damage Grade

☐ Grade 1 ☐ Grade 2 ☐ Grade 3 ☐ Grade 4 ☐ Grade 5 ☐ None

Recommendations

☐ Repair ☐ Retrofit ☐ Demolish ☐ None ☐ Further Evaluation

Further Actions Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas: _____

☐ Further evaluation recommended: ☐ Structural ☐ Geotechnical ☐ Other _____

Comments: _____

Intensity (MMI) : ☐ I ☐ II ☐ III ☐ IV ☐ V ☐ VI ☐ VII ☐ VIII ☐ ☐ XI ☐ XII

Human Losses (if Known): Numbers of Deaths _____ Numbers of injuries _____

Photo: 1. Front view 2. Right Side View 3. Back Side View 4. Left Side View 5-8. Others

G.P.S _____

Survey End Time: hh/mm _____