

# Identification of Factors Affecting Rate of Reconstruction of Rural Housing: A Case of Bhardev Village, Gorkha Earthquake, 2015

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## Abstract

The impact of catastrophes on the built environment is greater in developing nations like Nepal since housing is typically the most significant asset for citizens. After the Gorkha Earthquake 2015, rural communities seriously suffered from post-disaster housing challenges. There were many issues and challenges faced during the reconstruction process, especially in the rural housing sector which consequently affected the rate and quality. This research is aimed to find the factors affecting reconstruction, which may help in better reconstruction policies for future setbacks. A questionnaire survey was used as the research tool, and the data was triangulated for validation utilizing key informant strategy and field observations. 110 household samples were taken through random sampling method and informal discussions with the social mobilizer, ward officials and engineers were done. Questionnaire was developed using studies from literature reviews and divided into four factors; physical, socio-cultural, economic and institutional factors. Through analysis of the survey data, critical factors affecting the rate of reconstruction were identified which was reconfirmed through the informal discussions with the key informants.

## Keywords

Reconstruction, Rural housing, Rate of reconstruction

## 1. Introduction

Two large earthquakes that devastated Nepal on April 25 and May 12 left thousands dead and severely damaged the country's infrastructure and way of life. More than 800,000 private residences, thousands of educational facilities, hundreds of cultural landmarks, and several other physical infrastructures were all impacted by the earthquake [1]. Residential structures, educational institutions, medical facilities, water supplies, communication networks, rural roads, agricultural land, bridges, electricity, and hydropower facilities were all impacted by the earthquake [2]. In the 2015 Gorkha earthquake, which largely affected rural areas, over 500,000 dwellings were severely damaged or destroyed. The majority of those whose homes were seriously damaged continued to live in temporary and improvised shelters more than 18 months following the earthquake. The disaster effect on social sector was 58% of which 86% was in housing sector. 49% of the total need was estimated for the housing sector alone as per the PDNA 2015.

Nepal Rural Housing Reconstruction Program is one of the program that was being implemented by NRA adopting Owner Driven Approach in order to assist the rural housing technically and financially for reconstruction of their damaged houses imposing some rules in order to make their houses earthquake resistant. The governmental financial assistance was provided in three stages: the first or initial tranche was given for mobilization of construction work, the second, on the completion of plinth level construction, the third or the final, on the completion of roof band level construction. After 18 months of the earthquake, the first tranche was distributed to beneficiarie. [3]. Large-scale housing destruction was mostly caused by Nepal's unreinforced masonry homes, which are typically located in rural areas, and are seismically vulnerable.

For the reconstruction program to be successful especially in developing countries like Nepal, the reconstruction of rural housing should be focused on. However, there were many issues and challenges faced during the reconstruction process, which consequently affected the rate and quality. This research is thus aimed to find the factors affecting reconstruction, which may help in better reconstruction policies for future setbacks.

The main objective of this study is:

- To identify the critical factors affecting the rate of rural housing reconstruction.

The specific objectives of this study are as follows:

- To find out the issues faced during the reconstruction process in rural housing.
- find the causes that hinders the speedy reconstruction in rural housing

## 2. Literature Review

### 2.1 Reconstruction

The medium- and long-term reconstruction and sustainable restoration of vital infrastructures, services, housing, facilities, and livelihoods necessary for the complete functioning of a community or society affected by a disaster, in accordance with the principles of sustainable development and build back better, to prevent or reduce the risk of a future disaster. [4]

### 2.2 The Reconstruction strategy in Nepal

As a response to the emergency declared by the Government of Nepal, clusters with the respective government departments as

the lead with co-lead by IFRC/UN agencies were activated. Shelter Cluster was led by DUDBC under MoUD with International Federation of Red Cross (IFRC) as the co-lead. Together, the Government of Nepal (GoN), local administrations, and Nepali society effectively carried out the urgent response by first undertaking a number of initiatives targeted at restoring a sense of normalcy in the earthquake-affected districts. [5]

According to a Post Disaster Need Assessment (PDNA), which was done in June 2015, there were approximately US\$7 billion in overall damages and losses, with US\$ 6.7 billion in reconstruction costs. National Reconstruction Authority was established on 25th December 2015, a national body that has extra-ordinary jurisdiction. [6]. The National Recovery Agency is the organization with the power to organize, carry out, manage, and assess the process of recovery and reconstruction. The primary goal was to rebuild livelihoods and improve communities in earthquake-affected districts by developing, directing, and coordinating community-based development and reconstruction initiatives. [7]

### 2.3 Rural Housing Reconstruction Strategy

The NRA had adopted Owner Driven multi-tranche mechanism to support rural housing reconstruction based on the best practices and lessons from international housing reconstruction process. A subsidy of NRs. 300,000 was being provided to all eligible beneficiaries. The subsidy was a support to victims to incorporate the seismic resistant techniques in the houses they reconstruct and to ensure that the compliance had been met; monitoring and verification process had been introduced before every tranche release.

### 2.4 Challenges faced during reconstruction in Nepal post Gorkha earthquake

**Suitability of land for the construction of house** As per the housing by-laws formulated by the Ministry of Federal Affairs and Local Development for rebuilding resilient community housing, unstable slope, swampy areas, river banks, landslide prone areas are considered inappropriate for the construction of house. The earthquake of 2015 has changed the land morphology of different areas making them unsuitable for the construction of house.

**Land ownership legal documents** As per the housing recovery policy, in order to be eligible for support, the victims are required to produce a land ownership certificate and a proof of habitation in the form of an electricity bill or a copy of any other housing bill. But, there are various social and legal issues that complicate this process and need to be taken into consideration for the recovery process to be effective and fair.

**Family structure** The recovery policy and any subsequent programs should support all members of the community, but special and additional consideration has to be given to people belonging to the marginalized sections of the population, such as people with disability and the elderly.

**Education/ Knowledge gap** The Nepali building industry lacks expertise in both conventional and earthquake-resistant

technology in general and in particular. Moreover, there is little formal training for the local construction craftspeople. There are noticeable disparities in the pace of reconstruction and recovery for people based on their economic, educational and social status. People in disadvantageous positions due to education, gender, disability, etc., are already sidelined from participating in decision-making or having access to benefits and services.

**Source of income** In the aftermath of a natural disaster, some communities are better positioned to rebuild while others struggle to recover due to the disparities in their economic level. The source of income and the income level of family, determines the rate of reconstruction.

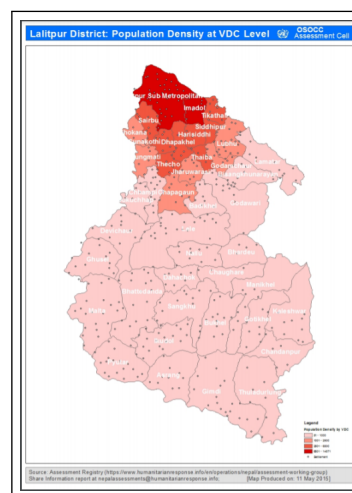
**Human resources and construction materials: timely availability and inflation** The collapsed houses failed to comply with the building code and the government also failed to enforce the building code. In this context, the technical service delivery part of the policy guideline covers the area of increasing the capacity at the local level by providing skill development training to masons. The shortage of manpower at the local level is directly related to the inflation in the rate of construction manpower.

Construction of large number of buildings at a very small period of time consumes huge construction materials. This creates shortage of construction materials in the market.

**Design of the house** Any community has its own unique identity which is displayed in the style of their housing as well. While the housing designs proposed by the government may be resilient to disasters, it is uncertain whether the designs can sufficiently fulfill the need of joint families or represent the communities' culture and identity.

## 3. Study Area

The study area is Bhardev village in Lalitpur district. It lies in the Konjyosom rural municipality which is just 22 km south from ring-road Satdobato. It borders with Panauti, Godawari, Lele, Nallu, Chaughare and Manikhel. As per the 2070 Nepal census it had a population of 2210 in 430 individual households.[8]



**Figure 1:** Study area Bhardev with bordering VDCs / municipalities

Around (65%) of the population is Tamang, (25%) is Newar and (10%) are from other castes. Tamang and Nepali are the two main languages used here. The majority of inhabitants rely on farming, especially maize, mustard, and other crops, as well as goat, buffalo, and poultry farming [9].

The number of beneficiaries enlisted for the reconstruction and retrofitting was 523. As per NRA, 304 of the listed beneficiaries had received their first installment of Rs 50,000, 277 beneficiaries had received the second installment of Rs 150,000 after the construction up to the plinth level and 204 beneficiaries had received the third installment of Rs 1,00,000 after the completion of their houses [10]. In the first two years of the program, only 60 people had started their reconstruction.

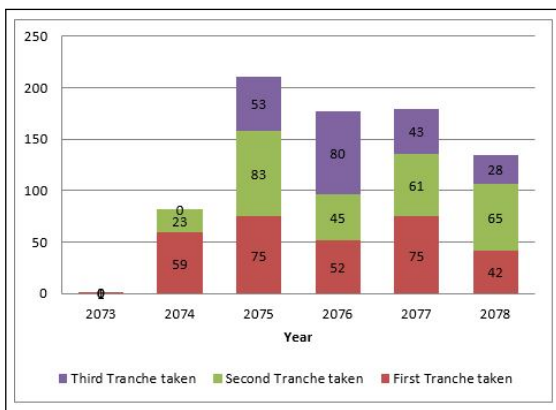


Figure 2: Data of instalments taken of Bhardev

#### 4. Methodology

The research is both qualitative as well as quantitative in nature. The study is qualitative as initially the factors affecting the rural housing reconstruction was collected through the literature reviews, direct observation of the study area and through the open ended unstructured interviews with the key informants. The questionnaire was prepared in such a way to ascertain the physical, socio-cultural, economic and institutional factors through different individual indicators. The data gained was recorded and quantified for analysis. Finally, thus obtained data was again validated through key informant interview and focused group discussion.

The data collection included both the primary and secondary source. Primary data was collected from site visit and observations, household survey through questionnaire and semi-structured interview on specific indicators of affecting factors with key informants. The ward secretaries of Bhardev, local elected representatives and the engineers that were involved during the reconstruction program are the key informants. The secondary data was collected from different sources; District Level Project Implementation Unit (DLPIU), Ministry of Federal Affairs and Local Development; District Level Project Implementation Unit (DLPIU), Ministry of Urban Development; HRRP, Lalitpur.

The sample size was determined by using the Yamane formula.

The formula used for these calculations was:

Formula for determining the sample size =

$$n = N \frac{N}{1 + N.e^2} \tag{1}$$

Where,

n = required sample size,

N = population size,

e = Margin of error (MoE),

e = 0.05

Now, total number of household = 523

Therefore, n=110

#### 5. Analysis and Findings

The demographic data of the beneficiaries is presented in the tables below.

##### 5.1 Demographic profile of the Beneficiaries of Reconstruction

Most of the respondents were male with about 72% of the total. The community was majorly of Tamang followed by Newar and Brahmin, Chhetri. The education level of the respondents was varied with equal number of literate and illiterate people. Majority of the people live in a joint family with agriculture as their main occupation.

##### Gender

Demographic Variables	Frequency(62)	Percentage(100%)
Male	45	72.60%
Female	17	27.40%

##### Caste

Demographic Variables	Frequency(62)	Percentage(100%)
Tamang	44	71.00%
Newar	10	16.10%
Brahmin	4	6.50%
Chhetri	4	6.50%

##### Age

Demographic Variables	Frequency(62)	Percentage(100%)
Below 20	6	9.70%
20-35	22	35.50%
36-50	16	25.80%
51-65	10	16.10%
Above 65	8	12.90%

**Education Level**

Demographic Variables	Frequency(62)	Percentage(100%)
Illiterate	15	24.20%
Literate	15	24.20%
Primary	7	11.30%
Secondary	9	14.50%
Higher level	16	25.80%

**Family type**

Demographic Variables	Frequency(62)	Percentage(100%)
Nuclear	14	22.60%
Joint	38	61.30%
Single woman	6	9.70%
Only elderly members	4	6.50%

**Source of Income**

Demographic Variables	Frequency(62)	Percentage(100%)
Agriculture	54	87.1%
Business	2	3.2%
Services	1	1.6%
Remittance	2	3.2%
Daily wage labour	3	4.8%

**Monthly income**

Demographic Variables	Frequency(62)	Percentage(100%)
less than 10000	8	12.9%
10000-30000	19	30.6%
30000-50000	30	48.4%
above 50000	5	8.1%

**5.2 Demographic profile of the Beneficiaries of Retrofitting**

Most of the respondents were male with about 92% of the total. People of Tamang caste were the majority in the community. Most people were literate and about 23% of people had received higher level education. Majority of the people live in a joint family with agriculture as their main occupation. Their monthly income on average is about 30000-50000.

**Gender**

Demographic Variables	Frequency(62)	Percentage(100%)
Male	48	92.30%
Female	4	7.70%

**Caste**

Demographic Variables	Frequency(62)	Percentage(100%)
Tamang	43	82.70%
Newar	6	11.50%
Chhetri	2	3.80%
Others	1	1.90%

**Age**

Demographic Variables	Frequency(62)	Percentage(100%)
Below 20	5	9.60%
20-35	13	25.00%
36-50	20	38.50%
51-65	11	21.20%
Above 65	3	5.80%

**Education Level**

Demographic Variables	Frequency(62)	Percentage(100%)
Illiterate	9	17.30%
Literate	17	32.70%
Primary	4	7.70%
Secondary	10	19.20%
Higher level	12	23.10%

**Family type**

Demographic Variables	Frequency(62)	Percentage(100%)
Nuclear	11	21.20%
Joint	37	71.20%
Single woman	1	1.90%
Only elderly members	3	5.80%

**Source of Income**

Demographic Variables	Frequency(62)	Percentage(100%)
Agriculture	50	96.20%
Business	2	3.80%
Services	0	0.00%
Remittance	0	0.00%
Daily wage labour	0	0.00%

**Monthly income**

Demographic Variables	Frequency(62)	Percentage(100%)
less than 10000	2	3.80%
10000-30000	21	40.40%
30000-50000	26	50.00%
above 50000	3	5.80%

**5.3 Type of house construction before and after earthquake**

The type of construction of rural houses was mostly stone masonry in mud mortar before the earthquake. Very few were of

brick masonry and reinforced cement concrete (Figure3) However, the type of construction preferred for reconstruction was brick masonry in cement mortar and stone masonry in cement mortar as shown in figure 4. The people believed that structure with cement mortar would be more resistant to earthquake.

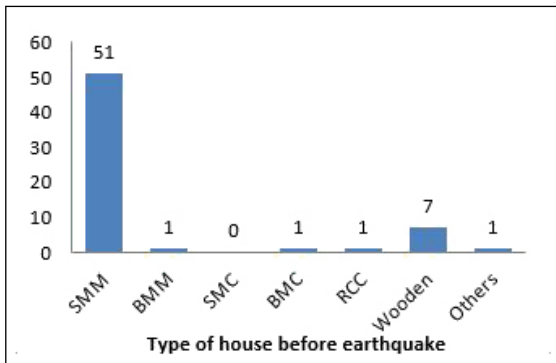


Figure 3: Type of house before earthquake

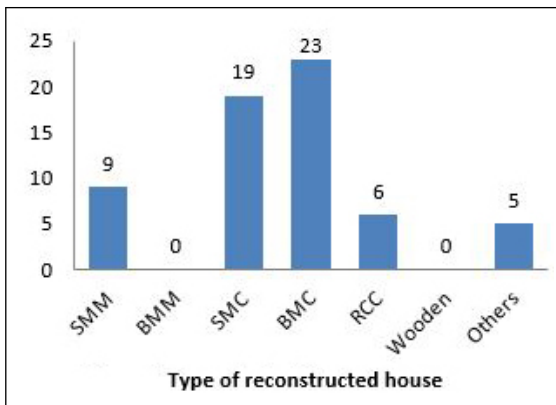


Figure 4: Type of reconstructed house

5.4 Grant distribution

Almost all the beneficiaries had received their first instalment of Rs 50000 provided by the government. 9 out of 62 beneficiaries had not taken the second instalment. Most of them did not follow the government norms, some had not started the construction and some were in financial difficulties as shown in the table3. Only 36 beneficiaries had taken the third instalment out of the 62 as shown in figure 5. Most of them did not follow the government rules and were in financial crisis. While few of them did not start the construction at all as shown in the table 4.

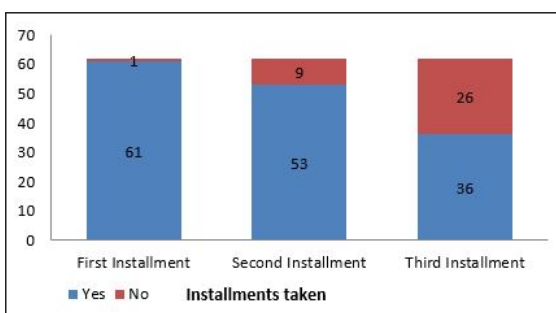


Figure 5: Installments taken

Table 1: Reasons for not getting second installment

Reasons for not getting second installment	Frequency(N)
First installment wasn't taken	1
Not completed till plinth level	0
Did not follow the government norms	5
Not started the construction	2
Financial difficulties	1

Table 2: Reasons for not getting third installment

Reasons for not getting third installment	Frequency (N)
First installment wasn't taken	1
Not completed till plinth level	0
Did not follow the government norms	10
Not started the construction	3
Financial difficulties	12

5.5 Satisfaction with the designs provided by the government

56% of the people were unsatisfied with the given designs. Most beneficiaries found the designs not functional enough. The rooms designed were very small to their needs. They usually store crops and other items in a big hall so, small rooms did not accommodate their needs.

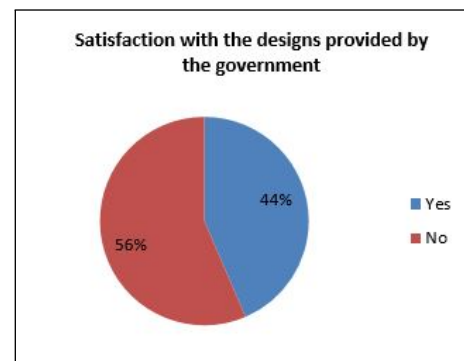


Figure 6: Satisfaction with designs provided by the government

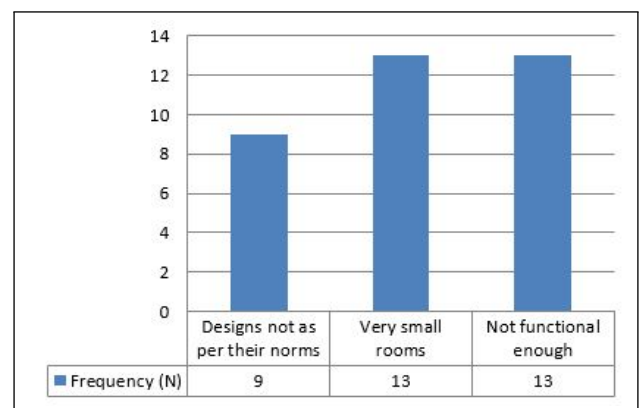


Figure 7: Reasons for dissatisfaction of designs

5.6 Reconstruction as per guidelines

Most of the beneficiaries reconstructed their houses as per the given guidelines. Those who did not follow the guidelines were mostly construction error. Some had no knowledge about the



norms while some were not satisfied with the designs and constructed the house as per their own needs. People with insufficient finance could not also complete the reconstruction as per the guidelines.

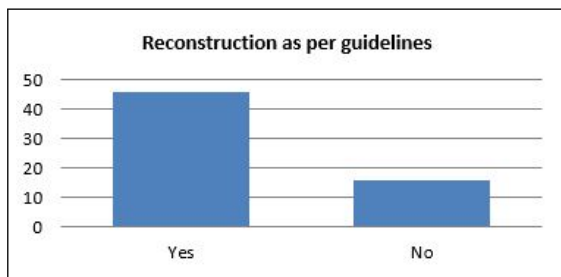


Figure 8: Reconstruction as per guidelines

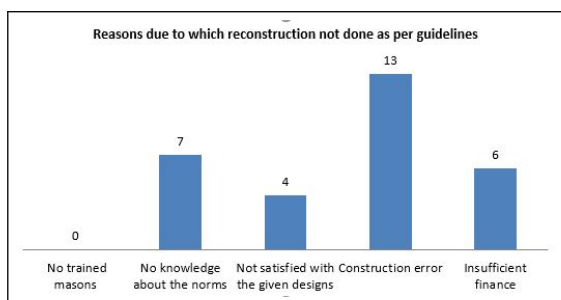


Figure 9: Reasons due to which reconstruction not done as per guidelines

### 5.7 Inflation in manpower and materials

Majority of the beneficiaries felt the inflation in construction manpower and materials due to which the reconstruction of the house was slow.



Figure 10: Inflation in construction manpower



Figure 11: Inflation in construction materials

### 5.8 Knowledge about post reconstruction activities and norms of government

Those who have knowledge about post reconstruction activities and norms of government have mostly completed the reconstruction and retrofitting of the house as seen below.

Table 3: Knowledge about reconstruction vs Completion of house

		Completed the reconstruction of house		
		Yes	No	Total
Knowledge about post reconstruction activities and norms of government	Yes	45	5	50
	No	7	5	12
	Total	52	10	62

Table 4: Knowledge about reconstruction vs Completion of retrofitting

		Completed the retrofitting of house		
		Yes	No	Total
Knowledge about post reconstruction activities and norms of government?	Yes	33	15	48
	No	0	4	4
	Total	33	19	52

### 5.9 Financial condition of beneficiaries

Table 5 shows that beneficiaries with low income were less likely to complete the reconstruction / retrofitting of the house. Chi Square test shows significant association among the family's income and completion of the house.

Table 5: Monthly income vs Completion of house

Family's monthly income		Completed the reconstruction of house		
		Yes	No	Total
		Count	Count	Count
Family's monthly income	<10000	3	5	8
	10000-30000	15	4	19
	30000-50000	29	1	30
	> 50000	5	0	5
	Total	52	10	62

Table 6: Chi-square test

Pearson Chi-Square Tests		
Family's monthly income	Chi-square	17.649
	df	3
	Sig.	.001 <sup>b,c</sup>

\*. The Chi-square statistic is significant at the .05 level.

## 6. Conclusion

The study was carried out to identify the factors affecting rate of reconstruction. According to the survey result it was found that the critical factors affecting rate of reconstruction were:

1. Financial status of the beneficiary

2. Knowledge about the post reconstruction activities and guidelines
3. Inflation in construction manpower and materials
4. Proper reconstruction techniques as per the guidelines
5. Design of the house as per the need

In Bhardev, 204 beneficiaries have completed the reconstruction. The rest of the beneficiaries could not complete the reconstruction within the given deadline due to the above mentioned reasons.

## 7. Recommendation

This research is done to identify the factors affecting reconstruction in rural housing. Further studies can be done in identifying factors affecting reconstruction in urban areas or comparing the factors to two different rural areas.

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