

Socio-Economic Impacts of Post-Earthquake of Nepal: A case of Owner Driven Approach in Rural Housing Reconstruction of Nepal

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Abstract

On 25 April 2015, a huge Mw 7.8 earthquake of Nepal, affected 31 of the country's 75 districts and more than 8 million people. 602,257 houses were fully damaged, and 285,099 houses were partially damaged. Government developed the Design Catalogue for Reconstruction of Earthquake Resistant Houses in October, 2015, to support rural households in the reconstruction of their houses. This research assesses Reconstruction impacts in Socio-economic aspects of rural housing with sustainable design parameters to Owner driven approach housing reconstruction of Sindhupalchok, Khalangataar Village of Nepal. Urge to move into permanent structure from temporary built during earthquake, financial burden of rural settlement mostly judged and exemplified to have two rooms house as better options according to their affordability. Vernacular architecture, sense of place and identity has been greatly influenced and impacted, creating chaos in livelihood and rural neighborhood because of same resolutions given by DUDBC housing models and format similar all over Nepal. Likewise, reconstruction is in the end phase of its five year program. Thus, this endeavor finds out villager's opinion on the sustainability aspects and impacts induced because of Owner-driven reconstruction design approach in rural housing reconstruction of Nepal.

Keywords

Reconstruction, Owner-driven approach, Socio-economic impacts, Sustainability

1. Introduction

On April 25, 2015, a 7.8 magnitude earthquake and its sequence of aftershocks caused 8,700 deaths and some 25,000 injuries. A Post-Disaster Needs Assessment (PDNA), completed on June 15, found that total damages and losses resulting from the earthquake sequence amounted to about \$7 billion, and reconstruction needs amounted to about \$6.7 billion. As the earthquake sequence destroyed 490,000 houses—mostly traditional mud-brick and mud-stone houses built and occupied by the rural poor—and rendered another 265,000 houses at least temporarily uninhabitable, the largest single need identified in the PDNA was housing and human settlements, accounting for \$3.27 billion of needs (or almost half of the total needs). This proposed \$200 million housing reconstruction project is being financing out of the IDA Crisis Response Window (CRW), and it will enable the reconstruction of about

one-tenth of the housing destroyed in the earthquake sequence. An accompanying Multi-Donor Trust Fund (MDTF) is also being established to enable development partners who are interested in contributing to housing reconstruction to participate in this effort.[1]. Nepal Reconstruction Authority (NRA), and Department of Urban Development and Building Construction (DUDBC) deployed the Design Catalogue for Reconstruction of Earthquake Resistant Houses in Oct. 2015, to support rural households in the reconstruction of their houses. The objective of this document is to provide rural households with clear guidance regarding earthquake resistant construction techniques and to support them to have house designs in compliance with the National Building Code of Nepal that are safe, adequate, and affordable. It is expected that the design catalogue supports rural households to apply for, and secure the building permit through various types of design models and flexible designs. And hoped that the

information provided in the Design Catalogue will be a strong basis for rural households to start the construction of their houses. The house designs have been prepared in such a way as to ensure that vernacular architecture and building practices can be maintained with the addition earthquake resistant construction practices to ensure that households are able to ‘Build Back Better’.[2]

A recent report by the [3] has concluded that the gaps between emergency relief and development must be addressed, and the recovery efforts have tendency of tapering off over time, with media and donor attention drifting to other emergency situations. However, since disasters and development are interlinked, it is the poor or low-income group, who could be left in precarious or vulnerable condition than pre-disaster, if recovery efforts are not planned with long-term vision.

2. Research Problem

Owner driven reconstruction (ODR), in its current form has been become prevalent after the 2001, Gujarat, India earthquake. The main idea in this model is to enable individuals to undertake the reconstruction of their houses. Diverse mechanism such as conditional financial assistance, usually an installment basis, as well as technical support and supervision are integrated into this model to ensure safe building practices. The ODR model has become default strategy in post disaster housing recovery as a result of being advocated by key lending agencies including World Bank, UN-Habitat. Funding the majority of reconstruction projects in disaster affected developing countries, the World Bank has been in a position to influence post disaster reconstruction policies. And hence has advised this approach as the most successful housing assistance strategy.

There are plenty of documented examples of reconstruction projects where short sighted investment has been unsuccessful mid or long term outcomes. For example, contextually inappropriate transitional shelter provision which lay scattered unused after housing reconstruction (e.g. in Sri Lanka) [4] inappropriate house design (size) without consideration of livelihood activity incorporation or house extension [5] or unaffordable resilient technology [6] or introducing radical changes to existing technology or proposing alien technology [7]. Similarly, the premature or poorly planned withdrawal of disaster recovery agencies in Sri Lanka, post 2004

tsunami has also led to poor social outcomes [8]. Furthermore, scholars have also witnessed that the surge in jobs created during reconstruction is typically not sustained, risking the skills in safe construction not getting embedded in the local culture [9]. All of these examples suggest that a short-term focus during reconstruction has retained or even increased people’s vulnerabilities to future disasters [10].

3. Need and Importance of Research

The ODR model has been promoted as it involves people in decisions that are directly related to them. By employing this model, the rebuilt houses reflect people’s requirement, priorities and aspirations. Such involvement offers intangible benefits such as instilling a sense of place attachment and empowering people. Numerous empirical studies e.g., report that adoption of this model ensues a higher level of perceived satisfaction and higher occupancy rate compared to other models of post-disaster housing reconstruction including the donor-driven model. Some researchers also indicate that this approach is faster and more economical as owners supplement the assistance with their own assets.

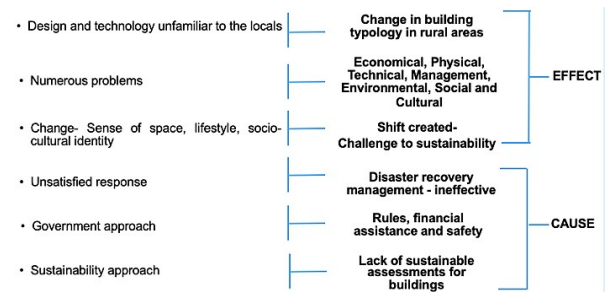


Figure 1: Framework of Research Problem [11]

A review of literature, however, reveals that apart from concerns over the safety of the reconstructed buildings raised by few studies, little is known about the potential shortcomings of this model. As this model is expected to be adopted in the aftermath of future disaster, it is critical to develop our understanding about its potential drawbacks [10]. Investigating the long term recovery process of affected household eight and ten years after these earthquake provides some insights about the deficiencies in the housing recovery programmes, their formulation and delivery. There are three main common issues, identified in these two post-disaster programmes [12].

1. Owner-driven housing reconstruction and the role of tenure in defining access to the programme.
2. Different capability of beneficiaries.
3. Quality of the built environment: Practical Shortcomings

Moreover, the formulation of the ODR model implies an incorrect assumption about equal capability of households to manage their housing reconstruction. Different factors including ex-ante vulnerabilities, disaster impacts, or contextual issues might curtail the capability of households to achieve their recovery. Even more problematic, the most vulnerable groups received the least assistance, compared to the elites who often expand their capabilities.

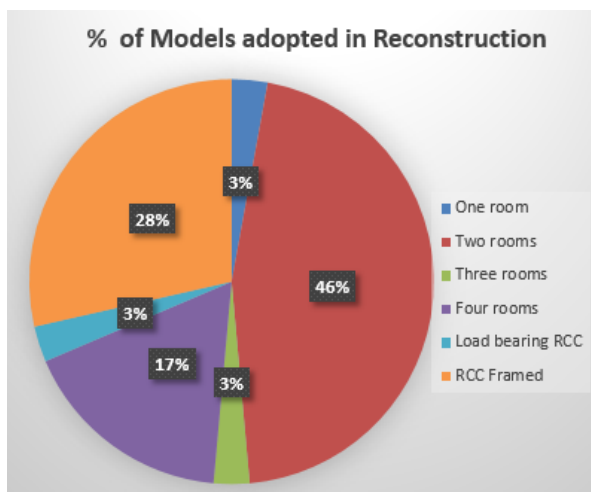


Figure 2: Choices and Adopted model of owner driven approach reconstruction

Given Pie chart illustrates the owner driven reconstruction adopted structure model of Padampokhari village in total of thirty-six houses. Where, two room design has majority in owner driven approach by 46% and 3% of one and three room design in least choice.

4. Research Objective

- The main objective of the research was to assess Socio-Economic sustainability perspective of Owner driven reconstruction approach in context of rural/village housing of Nepal.

And to achieve this aim of the research, the specific objectives were as follows:

- To study the social dimensions and impacts created by reconstruction in Rural Housing.
- To study the economic dimensions and impacts created by reconstruction in Rural Housing.
- To examine NRA guided 2 rooms Reconstruction design in terms of social and economic impacts

5. Methodology

This is a qualitative case study research, so it is designed to be more explanatory and descriptive that requires the use of mixed methods Thus, based on Post-positivist, Constructivist paradigm as it requires a particular methodology suitable to the problem of reconstruction mentioned Hundred percent effected site was selected for case-study i.e. Sindhupalchok-Khalangataar. Additionally, chosen site was also preferred because of having specific and rich local architecture. And the reconstruction model apdoted was Owner driven approach.

The ontology of the research is that ongoing reconstruction has socio-economic, socio-culture problems and challenges and missing sustainability assessment. The study of knowledge (epistemology) of the research is the information from the locals, organizations, government authorities, documents, data from NRA. And, on the part of quantitative study, the pattern of reconstruction and the impacts that has been in the study area “Khalangataar” has been approached with the use of semi structured questionnaires, in-depth interviews, focus groups discussions, key informant’s interviews, expert opinions, direct observation and photographs. As the research tries to identify the impacts indicators and parameters, so it is very essential to understand the meanings and analyze the responses collected through both qualitative and quantitative methods.

5.1 Research Design

To understand the ODR impacts in social, cultural and economic dimensions and to develop the building sustainability assessment which entails in depth study on what, why and how of the existing reconstruction scenario. This is designed to be qualitative case study research more with explanatory and descriptive mixed methods. On the part of quantitative study, the pattern of reconstruction and the impacts that has been in the study area “Khalangataar” has been approached with the use of semi structured questionnaires, remote

sensing imagery, household ground survey, telephone interviews. In order to carry out the site research, impacts and sustainability assessment tools with indicators and parameters have been frame worked. The selection of parameters and indicators are contextual and adaptable in the scenario of Khalangataar reconstruction. For every indicator, the criteria for impacts was developed that were subjective, case dependent and effective. On the basis of rural reconstruction, the “Reconstruction impacts analysis and Sustainability matrix” developed for the assessment of reconstructed buildings with indicators and the parameters for the Sustainability mentioned below:

5.1.1 Society

- Welfare- Better Services and Facilities.
- Maintenance, Building Easily Adaptable to Future Changes, Social Status.
- Health- Indoor Air Quality, Diseases or Illness.
- Comfort- Illuminance/Sunlight, Daylight, Thermal Comfort-Warm Inside, Heat Insulation, Sound Insulation and Noise Reduction.
- Satisfaction- Psychosocial Well Being, Construction Satisfaction, Empowerment, Relaxation.
- Safety and security- New House Stronger than their Traditional House, Resilience of Traditional House, Build Back Better.
- Human Interactions- Accessible, Easier in Usage, Friendly to all Age Groups and Gender, Inclusiveness in Decision Making, Participation, Awareness.

5.1.2 Culture

- Architecture- Local Architectural Style, Functional Planning, Visual Harmony, Building Shape and Size, Design Choices Implementation, Design Choices Preference.
- Culture and Context- Historical Values Cultural Significance of House, Sense of Identity, Sense of Creation.
- Comfort- Illuminance/Sunlight, Daylight, Thermal Comfort-Warm Inside, Heat Insulation, Sound Insulation and Noise Reduction.
- Spatial Analysis- Production Function with crops, livestock, consumption, Life Function with comfort, development, communication space and Ecological Function with Design-Impact, Time-Communication Space and Clan-Community Space.

5.1.3 Economy

- Building adaptability- affordable.
- Long Term Stability- One Time Investment .
- Maintenance-Items to maintain.
- Resources Cost- Land, Materials, Labor, equipment, Transport.
- Funds- Helpful, Time in Receiving Fund, Difficulty in Receiving Fund, Loans.
- Source of Income- Rentable Space for Commercial Use.

The environmental and culture aspects are loomed partially with semi- structured questionnaires, remote sensing imagery, reports, interviews and observation. The social and economic aspects are dealt more with observations, in depth interviews and focus group discussions.

5.2 Sampling

The Total house in the Khalangataar are sixty-three in numbers. However, Thirty-five house are only being used by the villagers out of sixty-three. Other remaining houses are vacant; their owners are out of the village for better opportunities in the capital city and abroad. Since the research is descriptive, 42.8 percentage sample size has been taken in respective to total household of the village that are being used in the village. The samples cover the diverse socio-economic condition, making it representative of the population of selected case area.

6. Limitation

A lack of long-term research on ODR projects that identifies the contingent yet generalizable issues and factors which determine the success or failure of projects in enhancing the disaster resilience of at-risk human settlements and communities in Nepal. Disciplinary fragmentation and a lack of cross-disciplinary research on how ODHR projects are conceived, implemented and evaluated. Research does not provide actual design guidelines but examines the reconstruction impacts in socio-economic perspectives. Cultural and environment perspective of sustainability are briefly explored directly and indirectly, but Gender and social inclusion, are limited in this research. Physical mapping is done to understand the change in socio-economic activities and livelihoods of people created by post disaster earthquake.

7. Literature Review

Housing is part of Universal Declaration of Human Rights (developed in 1942 after the devastation of World War II); Establishment of a dedicated authority, the UN Human Settlements Programme (UN-Habitat, in 1978) for ensuring sustainable and adequate housing for all; Establishment of the UN International Strategy for Disaster Reduction (UNISDR, in 1999) for coordination of disaster reduction efforts in the context of growing numbers of adversities. Variety of hazard types, specifics of the particular context and diversity of challenges faced by communities imposed by disaster make post-disaster reconstruction complex [10]. Short-sighted investment has been unsuccessful mid- or long-term outcomes. For e.g., contextually inappropriate transitional shelter provision which lay scattered unused after housing reconstruction (e.g. in Sri Lanka) [4]. Inappropriate house design (size) without consideration of livelihood activity incorporation or house extension [5] Or unaffordable resilient technology [6], or introducing radical to existing technology or proposing alien technology [7]. Scholars witnessed that surge in jobs created during reconstruction is typically not sustained, risking the skills in safe construction not getting embedded in the local culture [9]. All of these examples suggest that a short-term focus during reconstruction has retained or even increased people's vulnerabilities to future disasters [10].

7.1 Owner driven Reconstruction

An owner-driven reconstruction (ODR) process has begun with the damage assessment, which determines the eligibility of households and will confirm the scale of the housing reconstruction effort. Cash assistance is being accompanied by government-instituted support mechanisms for technical, material, supervisory, training and social facilitation, by which homeowners will build back better with enhanced hazard resilience [5]. ODR principles [13]

7.1.1 ODR Principles

- Participatory process of decision-making.
- Appropriate technical support.
- Appropriate financial assistance.
- Government recognition of ODR and reconstruction policy advocacy.
- Disaster Risk Reduction (DRR) by understanding risk and building safer

environments.

- Participation and technical support requires regular access to the families.
- Reconstruction extends beyond housing.
- Addressing security of tenure-related vulnerabilities.
- Informed decision-making by all parties.
- Responsible Resettlement.

7.1.2 Policy framework for Recovery and Reconstruction

The Reconstruction and Rehabilitation Policy brings together all the important actors, government, NGOs, international agencies, private sector, communities and volunteers to plan and implement the earthquake recovery and reconstruction program in Nepal. Together, the Reconstruction and Rehabilitation Policy and the NRA establish a framework for managing earthquake recovery and reconstruction [14].

7.1.3 Local implementation for recovery and reconstruction

Several new bodies will be created to support local implementation. Ministries will provide technical oversight to local bodies responsible for carrying out reconstruction projects. District-level officers and staff will primarily have supervisory roles [14].

- NRA sub regional offices.
- District coordination committees.
- Resource centers.
- Village Development Committees.
- Municipalities.
- Existing Local Coordination bodies.

8. Case Area: Khalangataar, Sindhupalchok

Initial epicenter of the earthquake: Gorkha district, highest magnitude (6.7) aftershock took place in Sindhupalchok district. 7 May, 3057 people were dead and 860 are injured. 3000 people remain unaccounted for. (GON 8 May) 63,885 houses are severely and 2,751 houses are moderately damaged. 6th May an estimated 109,000 people (Ministry of Home Affairs 7th May) are affected (40% of district population as per the 2011 Census).

Khalangataar Settlement, totally destructed by earthquake. Reconstruction approach: Owner driven

with technical supervision of Red Cross Society and ARSO Nepal. Village settlements rich in vernacular architecture. Mostly Tamang community: 80% followed by Christian and Hindu. Habitat area around 260mx110m excluding agriculture land. Total number of Household: 63 in numbers. But, people live in 35 houses only Approximate population size 280 nos.

9. Findings

Table 1: Details of House before and after Earthquake

Details of House	Before Earthquake	After Earthquake
Land ownership	Personal	Personal
Architecture style	Stone masonry	RCC. & Brick masonry
No. Of storeys	2-3	1
No.of Rooms	3	2 and 4
Internal Room	13'x23', 15'x24'	10'x12', 12'x12'
Age of House	10-30 yrs.	1-4 yrs.
Ht. of Rooms	Six feet	Eight feet
Plinth area	16'x26', 18'x33'	13'6"x32', 12'x27'
Shape of House	Rectangle	Rectangle, Square
Door no.& Size	2 nos. and 3'x5'	3 nos. & 4'x7', 3'x7'
Window no. & size	4 nos. and 3'x4', 5'x4'	4 nos. and 3'x4', 4'x4', 5'x4'
topography	Moderate Slope	Moderate Slope
Foundation	Stone with mud mortar	Stone cement mortar -
Material	Stone, Wood,	Brick,Cement,metal
Position	Detached	Detached
Attic height	6-8 feet height	3 feet height
Roof truss	Natural wood	Metal pipe
Natural Light	Not good	Good
Kitchen	Inside	Outside
Grains Storage	Inside	Inside -Outside
Water Taps	Shared water taps	in each house
Drainage	No	No
Wood storage	Inside house	Outside house
Toilet	Far from house	Near to House
Thermal comfort	Better	worse

10. Analysis

1. Reconstructed house is Thermally uncomfortable. Mostly old aged people and children felt thermally uncomfortable in the House. Similarly, Young age people also realized that reconstructed house is not thermally efficient compared to traditionally built ones (old House).
2. Modern materials have increased the preference and use of the distant materials. Materials to be used for the houses depend upon the availability of the materials. However, import of foreign materials has increased carbon footprint/emissions, dependence on tractors, tippers causing air pollution and difficulty in management of non- biodegradable waste [11].
3. Trend of socio- economic stratification as rich and poor has been gradually developed in the society.

4. Locals are satisfied with the house constructed with the facilities of daylight and illuminance, sound insulation and noise reduction, improvement in indoor air quality, reduction in diseases or illness and friendly to all age groups and gender.
5. The availability of land has crafted the maximum use and change in land use with houses constructed on isolated areas along with the land pollution seen in agricultural land areas.
6. The operational use of water management has increased in number of toilets, outside the house and provision of taps in kitchen ultimately leading to the increased generation of wastewater.
7. Reconstructed House has not addressed the local needs in terms of planning family size, functions and distribution. The functional planning has been disturbed as it excludes the socio- cultural aspects within the design. There is the division of rooms that has caused less interaction between the family members. Additionally, more time is spent in the RCC houses and the interaction is less with neighbors as well.
8. Reconstructed houses have no cultural significance and meaning. They lack indigenous values in the space layout and design.
9. Due to the crucial need of house, the locals built 2 rooms houses in majority. Insufficient grants and lengthy process to receive fund brought financial burden to the home owner.

11. Discussion

The Findings and Analysis of this Socio-Economic Impacts of Reconstruction research entails a comprehensive clarification on every dimensions of the sustainability.

11.1 Social

The houses were homogeneous with no such status difference between Tamangs and Others. But, after earthquake, the difference in the typologies have created a gap as the rich and the poor in the community. RCC houses has impacted lot and seen as a high status in the rural society. These houses are conceived as permanent investment, so the increase in

the number of this typology is definite in future despite the locals are unaware about the materials and construction of RCC houses. Thus, such effort doesn't establish a community resilient and also the idea of build back better principle. However, locals are satisfied with strength and modern facilities of modern house leading to diminish traditional sense of place and character of the village.

11.2 Culture

A house is evidently the picture of the cultural values. But after the reconstruction, all the aspects of production and livestock, family and clan spaces that symbolized their ethnicity, is shifting. Fundamental needs of family size, left with no options but to build either permanent RCC houses or Brick and stone masonry as a temporary one. Considerations of preserving the cultural identity have not been prioritized by a reconstruction. Due to which, Locals themselves have been forced to change their way of living, when they still are in despair that their cultural representation and identity are Fluctuating.

11.3 Economic

One of the most challenging aspects of conditional cash transfers is ensuring that the money is spent as intended. Families will have other priorities such as food, education, transport, paying debts, business expenses etc. Majority of the locals are building houses as a temporary investment and just for the sake of taking the grants, questioning the quality standards maintained in the construction. Since grants are not sufficient as the cost of resources are very high. So the owners of RCC and Brick masonry have additional loans. Majority of them have taken loans from the neighbors and relatives. There are no considerations and approach from the financial institutions such as banks and ODR mechanisms are often inaccessible to the most vulnerable groups, due to lack of formal documentation and limited access to financial resources Thus, from the economic point of view, funds provided by the government has been the major cause for the initiation creating economic burden and social status symbol but they have been worth for the locals as they are in need for the houses that are strong to resist disasters.

11.4 Environment

The buildings particularly RCC are not compliant to the extreme climate of Khalangataar. Even with the consideration of orientation, the modern reconstructed houses are not thermally warm inside. The Brick masonry houses, expected to be more comfortable are not as warm as their traditional house. The modern materials like cement mortars, plasters and CGI sheets roof is not environmentally a viable option for building back better in cold climate like Khalangataar. Thus, the materials play vital role in the thermal comfort of a building. The design solutions should consider local materials significantly for making secure structures. Likewise, construction sprawl in agricultural land is expected to increase more. Separate structures are being built for the use of firewood and sheds for domestic animals. Majority of the brick masonry owners are in plans to build RCC slabs and RCC houses in the future. This affects solely to the productivity of the land and it has already initiated the sprawl in settlement development of Khalangataar.

12. Conclusion

The ODR approach implies an incorrect assumption about equal capability of households to manage their housing reconstruction. Different factors including ex-ante vulnerabilities, disaster impacts, or contextual issues might curtail the capability of households to achieve their recovery. Even more problematic, the most vulnerable groups received the least assistance, compared to the elites who often expand their capabilities. Contextually inappropriate transitional shelter provision which lay scattered unused after housing reconstruction (vacant house data), inappropriate house design (size) without consideration of livelihood activity incorporation or house extension or unaffordable resilient technology or introducing radical changes to existing technology or proposing unfamiliar technology. Likewise, reconstructed House could not addressed the local needs in terms of planning family size, functions and distribution. The functional planning has been disturbed as it excludes the socio- cultural aspects within the design. Due to the crucial need and urge of house, the locals built 2 rooms houses in majority. Insufficient grants and lengthy process to receive fund brought financial burden to the home owner. There is a feeling of empowerment among the locals that can be observed. RCC owners feel empowered due to bigger

house with modern design. Modern materials have increased the preference and use of the distant materials. Materials to be used for the houses depend upon the availability of the materials. However, import of foreign materials has increased carbon footprint/emissions, dependence on tractors, tippers causing air pollution and difficulty in management of non- biodegradable waste. The availability of land has crafted the maximum use and change in land use with houses constructed on isolated areas along with the land pollution seen in agricultural land areas.

Thus the ODR process of rebuilding houses and settlements after disasters has become a catalyst for introducing technological adaptations as well as enhancing disaster resilience for long-term developmental needs of the community. Newly reconstructed house has obviously constructed satisfaction, but lack of specific maintenance and restoring local livelihood, culture and traditions. The households affected by the earthquake are the most socially, Culturally, economically and environmentally vulnerable for long term.

13. Recommendation

- Understanding the local environment, socio-economic, socio-cultural aspects of village. Reconstruction with architectural sense of place, climate and environment considerations in design. Design resolutions for every other place cannot be similar as diverse society has its own cultural, environmental, economic and social aspects that need to be merged with the house.
- RCC houses has impacted lot and seen as a high status in the rural society. These houses are conceived as permanent investment, so the increase in the number of this typology is definite in future despite the locals are unaware about the materials and construction of RCC houses. Thus, such effort doesn't establish a community resilient and also the idea of build back better principle.
- Creating the sustainable reconstructions. i.e. Less impact in environment, economic affordability, social unity and cultural preservations. For this, Government should follow up research in rural housing sustainability with universities and researchers. Detail assessment should be carried out from building level to neighborhood scale. Likewise,

individuals to focus groups while developing and executing the assessment plans.

- Government should properly administer relief management by having context based housing programs. Co-ordination, technical guidance and ample amount of networking with municipalities, ward office, INGO's and NGO's. And, integrated approach with locals and related authorities for policy and strategies interventions.
- Locals should identify and prioritize needs of reconstruction models for their place. Identifying the context based parameter and indicators of sustainability, problems and issues of previous building based on local climate, architectural characteristics, social structures of village, cultural values and economic affordability.

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