

Post - 2015 Gorkha Earthquake Private Housing Reconstruction in Core Areas of Kathmandu Metropolitan City (KMC)

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Abstract

Housing after disaster is referred as reconstruction or rehabilitation of houses damaged by any disaster event. Reconstruction allows the affected people to have a secure and private space to return to their normal lives. The reconstruction process after 2015 Gorkha earthquake is mostly focused on the physical recovery. But a city is more than collection of buildings. It is also people who live there and how they interact with one another. The core area of Kathmandu is taken as the area of research. From a traditional core to an urban core, there is a huge paradigm shift in the way of living of people. Literature review showed that urbanization, globalization and demand for urban services and economic gain are the major factors for this change. There are multiple generations living in a same house that was constructed by their forefathers. With division of houses between the siblings, houses have become smaller and congested to live in. Hence the values and importance of a house has changed gradually. Reconstruction is taken as an opportunity to rebuild the traditional settlement into a contemporary one. A trend is seen that the new buildings have been constructed in a new style with disregard to the identity of the place. The study includes both qualitative and quantitative methods for research. Available secondary data is studied for quantitative research purpose to find out the trend of already reconstructed houses. Building permit drawing is studied and site visits are made during the research. A qualitative research method through personal interview and open ended questionnaire survey at the local level is done to understand the challenges of those beneficiaries who are unable to reconstruct. Findings showed that the major factor is the financial constraints of beneficiaries. Other notable issues like multiple ownership of land and building, small plot size, threat to the surrounding building during dismantling are found out.

Keywords

Private Housing Reconstruction, Traditional core, Urban core

1. Introduction

A massive earthquake of 7.8 Mw that occurred on 25 April 2015, epicenter at 80 km North West of Kathmandu in Barpak, Gorkha damaged over 4000 private houses in the ancient historic settlement of Kathmandu. It is a place which comprises of palaces, temples and houses that were built in the 15th -18th century. The unique architecture of a Newari house can't be found anywhere in the world. Almost all the building were identical looking and the building materials were sourced locally in the past. There was a sense of hierarchy maintained within the buildings such as houses were smaller than palaces and temples. But unlike the traditional houses, people gradually started to construct high rise tower blocks with

different design and scale. Use of modern building materials such as cement, reinforcement, glass, aluminum panels started to increase. With time, the identity of the place has changed from a culture centric district to a business centric district. Same trend is seen in the reconstructed house Post- 2015 Gorkha Earthquake. On the other hand, more than 6 years of earthquake disaster but still many damaged houses are in a dilapidated condition. While, minor nonstructural repairs have been done on majority of houses, some houses are untouched. This has affected the social well-being of people, displaced the local inhabitants towards the outskirts where shelter is less expensive.

1.1 Research Question

a. What is the status of private housing reconstruction in the traditional urban core of Kathmandu and what are the necessary interventions to achieve satisfactory progress in reconstruction?

1.2 Research Objective

- To understand the existing condition of Owner Driven private Housing Reconstruction in core areas of KMC.
- To identify issues and challenges of housing reconstruction in core area of KMC.
- To find suitable ways and means in order to speed up the reconstruction progress in traditional urban core area.

2. Literature Study

2.1 Housing in traditional core

The historic city core of Kathmandu was planned as high density settlement to minimize the waste of agricultural land situated at the periphery of the city. The settlement is built around interconnected courtyard system of houses separated by narrow lanes. This settlement is usually owned by Newar people belonging to the same clan and caste. The courtyard serves as the source of light, air and circulation to surrounding buildings. Besides, the courtyard spaces are connected to each other so that they can be used for pedestrian circulation from one neighborhood (tole) to another.

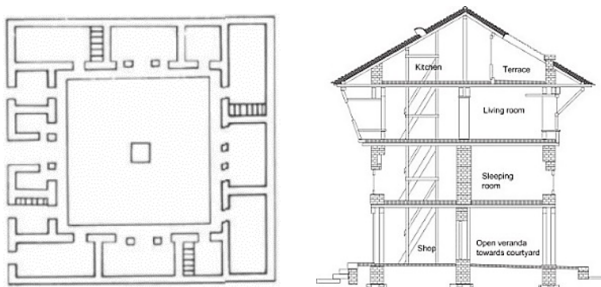


Figure 1: Settlement Pattern of a Newar House (Shrestha, 1981) and Section drawing of a Traditional Newar house (Gutschow, 1987)

Houses in the traditional core were mostly 4 to 5 storey with 6 to 7 feet floor height. Sun-dried or burn bricks, mud, wood, and tile were used as construction materials. The outer walls were built with burn bricks

to provide weather resistance and an attractive appearance. Houses were built with load bearing walls. The walls were supported by wide and deep foundation. On the ground floor, openings was usually limited to two windows and a big door. The slab of the house were made up of horizontal poles of thin wooden planks and bamboo reeds and packed earth, and mud plaster is placed over it. In the same way, symmetrical pitched roof at an angle of about 30° to 40° is made with flat red tiles with interlocking grooves on the top. The roof had eaves supported by wooden struts projected obliquely from the outer walls at right angles to the edge. The eaves provided shade in the summer and protected the external walls from rainwater. The rooms were vertically arranged. The ground floor (chendi) was usually damp and used for storing clay pots and wooden pails, washing utensils and keeping animals. The first floor (matan) consisting of closed latticed windows was used for bedroom. The second floor (chota) was used as a gathering room for the family and guests. Third floor (baigaa) was used as a kitchen and a sacred worship room is also located in this floor. Some Newar house consisted of fourth floor also, which was used for worshipping and storage space. [1]

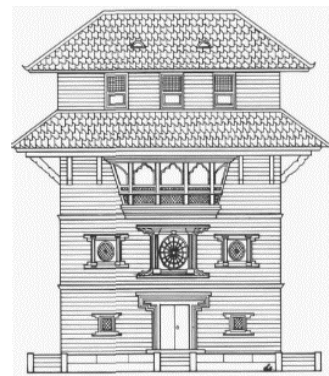


Figure 2: A Newar House Elevation (Shrestha, 1981)

Traditional Newar houses were lavishly carved. But with time, the fenestration of these houses have changed.

2.2 Housing after disaster

“It is a process of providing dwellings to the affected people due to any disaster event to bring back the livelihoods of the affected communities. After a disaster the needs for housing is even more because losing a house is losing dignity, identity and privacy.” [2]



Figure 3: Change in Fenestration of a Newar house (Korn, 1979)

2.3 Reconstruction in an urban core

“Reconstruction refers to the process of building something again that has been destroyed. It does not necessarily mean recreating something exactly as it was before. Often, it would result in a new building in the style relevant to the period even though adjusting to the inherited context” [3]. The nature of urban setting is mostly rapidly growing with less regulation and under services in urban areas which increases the vulnerability of people for reconstruction. So it is very challenging to implement post-disaster housing reconstruction in an urban area than a rural area.[4]

Many authors states that housing reconstruction efforts are often more difficult as well as more costly in an urban area because of the complex social structure which likely give rise to conflicts and complicate the reconstruction process. Hence, urban reconstruction requires strong planning and executive capacities of the local government with capacity to issue building permits and planning permissions, comprehensive building codes and their enforcement, effective cooperation between communities, local governments and private sector, and spatial planning in terms of access, density, public services and market places. It needs to acquire technically simple and feasible solutions related to reconstruction/ retrofit, safety of housing design and construction materials that are viable for the local climate, compliance with building codes, awareness about safe building standards and quality of construction, adaptable to the user’s needs and living conditions.

2.4 Reconstruction in a traditional core

The reconstruction strategy is very critical to effectively rebuild the physical and social amenities in a traditional city. It requires a common ground where people’s sense of belonging to the community, their

identity meets with the reconstruction policies and that it also improves the livability and livelihood of its people.

2.5 Approaches of Housing Reconstruction

Cash Approach (CA) where unconditional financial assistance is provided but without any technical support. **Owner driven reconstruction (ODR)** where conditional financial assistance is provided with technical support and regulations to follow it. **Community-driven reconstruction (CDR)** where financial and material assistance is provided through community organizations. **Agency driven reconstruction in situ (ADRIS)** where Construction Company is hired to rebuild at the pre-disaster location. **Agency driven reconstruction in a relocated site (ADRRS)** where Construction Company is hired to rebuild houses in a new site. [5]

2.6 Reconstruction model of private housing in Nepal after 2015 Gorkha Earthquake

The reconstruction model in Nepal is **Owner Driven Housing Reconstruction model (ODHR)** where individuals themselves decides safe building reconstruction practice. Here, the Government of Nepal (GON) through National Reconstruction Authority (NRA) provides cash grants and Socio-Technical assistance (STA). However, there are examples of reconstruction process that is aided by local organizations called as Community Reconstruction Committees (CRCs) and non-government organizations (NGO) in Bungmati, Pilachhen, Harisiddhi, Machhegaun, Thecho and others in an urban traditional core around the Kathmandu Valley. The committee are formed through the initiative of local stakeholders and influential residents. In these reconstruction project, councils and committees were formed to prepare a long-term rebuilding plan that supports reconstruction, as well as offer tourism promotion of the place.[6]

2.7 Private Housing Reconstruction Technical Inspection manual, 2073 adopted by NRA

The technical inspection manual is a standard format to inspect reconstructed house in all earthquake affected districts. This manual focuses on the safer building construction practice followed during reconstruction. To be able to apply for the tranche process, houses

must firstly comply building permit approved by the municipality. There are 13 annex published by NRA which approves for construction from foundation level up to DPC level and construction of the superstructure up to the roof level. The safer practice for housing reconstruction is divided into;

1. Site selection for building construction: The Slope of the site should be less than 20° and should be safe from landslide, rock slide, flood, liquefaction, fault line, water logging risks.
2. Shape of the building: The shape of the building should be regular as much as possible. Tall and slender building should be avoided. Height should not be more than 3 times of its width.
3. Building Material: Quality of construction as good as the quality of the materials and workmanship.
4. Minimum size and quality of material in Foundation, DPC, Column, beam, column to beam joint.

3. Methodology

Methodology is “an articulated, theoretically informed approach to the production of data” [7]. The research is carried out using both quantitative and qualitative research methodology (mixed method) within the pragmatic paradigm. The pragmatic method is based on the philosophy that a researcher should use that method that solves the problem [8]. The quantitative information about the status of reconstructed houses are informed through positivist paradigm who believes that reality can be understood through scientific enquiry. The ontological perspective of the research is based on the available data through secondary sources. The qualitative research to answer the research objective like ‘identifying the issues and challenges’ and ‘ways and means to speed up reconstruction progress in a traditional urban town’ is done through Interpretivist paradigm through personal interview, focus group discussion method including open ended questionnaire survey at the local level as well as key informant interview method.

A mobile application called ‘KoBo Collect’ is used to collect the secondary data in the field. A KoBo Toolbox is a free open-source data collection tool. Devices such as phones, tablets, and computers is used to collect field data. The primary data is collected by filling questionnaire survey at site and through phone survey method.

4. Study Area

The study area is an urban core area (ward number- 12, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27) of Kathmandu Metropolitan city. The landuse of the core can be divided into multiple types such as; world heritage site of human dhoka durbar square, oldest market place like ason, commercial zone like Newroad, numerous residential neighbourhood squares and private residential squares. According to the municipality profile of Kathmandu, there are 200 temples, 85 stupas, 140 baha/bahis, 750 public courtyards, 20 ghats, 150 water spouts/ taps which are the most important recognized sites located in this area. The population is about 132,269 and land is 275 hectares.

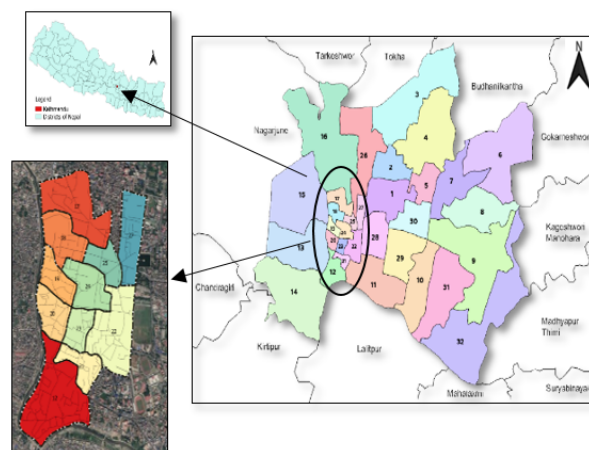


Figure 4: Location of Site

5. Data Collection and Analysis

Among 4004 reconstruction beneficiaries of the core, 906 people have completed reconstruction and 2225 have not yet started reconstruction. With confidence level of 95 percent and marginal error of 5 percent, 328 respondents [9] are surveyed during the research. (The reconstruction status is taken from secondary source, from Grant management and Local Infrastructure (GMALI) dated 31st Asadh 2078).

6. Finding and Discussion

A. Completed Reconstruction: According to the settlement pattern of Newar, almost all the building structures surveyed (damaged as well as reconstructed) are adjoined structures with at least 1 to 3 adjacent houses. Most of the house plots are

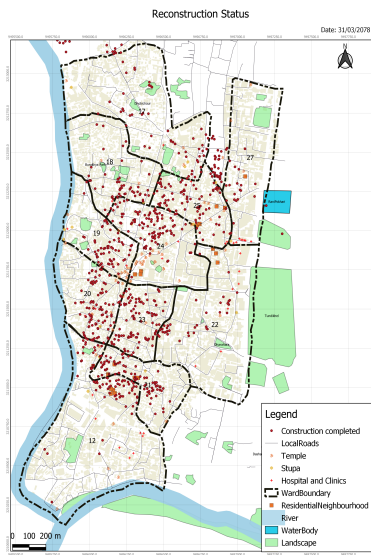


Figure 5: Location Mapping of Reconstructed House

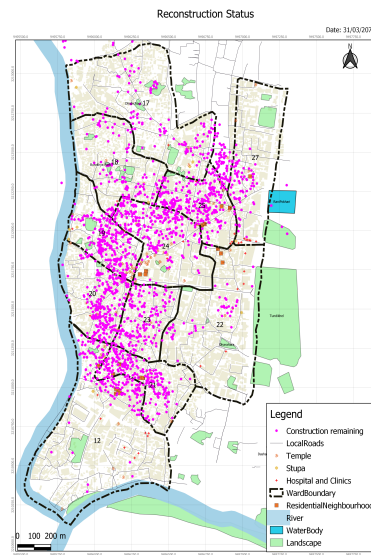


Figure 6: Location Mapping of Remaining Houses for reconstruction

between 0.5 to 2 aana in size. Almost all of the houses are multi storey- reinforced cement concrete (RCC) construction usually 5.5 to 6.5 storey in height. Houses facing at the street sides are used for commercial purpose. However, places where commercial activities are high, houses situated at inner courtyards are also built taking in consideration about the commercial opportunity.

The partitioning of property has minimized the frontage as small as 7 feet. One can imagine the living condition in such a congested place. Most of the buildings are adjoined structure with only one facade for door and window. So there is lack of proper light and ventilation. For houses which have land area of 0.5 aana, 50 percent of the floor area is reduced due to staircase and circulation space, so houses are expand vertically.

On the whole, Technical assistance and supervision provided by the contractors, Engineers appointed by NRA helped in achieving a good construction practice during reconstruction. Houses not complying with the building codes are withheld with enlisting them on non-compliant issues and such houses are not accepted for further tranche distribution. Such house has to be retrofitted to ensure structural safety. However, reconstructed house could have possibly preserve the traditional architecture of the place, but has been neglected completely for economic gain and urban services.

B. Housing Status of beneficiaries remained to reconstruct: Disaster is a natural phenomenon. No

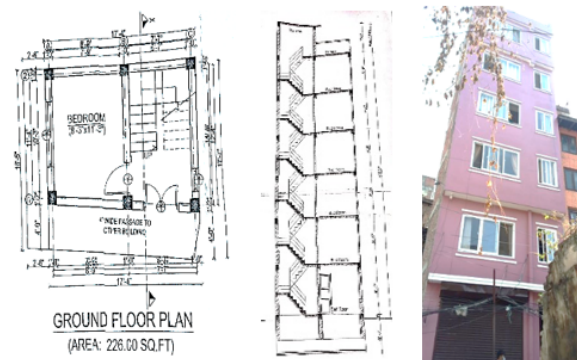


Figure 7: Typical floor plan, section and elevation of a reconstructed house

one can exactly predict when the next disaster is going to happen. Even with this truth, more than 80 percent of the surveyed beneficiaries are still living in the damaged house risking their lives. Some non-structural minor repair to the building structure has been done frequently. This has costed them around the total amount of tranche offered by the Government of Nepal for house reconstruction. But there is a problem of frequent water leakage from roof and walls during rainy season. Houses that are in dilapidated condition has caused threat to the passerby as well as to the surrounding building. Damaged houses are so connected to each other that many of them stand on a same load bearing wall and that dismantling of one house cause an effect to its adjacent house. 10 percent surveyed are living on rent near their damaged house or towards the fringes in a

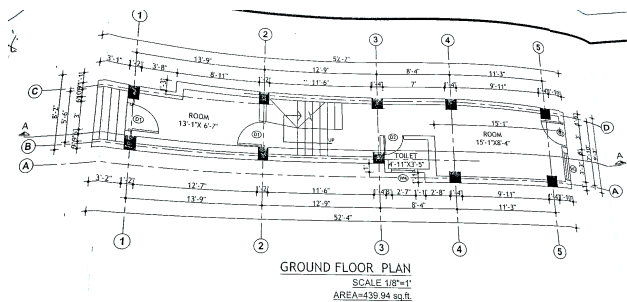


Figure 8: Small frontage house plan in the core

single family detached residential building in a rented house. In some cases, properties are sold and/or rented due to family separation and/or due to high commercial value of property in the core area.



Figure 9: Vulnerable housing condition

1. Preference of Beneficiary

i. Location Preference: People in the core have a history of living in the same place since many generations that has a history of more than thousand years. For them, a house is not only a place for shelter, but it is a place which has emotional, religious and spiritual values. Many religious activities such as celebration of frequent festivals, jatra, music and dance is the identity of the place. And now the identity of the place is their identity. Most of the surveyed beneficiaries are willing to reconstruct in the same place and don't have land elsewhere. Sooner or later, they want to reconstruct/ retrofit their house at the same place. 5 percent of beneficiaries who would be fine to reconstruct elsewhere are the ones, whose land is limited in the core area and for a good living condition and/ or they have land elsewhere, the are willing to move out.

ii. Preference to Building Construction: More than 90 percent surveyed beneficiaries stated that they want to build RCC house. More than one third stated that RCC as a building technique is popular as most structurally stable because it performed much better than the traditional houses during recent earthquake

and that it is a common building construction practice that is seen in most of the urban areas of Nepal, hence they would also like to follow the trend. Since most of their neighbors have constructed in same RCC technique, it will be easier for them to share the knowledge regarding construction technique, legal process to acquire the building permit from the municipality. One in three respondent stated they have plot size as small as 300 square feet and the building permit in the core area can be obtain up to 8 storey and that there is an opportunity of more floor area when constructed with RCC building construction. Traditional houses were usually 4 to 4.5 storey. Post reconstruction, beneficiaries are willing to increase the storey because half of them thinks that the present space is insufficient due to increasing family size. One third thinks that increase in building storey means more spatial opportunity. Houses facing towards the road side are seeking for economic opportunity through house rent, shops etc. about 10 percent wants to reconstruct up to permissible building bylaws in the core area.

iii. Preference to traditional housing style: Among surveyed beneficiaries, one in five stated that they would be able to reconstruct in a traditional built form if soft loan is available from banks and co-operatives. More than one third thinks that it would be good, if ward and municipality provides them incentives like; discount in building permit, drawings, availability of building construction materials and labours, technical assistance. They also stated that they would like to maintain the façade of the building in a traditional way with brick cladding but modern RCC building technique is applicable. One third are not interested to reconstruct in traditional built form because the number of storey in RCC building is more than the traditional building construction. And that the land value is more in the core area and it would be financially viable and many opportunities can be obtained through rent or commercial shops in RCC building.

They also considered that it is very difficult to maintain the traditional architecture of core at present. Only one or two houses built in a traditional form cannot preserve the heritage of the place. There are multiple houses already constructed in RCC techniques, which is actually true. Hence government should propose projects to preserve the essence of the place without disturbing the economic aspect of the house owners. The traditional Newari houses were

decorated with lavish carved wooden doors and windows. It is financially almost impossible to construct using such materials now. Also with time, manpower to construct in a traditional building technique has become rare. Brick mud house requires a lot of frequent maintenance. In today's world, where each house members have to earn for a living, it is time consuming for regular maintenance. People would only prefer the façade of the building to be traditional looking but modern building materials will be used. Also, nowadays people prefer flat roof over a gabled roof for various reason such as; sun-basking, drying, open space and so on.

2. Major Issues

i. Financial Issues: The major housing reconstruction related issue is insufficient saving and low income of the beneficiaries. More than two third households people are involved in low paying private jobs. The UN [10] found that the average monthly income of urban poor is NPR 4,173. It is impossible for those people whose income is below NPRs 4,000 a month to reconstruct their house while the average cost of a house 1000 sq. ft in urban area is about NRP Two million. Some families are under already existing debt which disallows them from credit from the formal sector while interest rate is very high in informal sector. (Shrestha et al., 2020). Even if some are able to start rebuilding their house, it is difficult for them to reach up to the same storey as the damaged house.

ii. Land Issues: Multiple land ownership criteria is also a huge issue faced between siblings, where reaching towards a communal agreement towards reconstruction is often difficult to achieve. Reconstruction of adjacent houses are to be started at the same time, but due to land dispute, it is difficult to reach to a mutual agreement. Another major land issues is; unavailability of legal papers. Usually in the past, property division is done without any supporting legal documentation, with a mutual consent between families. One third of beneficiaries are unable to reconstruct due to small plot size. The first difficulty here is dismantling of damaged house due to small plot size, where there is high chance of building damage and/ or collapse of its neighbouring houses. One forth believes that transportation of building materials and accessibility to house loans from bank is impossible due to right of way. Another issue is un-delineated land boundary. Many of them are not aware about the land boundaries and legal documentation such as cadastral map to the exact

extent of their site.

7. Conclusion

The study shows that the popularity of RCC buildings over traditional building practices in Nepal is also seen in the core area. People tend to search for space opportunity as well as economic opportunity through housing. But such practice of housing in Nepal is considered very expensive. Where most of the people are dependent upon low paying private jobs, disaster like earthquake has given a huge economic burden to the earthquake victims. On the other hand, reconstruction in traditional urban core of Kathmandu is very complex. Many of the issues are beyond the capacity of household beneficiaries as well as government organizations. Focused group discussion also stated its high time to find the solution through group housing like house pooling concept.

8. Recommendation

A. Financial Intervention: Provision of soft loans should be provided to the earthquake affected beneficiaries where high priority can be provided to the ones who are situated near the heritage site. Affordable housing finance, building material and techniques especially for vulnerable ones should be provide

B. Municipal lead solutions for land issues: Documentation and legal issues related to land management such as; land ownership, legal land ownership certificates, that can be solved through municipal efforts.

C. Enforcement of strict Building Bylaws: The building bylaws of Kathmandu valley in 2018 changed maximum height of the building in 'Mixed old settlement sub zone' from 45 feet to 75 feet. However, some houses are built higher than this which might increase risks during hazard. Mandatory by law that a building when reconstructed in the historic core should be dictated by the traditional form (at least facade) but structure can use modern materials. Identify plans that support areas considering issues like demolition, debris management in an adjoined structures.

D. Intervention for Housing issues:

1. House pooling: There are many issues and challenges which are beyond the capability of

individual house owners and hence demands for Agency-Driven Reconstruction in-Site. House pooling can be one of the solutions to such problem where, in a common settlement, there are multiple earthquake beneficiaries who are being unable to reconstruct due to challenges that could occur during clearing the debris and dismantling of the damaged house. This concept could also contribute to preserve the cultural identity of the place and help against displacement of indigenous people/ beneficiaries.

2. **Incremental housing** should come into practice to fulfill the immediate need for safer housing.

E. Other Recommendation:

1. **Re-examination of houses** that could comply for retrofitting techniques should be done.

2. **Training to technical persons and masons** for retrofit techniques should be provided.

3. The local government including ward and municipality should **establish an information system** such as awareness program for earthquake resistance building and risk of living in a vulnerable dilapidated house.

4. A **two way communication system** should be established to identify the communication gaps between the beneficiaries and major stakeholders.

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References

- [1] Mohan N Shrestha. Nepal's traditional settlement: Pattern and architecture. *Journal of Cultural Geography*, 1(2):26–43, 1981.
- [2] Daniel Félix, Jorge M Branco, and Artur Feio. Temporary housing after disasters: A state of the art survey. *Habitat International*, 40:136–141, 2013.
- [3] Jukka Jokilehto. Reconstruction in world heritage context. *European Association for Architectural Education*, page 1, 2013.
- [4] globalcommunities.org. Shelter and settlements: Post-disaster response in urban environments. *European Association for Architectural Education*, 2012.
- [5] Abhas K Jha. *Safer homes, stronger communities: a handbook for reconstructing after natural disasters*. World Bank Publications, 2010.
- [6] Patrick Daly, Jennifer Dwyne Barenstein, Pia Hollenbach, and Sabin Ninglekhu. Post-disaster housing reconstruction in urban areas in nepal: aid governance and local rebuilding initiatives. *IIED Working Paper*, page 10836IIED, 2017.
- [7] Raymond William Firth. *Ethnographic research: A guide to general conduct*. Number 1. Academic Press, 1984.
- [8] Abbas Tashakkori and Charles Teddlie. Issues and dilemmas in teaching research methods courses in social and behavioural sciences: Us perspective. *International journal of social research methodology*, 6(1):61–77, 2003.
- [9] Robert V Krejcie and Daryle W Morgan. Determining sample size for research activities. *Educational and psychological measurement*, 30(3):607–610, 1970.
- [10] UN COUNTRY TEAM IN Nepal. A country analysis with a human face, 2011.