17th World Conference on Earthquake Engineering, 17WCEE
Sendai, Japan - September 13th to 18th 2020

THE ROAD TO RECOVERY: GOOD PRACTICE FOR SCHOOL RECONSTRUCTION IN RURAL NEPAL

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Abstract

Many schools in rural Nepal were damaged or destroyed in the 2015 Gorkha earthquake, highlighting major vulnerabilities in Nepal's school infrastructure. Schools are particularly important within these communities, so it is vital that facilities are constructed well, to improve their resilience.

There are examples of good school reconstruction within Kathmandu and in more remote areas. However, this good practice is limited, and there is much greater scope for better knowledge transfer between stakeholders at different levels within the process. There are also a wide range of challenges affecting construction in different locations and contexts. These challenges, identified in earlier stages of the research, include issues with the availability and quality of construction materials and labour, as well as a complex government approvals process, and limited accessibility of many school sites. This project seeks to identify pockets of good practice that have been implemented within school reconstruction projects, to overcome or mitigate these challenges.

In this paper we present some of the results of interviews with stakeholders involved in Nepal's rural school reconstruction efforts. Examples of good practice have been identified, for rural case study schools, and from experience of implementing school reconstruction projects on a wider scale. This good practice covers a variety of facets of project delivery, including suitability of different construction materials, training and enterprise schemes for labourers, coordination and allocation of projects to allow more effective material distribution and project supervision, and utilizing opportunities for improving facilities through reconstruction efforts and we present details of one of these.

These findings will feed into guidance and decision-making tools that will be produced within the research. The aim is for these tools to be able to inform how the lessons learnt could be applied to projects in similar locations or contexts, or how they could be adapted to be made suitable for other areas. These tools will be disseminated to stakeholders, in order to be used to assist in implementing ongoing school reconstruction and upgrade work across rural Nepal. These would help to improve the overall efficiency and efficacy of school reconstruction project delivery, and work towards Nepal's wider 'Build Back Better' efforts, in line with the Sendai Framework objectives, to see improved resilience against future disasters.

Keywords: School reconstruction; Good practice; Gorkha earthquake; Resilience; Build Back Better

1. Introduction

In previous years, there have been many earthquakes that have caused significant damage to school infrastructure, and in some events, a high loss of life due to this, highlighting global vulnerabilities in school construction [1]. In recent earthquake events: over 15,000 children died in school collapses in the 2008 Sichuan earthquake [2]; 4,748 schools suffered damaged in the 2009 Padang earthquake [3], including 70 per cent of schools in one district [4]; and during the 2011 East Japan earthquake 6,284 schools were destroyed, although much of this can be attributed to the associated tsunami [2].

This is particularly concerning as schools play a vital role within communities, providing access to education, but also for the role they play during and after disasters, as a centre for aid distribution and shelter [5], and to aid children's recovery from the trauma experienced [6].

This high level of school damage was also seen during the 2015 Gorkha Earthquake, in which 8242 public schools were damaged or destroyed [7], which luckily occurred outside of school hours. A previous

earthquake, the 1988 Nepal-India border event, had highlighted the vulnerability of Nepal's school infrastructure, which had led to an increased earthquake awareness and the introduction of the School Earthquake Safety Programme in 1997, assessing vulnerability of schools and implementing retrofitting projects for the most vulnerable [8]. While all the retrofitted schools performed well in the 2015 earthquake [9], success was limited, with only 300 schools reached across the 17 year duration of the programme [10], with most of these based within Kathmandu, leaving little support for more rural areas.

This has also been mirrored in post-earthquake reconstruction efforts, with slower progress and less support seen in less accessible areas, despite the high levels of damage, and many additional challenges impeding reconstruction in these contexts [11]. It is necessary to understand these challenges, in order to find solutions, to reconstruct and upgrade school infrastructure in an efficient way, adopting the 'Build Back Better' ethos set out in the Sendai Framework [12] ensuring suitable seismic resilience of schools. This is particularly important to reduce the potential damage caused by a future earthquake. This paper presents some of the challenges that have been identified that affect school reconstruction in Nepal, and good practice that has been implemented to overcome and mitigate against these challenges.

2. Methodology

Producing good quality construction and reconstruction is a multifaceted and complex process, involving many different stakeholders, with diverse backgrounds of technical and contextual experience [13]. Only when all these perspectives are drawn together can an effective, holistic solution be found. This research attempts to gather a range of perspective and experiences of stakeholders directly involved with Nepal's school reconstruction process. These narratives are collected through interviews with stakeholders: those involved with individual case study schools, as one-off projects or part of wider schemes, and those involved on a broader scale, with more general involvement in the overarching school reconstruction process across the earthquake affected districts. This helps to identify specific practices relevant to individual schools, that may be lost if only focusing on the wider scale, but also to see how these individual case studies compare with experiences across a wider area, and to understand the broader coordination involved.

This narrative data has been collected during interviews held during two visits to Nepal. The first, a Pilot Study visit, was conducted in October to November 2017, and the Phase 2 visit in October to November 2018. The interviews were conducted face-to-face to aid communication [14], and were generally one-to-one with just the interviewer and participant present, to encourage participants to share more openly about their experience, particularly for more negative views [15]. In some cases it was necessary to work through an interpreter, following protocol to maintain conversation flow while ensuring accurate data collection [16, 17].

The aim of the Pilot Study was to understand the wider context of the study, exploring earthquake damage in Nepal and resilience and reconstruction efforts, and to identify challenges affecting the school reconstruction process, to understand where more investigation was needed. A more structured interview approach was used, to ensure that there was broad coverage of all key areas of interest, including the impacts of the earthquake, the technical aspects of the design, and the coordination and delivery of the project, and allow for direct comparison between responses [18]. Within the Pilot Study visit, five case study interviews (two urban, three rural), and five wide scale interviews were conducted, as well as visiting three of these schools and meeting with a range of other organisations involved in resilience work more generally.

The Phase 2 visit used a semi-structured interview approach to provide a more in-depth understanding of the six key challenges identified in the Pilot Study, and any associated good practice. Interviews all followed the same base schedule, although there was space for participants to expand on relevant areas, and for the interviewer to ask follow up questions not included in the interview schedule, to clarify meaning and bring out more detail on specific areas of interest [18]. Questions covered the context of the work, particularly for the case study schools, the six challenges identified, including asking participants to rate the challenges as have no, minor or major impact on projects, give insight into how these affected project delivery and quality, and to highlight items of good practice that had been used within projects, or improvements they would suggest for future projects. During this visit, nine interviews were conducted, five case studies (one urban and four

rural), and four wide scale interviews. Four of the schools were visited during this time, and additional meetings were held with other stakeholders, who did not have a direct involvement with school reconstruction but had expertise in key areas of interest. An additional rural case study was also collected digitally, through an online form replicating the interview schedule.

The data collected was analysed using a process of manual coding, in which responses were assigned classifications based on the information they represented, from which common themes and trends could be identified [19, 20].. For the Pilot Study, responses were categorized by challenge, while the Phase 2 data was categorized based on the good practice represented, for each of the six challenge areas identified. Cross-referencing and collating these results provided a full catalogue of challenges, relevant good practice, and the contexts in which these are suitable. The ratings given to each challenge category were also analysed, assigning quantitative values of zero, one and two respectively to the responses of no, minor and major impact. From this, mean and modal responses were found, in order to identify the relative impact of each challenge.

3. School reconstruction process

The interviews conducted outlined the process of reconstructing schools following the earthquake, from initial temporary facilities through to permanent construction. Many schools closed for several months following the 2015 Gorkha earthquake, and safe school buildings were often used as temporary shelter for those whose homes were damaged [21]. To effectively implement and prioritise recovery efforts, it was important to understand the scale of the challenge and identify areas and schools most in need of support. To do this, the Structural Integrity and Damage Assessment [22] was conducted, assessing the level of damage at all public schools in the affected districts, and information about the size and needs of the school.

For damaged schools, the priority is to quickly re-establish safe learning spaces, so that children can return to school and education is not interrupted. Initially, 'Child Friendly Spaces' (CFS) are used, which are generally tents that can be very quickly distributed and assembled following the earthquake. Interview participants reported that these spaces could be used to hold sessions with the children, playing games and music, or running craft activities, to help process and overcome the trauma faced. CFSs cannot provide an adequate long-term learning environment, so Temporary Learning Centres (TLCs) were used to provide a longer-term solution, designed to last six months and act as temporary classrooms until a permanent structure can be built. 3576 TLCs were constructed, allowing most children to return to school [23]. They are constructed using locally available materials such as bamboo, wood, steel sheets or tarpaulin [24], such as those shown in Fig.1, However, many participants reported that most TLCs are used far beyond their design life, with many still required several years after the earthquake. A lack of sufficient weatherproofing for Nepal's climate also made them unsuitable for long periods of the year.

Fig.1 - Examples of Temporary Learning Centre construction, at schools visited during fieldwork, one constructed using bamboo, and one with corrugated sheet metal

Delivering full reconstruction can take a long time, and for some schools that had not been assigned for permanent reconstruction, Transitional Learning Centres were used to bridge the gap between unsuitable temporary facilities and a permanent structure, as they have a design life of three to five years. It was reported that this can help to reduce pressure to reconstruct immediately after the earthquake, when challenges are greater due to higher demand for materials and labour.

For permanent reconstruction across all sectors, the National Reconstruction Authority (NRA) was established following the earthquake, to coordinate all work. For the education sector, a Central Level Project Implementation Unit (CLPIU) was set up, to coordinate and oversee school reconstruction. They are responsible for allocating and approving projects, ensuring that designs adhere to the Nepal National Building Code. The CLPIU is supported District Level Project Implementation Units (DLPIUs), to provide local level oversight, technical support and conduct checks to ensure that construction is in line with the design.

While good progress has been towards reconstructing Nepal's schools, there is evidence that there are still gaps within this process, and areas of weakness that could be improved. Participants reported that less accessible areas are falling behind in the construction process, and despite the CLPIU ruling that designs using earth bags would not be approved, there are earth bag schools being constructed, suggesting that it is possible to bypass the approvals process. As well as the construction in earthquake affected districts, large parts of Nepal were not affected by this earthquake, and still have very vulnerable school infrastructure, which could result in significant losses in a future event. Learning lessons from the reconstruction process will help to identify ways to fill these gaps and improve the quality of school infrastructure across all of Nepal, either pre-emptively or following a future earthquake.

4. Challenges

There are numerous challenges affecting construction in Nepal, many of which are exacerbated in a post-earthquake context. It is important to understand what these challenges are, and the ways in which they affect projects, in order to identify suitable good practice to mitigate against or overcome them. The findings of the pilot study conducted during the first visit to Nepal identified six main challenges that commonly affected projects [25]. These challenges areas are 1) accessibility, 2) labour, 3) land, 4) government, 5) materials, and 6) the community.

The interviews conducted in the second visit to Nepal focused on these six challenges specifically, understanding whether the effects of these challenges had no impact, a minor or major impact within the projects the participants had experienced. Reports of no challenge were given a score of zero, minor a score of one, and major a score of two. The results of this are shown in Fig.2, in which accessibility and transportation is reported to be the challenge which has the most impact, while community involvement has the least, and was reported as a positive by some participants.

This paper will focus on the specific challenge narratives reported by participants relating to labour provision within school reconstruction projects, and go on to outline some of the relevant good practice identified to tackle these issues. Labour was the second most highly ranked challenge. Of all ten participants, only two case studies reported no challenge related to labour. The specific challenges relating to labour can be grouped into two overarching categories: the skills and availability of labour.

Firstly, there are issues over the quality and skills of the labour, which can affect the overall quality of construction. Many of the workers lack skills and training, particularly in seismic resistant details and new technologies. Three case study participants reported using local labour, including volunteers, all requiring training to do any skilled tasks, and even workers with some experience or training required additional training. Participants also reported that they faced difficulties of retaining workers, particularly when projects were delayed, causing them to move to new projects in order to continue to receive a daily wage. This left gaps and meant projects had to train additional workers to fill these gaps.

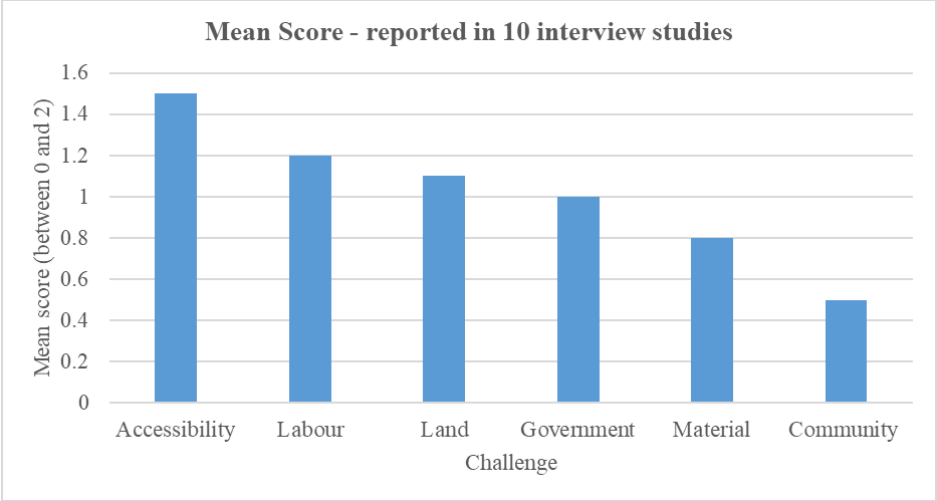

Fig.2 - Results of analysis of Phase 2 interview results, categorising a report of 'No Challenge' as a score of 0, 'Minor Challenge' as a score of 1, and a 'Major Challenge' as a score of 2.

There are also issues of the availability of labour. There is an overall shortage of labour, as there is a large demand due to the extent of reconstruction work to be done across all sectors, which as well as making finding workers a challenge, can increase the cost of labour. One participant reported that workers were now moving from Western Nepal to earthquake affected districts, where the daily wage was double the standard daily wage. The shortage of labourers is also exacerbated by processes that are slow and very labour intensive, such as hand-cutting stones, digging foundations in difficult ground, and demolishing the existing damaged buildings before reconstruction can start.

As well as the shortage of labour to complete the reconstruction work, there is also a lack of capacity to oversee and supervise this work throughout projects, and to conduct regular checks. This can have a negative effect on the quality of reconstruction and can be particularly important given the lack of skills of the workers, and the other challenges affecting the overall school reconstruction process.

5. Good practice

While there are many challenges that impact on school reconstruction, a range of good practice to improve reconstruction was also identified within the interviews. This good practice has been positive for the overall reconstruction process, but it is clear that there are also many gaps and scope for much greater transfer of this knowledge to improve overall project delivery. Achieving this could improve the efficiency and efficacy of ongoing and future reconstruction work, as well as long term planning to improve delivery in the event of a future earthquake.

The good practice presented here has already been implemented by organisations working on the ground in Nepal and therefore if applied in similar contexts should result in improved project delivery. The individual items of good practice and their contexts have been associated with different challenges, and then these have then been cross-referenced, grouping similar reports of good practice, to identify the range of contexts where they may be successful. By doing this, the catalogue of individual reports of good practice can be used to produce generalised guidance for all reconstruction, and a decision making tool that can identify items of good practice suitable to the context in which a project is to take place, and the stakeholders involved.

We argue that the generalised good practice could and should be considered for any school reconstruction project and overall coordination. One example of this is regular supervision throughout a project with additional checks (three or four across the construction period) to ensure quality of construction. If implemented then it is desirable that this should be carried out by qualified technical personnel, where possible, and independent from the funding organisation, to ensure transparency.

The specific items of good practice, suitable for particular contexts, can be represented as decision trees. For a school reconstruction project, the pathway relevant to that context could be selected, in order to identify the good practice that may be appropriate. Examples of an individual decision tree, such as those in Fig.3 and Fig.4, can be produced for each element of the decision-making process for initiating a school reconstruction project.

Fig.3 covers the sourcing of labourers for a project, dependent on the level of access to skilled professionals. Three of four items of good practice (except the hiring of professionals) were reported within both case study and wide scale interviews. This is important when producing guidance that will be applied outside the individual case study contexts, suggesting that some generalisation can be made. While this will vary between projects, it is expected that the most accessible projects will have greatest access to professional contractors, while projects in very remote communities are likely to be reliant on less skilled, or untrained labour. This good practice also indicates the importance of capacity building knowledge and technology transfer, to improve long-term prospects for communities, and maximising mutual benefits across the different reconstruction sectors.

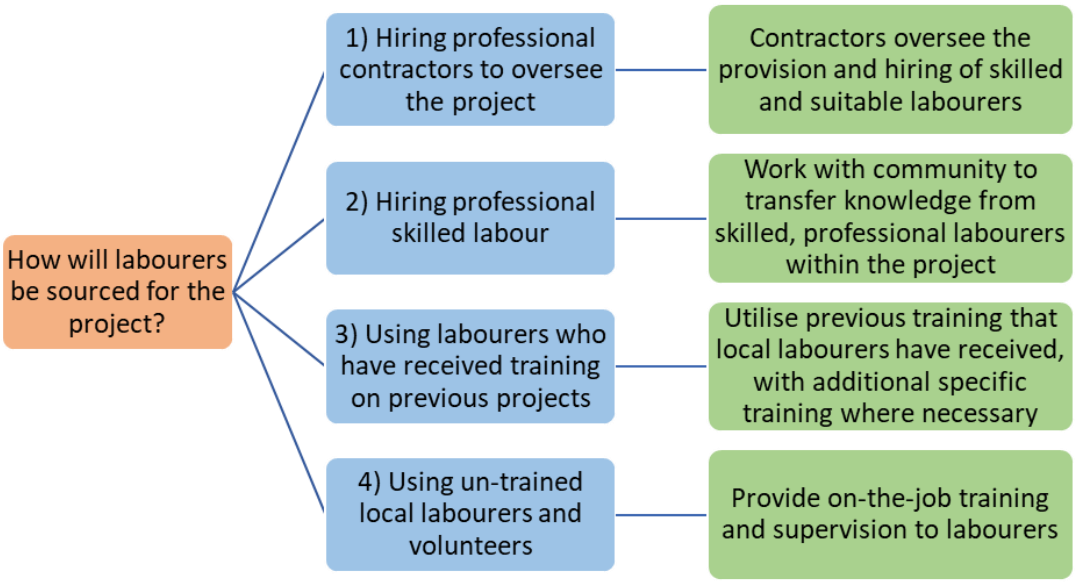

Fig.3 – Decision tree for the sourcing and training of labourers. This would form one branch of an overall decision tree to help with the delivery of school reconstruction projects.

Having identified suitable mechanisms for providing labour for an individual project, Fig.4 can then be used to provide good practice for establishing longer term relationships within communities and with workers, dependent on the distribution of projects. If multiple projects are to be completed by the same organisation, project locations may be dictated by the funding mechanism. Donor-led funding can lead to projects being spread over very diverse areas, while more systematic funding may limit work to one or two districts. This alters the approach to engagement and provision of labour, in order to minimize time required to source and train labourers throughout a project.

It is important that these findings and the lessons of good practice learnt can be translated into a usable tool that stakeholders can use to assist and improve project delivery. The individual decision trees can be collated, feeding into a tool to be produced as a future stage of this research. This tool could be used by a variety of stakeholders involved in the school reconstruction process especially when the overseeing and coordination is provided by NGOs (who may have a narrow range of school construction experience) or SMCs (who may have limited or no experience in school construction). The tool would be most valuable in the initial phases of the project, identifying school sites, funding mechanisms, and the design and approvals process, although it could be used in later stages and still give benefit. By inputting details relevant to the school context,

such as the location, availability of resources, the roles of the stakeholders involved, the appropriate good practice can then be identified. However, it is important to note that while these generalisations have been derived using local experiences, the recommended good practice still needs to be assessed by the relevant stakeholders, to judge the suitability. This is particularly important as no two schools or general perspectives could accurately represent precise individual school contexts and to ensure no biases have been introduced into the research.

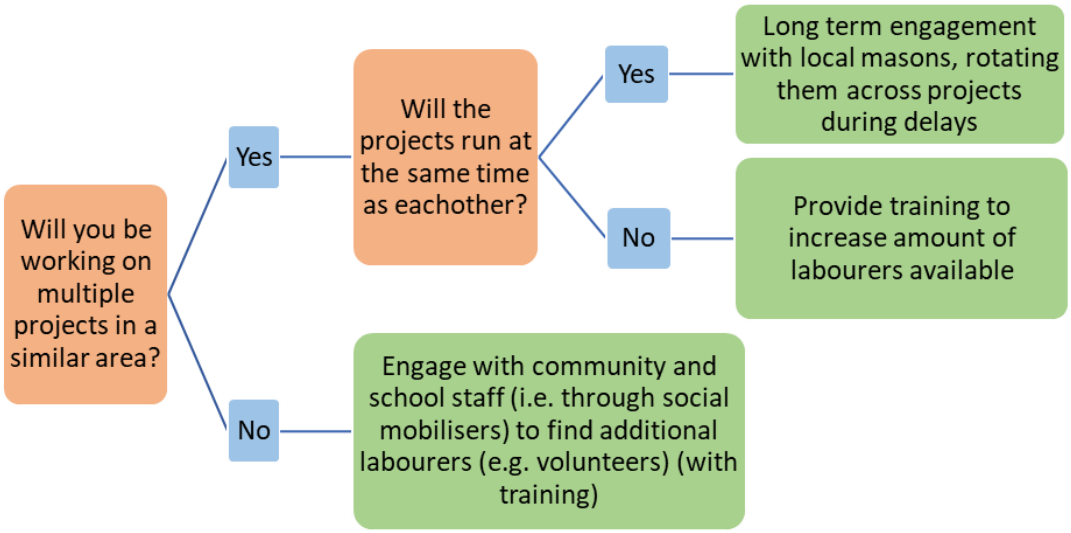

Fig.4 - Decision tree for the engagement and provision of labourers across individual and multiple projects. This would form one branch of an overall decision tree to help with the delivery of school reconstruction projects.

6. Conclusions and future work

Schools suffered significant damage in the 2015 Gorkha earthquake, and there are now many challenges affecting the reconstruction process, including the skill and availability of labourers, which can affect the delivery and quality of construction. However, there is an array of good practice that has been identified, to mitigate and overcome these challenges. Collating and cross-referencing this good practice, specific to the context in which they could be suitable, enables the production of a decision making tool that could be used to broaden the implementation of this good practice, and improve delivery of ongoing and future projects

Once this tool has been developed, it will be important to validate it, testing the rules and relationships within it. It is proposed to do this through consultations with Nepal's school reconstruction stakeholders, within a workshop or focus group, allowing participants to test the tool based on a school of their own experience. They could then judge the suitability of the good practice recommended based on the information they provide. And suggest how to fine-tune the relationships within it.

This tool will have been developed based on lessons learnt from school reconstruction in the districts affected by the 2015 Gorkha earthquake and therefore it is important that consideration is given to making the findings transferable to the whole of Nepal, where infrastructure is still very vulnerable. It will also be important to explore the links that could be made, in order to make this tool appropriate to use in other countries. While not all of the good practice identified would be suitable, as some will be specific to the context of Nepal, some elements could be transferable and may help with the delivery of post-earthquake reconstruction efforts, particularly with immediate coordination and planning long term strategy.

Applying this tool could be used to improve the delivery of reconstruction projects, decreasing the time and costs, while maximizing wider benefits, with knowledge transfer and capacity building within

communities. This would help Nepal, and other countries, to 'Build Back Better' and construct more resilient and safe school infrastructure.

8. Acknowledgements

The authors would like to particularly acknowledge the interview participants and other stakeholders who provided information, for their time and knowledge that they shared. They have been anonymized for the purpose of the research, but their contributions have been vital. Also, the School of Engineering at Newcastle University, who are funding the research, and Prof. Nick Rosser and Dr. Katie Oven, Durham University, for their support with the fieldwork visits.

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