A RAPID DESK BASED SURVEY:

School Construction and Retrofitting to Achieve Disaster Resilience

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Report Summary

This study provides evidence in support of the main objective: **To undertake a rapid desk based study to identify the evidence and apparent gaps in evidence, in the school construction design and retrofitting to achieve disaster resilience, to inform the development of a DFID business case**. This objective is realised through the following four component questions:

1. *What global evidence is there to show that safer school buildings have resulted in a decrease in loss of life and injuries, and a reduced disruption to education services, after natural disasters?*
2. *What broader benefits have been seen by communities?*
3. *What examples are there of previous national or international projects to improve the structural and non-structural safety of school?*
4. *What global standards are available for safer schools, and how have they been applied?*

To meet the objective, a search of publically available material was undertaken as a desk exercise.

The rapid desk study did not find significant statistical evidence to demonstrate that safer school buildings have resulted in a reduction of loss of life, injuries, or disruption. However, post-2015 Nepal earthquake studies provided some evidence that safer schools save lives, prevent injury and reduce disruption.

There is a great deal of evidence for the impacts on increased loss of life, injuries and increase in disruption to services from *not* having safer schools.

The evidence shows that safer school projects do bring benefits to the community other than the 'hard' infrastructure, including improved preparedness, technical skills and livelihoods. The evidence found was generally anecdotal and there did not appear to be many monitoring evaluation and learning studies, especially post-disaster.

There are numerous examples of national and international projects to improve the structural and non-structural safety of schools. The evidence found that projects generally focus on common areas, such as the structural safety – either through retrofitting or new build, codes and standards, or labour skills in resilient construction. A holistic approach, with preparedness elements supporting technical interventions, appeared successful in many cases.

The evidence did not find absolute global standards relating to safer schools. Most standards comprise advisory initiatives to help ensure a holistic view is taken of disaster risk reduction work in schools and provide minimum standards in various thematic areas both technical and non-technical. These are generally 'high level', programmatic aims, which have been developed by global actors involved with school safety. These global standards are then adopted by implementation organisations within their safer school programmes.

SECTION 1

Introduction

1.1 Introduction

This study provides evidence in support of the main objective: **To undertake a rapid desk based study to identify the evidence and apparent gaps in evidence, in the school construction design and retrofitting to achieve disaster resilience, to inform the development of a DFID business case.** This objective is realised through four component questions which provide additional information in support of this overall objective.

1.2 Definitions and scope

School construction design is taken as covering the design and construction process from concept and detailed design (ie drawings, specifications, quantities) through to the completed construction on site and then the subsequent maintenance.

A safer school can be considered as combining the following three elements[1]:

- Safe learning facilities
- School Disaster Management
- Disaster Risk Reduction and Resilience Education

Safer school buildings. The following definition has been generally taken in this study:

*"*Safer school buildings have been planned, designed, constructed and maintained to be, at a minimum, resistant to known hazards such that they protect students and other occupants during extreme hazard events. No building can be considered 'safe' in an absolute sense. Rather, safety is based upon anticipated hazards and available safer construction techniques. As knowledge in these areas changes, schools that were once thought to be safe may become understood as unsafe.

Safety also depends upon how a school will be used. At minimum, schools should be 'life safe' in anticipated hazards – the structure should retain some margin of safety against collapse and non-structural elements should not cause injury or death. However, these buildings may be heavily damaged. Even schools considered 'life safe' may need substantial repair before it can be reoccupied. Where schools will be used as shelter during emergencies and disasters, a safe school should not sustain heavy damage[2]*."* (GADRRRES, 2015).

Retrofitting is defined as any alteration of the existing structure in order to improve the performance of the building against expected conditions (GADRRRES, 2015).

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1 Definition based on The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector definition. Available at: http://www.wcdrr.org/uploads/Developing-a-Worldwide-Initiative-for-Safe-Schools-Two-pager.pdf. See also Page 16 of this report.

2 (GADRRRES, 2015, pIV).

Disaster resilience "is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses - such as earthquakes, drought or violent conflict - without compromising their long-term prospects[3]." (DFID, 2011).

1.3 Explanation of the methodology used

The methodology used to answer the four component questions is described below. Generally, evidence from the past five years was prioritised, but older material was included where relevant. Relevant global examples were included where appropriate, but the focus is on Nepal and the Asia region.

1. What global evidence is there to show that safer school buildings have resulted in a decrease in loss of life and injuries, and a reduced disruption to education services, after natural disasters?

The evidence to answer this specific question was generally derived from the following sequence of events:

- Safer school infrastructure is constructed.
- A disaster event of sufficient magnitude to cause loss of life/damage occurs.
- An evaluation of safer schools' performance against equivalent 'non-safe' schools.

Evidence was investigated at project, programme and country (or countries) level. Disaster resilience in the context of safer schools will primarily cover seismic hazards (earthquake resilience), but all hazards, such as flooding, are relevant.

2. What broader benefits have been seen by communities? This is taken to mean benefits outside of the lifesaving function of the school infrastructure and is taken to relate to socio-economic factors such as livelihoods, disaster preparedness and capacity building.

Evidence was particularly looked for in evaluations or analysis of safer schools programmes, particularly community-led school construction where community benefits are often generally greater (GADRRRES, 2015). To help provide an analysis framework, the results will be considered against the characteristics of a disaster resilient community (Twigg, 2009):

- Governance
- Risk Assessment
- Knowledge and Education
- Risk Management and Vulnerability Reduction
- Disaster Preparedness and Response

3. What examples are there of previous national or international projects to improve the structural and non-structural safety of school? A general search of evidence and available material was undertaken.

4. What global standards are available for safer schools, and how have they been applied? A general search of evidence and available material was undertaken.

[3] (DFID, 2011, p6)

1.4 Contacts

The following organisations were contacted to gain their insights and to source additional evidence:

- Asian Development Bank (ADB)
- The Centre for Research on the Epidemiology of Disasters (CRED)
- National Society of Earthquake Technology, Nepal (NSET)
- United Nations Office for Disaster Risk Reduction (UNISDR)

1.5 Caveats and challenges

This assessment was time constrained and included generally only publically available material. Additionally the most readily available information is often promoted by those with an interest in the success of the scheme and can contain certain biases when considering the success of a project, although not necessarily. Peer reviewed or independent evaluations which may have provided a more accurate picture were not so readily available.

The methodologies to answer Q1, and to a certain extent, Q2, are partly reliant upon there being post disaster safer schools evaluations. It must be recognised that such evaluations can be challenging - in the aftermath of a disaster, the greatest efforts may be directed at lifesaving activities rather than technical evaluations needed for subsequent statistical analysis. Additionally ascertaining exact causes of failure of a school and comparing loss of life and injury across schools may not be straightforward. The damage and failure (and injuries and deaths) associated with any building can be subject to variations[4] in seismic activity, ground conditions, event timing[5], construction quality (including hidden variables of steel reinforcement quality etc). (Ramirez, 2005) (Petal, 2015).

[4] For example; falling bookshelves, loose storage and fixtures can kill or seriously injure in an earthquake – all of these might be considered as outside of the structural fabric of the building.

[5] The 2015 Nepal quake occurred on a Saturday – a non-school day, so casualties were lower than might have been otherwise. This illustrates that drawing any conclusions from statistics needs caution.

SECTION 2

Evidence

2.1 Evidence

Question 1. What global evidence is there to show that safer school buildings have resulted in a decrease in loss of life and injuries, and a reduced disruption to education services, after natural disasters?

The following, generally anecdotal, evidence was found. It does support the premise that safer school buildings do result in reduced loss of life and injuries, and reduced disruption during a hazard event. Generally, as might be expected, no evidence was found to suggest that safer schools had any negative effect on saving lives, although in one case below some 'safer schools' had indeed collapsed[6]. Further details of the evidence can be seen in Annex 1. The evidence found is also summarised in Table 1 below:

Ref. [7,8].	Evidence source	Event	Effect on decrease in deaths, injuries and disruption
1a & 1b	Nepal	2015 earthquake	160 structurally retrofitted buildings were undamaged by earthquake
2	Nepal	2015 earthquake	Retrofitted school buildings performed much better than non-retrofitted buildings.
3	Nepal	2015 earthquake	Retrofitted buildings had no damage
4	Nepal	2015 earthquake	Resilient 'earth bag' construction showed only minor damage and performed much better than concrete buildings, which collapsed.
5	Nepal	2015 earthquake	11 retrofitted buildings were undamaged
6	Nepal	2015 earthquake	160 retrofitted schools showed no significant damage and were being used as shelters
7	Bhutan	2011 earthquake	Vulnerability increased from poor school construction
8	China	Earthquake	Retrofitted school undamaged. Non retrofitted schools collapse and cause many deaths.
9	South Kyrgyzstan	2008 earthquake	Retrofitted school undamaged. Non retrofitted schools collapse and cause many deaths.
10	Azerbaijani	2013 earthquake	Disaster preparedness actions save children's lives

Table 1 Q1. Summary of evidence found

6 From Ref 2. Refer to Annex 1 for details. The report reports that the concept of a 'safer school' was valid, but deficiencies in design/construction were likely factors in the collapse.

7 Refer to Annex 1 for more details on evidence

8 It is possible, but not confirmed, that examples: 1a, 1b and 6 are the same project, but described differently in various sources.

2.1.1 Comments on Question 1 evidence

The rapid desk study did not find a significant body of evidence that safer schools result in a reduction of loss of life, injuries, or disruption. This conclusion was also supported by a 2014 investigation into the economic case for safe schools by a leading NGO, which reported that:

"The literature quantifying the impacts of safe schools is sparse. As one might expect, there is more evidence available in relation to retrofitting as a structural intervention as this is easier to quantify and model than non-structural interventions, such as better contingency planning or disaster risk education. However, the evidence is nonetheless far from systematic across all potential areas of impact and activities (in other words there is not a body of evidence that allows us to draw robust conclusions)[9]" (Venton, 2014).

The evidence found was generally from Nepal, which is understandable, given it is one of the most recent disasters and also had a number of safer schools projects already underway at the time of the disaster.

Most of the evidence found was based around structural retrofitting, which is line with the definition of a safer school building (on page 1). The overwhelming majority of the retrofitting work appeared successful – most of the retrofitted schools did not suffer major damage and consequently there were no injuries and disruption was minimised after the disaster. Very little evidence was found concerning private schools.

It is worth noting that there is a great deal of evidence of the estimated number of children killed in disasters[10], lives that *could* be saved, and numbers of damaged schools as well as the benefits that resilient school programmes are predicted to achieve. Presented in this way, there is a great deal of evidence for the impacts on increased loss of life, injuries and increase in disruption to services from *not* having safer schools (Petal, 2015). However, this evidence does not specifically answer the question set and whilst the benefits of a safer school may seem obvious, there appeared to be very little evidence, such as a comprehensive assessment of safer schools across a county or major programme which may have provided the evidence required.

[9] (Plan, 2014, p16)

[10] An excellent reference for a catalogue of disasters and impact on schools and children can be found on the following link: http://www.researchgate.net/publication/277820958_Petal_M._et._al._School_Seismic_Safety_and_Risk_Mitigation_in_Khazai_B._et._al._Eds._Encyclopedia_of_Earthquake_Engineering_Section_Policies_and_Approaches_in_Earthquake_Resiliency_and_Risk_Mitigation_Springer_2014

Question 2. What broader benefits have been seen by communities?

As described in the methodology, the benefits have been assessed according to the characteristics of a resilient community[11]. This is to help the analysis using an established framework, rather than an absolute categorisation.

The evidence is presented below:

Characteristic 1. Governance

Thailand: Child-led Disaster Risk Reduction (CLDRR) work

In Thailand, an important element of Save the Children's CLDRR program has been the approach of institutionalizing CLDRR in schools. Getting official support from senior government was critical. This shows the schools that the process is approved and that they are recognized as participating in an important process. As a result Save the Children held workshops for principals, teachers**, provincial education officers and a senior representative from the Ministry of Education** (Benson).

Pakistan: Child-led Disaster Risk Reduction (CLDRR) work

In Pakistan, Save the Children trained 100 government officials in disaster risk reduction and preparedness. This enabled the officials to function more effectively and have better technical capacity in disaster risk reduction and response. The trainings were aimed at bridging the gap between local government and communities, with an emphasis on the need for clear communication and coordination (Benson).

Characteristic 2. Risk Assessment

Thailand: Child-Led Disaster Risk Reduction

Hundreds of children in dozens of schools were trained in DRR activities. Activities were undertaken to support this. For example, children took community trips, **conducted risk and resource mapping**, and developed a disaster risk reduction education campaign (Benson).

Characteristic 3. Knowledge and Education

Indonesia: Emergency Capacity Building

In Indonesia, Save the Children was part of the multi-agency program called Emergency Capacity Building, which worked with local partners and local government to develop their abilities to prepare and respond to disasters. This was achieved through a series of trainings and workshops. One component was working to raise awareness amongst the community and schools through the production of information education and communication (IEC) materials around the main hazards including earthquakes, flooding and tsunamis (Benson).

Indonesia – Disability-Inclusive disaster risk reduction

Arbeiter-Samiter-Bund (ASB), in partnership with the Provincial Department of Education, Yogyakarta, has conducted earthquake preparedness training for teachers and students at all of the province's 60 special needs schools. They developed multimedia earthquake preparedness materials including an educational drama involving deaf children. Audio based materials for blind children were also developed. The project also provided teachers with communicative training, including simple sign language and mime techniques (UNESCO, 2015).

[11] Further details on elements which comprise each of the characteristics can be seen on the following link: http://discovery.ucl.ac.uk/1346086/1/1346086.pdf

Nepal: Knowledge transfer

A small scale school study found that communities engaged at sites involving new construction and retrofitting showed better knowledge of risks and earthquake resistant construction. As a result, new housing was reported to have incorporated some of these technologies. It reported that links with parents were important to disseminate knowledge to overcome language and cultural barriers. It also noted that impacts of these benefits faded over time where safer schools lacked anything different about them to promote or educate earthquake resistant construction features. In general, the assessment advocates a community-led approach for safer schools (Paci-Green, 2015).

Indonesia: Impact of retrofitting work on awareness raising and knowledge transfer

An assessment was made of the effects of schools, health facilities, and houses retrofitted by Save the Children from 2005 to 2008. The assessment results showed that there were positive impacts on those that participated in the work, but that the impact of retrofitting work on transferring technical knowledge within the communities was not significant. However, the respondents felt that the retrofitting work had a definite impact on raising awareness of disaster risks and measures for disaster risk reduction (Shrestha, 2013).

Characteristic 4. Risk Management and Vulnerability Reduction

Nepal: Retrofitting and community preparedness

In 2013, the work of three experienced implementing partner agencies was assessed by DFID: CARE –Nepal and Rural Reconstruction Nepal working together in the Community Support Programme (CSP), and the Emergency Response and DRR (ERDRR) programme of the Rural Access Programme (RAP). The work assessed the seismic retrofitting for community buildings (including schools) and community resilience aspects such as training (including light search and rescue training) and disaster preparedness. The assessment feedback was generally positive. For example: "Feedback from community participants was encouraging and largely positive on the inclusion of women and marginalised groups in this work[12]." However, it was also noted that until capacity is tested in an emergency situation then the real benefits cannot be known[13] (DFID, 2013).

Peru: Market enterprise through resilient materials

In Peru, Mujeres Unidas para un Pueblo Mejor[14] developed techniques for constructing earthquake-resistant bricks using inexpensive local materials (with support from the NGO Estrategia). Producing these bricks is an income generating enterprise for women who built affordable, earthquake resistant houses in a 20 home pilot some years ago. They have sold bricks to municipal government in recent years for use in public facilities (GROOTS, 2008).

Characteristic 5. Disaster Preparedness and Response

Many of the previous projects would also fall under this category. For a specific example, the *Nepal: Retrofitting and Community preparedness* example above could also cover this characteristic.

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12 (2013, DFID, p4)

13 Note: No post 2015 earthquake assessments were found. Such an assessment, if in existence, may provide useful feedback.

14 Mujeres Unidas (Women United for a Better Community) is a network of women primarily located within two neighbourhoods of Lima, Peru. Mujeres Unidas encourages women to actively participate in bettering their communities in various ways.

2.1.2 Comments on Question 2 evidence

The rapid desk study found examples of projects and benefits in each characteristic, but generally evidence under the thematic area of *Characteristic 3: Knowledge and Education* was the most readily available.

It was noted that there are many examples of successful programs which incorporate a technical element (ie retrofitting) as well as an education programme of some description in areas of disaster preparedness.

The challenges of scale are apparent. Many of the schemes require working closely with a community, but how you scale this up to achieve safer schools at a country level, was described in less detail.

Evidence on quantifying and evaluating the benefits appeared to be less well documented. It is likely more evidence does exist to describe the benefits, perhaps from programme evaluation reports, but it would appear there is gap in publically available assessments and quantification of the benefits against any particular baseline (as is the situation in answering Question 1) particularly in post disaster resilience. For example, how resilient is the community and how do you measure this?

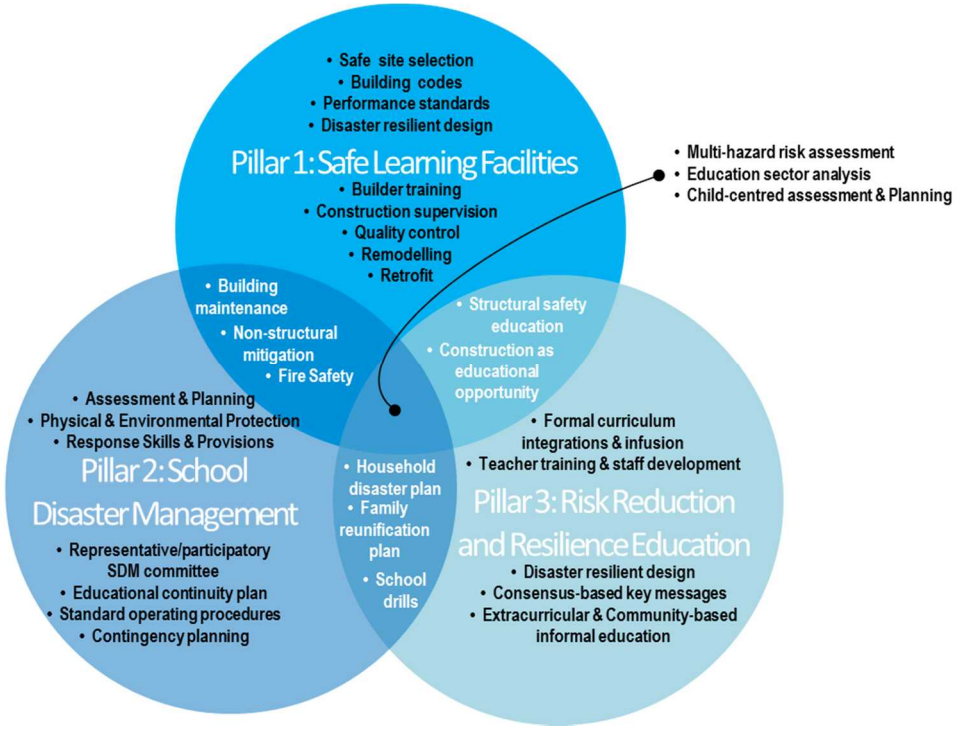
Question 3. What examples are there of previous national or international projects to improve the structural and non-structural safety of schools?

The project examples which provide a response to this question are shown in Annex 2. In response to the request to provide further analysis, these projects have also been tabulated and can be seen in Table 2 in Annex 2.

Analysis framework

For project assessment purposes, the following Comprehensive School Safety analysis has been used, as shown in Figure 1 below. Although this is generally aligned with policy and planning level activities, adherence to aspects of this framework could be seen as a reasonable indicator of school safety and therefore the type of activities that a safer school project might contain.

Figure 1 The Three Pillars of Comprehensive School Safety (adapted from GADRRRES, 2014)



Analysis

The desk study found a wide variety of projects, both in scope, size and budget. Of those which provided information on their size and scope, approximately 50% of the programmes could be considered to be 'large' scale - for example, carrying out countrywide initiatives. Conversely, there were many examples of smaller initiatives working at local or regional level.

All projects found as part of this rapid desk study were broadly considered against one or more of the three pillars, as in Figure 1. This rapid assessment indicates common areas and is not a comprehensive assessment.

Thematic areas which appeared more frequently in projects were:

- Assessment & Planning
- Retrofitting (seismic)
- Disaster resilient design
- Builder Training

- School drills
- Formal curriculum integrations & infusion
- Extracurricular & community-based informal education
- Response skills & provisions
- Contingency planning
- Representative/participatory SDM committee
- Child-centred assessment and planning[15]
- Multi-hazard risk assessment
- Construction as an education opportunity

Thematic areas under the pillars for which evidence was less available:

- Fire safety, non-structural mitigations
- Building maintenance
- Household disaster plan
- Family reunification plan
- Standard operating procedures
- Educational continuity plan

The information found under this assessment did not provide enough detail to draw conclusions from why some thematic areas had more evidence than others.

Holistic approaches

Most projects covered more than one thematic area within the three pillars. No evidence was found to suggest that this brings more benefits than one which targets fewer elements, but it would appear that the most successful projects do not work in isolation and take a holistic view, or are in synergy with other separate programmes.

Collaboration

Promoting collaboration and institutional support was identified as a learning point on a number of the GFDRR projects, including their recommendation of the essential requirement of increasing public knowledge to gain support for upgrading schools. Iran's Safer Schools Programme also placed a large emphasis on educating children on disaster preparedness. These children then engage with families and the wider community to further disseminate preparedness messages (McClean, 2015).

Retrofitting and preparedness

A large proportion of the projects were technically focussed, often involving retrofitting, combined with one or more preparedness components such as disaster planning. For example, teaching children what to do in an earthquake emergency. Many programmes were addressing inherent seismic risks already contained in the existing school building assets using a retrofitting approach to bring buildings up to a determined standard. Non-structural retrofitting[16] appeared less frequently.

Of the countries studied, no country reported a 100% 'safer schools' stock following safer schools initiatives. This may reflect the technical challenges of retrofitting, which were often carried out on a case by case basis at each school, and consequently indicate that a

[15] Refer to Q2 response for example project details.

[16] 'Non-structural retrofitting' comprises improving safety through the 'non-core' elements of the building. For example, fixtures, fittings and vcladding etc. Further explanation can be seen on the following link: http://toolkit.ineesite.org/resources/ineecms/uploads/1055/Case_Studies_Seismic_Nonstructural_Retrofit.pdf

countrywide programme requires significant budget[17] and technical expertise together with government support.

Preparedness activities (aligned with pillars 2 and 3) were widespread and were often reported as reaching large numbers of people. However, as in the case of safer school technical interventions, no independent post disaster evaluation reports on the impact of the preparedness components in saving lives or reducing injuries were found.

Education
Structural safety education components featured in several projects, but generally focussed at local labour rather than the 'formal' construction industry or industry bodies. The GFDRR project encompassing training for civil engineers in Turkey was arguably one exception (GFDRR, 2014) (World Bank, 2014) (GFDRR, 2011).

Community initiatives
The response to Q2 should also be read in conjunction with this analysis.

Training components for local labour and local construction initiatives were reflected in a number of programmes. One project reported that community awareness is a key driver, with increased local technical support both through supervision and local mason training required for successful project implementation (NSET, 2012). This view concurs with the GFDRR's view, who also reported that a strong local team was the key to successful project implementation (GFDRR, 2014) (World Bank, 2014) (GFDRR, 2011). No 'community led' retrofit projects were found. This is possibly due to shortfall in technical expertise required at local level and the high level of external construction supervision that would be required to ensure quality is maintained.

Prioritisation
A 'risk analysis process' has been used, generally in the larger safer schools programmes, to identify the greatest needs and determine the level of seismic risk against which schools need to be able to withstand. Where new school infrastructure was being delivered then resilience was included as fundamental part of infrastructure design, but in these projects the primary aim was meeting the educational sector's needs rather than a safer school per se.

Nepal - Rural vs urban
In general, rural schools appeared less represented or at least not differentiated from urban schools within the project information found. It was noted that the evaluation report of the ERDRR project reported on the challenge of retrofitting rural buildings and schools when applying urban standards (Scott, I. et al , 2013).

In terms of safer schools projects in Nepal, there was a significant focus of efforts on schools in and around Kathmandu Valley, supported by a significant amount of available technical analysis covering probabilistic hazard mapping and predicted effects on building assets.

[17] Depending on the level of retrofitting required, at some point it becomes economically more efficient to rebuild. There are no hard and fast rules, but if the cost to retrofit exceeds 40% of the cost to rebuild, then it can be better to rebuild (GFDRR 2009).

Question 4. What global standards are available for safer schools, and how have they been applied?

The desk study did not find evidence that there are 'true' global standards which are universally accepted and applied within the context of safer schools. However, the following toolkits, information sources, and initiatives and were found[18] which came closest in terms of safer schools standards.

INEE Toolkit[19]
INEE is an open, global network of practitioners and policy makers working together to ensure all persons the right to quality education and a safe learning environment in emergencies and post-crisis recovery. http://toolkit.ineesite.org/overview_of_the_inee_toolkit

This INEE Toolkit contains a wide variety of practical, field-friendly tools and resources to guide educationalists, humanitarian workers and government officials working in the field of education in emergencies through to recovery. The tools and resources in this Toolkit are organised in the following sections:

- INEE Minimum Standards: this section contains the INEE Minimum Standards Handbook in various languages, Implementation Tools, Education in Emergencies Training Materials, Case Studies and Assessment Reports, and Contextualized Standards.
- Training and Capacity Development Tools: this section contains Education in Emergencies Training materials and Conflict Sensitive Education Training Materials
- Guidance Notes on Teaching and Learning: this section contains Guidance Notes on Teaching and Learning in various languages and a resource pack on Teaching and Learning.
- Guidance Notes on Teacher Compensation: this section contains Guidance Notes on Teacher Compensation in Fragile States, Situations of Displacement and Post-crisis Recovery in various languages and implementation tools for teacher compensation.
- Guidance Notes on Safer School Construction: this section contains the Guidance Notes on Safer School Construction in various languages and implementation tools on safer school construction.

These Guidance Notes were developed through a widely consultative process under the leadership of the INEE and the Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank, and in partnership with the Coalition for Global School Safety and Disaster Prevention Education, the IASC Education Cluster and the International Strategy for Disaster Risk Reduction. They provide a framework of guiding principles and general steps to develop a context-specific plan to address a critical gap to reaching the Education for All (EFA) and Millennium Development Goals (MDGs) through the disaster resilient construction and retrofitting of school buildings

- Pocket Guide to Gender: this section contains the Pocket Guide to Gender in various languages and implementation tools on gender.
- Pocket Guide to Inclusive Education: this section contains the Pocket Guide to Inclusive Education in various languages and implementations tools on inclusive education.
- Pocket Guide to Supporting Learners with Disabilities: this section contains the Pocket Guide to Supporting Learners with Disabilities in various languages and implementation tools on supporting learners with disabilities

[18] Many of these global standards were referred in the project examples found as evidence on Question 3.
[19] Information contained on the INEE Toolkit is replicated here from: www.ineesite.org

- Guidance on HIV in Education in Emergencies: this section contains guidance on HIV in Education in Emergencies in English and Spanish.
- Advocacy Materials & Peace Education Programme: this section contains INEE Advocacy Tools, Minimum Standards Case Studies and Assessment Reports, Key Documents, Peace Education Programme, and EiE Infographics.
- Reference Guide on External Education Financing: this section contains the Reference Guide in various languages and implementation tools to support the use of the Reference Guide.
- INEE Conflict Sensitive Education Pack: this section contains tools and resources related to Conflict Sensitive Education, including a Guidance Note on Conflict Sensitive Education, Reflection Tool for Designing and Implementing Conflict Sensitive Education Programs in Conflict-Affected and Fragile Contexts, INEE Guiding Principles on Integrating Conflict Sensitivity in Education, additional resources, and implementation tools for conflict sensitive education.
- Teacher Professional Development: this section contains the Where It's Needed Most: Quality Professional Development for All Teachers guide and implementation tools.
- EiE Term Bank: this section contains over 330 key EiE-related terms, their definitions and sources, and was created to promote a common understanding of EiE technical terms and to support correct and universal usage of these terms.
- Key Thematic Issues: this section provides thematic resources to help to strengthen the implementation of the INEE Minimum Standards in the particular thematic areas of conflict mitigation, disaster risk reduction, early childhood development, gender, HIV/AIDS, human rights, inclusive education, inter-sectoral linkages, protection, psycho-social support, and youth.

Other related initiatives

Sustainable Development Goals (SDGs)

The United Nations Conference in 2012 on Sustainable Development (Rio+20) resulted in political commitments and efforts to align Sustainable Development Goals with the United Nations development agenda. The efforts have highlighted how disasters disrupt development, making disaster risk reduction fundamental in sustainable development. It also called for a shift access to education alone to quality education, including safe buildings (GADRRRES, 2015).

Millennium Development Goals (MDGs)

The United Nations adopted the Millennium Development Goals (MDGs) in 2000. The MDG's made universal primary education by 2015 as the second highest priority. (GADRRRES, 2015).

Education for All (EFA)

"Initiated through the 2000 Dakar Framework for Action and coordinated by UNESCO, EFA was a global movement to provide quality basic education to all children, youth and adults by 2015[20]." (GADRRRES, 2015).

Hyogo Framework for Action (HFA)

With the goal of substantially reducing losses by 2015, the United Nations Office for Disaster Risk Reduction (UNISDR) coordinated the first 10-year disaster risk reduction framework in 2005. Priority Action 3 covers the use of knowledge, innovation and education to build a culture of safety and resilience at all levels. The framework is succeeded by the Sendai Framework for Action in 2015 (GADRRRES, 2015).

[20] (GADDRRRES, 2015, p7)

Disaster Risk Reduction Begins at School

A UNISDR-led initiative to integrate disaster risk reduction into education programmes and to promote school resilience (GADRRRES, 2015).

Child-Friendly Schools

UNICEF's 2009 Child-Friendly Schools model aims to improve education quality and learning outcomes by addressing student needs, school environment, and curriculum and teaching processes (UNICEF 2015).

Comprehensive School Safety

A global framework in support of **The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector** and **The Worldwide Initiative for Safe Schools**, in preparation for the 3rd U.N. World Conference on Disaster Risk Reduction, 2015. Developed by the United Nations (UNISDR) and humanitarian organisations in the education sector it seeks to ensure children and school personnel are not killed or injured in schools, and that educational continuity is assured.

It uses three overlapping pillars of:

1. Safe Learning Facilities
2. School Disaster Management
3. Risk Reduction and Resilience Education
   (GADRRRES, 2014) (GADRRRES, 2015).

Worldwide Initiative for Safe Schools (WISS)

The WISS is a global initiative that covers key school safety programmes at the global levels to provide a coordinated approach to school safety. Is has resulted in the creation and involvement of 21 Safe School Leader countries to school safety implementation at the national level (GADRRRES, 2015).

Global Program for Safer Schools (GPSS)

The program is an important part of the Worldwide Initiative for Safe Schools. It aims to strengthen the on educational infrastructure resilience in selected World Bank priority countries and also tracks progress in implementing comprehensive school safety globally (GFDRR, 2015).

ASEAN School Safety Initiative (ASSI)

The Association of Southeast Asian Nations (ASEAN) has a regional initiative for comprehensive school safety implementation that supports the objectives of the Worldwide Initiative for Safe Schools. The ASSI includes three components:

a) ASEAN Common Framework for School Safety (including targets and indicators and roll-out guidance)
b) School Vulnerability & Capacity Assessment Tools (including linked to CSS Assessment Suite).
c) School Disaster Management Toolkit
   (ASSI, 2015).

Universal Access

Universal access provides standards covering access to buildings for all users including those with mobility restrictions etc. The standards address access in schools, including emergency access. Applying this guidance[21] is a mandatory requirement of DFID infrastructure projects and of many other donors and institutions.

[21] Refer to bibliography for details.

Sphere Standards

Parts of the Sphere Standards relate to schools – hygiene, excrete, health, in the humanitarian response or emergency situation, but not specifically on resilience or safer schools.

2.1.3 Comments on Question 4 evidence

As commented on in the response to Q3, safer schools initiatives generally comprise both technical and non-technical elements. The technical elements often focus on the resilience of the building against hazards, whilst the 'non-technical' elements tend to focus on preparedness of people.

For technical elements, no evidence was found relating to the existence of specific global technical design or construction standards for a safer school. For non-technical elements, the evidence could be used to develop a holistic safer schools programme, but there are no absolute global standards.

Overall, the evidence appeared fragmented with no one mandatory or overarching document or structure linking it together. Figure 2, overleaf, shows one interpretation of the relationships between the evidence found.

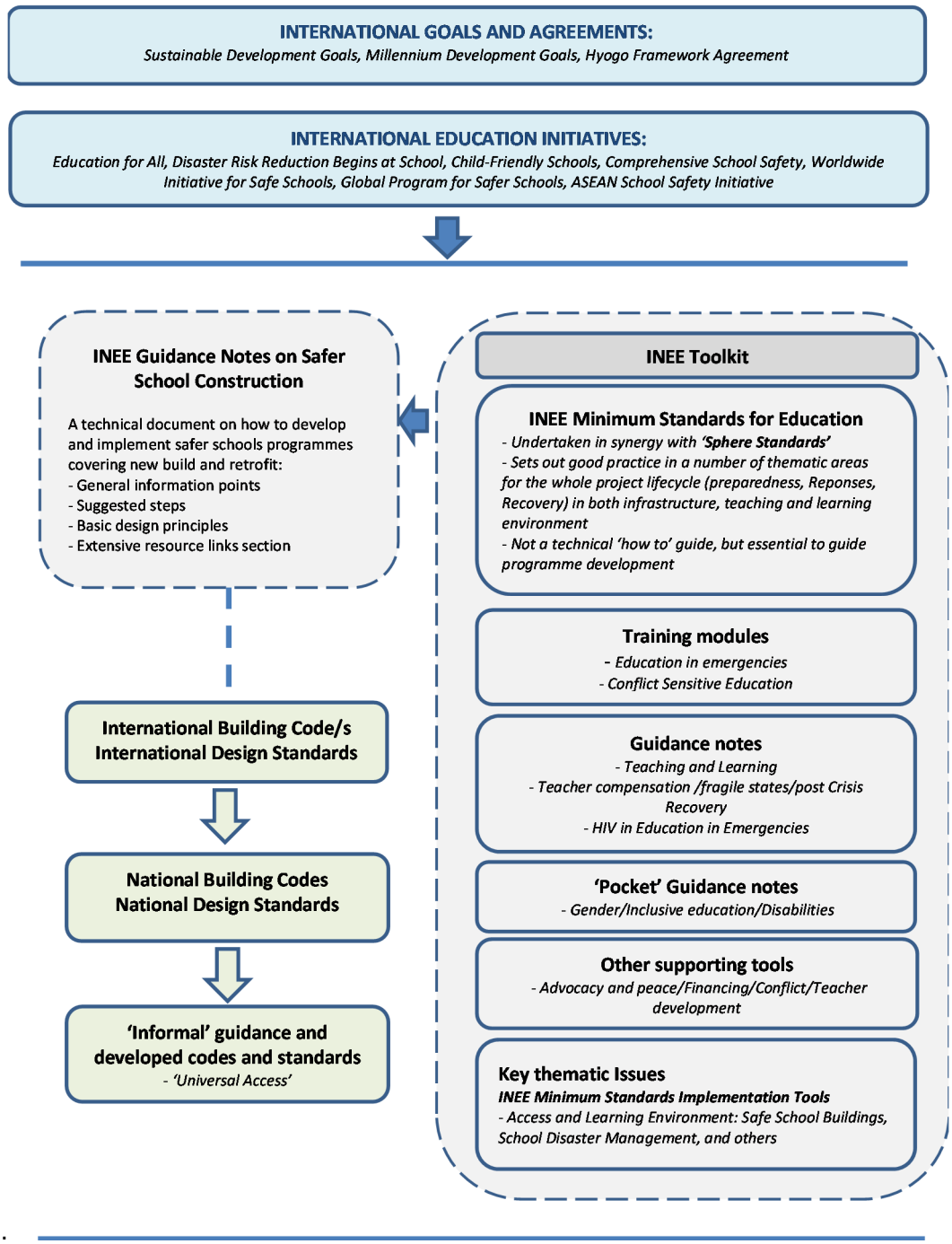
At the upper level, international goals drive much of the subsequent development especially in terms of resilient infrastructure and educational requirements under various thematic areas. Below this, there are wide varieties of generally donor funded education initiatives which cross cut a number of areas – these initiatives are wide reaching - both drive their own projects as well as influencing other projects. For example, the Global Program for Safer Schools (GPSS) has one initiative in multiple countries to improve design standards. These revised design standards may then be incorporated into other downstream projects undertaken within and outside of the GPSS.

The INEE toolkit contains advisory minimum standards for education. As a whole, the toolkit covers more than just safer schools, but aspects of it are directly relevant and these parts could arguably be considered the closest application of a global standard for safer schools. It also provides limited technical advice via the *Guidance Note on Safer School Construction*, but this is primarily aimed at programme development rather than providing a specific global standards. The INEE toolkit is shown as linking to the building codes and design standards. This is indicative, as there is no direct link or requirement to follow the INEE guidance notes.

Technical global standards are covered by internationally accepted design codes and specifications. Application of any codes and standards would fall under the mandate of the country of operation of the particular programme.

Under any mandatory codes and standards is vast body of 'informal 'guidance covering a wide variety of technical and non-technical areas relating to safer schools, but could not be considered as a global standard. National standards are not included, as these are not generally considered as global.

Figure 2 Interpretation of the relationship of identified 'global standards' (Fitzmaurice, S. 2015) [22]



[22] Diagram prepared by report author

2.2 Conclusions

The rapid desk study did not find significant statistical evidence to demonstrate that safer school buildings have resulted in a reduction of loss of life, injuries, or disruption. However, post-2015 Nepal earthquake studies provided some evidence that safer schools save lives, prevent injury and reduce disruption.

There is a great body of evidence on the *estimated* number of children killed in disasters[23], school damage caused, and lives that *could* be saved through safer schools, as well as the estimated benefits that resilient school programmes are predicted to achieve. Presented in this way, there is a great deal of evidence for the impacts on increased loss of life, injuries and increase in disruption to services from *not* having safer schools. However, this evidence does not specifically answer the question set.

There are a number of challenges in obtaining rigorous statistics to gain this evidence - the large amounts of variables which can affect statistical analysis, collecting data in a post-disaster situation, and perhaps simply because there has been little challenge to the conventional acceptance that safer schools do save lives.

Much of the evidence found was based around structurally retrofitting public schools in Nepal, which is understandable, given it is one of the most recent disasters and also had a number of safer schools projects already underway at the time of the disaster. Very little evidence was found concerning private schools. The overwhelming majority of the retrofitting work appeared successful – most of the retrofitted schools did not suffer major damage and consequently there were no injuries and disruption was minimised after the disaster. However, cases were noted in Nepal in both new build and retrofitting projects led by international organisations that resulted in failed 'unsafe' schools following the 2015 earthquake. This suggests that implementing the appropriate technical oversight is crucial.

There was evidence from Nepal reporting the difficulties in applying retrofitting guidance to more 'informal' rural construction types as opposed to more standard construction that might be found in urban environments. The extent of this gap, in Nepal or other countries, was not clear from the evidence, but may represent a potentially significant unknown risk where schools do not have standardised typologies or the same levels of construction resilience within schools.

The evidence shows that safer school projects do bring benefits to the community other than the 'hard' infrastructure, including improved preparedness, technical skills and livelihoods. The evidence found was generally anecdotal and there did not appear to be many monitoring evaluation and learning studies, especially post-disaster. For example, how resilient was the community, and how do you measure this? The challenges of scaling up community level interventions were not well covered in the evidence found.

[23] A useful reference for a catalogue of disasters and impact on schools and children can be found on the following link: http://www.researchgate.net/publication/277820958_Petal_M._et._al._School_Seismic_Safety_and_Risk_Mitigation_in_Khazai_B._et._al._Eds._Encyclopedia_of_Earthquake_Engineering_Section_Policies_and_Approaches_in_Earthquake_Resiliency_and_Risk_Mitigation_Springer_2014

There are numerous examples of national and international projects to improve the structural and non-structural safety of schools. The evidence found that projects generally focus on common areas, such the structural safety – either through retrofitting or new build, codes and standards, or labour skills in resilient construction, in combination with disaster preparedness activities, often in urban settings. A holistic approach, with preparedness elements supporting technical interventions, appeared successful in many cases.

Retrofitting is a technically complex area and presents challenges in scaling up programmes to a country level; the evidence shows that country level interventions require significant time budget and resources.

Judging the success of a project is problematic – information sources can be biased, especially those which are most readily available or promote particular schemes, but if success is judged on impact, then the larger scale projects have achieved a greater degree of resilience in terms of infrastructure. At a smaller scale, there are numerous examples where community level safer school interventions have been reported as being successful.

The evidence did not find absolute global standards relating to safer schools. Arguably, the INEE toolkit is the closest fit to a global standard. Most standards comprise advisory initiatives to help ensure a holistic view is taken of disaster risk reduction work in schools and provide minimum standards in various thematic areas both technical and non-technical. These are generally 'high level', programmatic aims, which have been developed by global actors involved with school safety. These global standards are then adopted by implementation organisations within their safer school programmes.

2.3 Recommendations

The impacts of safer schools does not appear to have been systematically or statistically assessed as yet but such an assessment may be important in supporting and guiding relevant policy action for school safety by interested Governments and partner agencies.

It is possible that further evidence is available, but which is not publically available, or that which will take longer to source. If additional information is sourced and gaps still remain, then further work should be done in this area in terms of a systematic review. Additionally, while not specifically relevant in this report, a number of studies have been carried out looking at the cost: benefit analysis of safer school interventions. This is also one potential area to investigate further in term understanding the benefits of various interventions.

There are a wide variety of projects from which to learn from when considering any future interventions and discussions with key stakeholders in these would provide greater insight into what has worked and what has not.

Especially in Nepal, there is some evidence to suggest that there is a technical knowledge gap between applying rural and urban standards in retrofitting projects (or formal vs informal construction). This should be considered further if interventions are planned under these different scenarios.

Within Nepal, early work has been carried out to investigate and develop a 'national risk assessment'). Some of the preliminary information or inception reports may be available to help inform a risk-based approach in assessing school safety[24].

Two forthcoming studies were identified which may be of particular interest to the reader in helping to answer the framing questions. For future reference, these are listed below.

Nepal:

Comparative Assessment of School Building Damage (Risk RED)
Further to the existing study highlighted in Annex 1 (Ref 2. Nepal: Small scale post disaster study), Risk RED are looking to extend this assessment to analyse more post-disaster rapid damage assessment data and to carry out random sampling of the remaining affected schools (Risk RED, 2015).

Causes of Deaths and Injuries in the 2015 Nepal Earthquake (Risk RED)
Risk RED are planning to carry out a study of over 2,000 people, so that they can better understand how those most affected by the earthquake were injured or killed. This information can help communities to better protect themselves in the future. A report and national workshop is planned (Risk RED, 2015).

[24] With involvement by the National Risk Reduction Consortium (NRRC) , Nepal

Annotated bibliography

Reference	Type of literature and research type	Summary
AADMER Partnership Group (2015) *ASEAN Safe Schools Initiative (ASSI)* Available at: http://www.aadmerpartnership.org/what-we-do/assi/ [Accessed 28 October 2015].	Website	ASEAN Safe Schools Initiative (ASSI) is an initiative with the goal to ensure children are more resilient to disasters and have a safe and secure learning environment. This is realised through improved technical and institutional capacity of ASEAN member states. (ASEAN: The Association of Southeast Asian Nations).
Asian Development Bank (2015), *Nepal: School Sector Programme,* Manila: ADB. Available at http://www.adb.org/projects/35174-082/main [Accessed 27 October 2015].	Programme status	This is a follow-up of the Education Sector Program which aims to (i) expand access and equity, (ii) improve quality and relevance, and (iii) strengthen the institutional capacity of the entire school education system.
Asian Development Bank (2015), *Schools with Earthquake-proof Technology Survive Nepali Disaster*, Philippines: ADB. Available at: http://www.adb.org/news/features/schools-earthquake-proof-technology-survive-nepali-disaster [Accessed 23 October 2015].	Grey literature Secondary data	In Kathmandu Valley, Nepal about 160 public school buildings survived the 7.8 magnitude earthquake-thanks to an ADB-supported school safety program from the Government of Nepal.
Bastidas, P. (2011) *School Safety Baseline Study*, Geneva: UNISDR and UN Thematic Platform on Knowledge and Education, Available at: http://www.unisdr.org/we/inform/publications/23587 [Accessed 27 October 2015]	Grey literature Secondary data	This study consists of a desk analysis of ten selected countries using available information provided by key informants from institutions working in those selected countries in disaster reduction project in the education sector. The scope of this work is to develop a baseline on school safety study of existing initiatives undertaken by governments, civil society, UN, donors and other major stakeholders that aim at assessing and improving school safety. The four main dimensions identified are a) hazards and risks knowledge, b) structural and non-structural safety, c) systems, procedures and skills, d) curricula.
Benson, L., Bugge, J., (no date), *Child-led Disaster Risk Reduction: A Practical Guide,* Sweden: Save the Children, Available at: http://www.preventionweb.net/files/3820_CHLDRR.pdf [Accessed 27 October 2015]	Grey Literature Primary data	Save the Children believes that children should be engaged in reducing the risks of disasters in order to minimise negative impacts on communities. Children have the capacity to contribute, bring a unique perspective to DRR preparations and have the right to play a part in making themselves and their communities safer. This guide aims and promotes community led disaster risk reduction as a child-centred community based framework where children play leading roles in their communities to minimize the negative impacts of disasters. This will include child participation in assessing, planning, implementing, monitoring and evaluating DRR based on the United Nations Convention on the Rights of the Child (UNCRC).

Reference	Type of literature and research type	Summary
		According to the guide the question to ask is not if children should be involved but rather how they should be involved. This practical guide is aimed at practitioners working with children to provide them with examples and ideas to help them enable children to lead the process of disaster risk reduction.
Bryneson, M. (2015), *Building Safer Schools*, Kathmandu Post, Kathmandu: Kathmandu Post, Available at: http://kathmandupost.ekantipur.com/news/2015-05-13/building-safer-schools.html [Accessed 23 October 2015].	Newspaper article	About 20,000 schools have been severely damaged or destroyed by 2015 earthquake, according to the Department of Education. That means that tens of thousands of children might not be able to return to school. Plan International in Nepal recognised the risks that disasters pose to schools and has been working with partners to take action. Plan and other partners began to work on the Safe Schools programme in order to minimise those risks.
DFID (2011), *Defining Disaster Resilience: A DFID Approach Paper*, London: DFID. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/186874/defining-disaster-resilience-approach-paper.pdf) [Accessed 23 October 2015].	Grey literature Secondary data	This Approach Paper is intended to inform the next phase of DFID's work on resilience to both natural and man-made disasters, by providing a starting point for discussion within the Department and with our partners. Although the focus is on disasters, this is part of a wider process to mainstream resilience across all of DFID's work which is being led by Policy Division. The paper begins with an outline of what resilience is and sets out a framework to improve understanding of the different elements to be considered in building resilience through DFID's country operations. It then looks at a range of existing DFID resilience interventions at country and regional levels. The paper concludes by providing suggestions for what DFID can do to strengthen its work in this area and how it can provide strategic leadership across the international system.
DFID (2013) *Case Study Building Safer, Stronger Schools in Nepal*, London: DFID. Available at: https://www.gov.uk/government/case-studies/building-safer-stronger-schools-in-nepal. [Accessed 27 October 2015].	Grey literature	Nepal is located in one of the world's most earthquake-prone regions with a very high risk of a devastating natural disaster. DFID is building new classrooms that are designed to reduce the chance of a collapse during a quake and therefore potentially saving the lives of the children inside.
DFID (2013) *Independent Evaluation of the Integrated Disaster Resilience in DFID funded Programmes in Nepal: Final Report,* London: DFID. Available at: http://flagship4.nrrc.org.np/document/independent-evaluation-integration-disaster-resilience-dfid-funded-programmes-nepal-2013 [Accessed 26 October 2015]	Desk study Key informant interviews Community perception survey	The overall objectives of the evaluation were to assess how well disaster resilience has been integrated into DFID funded programmes that have been piloting this over the last year in order to track progress at an early point, understand the effect of this at community level, and provide lessons for future programming.
GFDRR (2011) *Istanbul Seismic Risk Mitigation and Emergency Response Video ISMEP, uploaded in 2011. Available at:* https://www.youtube.com/watch?v=XYV-Nj-HSl0 [Accessed 26	Website	This video is related to the ISMEP project which contributes to the long-term program to save lives and reduce social, economic and financial impacts in the event of future earthquakes.

Reference	Type of literature and research type	Summary
October 2015]		
GFDRR (2014) *Stories of Impact: Enhancing Seismic Preparedness in Istanbul,* Washington: GFDRR. Available at: https://www.gfdrr.org/stories-impact-enhancing-seismic-preparedness-istanbul [Accessed 26 October 2015]	Website	A partnership between GFDRR, the World Bank and the Governorship of Istanbul developed a comprehensive program to help the city prepare for and respond to earthquakes.
GFDRR (2014) *Stories of Impact: Protecting School Infrastructure Against Earthquake Risks in Peru,* Washington: GFDRR. Available at: https://www.gfdrr.org/stories-impact-protecting-school-infrastructure-against-earthquake-risks-peru [Accessed 26 October 2015]	Website	The World Bank, GFDRR and the Peruvian Ministry of Education are working together to strengthen the structural and functional conditions of school infrastructure in the cities of Lima and Callao. They are also aiming to reduce vulnerability to earthquakes through the development of a National School Infrastructure Plan and Structural Retrofitting Programme.
Ghesquiere, F., Jamin, L. and Mahul, O. (2006) *Earthquake Vulnerability Reduction Program in Colombia, A Probabilistic Cost-Benefit Analysis*. Washington: World Bank. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/8438/wps3939.pdf?sequence=1 [Accessed 28 October 2015].	World Bank Policy Research Working Paper	This paper presents a probabilistic cost-benefit analysis relying on a catastrophe risk model. It produces risk metrics such as the exceedance probability curve of the benefit-cost ratio, thus providing the decision maker with a more complete risk analysis of the net benefits of the project. This is illustrated with the earthquake vulnerability reduction project in Colombia.
Global Alliance for Disaster Risk Reduction & Resilience in the Education Sector (GADRRRES) & UNISDR (2014) *Comprehensive School Safety: A Global framework in support of The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector and the Worldwide Initiative for Safe Schools, in preparation for the 3rd U.N. World Conference on Disaster Risk Reduction, 2015*. UNISDR. Available at: http://www.preventionweb.net/files/31059_31059comprehensiveschoolsafetyframe.pdf [Accessed: 28 October 2015].	Website	This framework provides a comprehensive approach to reducing risks from all hazards to the education sector. The purpose of this Comprehensive School Safety Framework is to bring these efforts into a clear and unified focus in order for education sector partners to work more effectively, and to link with similar efforts in all other sectors at the global, regional, national and local levels.
Global Alliance for Disaster Risk Reduction & Resilience in the Education Sector (GADRRRES) (2015) *Worldwide Initiative for Safe Schools*. GADRRRES. Available at: http://gadrrres.net/resources/worldwide-initiative-for-safe-schools and http://gadrrres.net/uploads/files/resources/Worldwide-Initiative-for-Safe-Schools-v.Feb2015.pdf	Website	The main objectives of the Worldwide Initiative for Safe Schools are: • To promote Governments' good practices, expertise and achievements in safe school implementation for possible replication in other countries and regions; • To identify remaining challenges to effectively implement safe school; • To support Governments in developing national strategies for school safety as part of existing national disaster risk reduction or Education

Reference	Type of literature and research type	Summary
[Accessed 28 October 2015].		plans; and • To offer technical assistance and particular expertise as required by Governments, around the core three pillars of safe schools.
Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (2015) *Towards Safer Construction: A community-based approach,* GADRRRES. Available at: *https://www.gfdrr.org/sites/default/files/publication/45179_towardssafer schoolconstruction2015_0.pdf* Accessed 23 October 2015].	Grey literature	This guideline indicates how community-based approaches to safer school construction can do more than just provide safer school buildings in hazard-prone places. This manual aims to raise awareness about hazards within communities, build local capacity for safe construction practices, strengthen a culture of safety within and around the school, increase a sense of community ownership of the school, and ensure community values are incorporated into school designs.
Global Facility for Disaster Reduction and Recovery (GFDRR) and the Inter-Agency Network for Education in Emergencies (INEE) (2009) *Guidance Notes on Safer School Construction*. Washington: World Bank. Available from: http://www.ineesite.org/en/materials/inee-guidance-notes-on-safer-school-construction [Accessed 28 October 2015].	Grey literature	The Guidance Notes on Safer School Construction present a framework of guiding principles and general steps to develop a context-specific plan to address this critical gap to reaching EFA and the MDGs through the disaster resilient construction and retrofitting of school buildings.
Global Facility for Disaster Reduction and Recovery (2015) *Making Schools Resilient to Natural Disasters,* Washington: GFDRR. Available at: https://www.gfdrr.org/making-schools-resilient-natural-disasters [Accessed 26 October 2015]	Grey literature	This GFDRRR initiative is ensuring that school facilities and the communities they serve become more resilient to natural hazards by reducing the physical impact of disasters on school infrastructure. GFDRR is working with ministries of finance, public works, and education, to integrate risk into new and existing education investments to increase resilience on a large scale.
Global Facility for Disaster Reduction and Recovery (2015) *Safer Schools*, Washington: GFDRR. Available at: https://www.gfdrr.org/areas/SafeSchools [Accessed 26 October 2015]	Grey literature	GFDRR's Global Program for Safer Schools (GPSS) aims to make school facilities and the communities they serve more resilient to natural hazards. The initiative is focused on Building an Enabling Institutional, Policy, and Regulatory Environment for Risk Reduction; Improving School Construction Practices and Monitoring Global Progress on School Safety.
Global Facility for Disaster Reduction and Recovery (GFDRR) (2015), *What we do, Safer Schools.* Available at: www.gfdrr.org/areas/SafeSchools [Accessed 28 October 2015].	Website	GFDRR is part of the World Bank. GFDRR has a Global Program for Safer Schools (GPSS). The aim is to make schools and communities more resilient to natural hazards. This covers both physical infrastructure and educational outcomes. They have a number of ongoing projects worldwide covering institutional, regulatory, construction, transparency, and many other areas. The program is delivered through a partnership approach.
Global Facility for Disaster Reduction and Recovery, World Bank, UN Habitat and Eduardo Mondlane University (2015) *Stories of Impact: Building Stronger*	Website	The World Bank, GFDRR, UN Habitat and Faculty of Architecture and Physical Planning at Eduardo Mondlane University are providing financial and technical assistance to support Mozambique to develop school safety guidelines for classroom

Reference	Type of literature and research type	Summary
Classrooms to Weather Disasters in Mozambique, Washington: GFDRR. Available at: https://www.gfdrr.org/stories-impact-building-stronger-classrooms-weather-disasters-mozambique [Accessed 26 October 2015]		facilities across the country.
Government of Nepal (GoN) (2015) *Nepal Earthquake 2015: Post Disaster Needs Assessment: Vol B: Sector Reports*, Kathmandu: National Planning Commission. Available at: http://un.org.np/sites/default/files/PDNA-volume-B.pdf [Accessed 23 October 2015)	Primary and empirical	This post-disaster assessment evaluate the needs in the following sectors: housing and humans settlement, health and population, nutrition, education, cultural heritage, agriculture, irrigation, commerce and industry, tourism, financial sector, electricity, communications, community infrastructure, transport, WASH, and other cross-cutting sectors such as environment and forestry, employment and livelihoods, gender equality and social inclusion, social protection, governance, disaster risk reduction.
GROOTS (2008) *Recipes for Resilience, Latin American Grassroots Women's Practices for Building Resilient Communities.* Antigua: Groots International. Available at: http://www.disasterwatch.net/resources/recipesforresilience.pdf [Accessed: 23 October 2015]		GROOTS International, supported by the Pro-Vention Consortium, convened and facilitated local experts in a workshop to draw upon and amplify the knowledge and skills they have gained from coping with the short and long-term impacts of floods, droughts, hurricanes, tropical storms, frosts, earthquakes, and erosion of natural resources as the result of climate change. Approximately 50 leaders representing 25 grassroots and indigenous organizations participated in a three day workshop entitled "The Role and Power of Grassroots and Indigenous Women's Groups in Disaster Risk Reduction (DRR)". The women's groups from 10 Latin American and Caribbean countries shared their work experience of responding to natural disasters and crises, explaining the effective practices they developed to reduce risks and vulnerabilities along with their efforts to secure food and livelihoods.
Islamic Development Bank (IDB) (2015) *Fael Khair Program,* Bangladesh. Available at: http://fkprogram.org/ [Accessed 28 October 2015].	Website	The Fael Khair Program consists of two main components: 1. The Fael Khair Project for the Construction of School-cum-Cyclone Shelters (dual-purpose buildings that are to be used as school buildings in normal times and as shelters in case of calamities); 2. The Fael Khair Program for Rehabilitation of Cyclone Victims, which aims to restore livelihoods of Cyclone victims (principally by providing them with interest-free microloans).
Kidson, S. (2015), *Focus now on massive rebuild*, Nelson Mail, NZ, Available at: http://www.stuff.co.nz/nelson-mail/news/69515755/focus-now-on-massive-rebuild [Accessed 23 October 2015].	Newspaper article	Usage of earth bag technology to rebuild schools in Nepal. This new earth bag building had shown it could stand up well in big quakes and it is an environmentally friendly and sustainable option. The first earth bag school was built by New Zealand builders and was finished just two weeks before the quake. It survived the massive shakes with only minor repairable damage while many concrete or stone schools, in the region collapsed.
Kishore, K. (2015) '*Lessons Learned from Nepal Earthquake',*	Academic	Few months after the earthquake in Nepal, a DRR professional, who has had the opportunity to work in

Reference	Type of literature and research type	Summary
Rebuilding Nepal by Implementing SFDRR, Issue 134, July 2015, pp. 4. Available at: http://www.aidmi.org/publications.aspx [Accessed 23 October 2015].		Nepal for many years, provides the following reflections: investment in prevention pays, investment in risk reduction pays, investment in preparedness pays, the importance of risk communication after a disaster, planning is everything.
McClean, D. (2015) *Iran nears goal of 100% safe schools*. Teheran: Reliefweb. Available at: http://reliefweb.int/report/iran-islamic-republic/iran-nears-goal-100-safe-schools [Accessed: 26 October 2015]	Grey literature	Iran has commitment to ensure Safe Schools and therefore has announced plans to spend $3 billion over the next five years to complete its programme of retrofitting or reconstructing all public schools located in the country's seismic zones.
Ministry of Education, Culture, Sports, Science and Technology (MEXT) Department of Facilities Planning and Administration (2006) *Seismic Retrofitting Quick Reference: School Facilities that Withstand Earthquakes. Examples of Seismic Retrofitting,* Tokyo: Office for Disaster Prevention. Available at: http://www.nier.go.jp/shisetsu/pdf/e-taishinjirei.pdf [Accessed 27 October 2015]	Primary and empirical	This guide provides some example of seismic retrofitting in school facilities.
Ministry of Education, Culture, Sports, Science and Technology (MEXT) (2006) *Seismic Retrofitting Quick Reference, School Facilities that Withstand Earthquakes, Examples of Seismic Retrofitting.* Tokyo: MEXT. Available at: http://www.nier.go.jp/shisetsu/pdf/e-taishinjirei.pdf [Accessed 28 October 2015].	Grey literature Online publication/ report	This quick reference is based on the "Report on the investigative research on seismic retrofitting of school facilities", which was published as a result of the above research, and then, by adding explanations, it was rearranged to make it easier to understand for those who are not specialized in architecture.
National Society for Earthquake Technology Nepal NSET (2012) *School Earthquake Safety Programme*, Nepal: NSET. Available at: http://www.nset.org.np/nset2012/index.php/successstory/successstoryview/successstoryid-4 [Accessed 26 October 2015]	Grey literature	The National Society of Earthquake Technology pioneered the School Earthquake Safety Program (SESP) in Nepal since 19976, which has been very successful in terms of developing appropriate technical methodologies and a procedure for community-based implementation. The main goal of this project is to ensure that school children in seismic regions go to earthquake-safe schools and that local communities build their capacities to cope with earthquake disasters.
Nepal Red Cross Society (2015) *Disaster Preparedness for Safer Schools in Nepal (DPSS-2_ Project*. Available at: http://www.nrcs.org/program/disaster-preparedness-safer-schools-nepal-dpss-2-project Accessed [28 October 2015].	Website	Webpage from Nepal Red Cross website outlining details of the DPss-2 project.
Nepal Risk Reduction Consortium (NRRC) (no date) Flagship	Grey literature	A summary document from the NRRC providing details of their flagship programmes.

Reference	Type of literature and research type	Summary
Programmes. Available at: http://www.preventionweb.net/files/32158_32158nrrcflagshipprogrammesforweb19.pdf [Accessed 28 October 2015].		
NSET (2015) *Final Report on Post Earthquake Rapid Damage Assessment of School Buildings*, Kathmandu, NSET. (unpublished).	Grey literature Report for ADB	A report for ADB – following the 2015 Nepal earthquake ADB requested a rapid damage assessment of school buildings in Kathmandu Valley. A study on school damage assessment of public schools in Kathmandu Valley. This report describes objectives, scope, methodology and overall findings in brief.
Paci-Green, R., Pandey, B., Friedman,R. (2015) *Safer Schools, Resilient Communities. A Comparative Assessment of School Safety after the 2015 Nepal Earthquakes.* RiskRED. Available at: http://media.wix.com/ugd/310a66_fc5b91f810fb4825a0069d4ea3895db3.pdf [Accessed 23 October 2015].	Primary and empirical Interviews with key stakeholders	The effects of the 7.8 earthquake on Nepal's educational infrastructure offer a rare opportunity to study whether previous interventions to improve building practices, combined with community engagement, have resulted in safer schools and communities. The primary questions considered were: how did damage at purportedly disaster-resistant public school buildings, whether retrofitted or newly constructed, compare to damage of typical public school buildings? And what affect, if any, did community engagement around safer schools have on risk awareness and community construction practices?
Petal, M. (2008) *Disaster Prevention for Schools, Guidance for Education Sector Decision-Makers, Consultation Version, November 2008.* Geneva: UNISDR. Available at: http://www.preventionweb.net/files/7344_DPforSchoolssm.pdf [Accessed 28 October 2015].	Grey literature Online publication/ report	Guidance document covering a number of areas: Creating and Maintaining Safe Learning Environments, Prevention and Preparedness, Educational Materials, and Developing a culture of Safety. Several case studies are contained in the publication.
Petal, M., Wisner, B., Kelman, I, et al. (2015) 'School Seismic Safety and Risk Mitigation', in Khazai B. (ed.), (2014) *Encyclopedia of Earthquake Engineering.* Springer, pp 1-20. Available at: http://www.researchgate.net/publication/277820958_Petal_M._et._al._School_Seismic_Safety_and_Risk_Mitigation_in_Khazai_B._et._al._Eds._Encyclopedia_of_Earthquake_Engineering_Section_Policies_and_Approaches_in_Earthquake_Resiliency_and_Risk_Mitigation_Springer_2014 [Accessed 27 October 2015].	Academic	This document assesses seismic threats to schools and reviews incidents of children and teachers killed by structural failure of school buildings as well as structural damage to schools and near misses. It reviews progress, good practices, and lessons learned based on these threats.
Plan International (2014) *Safe Schools Global Program*, London: Plan. Available at: https://plan-international.org/safe-schools-programme [Accessed 26 October	Secondary	About 875 million children live in high seismic risk zones and hundreds of millions more face regular floods, landslides, extreme winds and fire hazards. Children spend most of their time in school facilities; however most schools are not constructed or

Reference	Type of literature and research type	Summary
2015]		maintained to be disaster resilient. Plan's Safe Schools Global Programme engages education sector partners to promote schools as a platform for children and youth to grow up safely in resilient communities with their rights respected. The Safe Schools Global Programme aims to reach 1,531,000 children across 40 countries by 2017.
Ramirez, M. and Peek-Asa, C. (2005) 'Epidemiology of Traumatic Injuries from Earthquakes'. *Epidemiologic Reviews*, Vol 27, 2005, pp. 47–55. Available at: http://epirev.oxfordjournals.org/content/27/1/47.full [Accessed 23 October 2015]	Academic Secondary	This paper highlights findings from and methods utilized in various population-based epidemiologic studies identified through an extensive literature search of published studies on earthquake-related traumatic injuries in MEDLINE and PubMed, as well as conference proceedings.
Risk RED (2015) Projects, Nepal. *Project: Comparative Assessment of School Building Damage*, Available at: http://riskred.wix.com/riskrednepal#!nepal/c1flp [Accessed 28 October 2015].	Website	Risk Reduction Education for Disasters, Risk RED, is U.S.-based non-governmental organisation. They are involved with the right of children to have safer schools worldwide
Scott, I. et al (2013) *Independent Evaluation of the integration of Disaster Resilience in DFID funded Programmes in Nepal: Final Report June 2013*, Nepal: DFID. Available at http://flagship4.nrrc.org.np/sites/default/files/documents/Evaluation%20on%20the%20Integration%20of%20Disaster%20Resilience%20in%20DFID%20funded%20projects%20in%20Nepal%20Final%20Report%20270613.pdf [Accessed 27 October 2015].	Secondary	The overall objectives of the evaluation were to assess how well disaster resilience has been integrated into DFID funded programmes that have been piloting this over the last year in order to track progress at an early point, understand the effect of this at community level, and provide lessons for future programming.
Shrestha, H.D., et al (2013) 'The Impact of Retrofitting Work on Awareness Raising and Knowledge Transfer in Aceh Province, Indonesia', *International Journal of Disaster Risk Science*. 4, 4, pp 182–189. Available at: http://link.springer.com/article/10.1007/s13753-013-0019-5 [Accessed 23 October 2015]	Academic Primary and empirical	Some of the buildings constructed in Aceh, Indonesia after the 2004 earthquake and tsunami disaster were found vulnerable. The vulnerable buildings were retrofitted to make them safer and child friendly.
The Royal Government of Bhutan, UN, World Bank (2011) *Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction,* Washington: GFDRR. Available at: http://www.gfdrr.org/sites/gfdrr.org/files/PDNA_Bhutan_2011.pdf [Accessed 26 October 2015)	Empirical	The joint rapid assessment mission conducted field visits from 5 -12 October 2011 to the affected districts of Haa, Paro, Chhukha, and Samtse in Bhutan which suffered approximately 60% of the total damages to houses. Before the field visits, meetings were held with representatives from the different government ministries to understand the damage context and extent. The report has been organized into six sections: i) context, ii) damage and loss assessment, iii) the way forward - early recovery, iv) the way

Reference	Type of literature and research type	Summary
		forward - reconstruction, v) the way forward - disaster preparedness and risk reduction, vi) outlines the total costs and key recommendations for implementation of the recovery, reconstruction, and DRR programme in Bhutan.
The World Bank (2005) *Seismic Risk Mitigation Project*. Washington: World Bank. Available at: http://www.worldbank.org/projects/P078359/seismic-risk-mitigation-project?lang=en [Accessed 28 October 2015].	Website World Bank Projects and Operations	The development objective of the Istanbul Seismic Risk Mitigation and Emergency Preparedness Project for Turkey is to improve the city of Istanbul's preparedness for a potential earthquake through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans.
Twigg, J. (2009) *Characteristics of a Disaster-Resilient Community: A Guidance Note Version 2*, London: UCL. Available at: http://discovery.ucl.ac.uk/1346086/1/1346086.pdf [Accessed 26 October 2015]	Grey literature	This is a guidance note for government and civil society organizations working on disaster risk reduction and climate change adaptation initiatives at community level in partnership with vulnerable communities.
UN Habitat, South Asian Association for Regional Cooperation – SAARC and UNISDR (2012) *Tools for the Assessment of School and Hospital Safety for Multi-Hazards in South Asia*, Fukoka: UN Habitat. Available at: http://www.fukuoka.unhabitat.org/info/misc/20130216.html [Accessed 26 October 2015]	Grey literature	This Toolkit comprises an assessment tools for existing and new schools as well as hospitals, which aims to offer user-friendly tools for the multi-hazard context in South Asia and target policy makers, experts, and end-users responsible for local level planning and implementation.
UNESCO (2010) *School Manual on Emergency Preparedness and Response,* Namibia: UNESCO. Available at: http://portal.unesco.org/en/files/47662/12740919541l0-0384-A4_Manuals.pdf/10-0384-A4%2BManuals.pdf [Accessed 27 October 2015]	Website	This manual is the result of a flood disaster in Namibia and efforts made to improve the preparedness for future disasters in the education sector. The target audience is education personnel in order to enable a culture of disaster risk reduction, to enhance disaster risk management and knowledge management in Namibia. The manual is meant to be a practical guide for teachers on how to prepare and involve the learners, parents, school boards, community members and local authorities in a participatory way.
UNICEF (2013) *Warned means ready: knowledge of the rules in emergency situations has saved hundreds of children in Azerbaijani school*. Available at: http://www.unicef.org/azerbaijan/media_25662.html [Accessed 28 October 2015].	Website	Case study example from UNICEF on disaster preparedness saving lives in earthquake emergency situation.
UNICEF (2013) *Warned means ready: knowledge of the rules of conduct in emergency situations has saved hundreds of children in Azerbaijani school,* Azerbaijan:	Grey literature (news)	Children from a small rural school in the Zagatala region of Azerbaijan were hit by a devastating earthquake in 2012, but were able to avoid disaster. This was thanks to regular earthquake response training conducted with the children who were

Reference	Type of literature and research type	Summary
UNESCO. Available at: http://www.unicef.org/azerbaijan/media_25662.html [Accessed 27 October 2015]		prepared to act in an emergency situation. At the time of the earthquake more than 200 people were inside the school and, due to their training, were able to overcome their fear and panic to escape danger.
UNICEF (2015) *Child Friendly Schools.* Available at: http://www.unicef.org/cfs/ [Accessed 28 October 2015]	Website	Improving educational quality must be high on any agenda to get girls into school and keep them there. UNICEF adapts its education programmes to girls' learning styles and promotes environments that facilitate their learning. The Child-Friendly Schools model is now the major mean through which UNICEF advocates for and promotes quality in education.
UNISDR (2015) *Safe Schools and Hospitals,* Geneva: UNISDR. Available at: http://www.unisdr.org/we/campaign/schools-hospitals [Accessed 26 October 2015]	Grey literature	Safe schools and hospitals is part of the Making Cities Resilient campaign which highlights the urgent need to disaster-proof public services and infrastructure such as schools and hospitals.
UNISDR (2015) *Worldwide Initiative for Safe Schools*, Geneva: UNISDR. Available at: http://www.unisdr.org/we/campaign/wiss [Accessed 26 October 2015]	Grey literature	This is a government-led global partnership for promoting safe school implementation at the national level. This Initiative is coordinated by UNISDR and was developed in collaboration with key partners from the Global Alliance on Disaster Risk Reduction Education and Resilience in the Education Sector. The goal is to promote coherent and coordinated action on school safety globally.
United Nations (2012) *NRRC Flagship 1: School and Hospital Safety,* Nepal: United Nations Nepal Platform. Available at: http://un.org.np/nrrc/flagship1 [Accessed 27 October 2015].	Programme status	Description, objectives and targets of the NRCCC Flagship 1 programme School and Hospital Safety.
United Nations Centre for Regional Development (UNCRD) (2009) *Reducing Vulnerability of School Children to Earthquakes: School Earthquake Safety Initiative (SESI).* Hyogo: UNCRD. Available at: http://www.preventionweb.net/files/2951_SESIOutcomeallfinal.pdf [Accessed 28 October 2015].	Grey literature	The current project on "Reducing Vulnerability of School Children to Earthquakes" was in four countries – Uzbekistan, Fiji, India and Indonesia. The project aims to ensure that school children living in seismic regions have earthquake resilient schools and that local communities build capacities to cope with earthquake disasters. The project has the following key components: School retrofitting; Disaster education, Capacity building and Raising awareness.
USAID (2015) *Nepal Earthquake Risk Management Program Stage II (NERMP-2),* Nepal: USAID. Available at: https://www.usaid.gov/sites/default/files/documents/1861/DRR%20-NERMP%20II%20-%20May%205.14.pdf [Accessed 26 October 2015]	Programme status	USAID is supporting the continuation and expansion of Nepal Earthquake Risk Management Program to reduce earthquake risks in Nepal through raising awareness, capacity building, preparedness, mitigation, and institutionalization initiatives. The project promotes long-term earthquake risk reduction planning and works with the Government of Nepal to increase earthquake awareness and preparedness.
Venton, C (2014) Making the Economic Case for Safe Schools, Woking, Plan International Available at: https://plan-international.org/making-economic-case-safe-schools	Grey literature	This report investigates the economic argument for investing in safe schools. It reviews the existing evidence on the cost-effectiveness of safe schools interventions and identifies measures which have higher cost-benefit ratios. The report also uncovers evidence about the importance of investing in the 'whole child' in order to

Reference	Type of literature and research type	Summary
[Accessed 27 October 2015].		ensure educational outcomes during and after emergencies.
World Bank (2014) *Enhancing Seismic Preparedness in Istanbul,* Washington: GFDRR, Available at: http://www.worldbank.org/en/results/2014/08/05/enhancing-seismic-preparedness-in-istanbul [Accessed 26 October 2015]	Website	To protect the city from earthquake risk, the Governorship of Istanbul with support from the World Bank and GFDRR launched in 2005 a comprehensive program to help the city prepare for and respond to earthquakes. In order to reduce damage from disasters like Marmara, the Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP) was conceived to enhance preparedness, strengthen critical infrastructure, and improve institutional and technical capacity for disaster risk management and emergency response.

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World Bank (2010) *Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters*, Washington: World Bank. Available at: https://www.gfdrr.org/housingreconstruction [Accessed 28 October 2015].

Internet resources

Seismic Safety of Schools by Country: Earthquake Engineering Research Institute. The website provides a summary of case studies on school seismic safety from selected regions or cities in 15 countries. Available at:
https://www.eeri.org/projects/schools/resources/seismic-school-safety-by-country/

Evidence on Demand (2012) Infrastructure: Rapid Evidence Reviews. Available at:
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Annex 1: Question 1 Supporting information

1a. Nepal: Post Disaster Needs Assessment (PDNA)[25]

The Post Disaster Needs Assessment carried out following the 2015 Nepal earthquake identified that of the 160 school buildings retrofitted by the government, none experienced any damage due to the earthquake (GoN, 2015).

1b. Nepal: Post Earthquake Rapid Damage Assessment of School Buildings

An assessment of damage post the 25 April 2015 earthquake looked at damage to an ongoing pilot school safety programme on school buildings (including 160 already retrofitted buildings). The report advised that the completed retrofitted buildings performed well and met the expected safety level. Some minor cracks were observed, but no significant or structural damage was reported. 84 schools were also being retrofitted under the same programme, but were not completed at the time of earthquake. Of these, at least 15 need demolition and a further 29 need a revised design to allow for damage by the earthquake. At the 40 remaining sites, the existing design is acceptable (NSET, 2015).

2. Nepal: Small scale post disaster study

A small scale school study was undertaken in Nepal following the 2015 quakes. The study carried out a visual damage assessment and conducted interviews at '*purportedly disaster-resistant*' (retro fit or new construction) at 12 public school sites and compared results with typical comparable public school buildings. Schools were selected for range of social environments and earthquake impacts and covered:

- Standard construction: schools built through government funding and oversight using template designs.
- Technical intervention only: schools built or retrofitted with the specific intent of being earthquake –resistant.
- Technical and social intervention on, schools built or retrofitted as an earthquake - resistant through a process that included substantial community engagement.

It is understood from the report that there was no loss of life in any school because the April 25th Gorkha Earthquake occurred when public schools were not in session.

The key findings noted that "School buildings retrofitted to be (sic) earthquake generally perform better than school buildings built without these considerations"[26].

The study acknowledges that a larger sample study would have given a more comprehensive picture. However the statistics in the report show that:

- The significant majority of buildings built through the standard construction process were so damaged that they could not be used post earthquake
- Where schools were constructed or retrofitted (ie 'safer schools')with earthquake resistance, over 50% had no damage

Interestingly two 'safer school' buildings did collapse, which indicates that label of a 'safer school' does not always guarantee performance (Paci-Green, 2015).

[25] It is possible, but not confirmed, that examples: 1a, 1b and 6 are the same project, but described differently in various sources.

[26] (Paci-Green, 2015, p4)

3. Nepal: Retrofitting and codes

An assessment of damage post the 25 April 2015 earthquake, reported that some observed buildings, believed to be compliant with Nepal buildings codes, and those retrofitted, performed much better than other adjacent buildings. Retrofitted school buildings, bar a few, had no damage (Kishore, 2015).

4. Nepal: Resilient Construction

Evidence of the performance of particular safer school was provided following the 2015 Nepal earthquake. The school construction, of an 'earth bag'[27], type, was finished two weeks before the earthquake, was found to have performed well with only minor damage, whereas numerous concrete and stone buildings in the region collapsed. Additionally a representative of the agency responsible for the project advised that the focusing on schools made sense as schools were the community centre and having functioning schools would benefit the whole community (Kidson, 2015).

5. Nepal: Safe Schools Programme

Prior to the recent Nepal earthquake, Plan International had been working with partners on a Safe Schools programme and has worked to minimise those risks. In 2014 they began 'retrofitting' 22 existing schools, 11 of which were complete before the earthquake. They reported that "After the initial shocks of the earthquake, the teachers returned to the school and saw that it was still standing. In fact, the school stood exactly as it had before the earthquake[28]." (Bryneson, 2015).

6. Nepal: Retrofitting example

An Asian Development Bank supported programme to 160 retrofit schools was reported as being successful. Their initial assessment following the 2015 quake showed there was no significant structural damage and that the schools were being used as community shelters (ADB, 2015).

7. Bhutan: Post Disaster Needs Assessment (PDNA)

The Post Disaster Needs Assessment carried out following the 2011 Bhutan earthquake identified that although no schools collapsed, 117 were damaged The PDNA reported that in the disaster overall there was one fatality (from landslide) and 14 injuries. The PDNA reports that the standard school design developed by the Ministry of Education are not always followed on site and poor construction practices increased earthquake vulnerability (RGoB, 2011).

8. China: Structural retrofitting work

At Sangzao Middle School in Sichuan Province, a school principal, worried about the resilience of his school, obtained funding and organised structural retrofitting work and also disaster preparedness. Following a subsequent earthquake events all 2,323 students were alive. In a school 20 miles away 1,000 students died in a school collapse during the same event (GADRRRES, 2015).

9. South Kyrgyzstan: Seismic design and construction

Following an earthquake on 6 October 2008 a public school in Nura village, seismically designed and constructed by the Kyrgyz Scientific Research and Design Institute of Seismic Construction was still standing (with no casualties it is assumed), whereas the majority of other buildings had collapsed. 75 people were killed during the earthquake (GADRRRES, 2015).

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27 For details of this construction type see: http://earthbagbuilding.com/projects/nepalschool.htm)

28 (Bryneson, 2015, http://kathmandupost.ekantipur.com/news/2015-05-13/building-safer-schools.html)

10. Azerbaijani: Evacuation saves lives

Earthquake response training meant children acted in a safe way and evacuated the building in an organised manor. The children applied their safe training and did not expose themselves to danger by rushing from the building. The project, teaches children games, workshops and emergency practical (UNICEF, 2013).

Annex 2: Question 3 Supporting information

Examples of previous national or international projects to improve the structural and non-structural safety of schools[29]				
Ref	**Program outputs**	**Size and Reach**	**Outcomes**	**Comments**
NEPAL				
1	**Nepal: Earthquake Recovery and Disaster Risk Reduction in Eastern Nepal (ERDRR) DFID** *** Primary** ***Seismic resilience: Retrofit, Preparedness, Capacity building, Education/Training** with community	* Small programme (62 buildings completed) * Local/regional level focus * Rural construction	* Good quality infrastructure and positive community feedback according to independent evaluation report * Tested: Post 2015 earthquake, the anecdotal evidence is that the retrofit works were successful. No assessment of community feedback	*National private sector organisation provided technical engineering expertise support. *General retrofit good practice followed – Department of Education standards were generally used. DUDBC also applicable, but more complex and harder to follow and apply in rural context. Gap in formal rural retrofitting guidance noted
2	**Nepal: Disaster Preparedness for Safer Schools in Nepal (DPSS-2) Project** * **Primary** * **Hazard Awareness, Disaster Management, Preparedness, Institutional, Training curriculum**	* Small programme: 220 schools (39,660 students, teachers and community to be directly reached and 250,000 indirectly) * Focus on schools at local and district level. Institutional at a higher level into public education system	*Mention of extending the programme	* National private sector organisation provided technical /engineering expertise and support
3	**Nepal: School Sector Reform Programme (SSRP)** ***Primary** (in some elements) ***Retrofitting,** Enhanced student learning	* Large: 7yr programme, >USD100M	* 160 retrofitted schools survived 2015 earthquake event. No significant structural damage. Nationwide roll out planned	* Retrofitting is only one element of the programme
4	**Nepal: Projects under the Nepal Risk Reduction Consortium (NRRC)** * **Retrofitting** and other technical interventions, **Preparedness**	* Medium: Target aim for 900 school buildings and 643 schools are safe from natural disasters	* No assessment	
5	**Nepal: Community Support Programme (2013)**	* Small programme (248 buildings completed)	* Infrastructure and positive community feedback according to	* Community resilience has not been tested

[29] Annex 2 also contains brief descriptions of each of these projects.

	*** Primary** ***Seismic resilience: Retrofit, Preparedness, Capacity building, Education/Training** with community labour	* Local/regional level focus * Rural construction	independent evaluation report	
6	**Nepal: School Earthquake Safety Program (SESP)** *** Primary** ***Training** of masons, Training of teachers, parents and students on earthquake preparedness and preparedness planning, **Seismic retrofit** or earthquake-resistant reconstruction of public school buildings.	* Small programme (300 buildings completed) * Kathmandu Valley focus and districts located at various physiographic regions of Nepal from the high Himalayan settlements to the plains of Terai in the south. * Usually, the local masons are engaged in the construction; contractors are avoided.	* Community participation is important	* Some lessons Learned from evaluation: - Community awareness is a key driver - Technical capacity of District Education Offices (DEOs) should be increased - More Supervision technicians needed - Mason training essential - Multi stakeholder partnership is necessary
7	**Nepal Earthquake Risk Management Program Stage II (NERMP-2)** * **Primary** * **Education** (Safe Home Campaign – Teach home owners on basic resilient construction). Vulnerability tours - key Government of Nepal officials, international agency personnel, and local communities - to see risks in Kathmandu Valley. **Preparedness** (CBDRM) and improving Emergency Response Capacities at the National Level. **Retrofitting.**	* Small: Implement structural improvement, training, and awareness programs in three schools per year. The project also revisits schools retrofitted during the past 12 years and conducts disaster preparedness activities in approximately 10 schools per year. *Focus on Kathmandu Valley and urban areas		
REGIONAL				
8	**Pakistan: School Construction and Rehabilitation Programme** * **Secondary** * **New build**	* Large: Infrastructure works in public schools across two provinces. >150M GBP budget. * Programme delivered	* Work still ongoing.	* Resilience is an essential part of the school infrastructure, but providing greater classroom capacity is the main aim. Minor CBDRM aspects. * Infrastructure works delivered by the

		through traditional contracting, with elements of capacity building of schools and communities		community takes a significant amount of time and capacity building
9	**UH-Habitat Infrastructure Toolkit – South Asia** *** Primary** *** Repair/Retrofit/Rebuild/New/ Codes & Standards**	* Applicable at any level and size	* To be confirmed.	* A useful tool to achieve consistency of approach in a specialist area of school building safety * Appropriate for a wide-ranging technical audience
WORLDWIDE				
10	**The United Nations Office for Disaster Risk Reduction (UNISDR) Worldwide Initiative for Safe Schools (WISS)** ***Primary** *Safe Learning Facilities (disaster-resilient **infrastructure**); - School Disaster Management - Disaster Risk Reduction and Resilience **Education**	* Based around providing support to and through Governments		* Covers a wide range of countries and initiatives
11	**UNISDR (Global Platform for Disaster Risk Reduction) Global advocacy campaigns** ***Primary** *Safe Learning Facilities (disaster-resilient infrastructure); - School Disaster Management; - Disaster Risk Reduction and Resilience Education	* Based around providing support to and through Governments: Global objectives and goals Standard indicators, Continuous sharing of good practices, National targets based on respective situations Cohesive support from development partners		* Covers a wide range of countries and initiatives
12	**Plan International: Safe Schools Global Programme** ***Primary** *Safe Learning Facilities (disaster-resilient infrastructure); - School Disaster Management; and - Disaster Risk Reduction and	* Large: The Safe Schools Global Programme aims to reach 1,531,000 children across 40 countries by 2017	* Reported that there are aims to upscale existing programme by 2017	* Covers a wide range of countries and initiatives

	Resilience Education			
13	**World Bank/GFDRR: Global Program for Safer Schools (GPSS)** ***Primary** *Enabling **Institutional, Policy**, and **Regulatory** Environment for Risk Reduction ***Technical** (Improving School Construction Practices) * Monitoring Global Progress on School Safety	* Large: Covers a wide range of countries and initiatives	* Funding and work ongoing/expanding. Work in progress to develop roadmap for recovery and reconstruction	* High profile and wide reaching programme
14	**Worldwide: 2011 School Safety Baseline Study** ***Primary** *Review: **Institutional** assessment of disaster resilience in schools	* Small (desk analysis) but covering a number of key countries and reporting on a number of key indicators.		* Contains country level information, but at a high level.
15	**GFDRR: Building stronger classrooms to weather disasters in Mozambique** * **Primary** * **Retrofit/Rebuild/New/Codes & Standards** *** Policy**	* Medium/Large: up to 100,000 children have benefitted	* Uptake by the government of Mozambique	* Working through the Ministry of Education to improve technical standards and school safety guidelines
16	**GFDRR: Protecting school infrastructure against earthquakes in Peru** *** Primary** * **Hazard Mapping/Seismic risk assessment** ***Retrofit**	* Large: 50,000 public schools assessed seismic risk assessment in 1,969 schools. 252 most vulnerable targeted ($17 M USD).	*The Government of Peru is now integrating retrofitting program into School Infrastructure National Plan	* Lessons learned: - Collaboration among institutions is essential to leverage the expertise of each stakeholder and achieve key milestones. - Efficiently addressing challenges requires alignment of institutional priorities and customized technical assistance.
17	**GFDRR: Turkey: Enhancing seismic preparedness in Istanbul** *** Primary** *** Comprehensive programme: Retrofit/Rebuild/New/Non-structural/Codes & Standards Gen. Preparedness/Education**	* Large: 1,086 public buildings have been retrofitted. 1.1 million students benefitted, 662,000 people trained, 3,630 civil engineers trained in codes, Disaster Management Centre established.	* The Government of Turkey plans to continue expanding its DRM agenda to other high-risk areas or priority sectors in the country	* Lessons learned: **-** Setting up a strong, highly knowledgeable local team is key to successful project implementation - Increasing public awareness is critical to build public support for upgrading schools

	/Training/Curriculum /Institutional/Regulatory & Enforcement			
18	**Multi-country: School Earthquake Safety Initiative (SESI)** *** Primary** *** School retrofitting; Disaster education, Capacity building, Raising awareness.**	*Large: four countries – Fiji, India, Indonesia, and Uzbekistan. *10 Demonstration schools in multiple case study countries and retrofit guidelines and manuals developed * One training specialist employed in each case study city *Deployment of educational software specialists and communication specialists *National and regional training programs	* Working toward project outcomes (latest results not found)	* SESI is aimed at promoting self-help and education for disaster mitigation by building resilient and sustainable communities. The participatory approach to community development and capacity building among the local people is the key focus area of the initiative.
19	**Turkey: Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP)** *** Primary** ***** Enhancing the **institutional** and **technical capacity** for **disaster management** and emergency response, **strengthening** critical public facilities for **earthquake resistance, enforcement** of building codes and land use plans.	* Large: Circa $400M USD * 799 public buildings retrofitted * Pilot activities on better building code enforcement * 3,361 engineers trained in retrofitting code * Emergency response units equipped and trained	* Progress reported as satisfactory	* Large scale holistic countrywide program
20	**Retrofitting Schools in Colombia – data analysis** * Academic cost-benefit analysis * Probabilistic catastrophic risk models	* Small – academic study		
21	**Colombia, Bogotá: School replacement, retrofit, and risk management** *** Primary**	* Large: Circa $460M USD * 201 schools retrofitted or replaced * Non-structural risk reduction		

	*** Retrofit/New build** *** Preparedness - Curriculum**	in 326 schools * 300,000 children are safer * 50 new 'mega' schools * 1,000 teachers trained and curriculum materials produced		
22	**Iran: Safer schools programme** *** Primary** *** Structural improvements** *** Training teachers** *** National earthquake drill** *** Preparation activities for children**	* Large: on going - $3 billion spend anticipated 2015-2020 * 83% of work completed	* Funding looks likely to be extended (at 2015)	* Children disseminate information on safer schools to the wider community * Parents engaged through school committees
23	**Japan: Structural retrofitting** *** Primary** * Seismic **retrofitting** ***** Reference guide	* Small/medium, * High schools * 'Advanced' construction in existing buildings and highly technical retrofitting techniques		
24	**Azerbaijan: Regular earthquake response training conducted with children** *** Primary** *** Preparedness:** using children's activities to get across key messages to them * School **curriculum** introduced on preparedness and training	* Countrywide		* Implemented by UNICEF and Government
25	**Bangladesh: Resilient schools/Cyclone shelters** *** Primary** *** New construction**	Medium: 190 schools-cum cyclone shelters	* Ongoing	* Technical oversight helping to achieve resilience

Table 2 Q3. Summary of evidence found

Question 3 Supporting information

Examples of previous national or international projects to improve the structural and non-structural safety of schools

1. Nepal: Earthquake Recovery and Disaster Risk Reduction in Eastern Nepal (ERDRR) DFID

The ERDRR (2012-2013) was funded by a DFID grant of UK£800,000 as an emergency response to the September 2011 earthquake and was implemented as a component of DFID's Rural Access Programme (RAP), under the Department of Local Infrastructure and Agricultural Roads (DOLIDAR). The work carried out under ERDRR included:

- Reconstruct, repair or retrofit public infrastructure (including schools) damaged by the 2011 earthquake or vulnerable to future earthquakes.
- Build local capacity for construction and retrofitting of earthquake resilient buildings in order to protect RAP investments in the future.
- Develop and implement earthquake resilience and preparedness training and awareness to build community disaster resilience and disaster risk reduction capacity.

(Scott, I. et al , 2013).

2. Nepal: Disaster Preparedness for Safer Schools in Nepal (DPSS-2) Project

The Nepal Red Cross Society (NRCS) and National Society for Earthquake Technology-Nepal (NSET) delivered this project in 220 schools (39,660 students) with funding support from American Red Cross (ARC). The project covered a number of initiatives including improving the disaster safety of public schools and communities through hazard awareness and improved preparedness (Nepal Red Cross Society, 2015).

3. Nepal: School Sector Reform Programme (SSRP)

The School Sector Program is supported by ADB and other development partners - Australia, Denmark, the European Union, Japan, Finland, Norway, UNICEF, United Kingdom, and the World Bank. SSRP mainstreams disaster risk reduction (DRR) and safety in school education. Additionally, in 2012, the Ministry of Education prepared a pilot school safety action plan to undertake retrofitting of 260 school buildings in Kathmandu Valley. It involved training 1050 masons on retrofitting, 30 Department of Education (DoE) and District Education Office (DEO) engineers and sub-engineers, and 150 other engineers on detailed vulnerability assessment and design. The action plan also included earthquake awareness safety orientation for 50,000 students and 4,000 teachers (ADB, 2015, Schools with Earthquake-proof Technology Survive Nepali Disaster), (ADB, 2015, School Sector Programme).

4. Nepal: Projects under the Nepal Risk Reduction Consortium (NRRC)

The Nepal Risk Reduction Consortium (NRRC) brings together humanitarian and development stakeholders with financial institutions in partnership with the Government of Nepal in order to reduce Nepal's vulnerability to natural disasters. Flagship1, of particular relevance, covers school and hospital safety (United Nations, 2012). Other Flagship programmes cover emergency preparedness and response capacity, flood management, community based DRR, and policy institutional support (NRRC).

5. Nepal: Community Support Programme (2013)

Community funding through DFID is helping support resilient classroom construction (DFID, 2013).

6. Nepal: School Earthquake Safety Program (SESP)
The National Society for Earthquake Technology-Nepal (NSET) is helping to implement community-based disaster risk reduction work to improve the seismic performance of about 300 public schools in Nepal located within the Kathmandu Valley and in other districts in Nepal (NSET, 2012).

7. Nepal Earthquake Risk Management Program Stage II (NERMP-2)
USAID's Office of Foreign Disaster Assistance supports NERMP. This programme is helping to reduce earthquake risks in Nepal through public awareness-raising, capacity building, preparedness, mitigation, and institutionalization initiatives. It also includes Implementing structural improvements, training, and awareness programs in three schools per year (USAID, 2015).

Regional
8. Pakistan: School Construction and Rehabilitation Programme
The DFID/UK supported School Construction & Rehabilitation Programme (SCRP) covers the rehabilitation and upgrading of existing education infrastructure, including those destroyed or at risk from natural disasters and those affected by conflict. Community capacity development is fundamental to the approach.

9. UH-Habitat Infrastructure Toolkit – South Asia
UN-Habitat have developed a toolkit to facilitate the decision-making process of retrofitting existing facilities as well as ensuring safe construction of new and existing schools and hospitals. The Toolkit comprises four sets of assessment tools. The Toolkit is a result of cooperation amongst the South Asian Association for Regional Cooperation (SAARC), UN-Habitat and UNISDR. The Toolkit serves Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, and complements the work of the SAARC Disaster Management Centre (UN Habitat, et al, 2012).

Other worldwide initiatives

10. The United Nations Office for Disaster Risk Reduction (UNISDR) Worldwide Initiative for Safe Schools (WISS)
The UNISDR is working with members of the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (GAD3RES) on school safety globally. (WISS) is a government-led global partnership for safe school implementation. The Initiative is coordinated by UNISDR and was developed in collaboration with key partners from the Global Alliance on Disaster Risk Reduction Education and Resilience in the Education Sector as a response to the High Level Dialogue Communiqué at the 2013 Global Platform for Disaster Risk Reduction (UNISDR, 2015).

11. UNISDR (Global Platform for Disaster Risk Reduction) Global advocacy campaigns
The UNISDR supported 'One Million Safe Schools and Hospitals' initiative is a global advocacy effort to make schools and hospitals safe from disasters (UNISDR, 2015).

12. Plan International: Safe Schools Global Programme
Plan International's Safe Schools Global Programme aims to reach 1,531,000 children across 40 countries by 2017. The approach builds local capacity across three pillars: safe buildings; school disaster management; and education in risk reduction and resilience. It does this while linking to national, sub-national and local disaster management and education plans. It is based on Plan's rights-based Child Centred Community Development approach (Plan International, 2014).

13. World Bank/GFDRR: Global Program for Safer Schools (GPSS)

GFDRR's Global Program for Safer Schools (GPSS) aims to make schools and communities more resilient to natural hazards. The GPSS program works with national and sub-national agencies, including ministries of finance, public works, and education. It also collaborates with a wide range of international partners, including United Nations agencies such as UNICEF, UNESCO, and UNISDR; international NGOs such as Build Change, Save the Children, and Plan International; and private sector companies such as Arup. The GPSS is also aiming to improve construction practices. It also supports countries in their efforts to ensure compliance with design standards, building codes, and appropriate maintenance of school infrastructure (GFDRR, 2015).

14. Worldwide: 2011 School Safety Baseline Study

The scope of this work is to develop a baseline on school safety by studying existing initiatives undertaken by governments, civil society, UN, donors and other major stakeholders that aim at assessing and improving school safety (Bastidas, 2011).

Related GFDRR projects:

15. Building stronger classrooms to weather disasters in Mozambique

Working with ministries in Mozambique, the European Union (EU), and the Education Sector Support Fund (ESSF), this GFDRR Global Program for Safer Schools is undertaking risk assessments of schools and creating a catalogue of hazard-resistant construction and architectural models with adaptive measures for both traditional and conventional materials (GFDRR, et al, 2015).

16. Protecting school infrastructure against earthquakes in Peru

The Peruvian Ministry of Education (MINEDU), in partnership with the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR), is working in Lima to mitigate schools against damage, protect students against the impact of earthquakes, and ensure the potential for educational development is realised through a National School Infrastructure Plan and Structural Retrofitting Program (GFDRR, 2014).

17. Turkey: Enhancing seismic preparedness in Istanbul

To help reduce seismic risk, the project pioneered an innovative approach that combined risk reduction investments such as the reconstruction of public buildings, broader programs including public awareness campaigns, and investments to strengthen disaster response (GFDRR, 2014) (World Bank, 2014) (GFDRR, 2011).

18. Multi-country: School Earthquake Safety Initiative (SESI)

The United Nations Centre for Regional Development (UNCRED) has led a project on "Reducing Vulnerability of School Children to Earthquakes" in four countries – Uzbekistan, Fiji, India and Indonesia. The project aimed to ensure that school children living in seismic regions have earthquake resilient schools and that local communities build capacities to cope with earthquake disasters. The project has the following key components: School retrofitting; disaster education, capacity building and raising awareness (UNCRD, 2009).

19. Turkey: Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP)

The objective of the World Bank funded Istanbul Seismic Risk Mitigation and Emergency Preparedness Project is to improve the city of Istanbul's preparedness for a potential earthquake through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans. Between 2007 and 2008, ISMEP Turkey, retrofitted 364 schools and reconstructed 106 others (The World Bank, 2005).

20. Retrofitting Schools in Colombia – data analysis

This World Bank study was based on the earthquake vulnerability reduction project in Colombia. It provided a probabilistic cost benefit model analysis for retrofitting public buildings, including schools, from earthquake risks. The model showed that structural investments generate an average annual return equal to 14.5 percent for retrofitted schools and interventions may also save lives and reduce the number of injuries (Ghesquiere, 2006).

21. Colombia, Bogotá: School replacement, retrofit, and risk management

In Bogota, between 2004-2008 a programme covering school replacement, retrofit, and risk management promotion, provided structural reinforcement of 172 schools and "non-structural" risk reduction in 326 schools, and the construction of 50 new schools, meeting earthquake-resistance requirements (Petal, 2008).

22. Iran: Safer schools programme

Following the BAM earthquake in 2003, Iran has carried out a number of initiatives including passing a 2005 Law for school safety that facilitated a Government budget of US$4.5 billion to increase the safety of 13 million students. This led to the assessment of 95,000 vulnerable schools across the country, of which over 66% schools were found to need either retrofitting or reconstruction. Iran's safe schools programme also incorporated training teachers how to talk to students about earthquake risk (McClean, 2015).

23. Japan: Structural retrofitting

The Government of Japan has carried out seismic retrofitting across a number of educational facilities covering high schools. The structural work included steel bracing. The information available reports that the schools performed well under earthquake loading, with minor damage only (MEXT, 2006).

24. Azerbaijan: Regular earthquake response training conducted with children

In this UNICEF project, children received earthquake response training in an emergency situation. Following a 7.0 magnitude earthquake in 2012, because of their training, more than two hundred people were able to evacuate from the school in an organized manner in just fifteen minutes and no children were hurt. The project, funded by the EU, teaches children in the form of games, workshops and practical exercises what kinds of emergencies could occur including natural disasters they may face and what they need to do to protect themselves and others (UNICEF, 2013).

25. Bangladesh: Resilient schools/Cyclone shelters

On the 15th November 2007, Cyclone Sidr killed at least 3,406 people, injured over 55,000 and caused extensive damage to crops (1,000,000 ha), livestock (106,000) and educational institutions (4,200 completely destroyed whilst 12,700 were damaged). In response to the urgent need for assistance to the victims of Cyclone Sidr and, in particular, to provide a long term solution to the damage from recurring cyclones which periodically afflict Bangladesh the construction of school-cum-shelters is underway in the coastal districts of Bangladesh (IDB, 2015).