Global Alliance for
Disaster Risk Reduction & Resilience
in the Education Sector

Towards Safer School Construction

A community-based approach

United Nations Educational, Scientific and Cultural Organization

ARUP

Save the Children

GFDRR
Global Facility for Disaster Reduction and Recovery

risk RED
risk reduction education for disasters

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Global Alliance for Disaster Risk Reduction & Resilience in the Education Sector

The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (GADRRRES) is a multi-stakeholder mechanism composed of UN agencies, international organisations, and global networks. The aim of this group is to promote a comprehensive approach to DRR education based on education policy, plans, and programmes that are aligned with disaster management at national, regional, district and local school site levels. **www.gadrrres.net**

The development of this manual is a contribution to the GADRRRES working group for 'Safe learning facilities'.

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Terminology

Architects work with communities to plan and design school and site layout. They ensure schools meet functionality standards. Architects seek the services of a structural engineer to provide safety calculations.

Capacity is the combination of strengths, attributes and resources available within a community, society or organisation that can be used to achieve disaster reduction and prevention.

Capacity development is the process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through the improvement of knowledge, skills systems and institutions.

Children – in this document – refer to individuals from birth to age 18.

In the context of community-based school construction, **community** is a group of individuals sharing a common geographic location at or below the smallest political unit of a country. In the context of school construction, a community is often bound within the catchment area of the school or otherwise connected to a school as students, parents, teachers and staff.

Community-based construction covers a spectrum of possible community involvement, from making informed programmatic planning and design decisions to directly taking part in building construction. Communities may receive funding, technical assistance and other support from government agencies or development organisations.

Community-driven development is a decentralised approach where governments empower communities to implement small-scale infrastructure programs including decisions about project design and implementation, as well as resource management.

Community-based school construction often occurs when community-driven development strategies are used.

Development actors are non-profit organisations – national or international – that pursue activities in support of community wellbeing. In the case of this document these actors may be part of or outside the United Nations system. They may be focused exclusively on education sector activities or development more broadly. Those working in post-disaster contexts may pursue humanitarian aims in accordance with globally recognised humanitarian guidelines.

A **disaster** is a serious disruption of the functioning of a community or a society that involves widespread human, material, economic or environmental losses and impacts, and which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk reduction is the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Engineers apply science, mathematics and ingenuity to develop solutions for technical problems. Structural engineers are qualified to design structures and certify their safety, although many do not have specialised training in hazard-resistant design.

Exposure occurs when people, property, systems or other elements are present in hazard zones and are thereby subject to potential losses.

Mitigation is the lessening or limiting of the adverse impacts of hazards and related disasters.

Natural hazards are natural processes or phenomena that may cause loss of life, injury, other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Hazard events can cause disruption, or even disaster, to communities when they are vulnerable to such events.

In the context of safe school buildings other hazards may also be of concern. These include proximity to industrial sites, overhead and underground utilities, traffic, school fires, conflict, abduction and bullying. Many of these hazards can be mitigated through careful site selection and design.

International and national **non-government organisations (NGOs)** are private organisations that pursue activities to relieve suffering, promote the interest of the poor, protect the environment, provide basic social services, or undertake community development; many of the larger NGOs are headquartered in developed nations. Most are not for profit.

Resilience is the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Risk is the combination of the probability of an event and its negative consequences. Disaster risk is a function of hazard, exposure and vulnerability. An increase in any of these three components drives the scale and impact of disasters.

Retrofit is the reinforcement or upgrading of existing structures so that they become more resistant to or able to accommodate the damaging effects of hazards.

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. A safe school used as shelter should be able to be occupied during and immediately after anticipated hazards.

School construction includes the building of new classrooms, school blocks, passageways, latrines, kitchens, grounds, laboratories and fencing. It also includes the projects that retrofit existing schools (also sometimes called renovation, remodelling, refurbishing, modernising or strengthening).

Vulnerability is the characteristics and circumstances of a community, system or school that make it susceptible to the damaging effects of a hazard.

A school building may be vulnerable to a natural hazard if it experiences infrastructure damages that harm students and other occupants or that degrade its ability to function as a school.

Acronyms

CSS	Comprehensive School Safety
EFA	Education for All
GFDRR	Global Facility for Disaster Reduction and Recovery
HFA	Hyogo Framework for Action
INEE	International Network for Education in Emergencies
MoE	Ministry of Education
MoPW	Ministry of Public Works
NGO	Non-government organisation, including international and national organisations
UNISDR	United Nations Office for Disaster Risk Reduction

Preface

All children deserve safe, accessible and culturally appropriate school buildings — regardless of class, creed, gender or ability. When children live in hazard-prone places where high winds, earthquakes, floods and other hazards threaten them, they need schools and grounds that protect them.

Yet recent disasters around the world attest to the fragility of many schools.

Earthquakes in China, Pakistan, Haiti and other countries have collapsed school buildings and crushed students. Flooding, storm surge and tsunamis have swamped schools in Japan, the United States, Thailand and countless other nations. Rising waters have damaged school grounds and destroyed educational material. It has kept students out of school for weeks and months, stunting development. High winds have blown off roofs and collapsed school buildings in Ghana, Laos, Nicaragua and the Philippines – to name a few.

Students, staff and community need safer schools. When schools will be used during crisis, safety has an added dimension. Communities need to be able to access and safely shelter in these school facilities.

Schools can be built safer and weak schools can be strengthened with concerted effort. When communities identify hazards and take them into account when planning where and how to build, school grounds become safer. When design teams and construction workers incorporate hazard-resistant techniques in construction, the school building becomes safer. These safer schools protect students, staff and other occupants from death and injury and become points of refuge for the wider community.

However, achieving safety is not always straightforward. In many places, building codes lag behind best practices or fail to address vernacular construction. Those who design and construct schools may be unfamiliar with hazard-resistant techniques or lack the oversight needed to ensure such techniques are put to use. School communities may inadvertently weaken schools through years of informal building modifications or poor maintenance. The result is schools that threaten communities rather than protect them.

A community-based approach seeks to achieve the twin goals of safer schools *and* more resilient communities. It treats school construction as a community learning opportunity to better understand risks, collectively commit to safety, and to learn and apply strategies for safer construction. A community-based approach builds community capacity in tandem with the laying of foundations and erecting of classroom walls. It also prepares communities to be knowledgeable caretakers of schools, able to maintain the physical safety of the structures and the culture of safety among those who use it.

Purpose of this manual

This manual shows how community-based approaches to safer school construction can do more than just provide safer school buildings in hazard-prone places. It can also:

- **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
- **Ensure community values** are incorporated into school designs

The scope of this manual

The focus of this manual is on the process of community-based school construction. It should supplement technical guidance on appropriate construction materials and techniques, such as UNESCO's *2013 Guidelines for Earthquake-Resistant Non-Engineered Construction*. This manual considers community-based school construction in depth, supplementing the broader *Guidance Notes on Safer School Construction* published in 2009 by the Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank and the Inter-Agency Network for Education in Emergencies (INEE).

Feedback on this manual

Every effort has been made to ensure that this manual is rooted in practical first-hand experience of building schools with the active participation of communities. Nevertheless, recognising the broad range of contexts in which schools are built and the ever evolving approaches of those involved in school construction, the authors and editors are keen to hear feedback from practitioners, communities and ministries of education who use this manual during community-based school construction projects. Feedback should be sent to drrandcca@savethechildren.org.au and will be used to update this package of material when appropriate. Feedback used will be accredited to the individuals or organisations in subsequent publication should they wish to be acknowledged.

Intended audience

This manual is intended for decision makers and program managers in agencies involved in, or intending to begin, school construction in hazard-prone areas. The manual is intended primarily for humanitarian and development actors – the organisations often building and repairing schools in hazard-prone locations – as well as government authorities seeking to introduce or oversee community-based school construction programs. The manual also provides insight for community disaster risk reduction and disaster management practitioners within the education sector.

This manual provides guidance for school construction projects that have one or more of the following characteristics:

- Local school committees or community leaders contributing to the funding, planning, construction or oversight of school buildings in hazard-prone areas.
- Construction that may enhance existing or planned disaster risk reduction education.
- A local construction sector that does not already include robust hazard-resistant design, construction and oversight practice.
- Combined post-disaster reconstruction and disaster risk reduction.

While the focus of the manual is on schools built through community-based processes, the guidelines may also enhance more traditional school construction processes, such as when government agencies directly build schools or hire contractors to do so. Integrating community awareness activities and collaborating with communities in the planning and design stages can strengthen community capacity for disaster risk reduction. Such community engagement builds community capacity for maintaining the school and helps ensure the school constructed takes into account both local hazards and community aspirations.

NGO and government staff in a planning session preparing to support the Ministry of Education's work on Comprehensive School Safety. Photo: Danielle Wade/Save the Children.

Consultations with Laos PDR Ministry of Education and Sport staff on the implementation of a Comprehensive School Safety program. Photo: Save the Children.

How to use this manual

This manual specifically addresses a school building's capacity to withstand natural hazards: floods, earthquakes, landslides, cyclones and high winds. While school safety in conflict zones or during acts of terrorism will not be covered in depth, vignettes will provide some examples for these situations. The INEE 2004 *Minimum Standards for Education in Emergencies, Chronic Crises and Early Construction* should be consulted for these situations. Social safety issues – bullying, sexual assault, ethnic violence, hygiene and other safety considerations during the delivery of educational services – will also not be covered in depth. See UNICEF's 2009 publication *Child Friendly Schools* for these operational aspects of safety.

The information and advice contained in this publication should be adapted to any given local context, and this publication is not a substitute for specific engineering advice. Every effort has been made to ensure accuracy of information. Save the Children, GFDRR, UNESCO, Arup, Risk RED, and the authors accept no liability for actions taken as a result of this report.

Why use a community-based approach?

Section I explains why a community-based approach can lead to safe schools and empowered communities. Key principles at the end of the chapter summarise the essential principles. The section ends with a case study highlighting some successes and challenges of applying these key principles in post-disaster school reconstruction in Haiti.

What is the community-based process?

Section II describes the general process of community-based school construction. It examines the opportunities, challenges and strategies that arise in community-based construction, as well as four cross-cutting themes of the approach. The section ends with a case study of a national community-based school construction program initiated in Indonesia.

How is a community-based school construction program run?

Section III offers specific guidance on achieving school safety and community empowerment during the five stages of community-based safer school construction – mobilisation, planning, design, construction and post-construction. In each stage, look for several elements:

- Each stage starts with *Key activities and considerations*, which describes how to implement safer school construction principles.
- Brightly coloured *In context boxes* provide examples of how these key activities have been applied in the field.
- *Resource boxes* suggest further reading.
- A list of important issues to consider can be found in a *Key considerations for practitioners* table near the end of each stage.
- Each stage ends with a *Case study* exploring one safer school project in-depth, especially noting the decisions and challenges made at the stage under consideration. Case studies end with key lessons the practitioners took away from the project.

While reading the document from start to finish is recommended, each section and stage of construction can be read independently.

SECTION I: INTRODUCTION

SECTION II: OVERVIEW

SECTION III: STAGES OF CONSTRUCTION

MOBILISATION

> Explains how to begin working in a new region with communities that have little existing disaster risk reduction knowledge, or when planning large-scale interventions.

PLANNING

> Suggests strategies for planning safer school construction once communities are identified and engaged.

DESIGN

> Describes how to collaborate with communities in safe school design.

CONSTRUCTION

> Details how to train communities and ensure construction quality.

POST-CONSTRUCTION

> Provides strategies for developing a maintenance plan and programs to support a culture of safety within and beyond school.

SECTION I: INTRODUCTION

A call for safer schools

All children deserve safe, accessible and culturally appropriate school buildings – regardless of class, creed, gender or ability. Students in dark, cramped and uninspiring classrooms should instead have positive learning spaces that invite creativity and engagement. Communities also want a focal point where they can congregate with pride to support their future development.

With clear foresight, the United Nations set a Millennium Development Goal for 2015 to bring children and youth what they deserve – universal primary education.

A global need for schools

1.26 billion
children and youth enrolled in primary and secondary education in 2012.

58 million
children and youth not attending primary school.

63 million
school-aged youth not attending lower secondary school.

Sources: UNSECO Institute for Statistics for year 2012; Theunynck 2009.

Yet access to just any classroom is not enough in hazard-prone places.

Although decades of building classrooms has brought education to millions of students globally, many sit in classrooms at risk of collapsing or being rendered unusable when the ground shakes, floodwaters rise, or when high winds sweep across the land. Poor design and construction – stemming from limited resources, corruption and unfamiliar building technologies – has made school buildings unsafe and has led to a staggering loss of life.[1]

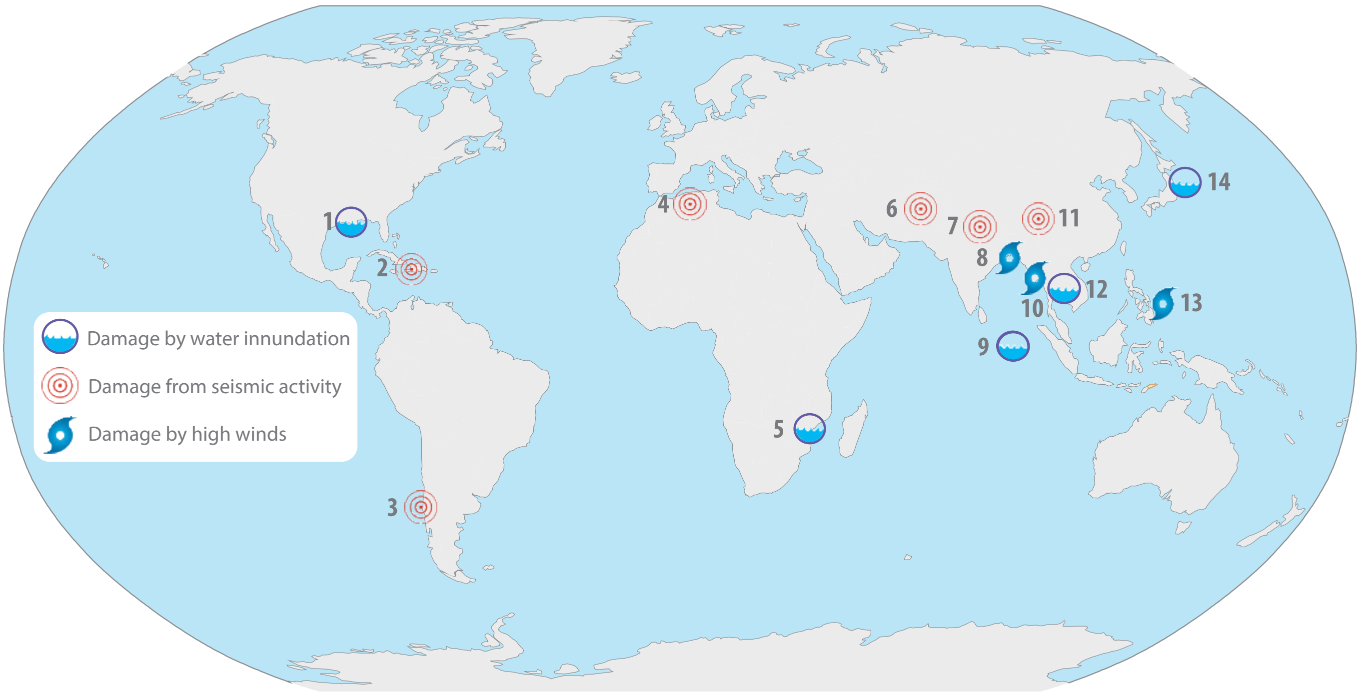
What's at stake?

Disasters striking these unsafe schools can shatter fragile development gains, undermining the hope placed in education. In disasters, students, school staff and families experience intense mental and physical trauma. Unsafe schools can injure and even kill occupants. Months, even years, of education can be lost as communities shift resources away from education during their arduous recovery. When students cannot attend school, they are more vulnerable to abuse, neglect, violence and exploitation.[2] With so much at stake, school buildings should be durable and functional, even after a disaster.

Though school safety has become a global concern, recent disasters highlight the continued vulnerability of school buildings. The 2010 Super Typhoon Megi, the 2012 Bangkok floods, the 2005 Hurricane Katrina, and other cyclones have damaged or destroyed thousands of school buildings. Earthquakes have been even more devastating. The 2005 Kashmir earthquake killed 17,000 students and destroyed 80 percent of schools in some areas. The 2008 Sichuan earthquake in China killed tens of thousands of students in the very buildings meant to protect them. Two years later, 200,000 people perished in Haiti and 80 percent of the schools in the capital city of Port-au-Prince were damaged or destroyed.[3] In each case, the emotional loss to the surviving community remains incalculable.

Whether a government education agency is managing thousands of classrooms across a jurisdiction, a humanitarian organisation is rebuilding school buildings after a disaster, or a small non-profit is constructing a single school in a disadvantaged community, a child's right to safety and survival is paramount.

A community-built school in Laos, designed and constructed without sufficient technical support, collapsed in high winds. Several students were trapped but successfully rescued. Photo: Save the Children.



	The need for safer schools
1	When Hurricane Katrina struck the United States in 2005, 700 school buildings closed, predominantly due to flooding. In the first year, US$2.8 billion was spent to educate displaced students.
2	The 2010 Haiti earthquake destroyed or damaged 80 percent of the schools in the capital city of Port-au-Prince.
3	In 2010, a large earthquake and tsunami destroyed or damaged more than 3,000 schools in Chile, affecting 1.25 million students.
4	Standard school design templates in Algeria do not follow the country's own seismic code recommendations.
5	Floods in 2015 inundated 335 school buildings in Mozambique.
6	More than 17,000 students were killed and 10,000 school buildings were destroyed in Pakistan's 2005 Kashmir earthquake.
7	Early assessment of school damage in the 2015 Gorkha earthquake in Nepal indicated that over 10,000 classrooms were fully damaged. Some districts reported 90 percent of schools were damaged.
8	The 2007 Cyclone Sidr affected more than 145,000 children in Bangladesh and the cost of reconstruction was estimated at US$81 million.
9	The 2004 Indian Ocean tsunami left 150,000 students without school buildings.
10	In 2008, Cyclone Nargis destroyed 2,460 school buildings in Myanmar.
11	The 2008 Sichuan earthquake in China crushed 10,000 students to death in their classrooms.
12	A total of 700,000 students and teachers were affected by the 2012 Bangkok floods in Thailand.
13	In 2013, Typhoon Haiyan partially or completely damaged 2,500 school buildings and 800 daycare centres in the Philippines.
14	Nearly 200 school buildings were destroyed and more than 700 were significantly damaged in the 2011 East Japan tsunami.

Sources: See cited works pg 25 4-8.

A community-based approach

A community-based approach offers one way of achieving safer school buildings in hazard-prone places.

Communities have the biggest stake in school safety – when disasters strike unsafe schools, it is the community's students that are harmed and the community's education assets that are lost. It will be their children experiencing trauma and losing their school. Communities intimately understand how these damages can delay community aspirations for years to come.

Community-based school construction covers a spectrum of possible community involvement, from making informed programmatic planning and design decisions to directly taking part in its construction.

How communities will benefit

This method seeks to build safe and appropriate school buildings, as well as community capital. It acknowledges that communities best know their context, capabilities and customs – what locations will be most accessible, which construction materials are familiar to local builders, and what designs are culturally acceptable.

Community-based construction can foster a sense of ownership as communities take part in planning and design stages. They can articulate their needs and ensure the appropriateness of the materials and the construction techniques used. By engaging in the construction process, they gain experience with the materials and construction techniques. This familiarity later helps the school community successfully operate and maintain the school, ensuring it remains a safe school throughout its lifespan.

The impacts of a single safe school construction project radiate outward from the school site. When communities are actively involved in constructing safe school buildings, they also build their capacity for safe construction practices. They see how to attach roof trusses so they are secure during cyclones; practise how to bend reinforcing steel to strengthen concrete columns so they are protective in earthquakes; and learn how to lay drainage systems and strong foundations to reduce the risks posed by heavy rain. Communities can then apply these techniques to their own houses and demand that future community facilities are also built safely.

The approach ensures school construction benefits the local community and livelihoods. Local labourers can find employment and opportunities to improve their skills. Community approaches ensure funds reach communities when the project relies on labour-intensive construction by community members rather than feeding profits to businesses outside the community. It's also beneficial when projects rely on local materials and local practice rather than pre-fabricated materials that communities will be unable to maintain or replicate.

The approach brings transparency and accountability. With training, communities can be better positioned to monitor school construction than distant donors or over-stretched

Kindergarten students in Ghana line up for school. The school was designed and built to address hazards, such as wind, earthquake and extreme temperatures. The school also incorporates local building materials and sustainability principles.
Photo: Jack Brockway.

Students lead the way

In 1999, a national NGO in Nepal dispatched an engineer to begin its first community-based safe school retrofit in a community on the outskirts of Kathmandu. Over time, the community began to trust the engineer as he went to the school site every day and got his hands dirty, drilling, laying and pouring with the rest of the labourers. In just four months the project seemed to be a success.

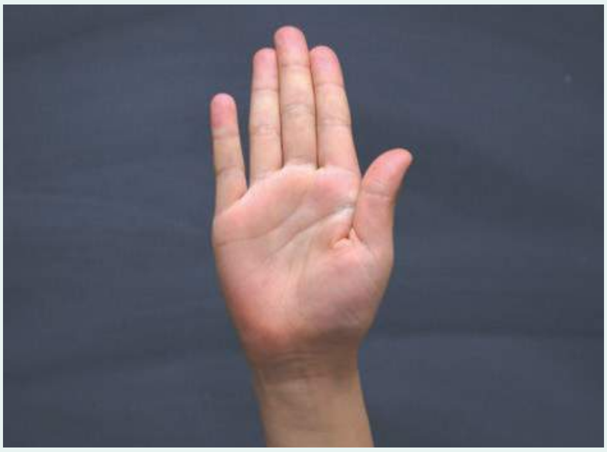
On one of the last days, the engineer noticed a building that was small and offset on the school grounds. He learned it was the classroom for the first and second graders. Worried about this building being overlooked in the retrofit, he called the community to a town meeting next day hinting the topic would be important.

As the NGOs' funding had been exhausted, he asked the community to give some of their own savings to help retrofit the small school building – in his mind the parents, teachers and friends of the first and second graders could not deny the children the safety given to the main schoolhouse. He asked the community to raise hands for a pledge.

Slowly, skinny arms raised. Hands of fifth graders were in the air. They were the first to pledge their meagre savings — if they had any — to their younger classmates. Seeing their example, a cascade of funding followed. Parents pledged hours of labour and cash, while teachers and the principal gave one month's salary. With no outside funding the first and second grade building was reconstructed.

School children, after learning of their own vulnerability, were the impetus for safe school construction and became leaders in creating a culture of safety.

In the weeks after the devastating 2015 earthquake, the engineer anxiously called the community. With excitement, a local resident reported that both the main retrofitted school building and the reconstructed first and second grade classroom had survived unscathed. Many houses around the school collapsed or were heavily damaged, but not all. Some residents had applied the seismic-resistant techniques they saw during the safer school construction project to their own homes. With relief the engineer learned that those homes had withstood the earthquake.



When the local first-grade classroom needed strengthening, a fifth-grade student was the first to lend support. Photo: Risk RED.

government representatives. Being in the immediate vicinity of the construction site day and night, they know when a contractor has not shown up for weeks or can voice justified suspicions the materials used are low quality. When they have direct responsibility for resources, communities can track how funds are spent and how materials are used. The cost per classroom often falls even as community satisfaction and the quality of construction improves, and middlemen are eliminated.[1,9]

In post-disaster contexts, community-based construction can also be a healing process. Youth, parents and communities can come together to rebuild, helping to relieve the trauma, stress and hopelessness felt after a disaster.

Finally, a community-based approach can create a community learning opportunity for disaster risk reduction. School buildings serve as community hubs. When the focus of construction is on safe school construction and community learning, the process can build a broader awareness of hazards. It can promote collective action to identify and reduce exposure and vulnerabilities to those hazards. Communities can then apply these lessons in other construction projects, multiplying the impact of safe school construction.

At the same time, students learn that their lives matter to the community. As students become adults, the impacts magnify. Students of safer schools are well-prepared to make choices about safe housing, demand safe public facilities, and they understand that natural hazard events do not need to be tragedies. Engaging in the construction of safer school buildings can transform communities by building a culture of safety and resilience.

The community-based approach challenge

Community-based school construction may be one of the most innovative yet challenging forms of school construction for achieving both universal education and comprehensive school safety goals.

In community-based construction, school- or community-based organisations have key decision-making roles in several aspects of school construction. In some cases, communities provide matching funds as material or labour. In others, communities provide land or build additional structures on the school site.

When governments initiate community-based school construction projects, communities typically manage the process by hiring contractors while receiving funding and support from central or regional governments.[11] When development actors initiate construction, communities may offer their labour as a contribution to construction.[1] In both cases, local communities may receive technical and financial support from national MoEs, local branches, designated social funds or development actors.[14] Without support, the safety of school buildings is usually compromised.

Based on the failures and the success of community participation, experience shows that the most successful community-based school construction occurs when:

- Locally available materials are predominantly used.
- Communities are familiar with the construction techniques.
- Only simple modifications are made to construction techniques already practiced by the community construction, and then only to ensure durability and safety.
- All stakeholders are well aware of their roles and responsibilities.
- Education and awareness-raising are embedded in all aspects of the design and construction process.
- Community involvement is already culturally engrained.[11,14,18]

Photos: NSET, UNICEF, CRS, Arup, Sabre Trust, Save the Children.

Advantages and potential limitations of community-based safe school construction

	Advantages	Potential limitations
Finance	Proven to be cost-effective in comparison to contractual systems where contractor overheads, profit and bank guarantees can increase costs by more than 15 percent.[11,15] School construction funds benefit local economies.[14] Can mobilise additional resources for education by enhancing community commitment to a local school.[16]	Localised financial control may limit the capacity for redistribution of financial resources across communities.[13] Where communities lack training in financial management, it is important to provide training before construction starts.
Equity	Sharing power between communities and government agencies or development actors can ensure community needs and preferences are addressed. Promotes shared responsibility. Can increase community awareness of their rights to information and decision-making power.	Decentralised and community-based strategies may increase inequity between communities, as each will rely more heavily on uneven levels local knowledge and resources.[13] Can shift responsibilities to local people with limited capacity or other priorities. Can exacerbate pre-existing inequities in social divisions, including ethic, gender-based or religious divisions.[16]
Quality	Can improve the visual quality of construction in comparison to school buildings constructed by external contractors.[17]	When local craftspeople lack adequate knowledge of hazard-resistant design and construction techniques, school construction may replicate the vulnerabilities found in local private sector construction.
Sustainability	Tends to increase community ownership through wider community involvement in its implementation.[11] Can infuse enhanced construction practices into communities – skills that may transfer to residential and other construction.[14] Helps ensure strategies are accepted and appropriate for community.	When initiated by non-government actors, government accountability to citizens can be undermined. Without clearly defined responsibilities for operation and maintenance, school buildings can deteriorate. When not properly supported, the process can burden community with learning skills, like construction management and procurement that may have limited transferability.

Global education and school safety initiatives

Millennium Development Goals (MDGs)	In 2000, the United Nations adopted the Millennium Development Goals (MDGs), prioritising universal primary education by 2015 as the second highest priority, following the eradication of extreme poverty.
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.
Hyogo Framework for Action (HFA)	In 2005, the United Nations Office for Disaster Risk Reduction (UNISDR) coordinated the first 10-year framework describing the roles of different sectors and actors in disaster risk reduction, with the goal of substantially reducing losses by 2015. Priority Action 3 supports the use of knowledge, innovation and education to build a culture of safety and resilience at all levels. The framework was to be succeeded by the Sendai Framework for Action in 2015.
Disaster Risk Reduction Begins at School	This UNISDR-led campaign seeks to integrate disaster risk reduction into national and local curricula and to further promote school resilience to natural hazards.
Child-Friendly Schools	UNICEF's 2009 Child-Friendly Schools model aims to improve education quality and learning outcomes by addressing student needs, school environment, curriculum and teaching processes.
Sustainable Development Goals (SDGs)	In 2012, the United Nations Conference on Sustainable Development (Rio+20) led to renewed 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 a fundamental component in sustainable development. These efforts have also called for a shift in focus from mere access to education to quality education, including safe buildings that are conducive to learning.
Comprehensive School Safety (CSS)	This framework for climate-smart disaster risk reduction in the education sector was finalised in 2014. The framework is supported by UN agencies and development actors, and aims to bridge humanitarian and development action. The framework is based on three pillars. The Three Pillars of Comprehensive Schools Safety **1.** Safe school buildings **2.** School disaster management **3.** Risk reduction and resilience education.

Learning from the past: Global school construction

In the push to achieve primary education for all, constructing school buildings has been an enormous challenge for governments, development actors and their partner communities. School construction programs in the last two decades have successfully expanded educational access worldwide.

Capital investment

Today, the majority of school buildings constructed worldwide are through national capital investment. National capital investment is where governments ask the Ministry of Education (MoE), Ministry of Public Works (MoPW) or their regional government offices to provide sufficient and functional classrooms.

Traditionally, school construction was a centralised planning process. The MoE assessed needs and directly built using their own technical offices or in coordination with other ministries, such as the MoPW. Alternatively, they sought competitive bids from contractors to carry out the work.

National and local governments globally build huge quantities of classrooms each year through direct construction and contracting. Capital expenditure on education, as a percentage of total expenditures on public institutions, is commonly around 10 percent. However, it can range from zero in some of the poorest countries to more than 20 percent in countries like Malaysia, Mozambique and Pakistan.[10]

Even with significant portions of national budgets spent on school construction, in countries with growing populations, the demand for classrooms still dwarfs supply. Existing classrooms may also be in poor condition, overcrowded or

Capital expenditure on education as a percentage of total expenditure in public institutions

Benin	14.2
Brazil	6.9
El Salvador	9.6
India+	4.5
Kazakhstan	7.9
Malaysia	24.7
Mexico	3.3
South Africa	3.0
Tunisia	12.0

Source: UNESCO UIS database, query 16 Jan 2015, most recent data for India is in the year 2006

constructed of temporary materials. Simply maintaining and repairing existing classrooms may overwhelm government funds and limit new school construction.[9,11]

Foreign aid

With pressure to provide school buildings in many low- and moderate-income countries, foreign aid and loans to national governments remain a significant source of school construction funding. The World Bank is the largest external supporter of education development. From 2010 to 2014, the Bank provided US$15.8 billion to education development. A little less than half of this has recently focused on school construction or rehabilitation.[9,12]

In some countries, foreign aid is a primary source of funds for school infrastructure. For example, in Senegal 55 percent of school construction is financed through foreign aid,[11] while in Chad and Laos 100 percent of school construction is from external sources. While much of this aid has gone directly to ministries within national governments for centralised school construction projects, a significant and rising portion is funnelled directly to NGOs for project implementation. In 2001, nearly one-third of World Bank-financed projects, including those in the education sector, involved international and national NGOs.[11]

Areas with disasters, conflict or weak states often rely more heavily on international NGOs for school building construction, even though the NGOs may play a modest role in other regions. Where possible, these development actors coordinate school construction and rehabilitation with national guidelines and local authorities. In some countries, however, government actors may have limited capacity to oversee school construction carried out by development actors.

Local construction

Communities, local community-based organisations and parents also take part in school construction. When governments have limited capacity or weak territorial claim and NGOs are not present, communities do build their own schools, although they are often temporary or of poor quality.[11] In other cases, private schools – whether newly built or in refurbished buildings – can make up a large portion of school infrastructure. Private schools serve 46 percent and 85 percent of total school attendees in Bogota, Colombia and Haiti respectively. The oversight of the construction of these private schools may hinge on the capacity and quality of the government's oversight of construction in general, which is weak in many low- and moderate-income countries.

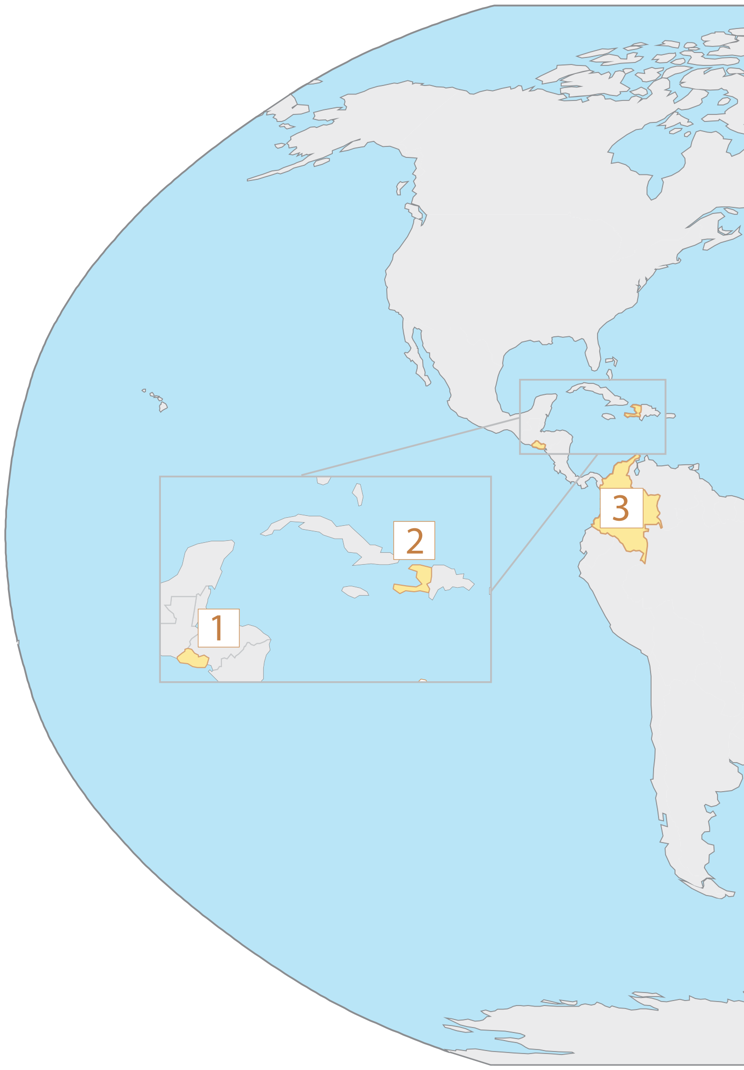
Based on decades of experimentation, some national governments have decentralised school construction, notably in Indonesia and some African and Latin America countries. Decentralised school construction often becomes a community-driven development approach. In higher-income nations, similar decentralised school construction may also be the norm, with local school boards in countries like the United States being fully empowered to manage school construction, although community members are not often involved.

More recently, national governments have experimented with empowering local governments to build school buildings with support from NGOs or specifically designated social funds. Local bidding and closer monitoring, along with design and materials that are familiar to local craftspeople have produced heightened community commitment to schools and significant cost savings.

In a comparison of school construction across 215 projects in Africa, cost-per-classroom averaged US$269/m^2 when national agencies sought international competitive bids, US$175/m^2 when local or regional offices directly constructed the school, and US$103/m^2 when communities built the classroom. Similar cost savings were found when NGOs and social funds delegated construction to communities, compared to directly building classrooms themselves.[11,13] Though cost savings are attractive, construction quality is not always ensured. As a result, hazard safety has been sacrificed in some cases, which undermines the moral premise of providing education for all.

Community-based school construction around the world

The form and impetus for community-based school construction varies globally, as does the safety of these school buildings.



1. El Salvador

Small private firms contracted by the government usually carry out public school construction. However, informal school modification is common when schools lack funding for operations and maintenance. Wealthy individuals also often donate land, yet these individuals may retain the property rights and later reclaim land for other uses.

2. Haiti

Around 85 percent of Haiti schools are privately constructed and run – built by NGOs, community and religious organisations or by individuals. The 2010 earthquake destroyed close to 4,200 school buildings as well as the MoE building, crippling a troubled education sector.

3. Colombia

Since the 1970s, the country has had strong building codes. However, parts of the country remain in conflict and outside of government control. In these places school construction happens through partnerships between communities and NGOs.

4. Ghana

Communities typically contribute to the building of public schools. Contributions include labour, materials or cash for contractors. Community elders sometimes monitor construction to ensure obligations are met, but safety remains a concern. In recent years, high winds have blown school roofs off.

5. DRC

Schools in the DRC have suffered from years of conflict, a lack of investment, and poor management. Vast swaths of the country remain cut off from state and external aid due to inaccessibility and a lack of roads. There, communities informally build most schools.

6. Kenya

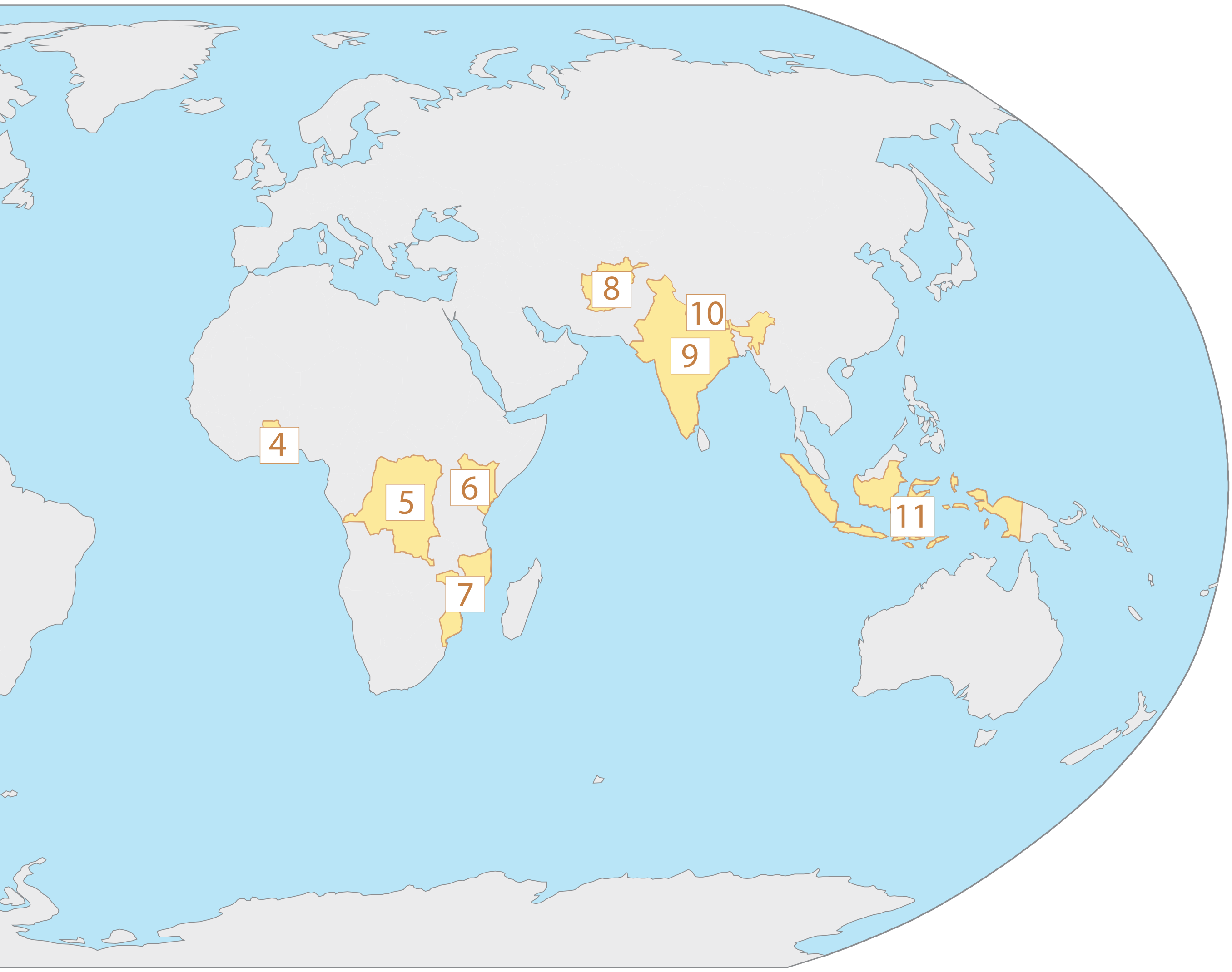
Kenya does not have a consistent school construction model. In urban and some rural areas, public schools are built by the government. But outside formal urban communities, non-profit organisations and communities often fund school construction. Until 2003, community-based school construction was financed entirely by the communities, with the government providing teachers for completed schools.

7. Mozambique

After 15 years of civil war, the government and development actors rapidly constructed more than 16,000 school buildings, nearly half of which were built by communities out of locally available materials. As many schools are damaged each year by high winds and floods, the UN and the government are now providing better guidance for community-based school construction.

8. Afghanistan

Community-based school construction largely happens in areas where the government does not have strong oversight. They have mandated standardised guidelines for NGOs building schools and these NGOs are often directed to specific areas of the country. Despite high seismic and landslide risks, poor site selection for schools is common.



9. India

While schools in remote and rural areas may follow government design templates, construction is typically informal and community-based. The government and key NGOs have spearheaded a massive push to build safer schools through seismic resistant school design templates, better engineering education, and improved construction practice.

10. Nepal

Through close collaboration with national and international NGOs, Nepal has been assessing the hazard safety of their school buildings in an effort to retrofit or rebuild all dilapidated buildings before 2020. To finance retrofits, the government usually relies on building community demand for safer schools.

11. Indonesia

In 1999, Indonesia responded to their complex geography and significant exposure to hazards by decentralising their governance. The MoE gave block grants to school management committees to build, repair and manage schools. Over the last five years, the government has allocated extra funding for improving school-building safety.

A commitment to safer school buildings

The **Comprehensive School Safety Framework**, adopted by United Nations agencies and development actors globally, aims to:

- Protect learners and education workers from death, injury and harm in schools.
- Plan for educational continuity in the face of all expected hazards and threats.
- Safeguard education sector investments.
- Strengthen risk reduction and resilience through education.

The framework places specific responsibility on those responsible for the construction, repair and retrofitting of school buildings. These responsibilities stem from two of the fundamental rights of children, and complement sustainable development goals of providing safe and positive learning environments for all.

1. Every child has the right to safety and survival.

- Every new school building should be planned, designed and constructed to minimum standards of life safety.
- Every existing school strengthened, renovated, remodelled, refurbished or modernised should be brought up to the life safety standard.
- Every school designated as a shelter for emergencies and disasters should meet the higher standard of operational continuity.

2. Every child has the right to access education.

- Every school building should be constructed to protect a child's access to education from hazards.
- Every school should be maintained to protect education sector investments from hazards.

Key principles of community-based safer school construction

	Essential principles
1	**Build safe schools and strengthen weak ones.** Schools must be designed and constructed to protect students and staff. When existing schools facilities are unsafe, they need to be identified, prioritised and strengthened. Concern for community priorities, cost and time takes second place to safety, and all stakeholders must commit to ensuring safety through quality assurance. Building anything that does not meet these assurances risks lives and wastes development funds and community effort.
2	**Engage as partners.** A community-based approach is premised on building consensus between the development actor/government body and the local community. Development actors and governments may be best positioned to provide knowledge of regional hazards, hazard-resistant designs and effective construction techniques. But communities will be more knowledgeable of local hazards, site conditions and material availability. They will also best understand local construction practices. Both parties need to learn from each other. Project implementers must avoid token participation. Rather, school communities should be empowered to be full partners in comprehensive school safety.
3	**Ensure technical oversight.** While appropriate safe school construction enhances community capacity and transfers technology, technical oversight remains crucial. The development actor or government must ensure design and construction complies with good practice for hazard-resistant construction. Where technical capacity is low, they should also increase local technical capacity by connecting skilled labour and technical specialists from the community with external specialists.
4	**Build upon local knowledge.** Safe school construction should build on local knowledge, not replace it. Site selection, design and construction should follow local practice, making only moderate adaptations to ensure safety. Doing so ensures communities can adapt good practices to existing ones and apply them elsewhere.
5	**Develop capacity and bolster livelihoods.** Community-based safe school construction provides an important training ground for new skills. Projects should support training for skilled craftsmen and women who need to learn hazard-resistant construction techniques. Once trained, these craftspeople may even market their new skills. Safe school projects may also be ideal for improving the skills of local government technical staff in hazard-resistant design and construction oversight. Their involvement in all projects – big and small – can spark interest in community-based approaches and further encourage governments to fulfil their obligation of providing safe schools to all communities.
	Good practice
6	**Support a culture of safety.** Building safe schools provides a tangible project for increasing community awareness about hazards and risk-reduction strategies, and this awareness can be sustained and enhanced. Establishing school disaster management committees and integrating hazards and risk-reduction concepts into curricula can encourage everyone to regularly engage in school disaster risk reduction after construction is complete.
7	**Scale-up and promote accountability.** Organisations and agencies engaging in community-based safer school construction should develop common standards, processes and guidance tools. This will allow successful aspects of the approach to spread. They can also make a public commitment to safer schools and track this commitment through measurable targets and indicators.

Photo: Veejay Villafranca/Save The Children

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
The United Nations Office for Disaster Risk Reduction

Global Alliance for
Disaster Risk Reduction & Resilience
in the Education Sector

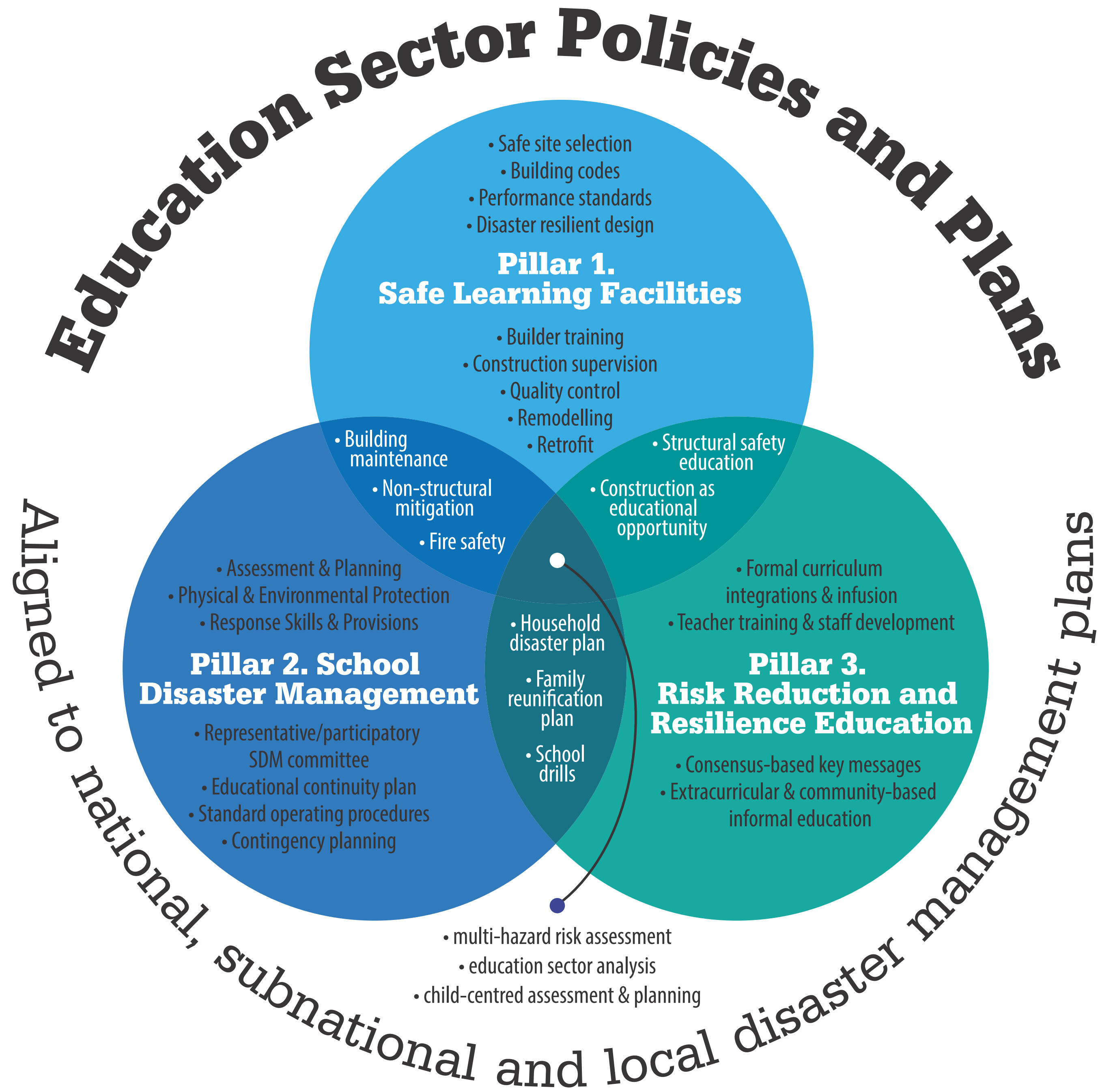
Comprehensive School Safety Framework prepared for the 3rd U.N. World Conference on Disaster Risk Reduction, 2015.

Comprehensive School Safety Framework

Goals of the framework

- Protect learners and education workers from death, injury and harm in schools.
- Plan for educational continuity in the face of all expected hazards and threats.
- Safeguard education sector investments.
- Strengthen risk reduction and resilience through education.

Comprehensive school safety is impossible without a safe physical structure. In countries with robust building codes and established regulatory systems, safe schools are possible by enforcing existing standards.[11] In areas with weak or non-existent systems, greater community-based oversight and capacity building is necessary. Regardless of context, school construction provides an opportunity to increase community awareness of hazards and engage people in disaster risk reduction.



CASE STUDY

Some key principles in practice:
Trade-offs in post-disaster response

Country: Haiti

Organisation: Save the Children

Hazards: Earthquakes, flash floods, high winds

Summary: Reconstruction in the wake of the 2010 Haiti earthquake was extremely challenging, spanning many years and hundreds of organisations. In the complex and shifting post-disaster context, the international humanitarian organisation Save the Children was tasked with providing school buildings to get children off the streets and back into school. Amid conflicting pressures of time, resource constraints, internal organisational mandates and relations with the Haiti government, Save the Children made difficult trade-offs to complete their mission using community-based principles.

Country and hazard overview

In 2010, a devastating earthquake struck Haiti, damaging or destroying 80 percent of schools around the capital city Port-au-Prince. Nearly 250,000 people were killed, and one-third of the population displaced. Most documents from the past 204 years of Haitian governance were buried under rubble. Land tenure was almost impossible to determine and the Haitian MoE was overwhelmed by the crisis, despite good coordination. In this extremely difficult context, Save the Children – who was co-leading the Education Cluster with UNICEF while working alongside other NGOs and the MoE – rushed to respond.

Returning children to the classroom was the most pressing goal for Save the Children from both educational and child-protection perspectives. Aiming for immediate relief amid the post-disaster turmoil required Save the Children to make difficult trade-offs. Pressures from key stakeholders pushed and pulled the school construction program, sometimes in opposing directions.

A laudable success

The Education Cluster was run by Save the Children and UNICEF. Together, they coordinated the efforts of approximately 100 organisations.

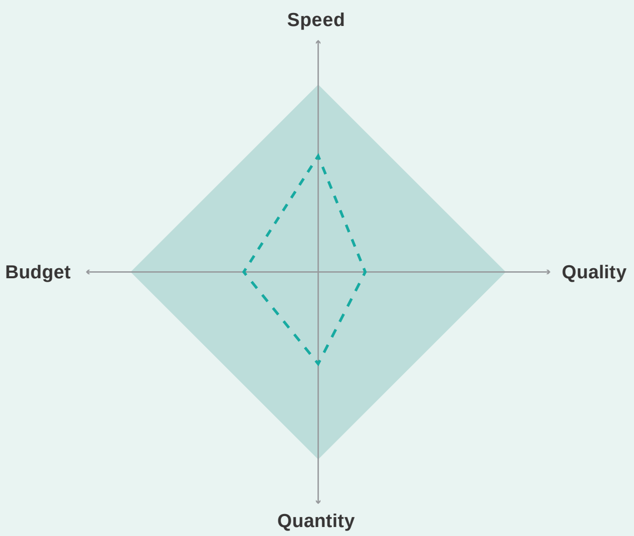
Collectively, the Haiti Education Cluster established more than 1,000 temporary learning spaces, trained more than 10,000 teachers in psychosocial support for children, facilitated the return to school of more than 1 million students, and undertook cholera-prevention activities in 20,000 schools.

Save the Children alone constructed at least 100 schools, helping thousands of children get off the street into their successful education programming that followed. Surveys indicate that community members were extremely grateful for Save the Children's efforts.

Key decisions or trade-offs:

- **Speed versus quantity.** Construction speed and cost versus building lifespan – to build semi-permanent or permanent?
- **Quality versus speed.** A consistent design for better compliance to safety standards and streamlined construction versus design diversity for increased functionality and tailoring to specific site characteristics.
- **Cost versus quantity.** Higher costs of site-specific design versus the economy of scale that comes with a consistent design template.
- **Quantity versus quality.** Breadth of school construction versus depth of community engagement – creating community "ownership" versus building more schools.

These conflicting considerations can be conceptualised by the project diamond: prioritising time, cost, quantity or quality can only be achieved at the cost of other factors.



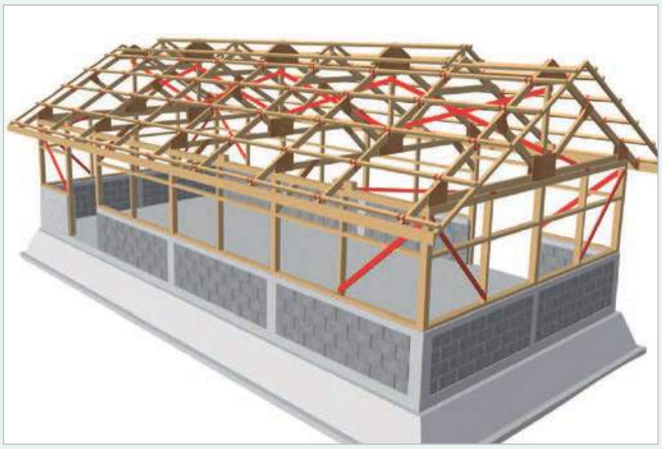
Many of the key trade-offs were made at the design stage, which in turn dictated the programmatic decisions that followed. Save the Children opted for a standardised school design and a semi-permanent structure in an attempt to optimise donor expectations for an immediate response, speed and cost.

A semi-permanent lifespan was seen as a middle ground. Donors were less inclined to lend money for permanent structures when the country was in the emergency and immediate recovery phase. Save the Children had its own goal to build a certain quota of schools and were contractually obligated to achieve those numbers. The Haitian MoE was also requesting temporary, immediate construction. Even as they drafted the design, they recognised that some building elements, in particular the plywood cladding, would require maintenance and replacement.

The semi-permanent school design was approved by the Haiti government through a protracted process, meaning the first schools were completed in June 2011 and the last schools in early 2013, three years after the earthquake. Initially, the short-term strategy made sense, but navigating the economic and political environment took so much time that the original argument for speed decayed. This left Save the Children with two key lessons about trade-offs in construction lifespan: the staff needed a shared definition of 'semi-permanent', and a well-communicated plan for upgrading schools to permanent structures when they degraded.

Ensure technical oversight and engage as partners

Many school construction projects functioned well with the standardised building footprint, while some required compromise to achieve sufficient classroom numbers. In the latter cases, school administrators made ad-hoc changes, some of which compromised safety and classroom function. A five-way memorandum of understanding (MOU) was established in an attempt to mitigate these changes. The MOU provided written agreement of roles and responsibilities of each stakeholder in advance, including school staff, MoE, Save the Children, the municipality and the local Parent-Teacher Association (PTA).



Schools were all single-story with 190-cm-high reinforced concrete skirt walls. The walls were topped with timber framing and clad with plywood. Corrugated metal was used for the roof. Graphic: Save the Children.

Because only a narrow gap existed between school buildings, the school staff cut doors into the gable-end walls of the buildings. The ad-hoc change removed bracing designed to help the building resist earthquakes and hurricanes. With doors only at the end of the long row of classrooms, building evacuation was also serious compromised. Photo: Bill Flinn.

When the site could not accommodate three standardised school building blocks, on-site engineers were able to improvise effectively, designing a staggered arrangement without compromising safety. Photo: Bill Flinn.

Both successful and unsuccessful examples of design modification show that technical management can make a huge difference in school safety. Having a suite of approved design alternatives can be a good option when on-site technical capacity is low, providing the site manager with reasonable flexibility. Further trainings and quality control can then be used to bolster the technical capacity of these local site managers. However, if further training is not possible, designs can be modified effectively if both qualified engineers and architects are on-site regularly.

Develop capacity and bolster livelihoods while building a culture of safety

To build community capacity and place disaster risk reduction at the forefront of all decisions, Save the Children formed Safer Construction and Disaster Risk Reduction Teams at each site. The process involved creating a detailed construction manual, posters of key concepts and models of rebar bending and lapping. They also held training sessions with builders and taught risk-analysis workshops to the school PTA and community members. Even with those strong steps, building risk reduction capacity during a humanitarian response was challenging.

Posters and a detailed training manual in Creole were used to communicate building schematics, material quality and the construction process. These materials were developed with the intention of helping Haitian engineers with on-site instruction. However, this communication style was not always in-sync with how local builders understood information. The team had more success with color-coded physical models showing the proper placement of steel reinforcement bars. Another challenge was that although training taught local contractors to identify high-quality sand and gravel, they often chose to purchase cheap, low-quality goods.

Significant training also was required to achieve the desired quality of construction. During site visits in the pilot phase, local engineers saw apparent high-quality construction but did not always have sufficient training to understand when external building elements were misleading. For them, if the required building elements were present then it passed the test but they did not always realise the quantity and placement of these elements was paramount in Haiti's high seismic and hurricane risk environment. For example, the lack of roof gable braces and sparse nailing patterns on timber frame connectors were not seen as problematic when they should have been.

While teaching local engineers about hazard-resistant design was a clear necessity in Haiti, additional benefits might have been gained by including skilled tradespeople, as well as other community members, in the earliest stages. These individuals could have assisted in some aspects of quality control, providing the double dividend of safer construction and increased community awareness on hazard-resistant construction techniques. Though it may seem unlikely that the community would spot what engineers would not, effective training from structural engineers with extensive knowledge on seismicity can increase community knowledge, aptitude and practice of safe design.

The community's long-term interest in the safety of their students might have provided extra motivation to ensure the school met top safety standards. Perhaps, just as valuable as a safer school, a more aware community may have increased demand for safer construction. Though the results may have been diffuse, the long-term impact would have been more important than any single building.

Design choice challenges

The construction typology of the school buildings was predominantly timber frame, while the modern vernacular of urban Haiti is reinforced concrete frame and concrete block. Haitians, after seeing heavy concrete walls crumble on friends and family, were fearful of rebuilding with masonry. This influenced Save the Children's initial design choice. However, those initial fears slackened over time, potentially warranting a design shift.

The construction of the concrete skirt wall provided some opportunity for training in hazard-resistant techniques, but the timber framing on the upper portions provided significantly fewer opportunities for Haitians to learn new techniques they could apply in their own homes. Learning opportunities would have been enhanced if masonry walls had been full height. These changes would not have significantly increased costs and may have dramatically increased the school's lifespan.

Key takeaways

The Save the Children experience in Haiti highlights the importance of applying key principles in safer school construction, and the challenges that come with this process. They were able to ensure the oversight of technical aspects and engage communities as partners to achieve and maintain safer schools on many sites. They were also partially able to develop the skills and awareness of local contractors and community. Supporting a culture of safety and building on local knowledge, however, proved more challenging during this complex humanitarian response.

- Periodically review decisions about the tradeoffs between 'time, quality, quantity and cost' to ensure the program remains relevant to shifting post-disaster reconstruction contexts.
- Where technical construction capacity is low but hazard risks are high, consider using visual and practical teaching approaches rather than printed guidance to engage local workers.
- Make the dissemination of risk reduction principles a deliberate goal of both private and public reconstruction projects.
- Look to lessons leant in other sectors – such as health and hygiene promotion and community-based shelter reconstruction – for effective education and behavioral change strategies that may be applicable to post-disaster safer school construction.

Students during a Disaster Reduction Drill at a school in Leogane Haiti. This school was built with Save the Children's support using innovative yet simple techniques that make it more hurricane and earthquake-resistant. Photo: Susan Warner/Save the Children.

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SECTION II: OVERVIEW

Overview of a community-based approach

Schools in hazard-prone places should be safe regardless of who funds, builds or maintains them. Achieving safety is straightforward when schools are designed according to strong building codes and constructed by well-trained professionals under robust systems.

For many school projects, however, achieving safety is not straightforward.

In many contexts, building codes may lag behind current best-practice models. The codes may not even apply to common construction practices or may not exist at all. Those who work on school construction projects may lack proper training or be unfamiliar with the life-saving techniques for making schools safer in hazardous regions. Construction oversight may be perfunctory or non-existent.

Where the location and quality of school buildings routinely puts students and staff at risk, building a new school or retrofitting an existing school should be more than a construction project – it should become an important community-wide learning process. Results should not only include a safer school but build a more resilient community with the knowledge and skills to reduce the risks from hazards they will face in the future.

New construction		**Retrofit construction**
Strategic planning and mobilisation	⟷	Strategic planning and mobilisation
Site selection	⟷	Survey and prioritise existing schools
Design	⟷	Evaluate existing structure and design retrofit
New construction	⟷	Retrofit construction
Operation and maintenance	⟷	Operation and maintenance

Safer schools: Retrofitting projects

A community-based approach is equally applicable to retrofitting projects, which aim to strengthen existing unsafe school buildings. Retrofitting projects are crucial where school buildings were built using poor safety standards or were not well maintained. In this document, safer school construction refers to both new and retrofit construction projects.

Existing school buildings may be vulnerable to hazards because the building was:

- Designed and constructed with no consideration of building codes.
- Designed according to an earlier code, which has since been upgraded.
- Designed to meet modern codes, but deficiencies exist in the construction.
- Not originally designed as a school.
- Designed and constructed well, but was modified inappropriately.

Fundamentally, the decision to build new schools or retrofit existing schools stems from a combined engineering and economic analysis. Assuming the number students has remained constant, the core question is whether the cost of applying the necessary retrofits will be less costly than constructing a new school. If the analysis reveals the new construction is cheaper, teams often choose to dismantle the old school and rebuild.

Most key principles of community-based school construction projects apply to retrofitting projects, but the stages are slightly different. Site selection is replaced with a survey and prioritisation process (See the the case study in *Section III: Planning*). When creating a retrofit design, the design team must first understand the building's weaknesses. The team should collect and analyse building data from architectural and structural drawings, design calculations, material properties, details of the foundation and geo-technical reports. The design team can then compare this building information with expected hazards and calculate what retrofit interventions are necessary to ensure safety.

Key actors

A community-based approach draws a wide number of stakeholders together, who all bring important perspectives and skills to safer school construction.

- **School community.** The school staff, parents, students, school boards and neighbourhood receiving a safer school are at the centre of a community-based approach and have an intimate knowledge of the local context. They may also be directly involved in construction, project management, elements of hazard assessment or funding. After completion, the school community often manage and maintain the building.
- **Development organisations and actors.** Development and humanitarian organisations, United Nations agencies and local NGOs may provide funds and assistance for school construction. They may also be important advocates for safer, sustainable and appropriate buildings.
- **Program manager.** When development organisations or government agencies initiate community-based school construction programs, they appoint an individual to ensure projects meet program objectives – quantity and quality – within cost and time constraints.
- **Local government.** District offices of education, public works and other government agencies often prescribe technical parameters for design and construction and supply land for new school construction. They may allocate local funds for school construction and monitoring, and report back to the central government.
- **Central government.** Ministries of education, public works and finance often manage education sector resources and develop guidelines for school construction. They oversee public sector school construction programs and may also monitor those in the private sector.
- **Technical professionals.** Engineers, architects, construction specialists and scientists may provide consulting services to specific projects. Through local and international professional societies, they shape codes, guidelines and good practice.
- **Policy and decision makers.** Elected officials and decision makers formulate the education sector programs and policies that shape school construction.

Each stakeholder has incentives and disincentives for supporting safer schools.

Photo: Danielle Wade/Save the Children.

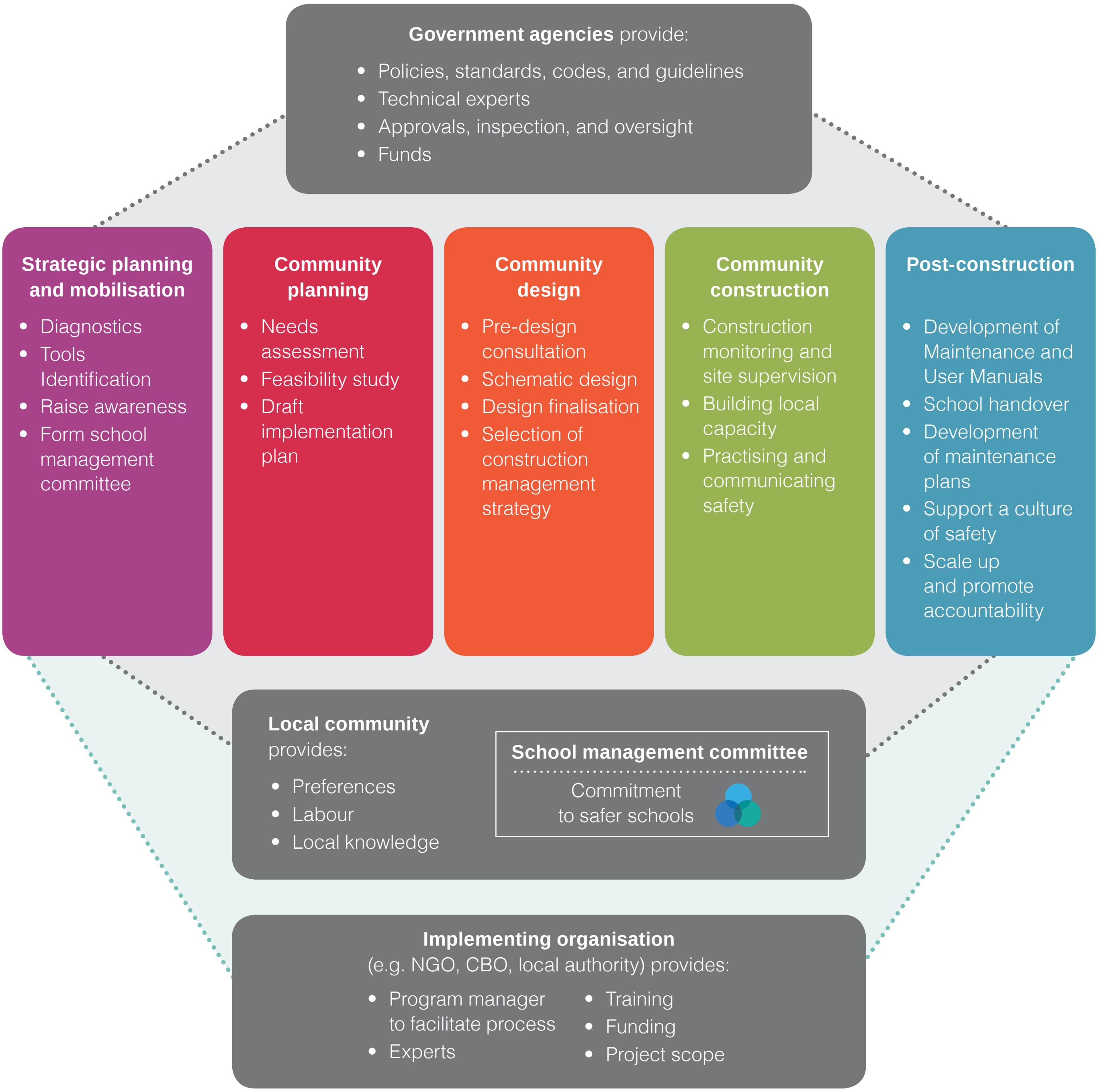
Stakeholder (dis)incentives for supporting safer school construction

	Incentives	Disincentives
School community	• Safety of self and school-age family members • Acquisition of hazard-resistant construction knowledge and skills • Local jobs	• Low risk awareness • Lack of confidence in risk-reduction techniques • School disruption for retrofitting projects • Mistrusting non-community members
Development organisations	• Fulfilment of organisation's mandate • Visibility of organisation • More effective long-term investment	• Lack of technical and financial capabilities to invest in safer construction • Lack of government or donor interest • Higher visibility in other actions or sectors
Program manager	• Desire for high-quality output	• Low risk awareness or disaster risk-reduction knowledge • Perceived trade-offs with speed, quantity and cost
Local government	• Protection of citizens • Use of safer schools as shelters • Increase local capacity to deal with hazards	• Lack of technical capacity in hazard-resistant design and construction • Extra workload for construction supervision and support
Central government	• Protection of infrastructure investment • Education continuity in emergencies and disasters • Safety and wellbeing of citizens, especially future generations	• Competing budgetary items, such as teachers' salaries, educational materials and training • Lack of confidence in disaster risk-reduction effectiveness • Lack of human resources to carry out the program
Technical Professionals	• Income generation, analysis, site planning and hazard-resistant design • Academic interest	• Lack of expertise in hazard-resistant design • Higher investment of time needed compared to common (unsafe) practices
Policy and decision-makers	• Infrastructure and community protection • Community development • Fulfilment of international commitments	• Lack of political incentives • Lack of funding and other resources • Donor dependency • Moral hazard: may gain more political clout by responding to catastrophic disasters than quietly averting them

Key activities of the community based approach

School construction projects, whether community-based or external, follow similar processes. These projects have a core Planning, Design and Construction Stage. In a community-based construction approach, there are two equally important stages which bookend the process – the Mobilisation Stage in the beginning and the Post-Construction Stage after construction is finalised.

When a community-based approach is used in a hazard-prone location, several key activities can help ensure school safety. First, the design must be responsive to the needs of the students, staff and community. Second, the community must gain knowledge and skills for disaster risk reduction. Each of the five stages is briefly described below, along with the advantages and challenges of a community-based approach.



In the five stages of community-based construction of safer schools, school management committees play a central role, providing their preferences, local knowledge and labour. The implementing organisation, whether an NGO, community-based organisation or local authority, provides experts, training, funds and project scope. They facilitate the process through a program manager. Government agencies at the central and local level provide the policy context and approval process. They may also provide technical experts and funding.

1. Key activities of the Strategic Planning and Community Mobilisation Stage

The first stage of a community-based approach seeks to understand the broad, physical, social, cultural and political environment in which the program occurs. Community mobilisation follows, culminating in the formation of a school management committee that is broadly representative and committed to safer schools.

- **Performing diagnostics.** A diagnostic assessment of the education, construction and development sector helps ground projects in local realities and identify champions of school safety.
- **Identifying tools.** Tools for risk awareness, disaster risk reduction and construction training may already exist. Identifying them ensures the program supports existing community activities.
- **Raising awareness.** Before communities commit to building safer schools or retrofitting existing ones, they need to understand the risks and believe in the project.
- **Forming a school management committee.** The school management committee oversees the process. They ensure community needs are met and safety is prioritised.

Burmese monks identifying risks in their local community.
Photo: Sam Lu/Save the Children.

Stage 1. Strategic planning and community mobilisation

Advantages	Challenges	Strategies
• Builds community risk awareness	• Inaccurate understanding of risks or ineffective risk communication	Risk communication is a two-way dialogue. It's important to understand stakeholder perspectives but it's also essential to share good practice and lessons learnt in risk communication.
• Increases knowledge of risk reduction strategies	• Lack of short-term benefit caused by a focus on future risks	Awareness campaigns should emphasise tangible and effective strategies for reducing risks and not focus too much on hazards and community vulnerability.
• Provides community oversight of the safe school construction project	• Cost, aesthetics or other concerns may be more highly valued than school safety	Build a commitment to comprehensive school safety at the formation of the committee while also recognising the importance of other community priorities.

2. Key activities of the Community Planning Stage

During the Planning Stage the school management committee and program manager work with stakeholders to identify community goals. The stage also lays groundwork for a safer school by assessing the school site for hazards and identifying what community training is needed.

- **Assessing needs.** Schools serve important educational and community development purposes. The needs assessment identifies how the school can best serve the community.
- **Conducting a feasibility study.** A feasibility study ensures projects are practical and achievable in light of community capacity, hazards, material availability and available construction sites.
- **Drafting an implementation plan.** Before moving into the Design Stage, the school management committee and program manager develop an implementation plan describing tasks and their timeline. Especially important tasks are those that increase community knowledge and skills in hazard-resistant construction.

Stage 2. Community planning

Advantages	Challenges	Strategies
• Ensures community needs and values guide the project	• Marginalisation of some perspectives • Pressure to compromise may lead to deviation from project goals	Include representatives of marginalised groups within the school management committee and facilitate consensus decisions without sacrificing children's fundamental right to safety and educational access.
• Builds a common vision and sense of ownership in the school	• Communities may place low priority on the safety of school buildings	Encourage the school management committee to champion safety through the project and to continue risk awareness activities at Mobilisation Stage.
• Ensures local site conditions and hazards are addressed	• Insufficient local knowledge of infrequent and emerging hazards like earthquakes, tsunamis, extreme floods and climate change	Create dialogue between community and hazard specialists using participatory hazard assessment processes to identify safe school construction sites.
• Uncovers context-specific challenges and potential solutions	• Local acceptance of poor materials and unsafe construction practices	Orient school management committees to hazard-resistant construction and work with local resource people and external experts to identify weaknesses in local materials and construction practices.
• Increases implementing actor's accountability to community	• Community concerns inflate the project scope until it is unachievable	Clarify scope and constraints to better manage expectations and potential disappointment at later stages.

3. Key activities of the Community Design Stage

Design teams develop the layout, structural system and construction materials for the safer school project. While technical specialists ensure the functionality and safety of the design, communities make other design decisions and learn how design choices can increase the hazard-resistance of the school.

- **Conducting pre-design community consultation.** The design team and school management committee agree on the goals of the school and how well it should perform during hazard events.
- **Drafting of schematic designs.** The design team creates a series of design alternatives from which the school management committee selects their choice.
- **Finalising design.** The design team finalises the design in accordance with national codes or good practice guidelines and seeks approval from local authorities.
- **Selecting a construction management strategy.** Together, the school management committee and program manager select a person or organisation to oversee the construction process and make sure the overseer remains accountable to the community and funder. The school management committee may take this role with appropriate support. Alternatively, the program manager or a hired management company may take the role.

Stage 3. Community design

Advantages	Challenges	Strategies
• Ensures community needs and values guide project	• May perceive Design Stage as too technical for community involvement	Use culturally appropriate language to communicate design alternatives. Clarify how community involvement in design helps the school address local concerns and preferences while maintaining safety as the top priority.
• Builds a common vision and sense of ownership in the school	• Community consultation may lengthen project times and increase Design Stage costs	Develop a limited set of design alternatives or a modular design that allows communities to make decisions about layout in ways that do not result in major changes to structural design.
• Transfers hazard-resistant design principles to community	• Housing and other community construction substantially different from school design • Safer school construction may not be possible with local materials	Strive to select a design that is at least partially replicable in other community construction. If the school materials or construction techniques cannot be replicated in housing and other local construction, provide a separate training on safer construction techniques applicable to local construction.
• Design team gains skills in community engagement	• Design team deterred by the extra effort in collaborative design process	Develop orientation and training programs for the design team to help them communicate with communities more effectively. Ensure project schedule accommodates extra time for consultation process.
• Local authorities improve their knowledge of hazard-resistant design	• Fears that a community-based design process undermines the power of local authorities	Invite local authorities to schematic design reviews or to be members of the school management committee. Seek approval for design.

4. Key activities of the Community Construction Stage

As school construction begins, a community-based approach must carefully pair construction activities with worker training and a transparent oversight process. Without training, community members and construction workers do not understand the hazard-resistant construction techniques needed to make the school safe. Without oversight, safety cannot be guaranteed.

- **Engaging in construction monitoring and site supervision.** In community-based school construction, construction monitoring may be a collaborative task: school management committees and other stakeholders may monitor daily activities and identify potential problems while technical specialists ensure design compliance. Such collaboration helps ensure construction quality even in remote locations and increases local knowledge of hazard-resistant construction.
- **Building local capacity.** When hazard-resistant construction techniques are new to the community, tradespeople and labourers need training. The training needs to be in a format they can easily understand. Hands-on demonstrations, practice sites and pictorial construction drawings work well.
- **Practising and communicating safety.** The construction showcases safer building practices to the community in ways that can influence future construction practices. Conscientious health and safety procedures and concerted community outreach can help achieve this.

Stage 4. Community construction

Advantages	Challenges	Strategies
• Reduces corruption by providing a constant community presence at construction sites	• Community ineffective at construction monitoring due to poor local knowledge or lack of experience with accountability processes	Engage local government offices and other stakeholders in formal frameworks through MOUs and other accountability tools. Provide training and checklists to community members engaging in construction oversight. Ensure engineers and inspectors visit regularly and frequently. Combine community monitoring with third-party review and oversight so responsibility for quality control does not lie solely with the community.
• Transfers hazard-resistant construction skills to the community	• Training adds costs and time to the project, and skills may be inappropriately applied later	Combine training with other community development activities, such as disaster risk reduction and resilience projects, and ensure training indicates when technology is appropriate in other building styles. Cost efficiencies can be achieved when trained tradespeople are employed on multiple projects, allowing local labourers in the next community to apprentice under those who have been trained.
• Lowers cost of construction and keeps funds within the community	• Appropriate construction experience lacking in local area	Experiment to find a good financial balance between hired external contractors and the use of local, trained, skilled and unskilled labourers.
• Increases income opportunities for trained tradespeople	• Tradespeople may lack experience leveraging training to boost their own income and livelihoods	Provide certificates for those who complete training. Teach strategies for marketing their new skills as part of the training.

5. Key activities of the Post-Construction Stage: Operations, Maintenance and Safety

Safety does not end with the completion of construction. Communities need to learn how to use and maintain their safer schools in the Post-Construction Stage. The safer school project can also solidify into a broader culture of safety at the school and in the community, as well as at the organisational and global level.

- **Drafting maintenance and user manuals.** Design and construction teams, government authorities and school staff jointly develop a manual for safe operation, maintenance and future use.
- **Handing the school over.** A commemorative handover establishes institutional memory about safer schools. Students and staff identify and reduce hazards inside the completed school.
- **Developing a maintenance plan.** Stakeholders create regular maintenance plans and identify how the school may be altered in the future. These plans help ensure the school remains a safe building during its entire use.
- **Supporting cultures of safety in schools.** The safer school can continue to teach communities about hazard-resistant construction and valuing safety. Commemorative events, signs and school safety committees support the ongoing learning process.
- **Scaling-up and promoting accountability.** Development organisations and government agencies can promote and scale-up safer school construction, whether through community-based or external approaches, by making a public commitment to safer schools.

Stage 5. Post-construction operations, maintenance, and safety

Advantages	Challenges	Strategies
• Improves understanding of non-structural mitigation	• Lack of awareness about non-structural hazards	Provide orientation and training on non-structural mitigation for the school management committee, parent-teacher associations and older students.
• Familiarity with building technology increases ease of community maintenance	• Competing priorities and insufficient funds for maintenance, or inappropriate alterations to safe schools	Develop maintenance and user manuals to alert school staff to their role in school maintenance and inform them when alteration requires technical review. Work with local communities to develop an income-generation strategy to support routine and non-routine maintenance when government support is insufficient.
• Builds and sustains a culture of safety within and beyond the school	• Assumption that safety efforts end with construction	Ask that school management committees display their continued commitment to comprehensive school safety through commemorative events, months and even years after school completion. Involve local officials and original stakeholders to increase accountability. Include long-term monitoring of safer school projects and their ongoing impacts.

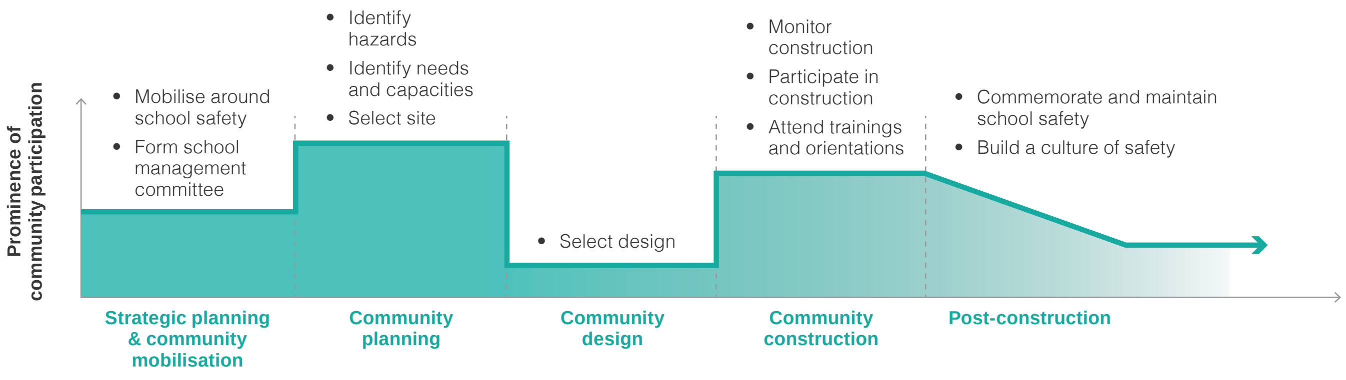
Crosscutting efforts in the community-based approach

While safer school construction is divided into five discrete stages, several efforts cut across these stages and their key activities. The prominence of these crosscutting efforts – raising awareness, building capacity, institutionalisation and community participation – change over time. In some stages, the crosscutting effort may be particularly prominent, indicated by a higher line in the graph below; in other stages, it may be lower. But each is present to some degree at each stage of the community-based approach.

The following diagrams show the prominence each crosscutting effort should have in each stage. Reading from right to left shows the chronological progression of each stage.

Community participation

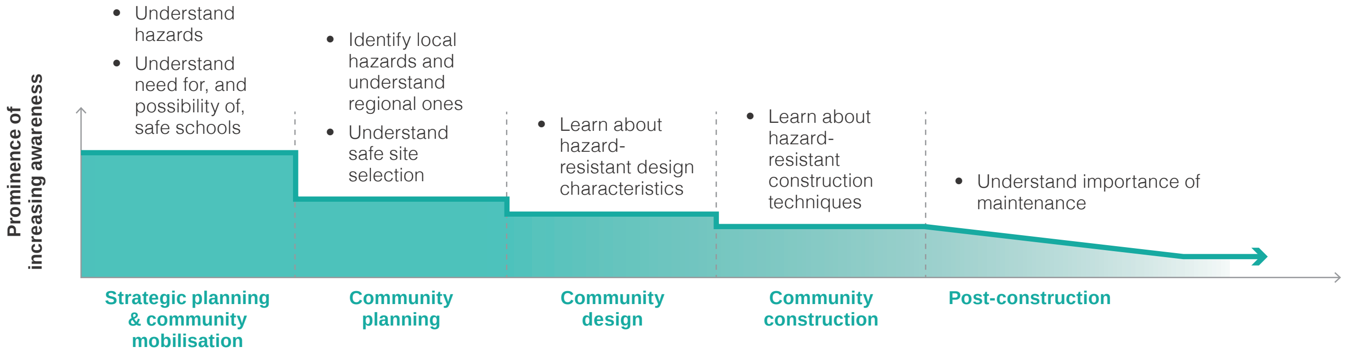
A community-based approach to safer school construction is based on continuous community participation. Through community participation, school designs are better attuned to local needs, meaning communities are better prepared to maintain them and better equipped to live with local hazards. The goal is not to lay all responsibility on communities. Rather, they should lead activities in which they are skilled and collaborate with experts in areas where they have little experience.



Increasing awareness

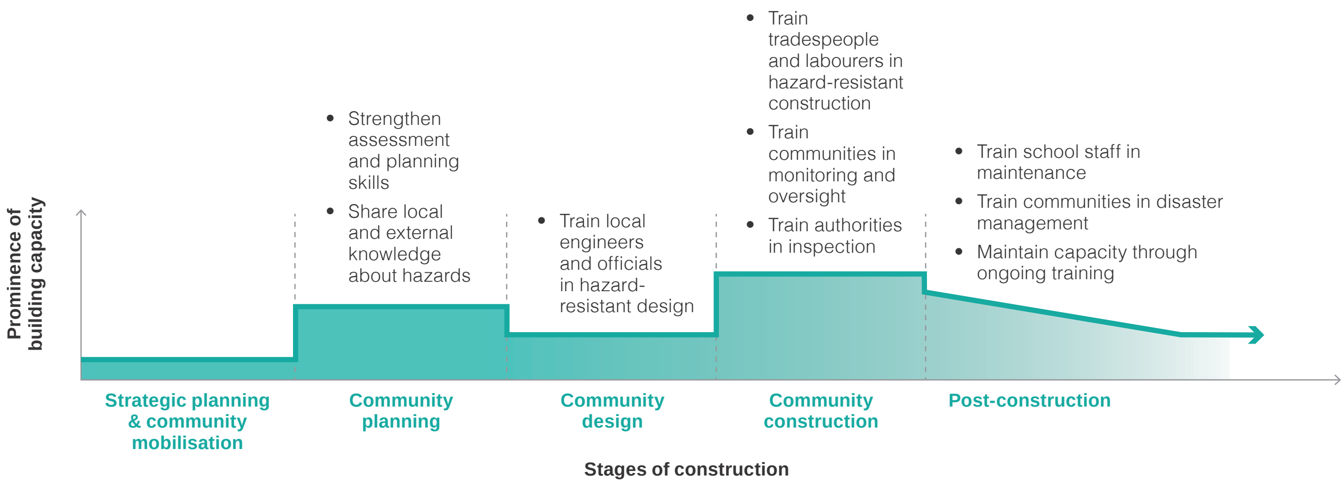
Safer schools are grounded in community awareness of hazards as well as the planning, design, construction and maintenance strategies that protect schools and their occupants from these hazards.

When communities are not familiar with risk-reduction strategies, awareness-raising in the Mobilisation Stage needs to be specific and targeted. Growing community awareness will then need reinforcement during the Community Planning Stage as communities engage with experts to understand hazards and to select a site. In the next Design and Construction Stages, design consultation and construction training should raise community awareness about hazard-resistant construction techniques and their effectiveness. Tradespeople and labourers especially need in-depth training in these new construction techniques. In the final Post-Construction Stage, commemorative ceremonies and visual displays can serve as ongoing awareness tools long after the construction is complete.



Building capacity

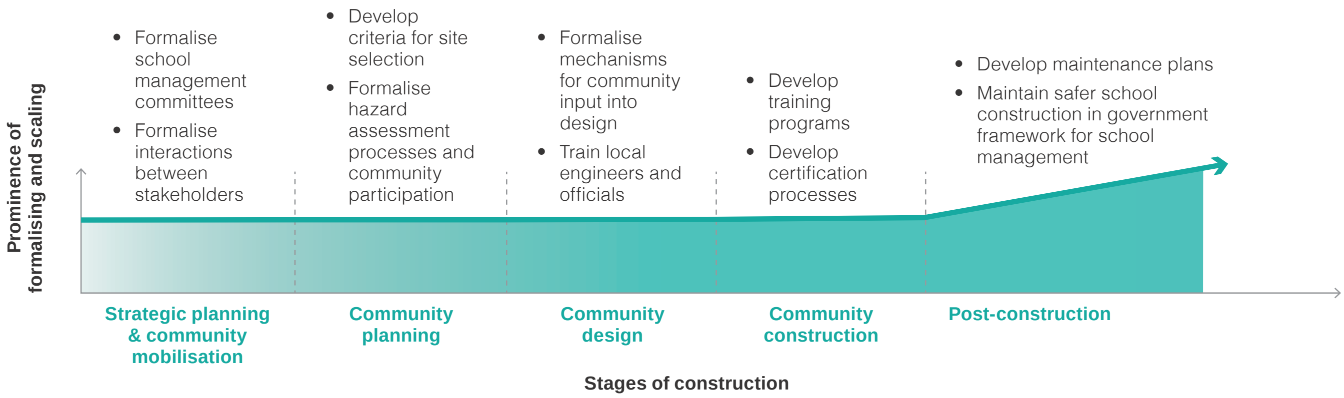
Community-based safer school construction projects should fundamentally seek to build local capacity. Through school construction, communities develop stronger knowledge, skills and resources for reducing risks and building resilience beyond the school site. In the Mobilisation and Planning Stages, communities should gain skills in assessment and participatory planning. Building community capacity is lowest in the Design Stage, though this stage may offer excellent opportunities to build the knowledge of local engineers and government authorities. The Construction and Post-Construction Stage should be filled with training activities, especially for tradespeople, labourers and school maintenance staff. Even school management committees and the wider community can gain experience in construction monitoring.



Formalising and scaling-up

The long-term goal of community-based projects should be communities that engage in comprehensive school safety and safer construction as a standard practice. For this to occur, communities and implementing actors need to retain knowledge of successes and adapt processes to learn from challenges. The committees, procedures and training developed and refined at each stage help to formalise safer school construction, whether through community-based construction or other approaches.

Engaging with and building the capacity of government officials, local engineers and hazard specialists – especially those connected to MoEs – can help formalise safer school construction. Individuals in these roles become the institutional memory on which communities rely in the future. At the school level, disaster management committees can perform the same function.



CASE STUDY

A decentralised approach to school construction

Country: Indonesia

Organisation: Ministry of Education, Ministry of Public Works, Ministry of Finance, World Bank

Hazards: Earthquakes, floods, landslides, high winds, volcanic eruptions, tsunamis

Summary: From 1999 Indonesia began decentralising almost all sectors of its government. By giving power to local authorities, it began to address the complex geography, cultural diversity and multiple hazards to which it is exposed. The Ministry of Education and Culture gave funding and decision-making power directly to school management and committees, even tasking them with managing school construction. Although the government is still struggling to provide an appropriate funding mechanism and enough technical support, many school communities have already constructed new school buildings or rehabilitated existing buildings in this decentralised political environment.

Country and hazard overview

In Indonesia, earthquakes, volcanic eruptions, tsunamis, floods, droughts and landslides are prevalent. Since 2000, the country has experienced three earthquakes with a magnitude greater than 8.0. Tectonic movements also make 76 of Indonesia's 150 volcanoes highly active and Indonesia's history includes a series of disastrous eruptions that have killed hundreds of thousands of people and affected global weather patterns. Flooding is also a perennial issue. These diverse and prevalent hazards place about 75 percent of Indonesian schools at risk to natural hazards.

School construction: From centralised to a community-based approach

Around 60 percent of Indonesian schools were constructed in the 1970s and 1980s in a massive Presidential Instruction (Inpres) Program funded in full by the government. Understanding of the building codes and hazards was low and corruption was rampant, leading to poor site selection and construction quality. Nevertheless, access to basic education significantly improved and enrolment was boosted.

Recognising the monumental challenge of building, operating, maintaining, repairing and retrofitting schools in various states of disrepair across thousands of islands, the government decentralised education management down to the community level in 1999. One year later, the central government established a block grant called the School Operational Fund with support from the World Bank, allowing school management and committees to directly receive and manage funding provided by the national government.

To actually give power to the school management committee, the Ministry of Education and Culture (MoEC) and the Ministry of Finance gave each community the responsibility to manage the School Operational Fund. As a block grant, the funding was flexible. It allowed the committee to spend money as they saw fit. It was also allocated based on the number of students – if enrolment increased, the funds to that school would increase.

The school management committee was flexible and consisted of a principal, treasurer and small group of democratically elected community members. These community members typically came from the immediate area but could be drawn from surrounding neighbourhoods or elected for special purposes. This system, in conjunction with the block grant, was intended to allow the school committee to operate as the school implementing unit.

Addressing school vulnerability to hazards

After learning that 75 percent of 258,000 schools in Indonesia are in disaster risk areas, the government launched programs specifically to increase technical assistance for disaster risk-reduction education. They also adopted regulations to increase the hazard-resistance of school infrastructure.

Even though the government knew about some of the problems with school buildings, they did not know specifics. To address this, the MoEC contracted a private company to determine the extent of damage and disrepair of Indonesian school buildings. Considering geographic and logistical challenges, the government allowed school committees to perform basic damage assessments that were then vetted at the district level. After years of surveys, the government learned that one-third of the total schools – more than 89,000 – fell into the heavily damaged and medium damaged category.

Without the capacity to address the diverse damages as a central agency, in 2011 the Ministry of Finance changed the existing Special Allocation Fund (DAK) – previously used for purchasing computers or textbooks – to help maintain education buildings. They drastically increased the portion of the budget allotted to physical expenditures and allocated funds according to damage level and student enrolment. School management committees could use these funds to build new schools or repair existing ones as they saw fit.

Challenges to this approach

Construction was a new responsibility for the school management committees. They had to hire their own contractors and sub-contractors to help them build new schools or retrofit existing ones. While committees did receive some assistance from a MoEC engineer to oversee a project, they did not always have the capacity to implement construction projects nor the appropriate knowledge to prioritise school safety. As a result, DAK funds have been spent returning buildings to their original condition, rather than improving structural components to make them safer.

According to an Indonesian report prepared for the World Bank, decentralisation of school construction increased ownership and decreased costs. In situations where school communities were already oriented to disaster risk reduction principles and where school principals took the lead in construction, school quality increased. However, the government is still working through some challenges related to safer school construction.

- **Technical oversight.** The government has not created an appropriate technical advisory system and school communities often lack the funds to perform rehabilitation and hire a technical consultant. Even if consultants are hired, they often lack the appropriate information to build hazard-resistant design according to local building code bylaws.

- **Public sector coordination.** In Indonesia, the MoPW is responsible for writing and enforcing the building codes, including the design review and construction inspection of schools. Unfortunately, local public works offices are given the same amount of funds regardless of the number of schools in a district. With so many diverse infrastructure tasks to supervise they rarely perform thorough checks – especially if the school is single story. In addition, public works officials rotate between departments to reduce corruption, but with the fast turnover rate officials rarely develop sufficient experience for thoroughly overseeing school projects.

  Under the current DAK fund, the responsibility to finance the supervision of school projects rests on local governments. Because local governments finance the supervision, each unique local political economy can influence the construction costs, potentially compromising quality assurance and safety.

  Noticing these funding and capacity issues, the MoEC provided a special portion of money for quality supervision for each school. Currently, this fund is only applicable for school construction directly financed by the MoEC and not for construction using the DAK fund.

- **Construction speed.** To compound these challenges, the speed at which school management committees must spend DAK funds has pressured school communities to implement projects faster than they are capable. Special allocation funds must be completed in three months to receive another allocation of money across all sectors. Other departments relying on DAK funds for education materials may pressure schools to finish their work within the three-month funding window so the funds for their sectors will not be delayed.

Community-based school construction policy at the national level is possible, but creating incentives that produce safer schools is a complex and lengthy process. In Indonesia, the decentralised approach may be the only opportunity to reach all communities. At the same time, decentralised construction and repair may be, in some cases, of substandard quality. And in Indonesia, where natural hazards are frequent, new vulnerabilities are especially dangerous.

Key takeaways

- Decentralised methods in regions with diverse contexts allow localities the freedom to address their unique needs.
- Even though school management committees can address their own needs well, they may not be immediately capable of managing a construction project.
- Oversight must remain a top priority even if schools management committees are given greater autonomy in construction.

Democratically elected school management committees may use funds to construct new schools or retrofit unsafe ones. The country is working to developing effective systems for providing technical support to local school management committees.
Photo: GFDRR.

The evolution of a community-based approach

The need for community involvment in all stages of safer school construction may lessen as societies develop safer construction practices. When governments have the capacity to build schools safely, their role in providing education and safer schools to their constituents is paramount. However, even when safety is ensured through strong codes and robust construction oversightmanagement, community involvement in school construction remains valuable.

- When local school management committees and broader stakeholders are part of school project planning and design, the schools better reflect cultural norms and community aspirations. Communities also better understand how their schools perform during natural hazards.
- When communities are invited to participate in safer school construction, the process can prompt discussion about disaster risk reduction and be a venue for alerting communities to the changing state of knowledge about hazard exposure. Local communities may find out about newly discovered seismic faults, sea level rise, increased severity or frequency of cyclones brought on by climate change, or how land-use patterns have altered flood plains. Safe school construction provides a local and immediately tangible focus for these conversations.
- Safer school construction also supports a diffused knowledge about the hazard-resistant infrastructure. While few local households may apply safer school construction techniques to their own homes in communities with mature construction industries, community involvement helps maintain the existing culture of safety.
- Broad awareness of and involvement in safer school construction projects also helps maintain the political will needed for funding school maintenance and retrofits, and the safe construction of new school buildings – even if these projects come with costs.

As a strong culture of safety emerges, community involvement in safe school construction becomes part of the wider process of a transparent, democratic and participatory community development process. It becomes one aspect of a resilient community.

A training session for local construction workers. Photo: Save the Children.

SECTION III: MOBILISATION

The Strategic Planning and Mobilisation Stage

Where disasters have destroyed schools or shoddy construction is the norm, communities may erroneously believe that hazard-resistant school construction is out of their reach because it is too complex or expensive. This disheartening message needs to be countered.

Safer school projects necessarily start with strategic planning. When those embarking on school construction understand the broader context within which they work – including the stakeholders, cultural practices, needs and hazards – they can better plan projects to achieve safer schools and stronger community capacity for disaster risk reduction.

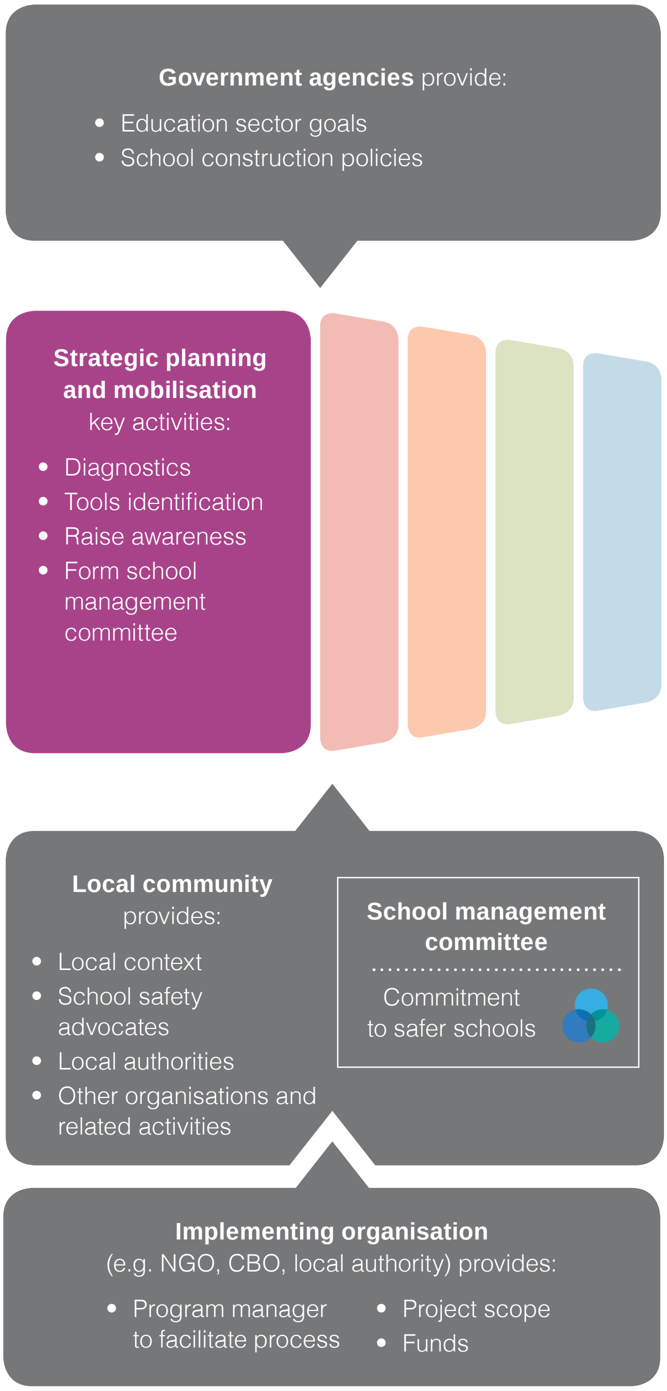
Strategic planning happens at various scales. Larger projects often have program managers within development organisations or government agencies who perform strategic planning, and who examine the broad national or regional context. When programs include only a few schools, or even a single school, strategic planning can be localised, focusing more extensively on the unique community context. Even in smaller projects, a basic understanding of the national policy and cultural context is important.

Community mobilisation follows strategic planning. Only when communities understand their children are at risk and know how to employ strategies to reduce the risk, will communities be ready to commit their time and resources to safer construction. Some mobilisation activities – such as sensitising communities to hazards and disaster risk reduction – may be carried out simultaneously across an entire region or nation, but also need to be adapted to suit the specific community and school construction project. One of the key activities in this stage includes forming school management committees at the level of implementation for a single school within a village, multiple school sites in a large community or at regional level, or both.

In addition, the school can become a platform for broader community learning around disaster risk reduction, as communities:

- Learn how to adopt hazard-resistant construction techniques.
- Advocate for safety, allowing governments to justify pubic investment in disaster prevention.
- Become knowledgeable custodians of safer schools.

Thus, this first stage provides a foundation for building a culture of safety with the community.



In the Strategic Planning and Mobilisation Stage, key activities for achieving safer schools include diagnostics, tool identification, raising community awareness and forming a school management committee.

Key activity 1: Diagnostics

A diagnostic assessment helps development actors understand the broad cultural, environmental and political context in which they are working. This provides a solid foundation for any safer school construction program. The assessment may occur at the country level for large programs or at the district or community level for small programs. A model "Education Sector Snapshot for Comprehensive School Safety and Education in Emergencies" typically developed by the national education authority, in partnership with education sector development and humanitarian partners, provides a sound template for this analysis. Program managers should have available the following components in these diagnostics:

- **Education sector analysis.** Early in the strategic planning process, it is vital to understand what drives the need for safer schools and potential stakeholders. When the gap between demand for schools and access to schools is great, new construction may be warranted. When the gap is small or when existing schools are in poor repair, the more pressing problem is fixing existing facilities. Sometimes repairs are too costly and schools need to be rebuilt from scratch. Rather than focusing on large new construction programs, the program may focus on rapid assessment and prioritisation of schools needing repair, retrofit or replacement and then carrying out these options for the weakest facilities (see the case study 'Rapid visual assessment for retrofitting' in the *Community Planning Stage*).
- **Contextual analysis.** Safer school construction happens in both a hazard and socio-cultural context. Gathering existing hazard maps, hazard studies and descriptions of past disasters can help orient the program to some of the major safety issues they need to address. Local hazards and a more nuanced understanding of impacts emerge through community engagement in the Planning Stage. An analysis of historical, socio-cultural and political processes also helps situate the role of education within past and present community development.
- **Stakeholder analysis.** Conceptually mapping the key stakeholders and interests, their relative powers and capacities can unearth local champions of safer schools. Bringing champions into each stage of the program increases the long-term ownership and replication of the process.

  Once program managers have identified stakeholders, they can invite them to engage in a participatory social assessment to help understand each stakeholder's priorities and needs. Without this direct dialogue, program managers have difficulty tailoring projects to local needs.
- **Analysis of school construction.** Constructing or retrofitting schools using a community-based approach is rooted in the local building culture, which may require analysis.

Components of an Education Sector Snapshot for Comprehensive School Safety and Education in Emergencies

1. Introductory Demographics
2. Education Sector Overview
3. Hazards and Risks Overview
4. Disaster Risk Management Overview
5. Comprehensive School Safety Overview
   - Pillar 1: Safe School Facilities: Policies, Practices & Programs
   - Pillar 2: School Disaster Management & Educational Continuity: Policies, Practices & Programs
   - Pillar 3: Risk Reduction and Resilience in Education: Policies, Practices & Programs

Program managers need to understand the technical capacity of the broader society, usually with support from external experts or existing technical assessments. It is vital to understand the current knowledge of hazard-resistant construction and assessment that exists within local universities, governments, vocational schools and trades. At times, this important knowledge may be limited, or even lacking. Where knowledge is insufficient, safer school construction programs need to build technical capacity – creating a sustained impact across a society.

The analysis should also identify known weaknesses in school construction or past school construction programs. Local engineering experts may be well-acquainted with systemic failures in vernacular construction or national building codes, where they exist. Past disasters may also paint a vivid picture of failings – roofs consistently blown off in high winds or dangerous cracking in columns after earthquakes. Program managers can use these historical weaknesses to implement strategies that avoid such problems in the current project. A review of funding and legal responsibility for school building construction supports this analysis.

Wider school construction analysis helps program managers shape programs that build on and support existing processes and systems. Coordinating with other groups strengthens the long-term sustainability of safer school construction and helps integrate safer school construction into national, regional and local programs.

IN CONTEXT

Outreach and visibility for stakeholder support

Keywords: government, coordination, corruption, miscommunication, grassroots, Kenya, small NGO

In Kibera, an urban slum of Nairobi in Kenya, 250,000 people are packed into just 3.2 square kms. They live in a maze of shanties and open sewage ditches. Almost all public infrastructure is lacking. Schools are mostly informal, hygiene is extremely difficult to maintain, disease is everywhere and toilets are scarce.

In 2008, Kounkuey Design Initiative (KDI) constructed the first playground in the slum and built a four-classroom primary school. They used a grassroots approach to community engagement. Through community forums and an open application process, they determined what public infrastructure would help the community most. Applications asked the community to identify their needs and capacities, to pose solutions, and to propose a financial plan to sustain their solutions. KDI then conducted wide-reaching interviews. They determined whether the community could follow through and established a site.

When the community first identified a potential site for the primary school and playground, it was a marsh of trash, debris and raw sewage. By diverting the water flow and adding soil, the team reclaimed the area and built classroom structures and a playground. Heavy rains still brought some floodwater, but the majority of the site had become an open green space for children and the public. KDI's philosophy was that the community was the project owner, so they never placed their name on the site.

Six years later, community members and KDI reunited to construct toilets on the school grounds but stopped just after laying the footing. Rumours emerged that a government-sanctioned 'chief camp' was planned for the same site as the new toilets. In Kibera, chiefs liaise between the formal government offices and Kibera residents, holding their meetings in these offices or camps.

KDI held meetings up the chain of command, starting with the local Chief and elders, the regional planning office, the government development fund, and finally the representing Member of Parliament.

After learning of KDI's work and the history of the project, the Member of Parliament asked everyone to stop work. KDI recommended that the chief camp and the toilets be built in parallel rather than opposition. The Member of Parliament agreed to work with KDI. Yet it soon became clear that the original plan was moving forward without KDI collaboration.

The next morning, KDI and community members watched as hired, machete-armed youths built a fence to delineate the new government project. The land they had taken included the existing playground and the footing excavations for the sanitation block. The team was able to salvage their unused materials, but they had to restart the design process on a neighbouring site. One week later, the old playground was razed.

The importance of visibility

KDI came to realise the importance of high-profile visibility and broad outreach. KDI had believed that the immediate neighbourhood was the sole owner of the project and had never locally broadcast their name. High-level government offices did not necessarily know or respect their work, and when the Member of Parliament learnt of the project it was too late. KDI did not have visibility and clout inside or outside the slum to stop government plans.

They changed course. They posted information boards outside each potentially threatened construction site showing before and after pictures, a list of the people working on the project, the duration of their work, a description of the site boundaries and the community's vision for the site. The NGO also worked to appear in local media, newspapers and magazines. They started tweeting in the local dialect, and they spoke at public events.

By increasing their visibility and communicating their work and its benefits, KDI increased the political sustainability of their projects while maintaining their community-owned model.

Key takeaways

- Increased project visibility can create future partners.
- Even though community ownership is paramount, the wider community must know and respect the work of implementing agencies to maintain effective relationships.

KDI worked with residents of a slum neighbourhood outside Nairobi to build a playground and school. Photo: Charles Mwendo Newman/KDI.

Key activity 2: Tool identification

After better understanding the broad context in which the safer school construction project will occur, program managers need to gather existing tools to support the program, or adapt tools from elsewhere.

Program managers and stakeholders should seek well-developed or adaptable tools for:

- **Hazard awareness tools.** NGOs, government agencies or individuals in the education sector may already have hazard maps, explanations, images or multimedia to help communities understand natural hazards. Comprehensive school safety school self-assessment template provides a strong starting point for school-community involvement.
- **School facilities safety tools.** Stakeholders may have physical models or images from past disasters that can be used to convince local communities that schools can be built to withstand hazards. Some of the most convincing tools for structural awareness may include videos of comparative shake table demonstrations, graphic demonstrations of typical construction errors vs. safer practices, physical models, images from past disasters. Visual materials are key to communicating technical information to all audiences, especially those that may have low levels of literacy. The Comprehensive School Safety Framework and other global initiatives provide a good foundation for reaching consensus on the need for safer schools. However, they may need to be translated into local languages.
- **Procurement and financial management tools.** Program managers may need to search for guidelines within their organisation, within the society they work or within stakeholder organisations. Procurement and financial management guidelines, especially when already tailored for community use, can help increase transparency. These tools support communities that are not familiar with managing construction projects. Transparency and community oversight has been demonstrated to have significant positive impacts on construction quality.
- **Construction training tools.** Program managers will need tools for training local labour in hazard-resistant construction. It is important to determine whether qualified local builders can be identified through certification programs, guilds or other means, or if such systems should be built into the program.
- **Construction supervision or tools for oversight.** Safe construction hinges on robust construction supervision. Program managers should look for existing certification, training, financial, construction inspection and auditing tools.

When proven tools do not exist, program managers should adapt tools from other organisations with similar mandates, or from other regions with similar construction and hazard exposure. This adaptation needs to be more than a mere translation into local languages. The adaptation should include collaborative review with stakeholders and users to ensure the tools are culturally relevant and understandable.

Key activity 3: Raising awareness

When school communities understand they are exposed to natural hazards but that their school buildings can be built to resist those hazards, they can be effective partners in safer school construction. Raising community awareness begins with an assessment of their knowledge. Eventually, it leads to dialogue within the community and with a wider group of stakeholders, including those who can provide further insight on natural hazard risks and safer construction practices. Raising awareness, as part of broad community mobilisation, includes several aspects:

- **Identify stakeholders and assess current knowledge.** A school community is comprised of diverse stakeholders, including students, parents and school staff. However, the community is not limited to immediate users of the school. Schools are a central institution in a community, one in which the public has keen interest. Nearby residents and community leaders have a stake in the safety of a local school too. Functionally, the school community also extends to the government agencies involved in education or construction oversight.

  Because community-based school construction often relies heavily on local labour, the school community also includes skilled tradespeople and unskilled labourers. Contractors, architects, engineers and inspectors also play key roles. For the duration of the project they can be considered school community members.

  Program managers should initiate conversations between stakeholders to understand their initial risk awareness. For example, what hazards concern them and what strategies they believe may be effective in protecting them. A review of how disasters, risk and safety are covered in public media could unearth common perceptions and even misconceptions. At the same time, stakeholders could identify complementary disaster risk-reduction or risk-awareness activities in the community to build linkages and support each other's messages.

Good practice in risk communication

- Consistent messaging across all sources.
- Accurate, timely and complete information.
- Risks explained as inevitable certainties, not complex probabilities.
- Hazards explained but higher emphasis placed on how hazards could affect valuable community assets, such as children, education, shelter and livelihoods.
- Emphasis on specific actions that communities or individuals can do to protect the assets they value, such as building safe schools.

- **Frame the message and convey it to public.** Based on the assessment of stakeholder risk awareness, program managers should develop a core set of messages targeting each stakeholder group and their specific role in the community. Messaging to students may focus on their fundamental right to safety and survival. For parents it may be the protection of their children. To tradespeople the messaging could be around their professional capacity and responsibility to build safer schools. Focus groups can help refine these messages and identify strategic channels through which to share the information. It is important that everyone recognize that they can make a difference as every safety measure does make a difference.

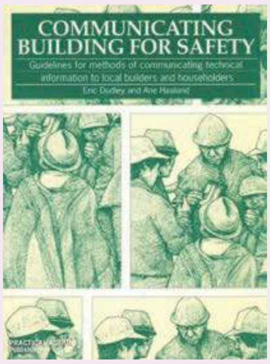
  Consistent messages about school safety should be conveyed through multiple outreach channels. These may include posters, social media, public events, radio announcements, newspapers, mass leafleting and others. At the same time, it is important to provide journalists and social service representatives with basic information about how hazards in their area can affect the community's children and their access to education. These individuals are in a good position to raise community-wide concerns and build consensus around the concept of safer schools.

- **Hold an orientation meeting.** As risk communication messages build interest in safer schools, individual school communities need to be oriented to the community-based approach to safer school construction. This orientation can continue the risk awareness messages around hazards and include messages about protecting schools and children's access to education from these hazards. Program managers should explain how safer schools fit within a Comprehensive School Safety Framework and support a conversation about each stakeholder's role in safe schools.

RESOURCE BOX

Communication channels for mobilising communities around safe schools

- Community meetings on the need of school safety
- Newspaper articles and advertisements
- Fliers and pamphlets with earthquake education
- Videos of past earthquakes and methods to fix vulnerabilities
- Public demonstrations and exhibitions of safety, for example, the shake table demonstration
- Fact sheets
- Invitations to community meetings
- Press releases
- Focused training on construction
- Hands-on exercises
- Technology exhibitions
- Site visits
- Art and other works by students on the topic, including paintings, essays or a quiz.
- Disaster safety-themed games for students
- Extracurricular activities, like a hazard hunt or mapping games
- Student drama performances



Conveying messages about hazards and safe school construction can sometimes create more confusion than clarity. When communities are unfamiliar with these concepts and have low literacy levels, cartoons, illustrations and photos are good alternatives to text. However, communities can misunderstand these, so any public outreach material needs to be field-tested. In many cultures simple symbols – like arrows, cartoon thought bubbles and ✗ and ✓ marks – can be wildly misinterpreted.

Communicating Building for Safety by Eric Dudley and Ane Haaland provide humorous examples of miscommunication and good tips for getting safety concepts across in low-literacy contexts.

- **Begin dialogue between community and experts.** Dialogue between the school community and those with knowledge about hazards and hazard-resistant construction practices can ensure the school building is safe and responsive to community needs. Hosting public seminars, mass meetings or round table discussions are good ways to begin this long-term dialogue. Hazard specialists, such as hydrologists, meteorologists and seismologists should talk with communities about hazards in their region. Engineers, architects and contractors can explain how buildings can be constructed safely.

  This early engagement helps build trust and provide a solid foundation for the Planning Stage, but only if done with respect. While experts may have important technical knowledge and more education than community members, experts need to be receptive to important local knowledge and be able to draw this out. An authoritative attitude alienates rather than builds dialogue.

An orientation on safe school construction creates dialogue between hazard and building specialists and school community stakeholders in Tashkent, Uzbekistan. Photo: Bishnu Pandey.

Models of traditional structures with and without hazard-resistant construction show remarkably different behaviour when shaken on a simple shake table during a community demonstration in Kabul, Afghanistan. Photo: Bishnu Pandey.

Key activity 4: Activating, re-activating or forming a school management committee

Stakeholders in community-based safe school construction need to collaborate with each other through an engagement framework that clearly defines roles and responsibilities. Without such a framework of responsibilities, programs may stall or key activities may be overlooked. The framework also formalises the commitment to community empowerment inherent in a community-based approach. Education systems frequently have a foundation for supporting safer schools framework in their existing school-based management system. Program managers should identify or establish a school management committee, which may choose to establish a broader sub-committee for school construction oversight. In ideal contexts, education authorities will have included responsibility for safer school construction in terms of reference for a school management committee. The committee overseeing safer school construction should widely represent key stakeholder groups, including education staff, parent-teacher associations, youth, community leaders, civil society organisations, project financers, elected leaders and local emergency response authorities.

Where conflict or social marginalisation is present, program managers need to take care to include representatives from marginalised groups – for example, women, religious minorities, ethnic minorities, people with disabilities – and create environments where they can feel safe to contribute.

Rather than merely being informed or consulted, the school management committee should ideally be the primary decision-making body on safer school construction projects, often in collaboration with the program manager. The committee may make key decisions about the school site and design, and they may have key responsibilities in maintenance and construction oversight. The committee should understand their decision-making should be in line with a commitment to safer schools, even though the ultimate responsibility of ensuring such outcomes rests with the implementing actor.

Stakeholders in safer school construction	Roles and responsibilities
Implementing actor: Development actor, local government, community organisation.	Financial administration, overall coordination, project implementation, monitoring of progress.
Local government: Local departments or offices of education, building and housing, civil protection, health and safety, human resources and public works.	Administrative support, identification and selection of communities with school needs, legal oversight.
School management committee: Representatives of school staff or local education unit, parent-teacher association, community leaders, civil society organisations, financers, elected leaders and local emergency response authorities.	Major decision-making at the local level, including mobilisation of local tradespeople and labourers, engagement of public in the process and coordination in project implementation.
Local resource persons: Local chapters or offices of engineering associations, NGOs, Red Cross and Red Crescent societies, training institutes, builders associations and building craft guilds.	Professional input to construction activities, training of skilled labour, community orientation, public education.
External experts: Hazard specialists, engineers, educators, development workers and other specialists.	Inputs on hazard assessment, design, and other technical work.

Community members gather for a meeting outside a school for girls in the village of Jagori, Pakistan. Photo: Joe Lapp/CRS.

Key considerations for the Strategic Planning and Community Mobilisation Stage

Safety	**What capacity does the community already have to construct a safe school building?** Safer school construction requires technical knowledge and a skill set that may not be available in the community where professionals may be scarce. Creating connections between communities and appropriate experts builds trust needed in later stages. **What is the community stakeholders' capacity to absorb and understand hazard and safer construction messages?** Communities may be unfamiliar with hazards and safer construction. Few people need to know the details, but everyone benefits from a better understanding of key concepts. Mobilisation efforts should focus on raising awareness in culturally accessible ways. In low literacy contexts, skits, cartoons, announcements and other strategies may be useful. But care should be taken to field-test communication approaches to avoid misinterpretation.
Capacity building	**Will the project leave knowledge, skills or technology that can have a long-term impact on safer construction and community resilience?** Risk communication alone is not enough to create safe construction practices in the community. When school construction is over, knowledge is the resource that remains in the form of skills and active school management committees. The mobilisation process should lay groundwork for building these skills and for ongoing community involvement in comprehensive school safety. **What support will the community need to perform their role in the community-based project?** Communities may not be initially capable of project management. If the project involves the school community as a key partner or as the sole manager of the project, they need detailed training and tools. Identifying and adapting tools for raising awareness, construction training, supervision and management is essential.
Socio-cultural	**What is the broad socio-cultural and physical environment in which the safer school construction program will be implemented?** Good programming starts with due diligence. Conducting diagnostic analysis on the hazards, the education sector, construction practices and stakeholders provides a solid foundation for any safer schools program. It allows program managers to build on existing processes and strengthen the long-term sustainability of a culture of safety within and beyond the education sector. **Has the community established their priorities around education?** In many rural communities, people are concerned about education and they are happy just to get extra classrooms or school buildings, no matter how they are built. They may have concern that any additional cost incurred for safer construction may prevent school construction altogether. Ongoing engagement during mobilisation and later stages can help them value safety and understand what steps are possible, even with little or no cost. **How does the community perceive hazards?** Communities naturally focus on more frequent disasters, which need immediate action. During community mobilisation, risk-awareness activities should highlight less frequent but potentially more devastating hazards. Increasing community awareness about hazards needs to be coupled with raising awareness about effective and culturally appropriate risk-reduction strategies.

CASE STUDY

Fostering demand for safer schools

Country: Nepal

Organisation: National Society for Earthquake Technology-Nepal

Hazards: Earthquakes

Summary: Nepal has a history of destructive earthquakes but until recently had done little to protect its infrastructure and housing. Then, the National Society for Earthquake Technology-Nepal (NSET) began a host of projects to raise national awareness through safer construction practices. Through community mobilisation, NSET started a public dialogue about the imminent threat of earthquakes and offered tools to the community to help them be more resilient. NSET encourages the community to connect with outside funding sources so costs are shared. In all projects, they work to identify which school projects are most likely to scale-up the program in their communities and protect more Nepali children and adults.

Update: *On April 25, 2015, Nepal experienced an M7.8 earthquake 77 kilometres northwest of Kathmandu. Because the earthquake struck at noon on a Saturday, few were inside the thousands of classrooms that collapsed. Tragically, some teachers were attending teacher training sessions and were killed. At the time of printing, a full education sector damage assessment had not been completed. Early assessments indicated over 10,000 classrooms were fully damaged and upwards of 90 percent of schools damaged in some districts.*

Country and hazard overview

Nepal is beset with high seismic activity. They have weathered four major earthquakes in the last 100 years, which have claimed more than 11,000 lives. In 1934, the Nepal-Bihar earthquake claimed 8,519 lives and caused massive devastation to Nepali infrastructure and housing. Extending all the way to 1250 CE, the seismic record suggests earthquakes of that size occur approximately every 75 years. If historical trends continue, another earthquake is imminent. Smaller and more frequent earthquakes serve as constant reminders of the looming threat.

Mobilising communities

NSET were pioneers of community-based safe school construction in Nepal. In 1993, the organisation consisted of just a few people and little more than an idea. They wanted to build awareness about earthquakes and other natural hazards from the children up, and at the same time use a school construction project to bring about earthquake-resistant construction practices.

Mobilising communities to build safer schools can require lengthy engagement and trust building. A mix of low risk-awareness, limited government capacity and limited resources drove NSET to focus on finding sites for a few successful projects. Their aim was to ensure the government, as a key stakeholder, repeatedly saw community-based safe school construction projects as an effective means to protect children, provide education, teach masons new skills and, by extension, protect Nepali people and vital infrastructure investments.

School selection criteria

- High community commitment
- Potential for publicity
- Replicability
- Enrolment
- Feasible socio-economic condition
- Availability of construction materials
- Potential for training

Selecting a school was done with care. For example, in Nawalparasi District, all of the district's 239 schools were surveyed to see which schools needed new classrooms. The number of available local masons was assessed, along with the socio-economic condition of all communities and the available construction materials. Through an analysis of these quantitative factors, NSET made a shortlist of around 20 schools.

The most resource-intensive and time-consuming part of strategically selecting a site was determining which communities would most benefit from a project. It was decided the benefit would be higher in communities that did not even know they were particularly vulnerable or that their vulnerabilities were preventable. Benefit would also be high in communities where local contractors or masons failed to follow earthquake provisions mandated by the building codes because they could not read the codes. NSET was more likely to choose these communities, but only if they showed potential for sustained community engagement.

Community engagement began with town hall meetings where community members were invited to learn about hazards and earthquake technology. At first attendance was low, but as the few attendees chatted with their families over dinner, tea and at other gathering points, involvement increased. Potentially saving children from harm in the next earthquake proved an effective conversation piece.

Once the initial novelty of the information wore off, sustaining the interest and commitment of the community's stakeholders was a challenge. NSET, along with community members, organised shake table demonstrations to continue conversations and demonstrate the effectiveness of hazard-resistant construction.

Shake table demonstration

Shake table demonstrations are now widely used for teaching school communities and local masons about the effectiveness of earthquake-resistant technology. Typically, two one-tenth scaled models –that look like the local school – are placed side-by-side on an apparatus that partially simulates the movement of real earthquakes. Although the external design of both models is the same, one of the models has earthquake-resistant features and one is a replicate of current building practices. As the table vibrates, the community simultaneously witnesses the potential destruction of their own building, while they are given hope through the model that withstands the quake scenario.

Out of all the schools surveyed in the Nawalparasi District, Kalika Secondary School was finally chosen. Community members were low- to middle-income, meaning there was potential for donation from the wealthier community members and deep interest in a safer school. The local government was also an eager partner.

In Nepal's Nawalparasi District, NSET engineers answer questions at a shake table demonstration. Onlookers learn their traditional building may collapse in earthquakes, but that small changes in their construction practices can save their schools and their lives. Photo: NSET.

Funding and retrofitting

NSET requires communities to gather almost all the funding required for a school construction project. Challenging as that may seem, their exacting method for choosing communities helps make sure that community demand is very high before initiating the project. However, they do not leave schools to operate alone.

At the Kalika Secondary School, NSET facilitated the formation of community-based organisations (CBOs) that would spearhead school retrofit activities. NSET representatives accompanied the funding CBO to request donations from the community and district-level government offices. Again, in the company of an NSET representative, the CBO went to the steel manufacturer asking for a tax-deductible donation, which would be part of the steel company's corporate social responsibility. As those negotiations began, NSET started to mobilise in-kind contributions of sand, boulders and bamboo that would eventually be necessary in the construction project. After developing a presence in the area, they were also able to secure some funding from a local NGO to support the project.

NSET also maintained a consistent presence during construction. NSET engineers remained on the construction site throughout the process, providing on-the-job training for local masons. Trainings were not only focused on how to construct for earthquake safety, but on why the changes produce safer school buildings.

After training masons, and tearing down one of the school buildings, a new three-story building was completed in 2010. Since then, around 60 percent of the construction completed by the trained masons has included earthquake-safer technology. NSET has seen masons tear down sections of their work when engineers point out deviations from the safer methods.

Challenges to this approach

Communities often resisted new construction practices at first. The initial scepticism made financing especially difficult. Constructing a high-quality building was expensive, and NSET wanted the school to either contribute directly or be involved in gathering funds from other sources. Garnering the support and demand for the project took time before community members were willing to plunge into the project and provide time-consuming support. However, after decades of work the region, Nepal's MoE now fully supports the community-based approach (see *In context: Working towards a culture of safety* in the *Post-Construction Stage* section).

Key takeaways

- Although adequate mobilisation can be time consuming, it can make drastic differences in project feasibility and procurement.
- Allocating a large proportion of resources to project selection can be useful when project goals include a focus on scaling-up.
- Raising community awareness through demonstrations and public forums can generate invaluable conversations.
- Shake tables are a particularly powerful tool for creating community interest and demand for safer construction.
- If communities lack the resources to build a school, and they lack the skills to gather the funds from outside sources, implementing agencies can facilitate conversations with public and private groups that may be willing to make donations.

SECTION III: PLANNING

The Community Planning Stage

Achieving a safe school building in a specific community begins with the Planning Stage. During this stage, needs and risks are identified, and school sites are chosen. It is also at this stage that early choices about materials and construction processes are made. These choices can impact the quality of the school building, its fragility to local hazards, and the ease of community maintenance and operations.

During the Planning Stage, community assets and concerns should be weighed against technical concerns. While constantly balancing these two, the Planning Stage moves safer school projects from a mere idea to solid conception, complete with an initial strategy for achieving it. School management committees, in collaboration with program managers, should execute three key activities:

Key activity 1: Needs assessment

The school management committee and program managers should initiate planning by coming to agreement on what needs a school building will address. While a safe school building may already be a known need, other issues may also arise that are important for creating an appropriate learning environment. It is important to understand the underlying factors driving these needs.

School management committees should lead the needs assessment, which may be as simple as a community meeting or as extensive as a community survey and fact-finding process. Either way, program managers must vet community needs against the wider community. Working with local governments is essential.

During the Community Planning Stage, school management committees, in collaboration with program managers, should carry out a needs assessment, feasibility student and draft an implementation plan.

Community needs assessment questions

The school management committee should engage with a broad range of stakeholders to find out what issues are important to cover in a needs assessment. While each context is unique, needs assessments may include questions such as:

- Are existing school buildings vulnerable to hazards?
- Have existing buildings been damaged by disaster?
- Do students have trouble accessing education because of distance or dangers they face while commuting to school?
- What grades would a new school serve?
- Does the school building need to serve multiple functions, such as a shelter during hazards or a community gathering point?
- Can the school rectify existing educational inequality by enhancing access for girls, minorities, disabled children or others?
- Due to remoteness or cultural custom, does the building need to include teacher housing or other auxiliary features like large meeting halls, gymnasiums or kitchens?
- What innovations or community aspirations does the community want the school to include? For example, should the school include gardens, rainwater harvesting, electricity generation or specific cultural elements?
- What will make a positive learning environment?

By assessing need, the school management committee can develop criteria to guide the Planning and Design Stages. Program managers and the committee can also identify local resource persons and external experts who can advise the committee on strategies for addressing identified needs through the construction process.

In the remote DRC Plateau region, building safer schools starts with a community consultation to identify location requirements (distance from surrounding villages, known hazards, security, location of raw materials, etc). This engages the community from the outset and is also an opportunity for women and children to be included in discussions and decisions. Photo: Amy Parker/Children in Crisis.

IN CONTEXT

The importance of a needs assessment

In response to a request from one Maasai community leader, a new NGO built a small school in the rural Massai Mara in Kenya. The school was high quality, but they built with limited presence on-site and limited dialogue with other stakeholders. Unknown to the NGO, a government-built and staffed public school was just one kilometre away with almost no-one living between.

In Kenya, public school is technically free, but the costs of lunch, uniforms and exam fees turn public education into a financial burden for many. To stem the strain, the NGO required a flat monthly attendance fee of US$0.22, which undercuts the price of the nearby public school. Parents sent students to the new school in droves. After one year, class sizes ballooned to more than 60 students, overdrawing school resources and making the public school redundant.

Although the new school was well-constructed, an independent comprehensive needs-based assessment would have created dialogue with the local government and other stakeholders. With increased coordination, the NGO may have better served the educational needs of the community by expanding the existing school so all students in the area benefited or by building a new school at another site where children did not have access to *any* school.

Key activity 2: Feasibility study

The second key activity of the Planning Stage is the feasibility study, a task carried out in the program planning processes. While a feasibility study varies with project context and scope, there are four assessments that are especially important for safer school construction and retrofit programs.

These four assessments are:

- Community
- Hazard
- Site
- Material and capacity.

Program scale may shape stages of the feasibility study. A regional feasibility study may be necessary for large programs, followed by another study at each community site. A local and informal study in the form of a facilitated community meeting and formal interviews with local authorities may be enough to establish the project context for small programs or single projects.

The school management committee, formed in the Mobilisation Stage, should play a strong, even lead, role in the feasibility study. Program managers should support the school management committee's capacity to do this through identifying or providing local skilled people and external experts. They should also help by facilitating the planning process and/or providing tools and training so the committee can take action themselves.

Community assessment

The feasibility study should start with a review of the immediate community context of school projects. At this stage the focus becomes narrow compared to previous stages. In the Planning Stage, the focus is on how the particular community functions and how the school project can integrate with other development activities and goals.

The program manager and school management committee should identify community policies and standards, including land use and planning policies if they exist. The planning and policy cycle of local governments may influence funding availability or where school buildings can be constructed. Similarly, if community development plans are present, the school management committee and program manager should consider how the school project might support skill and knowledge development in the school community.

A demographic survey may also inform the feasibility and scope of the school construction or retrofit project. Demographic data should identify the school population, the catchment area and any future expansion requirements. Where the needs assessment identified specific issues of concern, such as student access to school, the demographic survey may also provide clarity.

Demographic surveys don't have to be complicated. A simple list of questions and a plan to talk with a certain number and type of people in each area of the school catchment area may provide sufficient information. Even when school committee members believe they can answer demographic and needs assessment questions, a structured but simple community assessment can ensure transparency of decision-making processes and build community trust in the school management committee and community-based approach.

Hazard assessment

Determining the type, frequency and intensity of hazards to which a school is exposed is fundamental to ensuring school buildings are well-designed and well-constructed. Forces from floods, earthquakes and high winds that could affect a school building are often marked on hazard maps maintained by the local civil defence or other authorities. Yet these maps usually provide only a general understanding of hazard severity, and they may not even be available in rural communities.

Hazard specialists can survey sites to visually inspect for geological and hydrological features that indicate hazard exposure. However, local knowledge provides particularly important information.

- **Local communities.** Local communities have personal experience with hazards that occur over months and years. For example, community residents are likely to know the location of annual floods, rapidly eroding riverbanks, avalanches, prevailing winds and landslides. They also understand when rain, wind or snow make roads impassable and know other effects from seasonal changes.

  Community understanding of hazards also has limitations. Collective memory is often limited to a decade or two because of lifespan, and usually is limited to a community's immediate area. Community members also commonly accept their extreme exposure to hazards that routinely damage property and kill residents, and so they may downplay these risks. Parents desperate for schools and infrastructure are even willing to accept an unsafe school or hazardous location. In addition, climate change is changing the pattern and intensity of extreme weather events. Historic knowledge is no longer sufficient for predicting future trends.

- **Hazard specialists.** While hazard specialists may not know local conditions well, they can provide regional hazard information as well as quantitative assessments of a hazard probability within a given time frame. Depending on data availability, they may be able to define seismic risk and tsunami or flood inundation zones. In mountainous regions, hazard specialists like geologists can observe slopes and aerial maps to find evidence of past large landslides. In historic river plains they can identify soils that are likely to become unstable in earthquakes and liquefy. Hydrologists can explain patterns in rainfall and flooding over multiple decades and estimate how far flood inundation may extend from a riverbank over the span of a decade or century. Meteorologists can identify similar patterns for high-wind events and note landforms that can potentially funnel wind and increase its damage to school buildings. Climate scientist can provide some insight into future climate variability and change.

IN CONTEXT

School-Based Hazard Vulnerability and Capacity Assessment

Keywords: HVCA, hazard assessment, child participation, Lao People's Democratic Republic

In 2013, when the Lao Ministry of Education and Sport undertook an Education Sector Analysis, they realised they knew little about the state and safety of school buildings and grounds. The ministry needed this information to improve their decision-making processes to support comprehensive school safety, education sector development, and strategic and financial planning.

Understanding and improving school safety was based on first understanding the issues in each community. In three provinces of Lao PDR (Bolikhamxay, Luang Prabang and Sayaboury), Save the Children helped to gather this information. In each community, the Village Education Development Committee and the School Disaster Management focal person led a school-based Hazard, Vulnerability, and Capacity Assessment (HVCA). Simultaneously, a Village Disaster Management Committee considered hazard and vulnerability issues across the village. Save the Children ensured children, people with disabilities, women, and ethnic minority groups were part of these committees to harness the power of diverse perspectives.

At schools, the committees first sensitised their students and communities using games and activities, based on nationally approved consensus-based DRR Key Messages. The school-based activities helped students, staff, and parents understand better regional hazards and construction techniques that would make their schools safer when these hazards struck.

School principals, teachers and education staff led communities in the hazard, vulnerability, and capacity assessment. Communities identified the hazards their school was likely to experience and catalogued school deficiencies. These, together with proposed solutions, were formed into a School Disaster Management Plan. District-level technical working groups, consisting of government authorities and representatives of NGOs and educational staff, used quality checklists to review these plans and sign plans that met all checklist items.

With an authorised plan in hand, the Village Education Development Committees were ready to lead school repairs to improve safety. With funds and technical guidance from Save the Children, some of the activities the Village Education Development Committees undertook included modifying school roofs to have a "hipped" profile which is better able to withstand high winds and hence less likely to be torn off and risk the safety of children and communities. In densely forested areas, other committees ensured flammable roof thatch was replaced with clay and metal roofing for wildfire protection. In flood-prone areas, they purchased waterproof containers and installed high shelves to keep educational materials dry.

School staff and communities also improved school safety by addressing site and functional problems. Communities planted trees to stabilise steep slopes and dug out clogged drainage canals. School staff replaced hinges, allowing exterior doors to swing outward to speed student evacuation. Communities developed creative local solutions to other problems, like access to water and sanitation, and unsafe school routes.

On International DRR day, VDMC member presents the risk reduction intervention to children and community members and how it is contributing to community safety. Photo: Thanoudeth Vongkhamsouk/Save the Children.

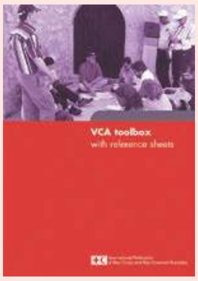
As part of a larger planning effort in Bolikhamxay, Laos, school children played a safe construction card game. With new knowledge about hazard-resistant construction techniques, school communities devised and implement plans to make their schools safer. Photo: Thanoudeth Vongkhamsouk/Save the Children.

RESOURCE BOX

Resources for planning

A variety of tools and resources exist to support community-based and participatory processes for hazard, vulnerabilities and capacities analysis. Whilst each tool is based on the same underlying objective of engaging communities to explore, understand, document and act upon identified risk, each individual agency's tool tends to be slightly different to suite the particular organisational needs or mandate.

Below are some examples of tools, all of which are available online.



The 2007 International Federation of Red Cross and Red Crescent Societies' *VCA toolbox* provides guidance and strategies for engaging volunteers and communities in vulnerability and capacity assessments. Participatory hazard mapping is one tool included in this guide that is particularly important for communities planning safer school construction projects.

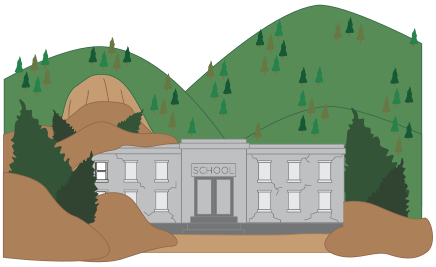
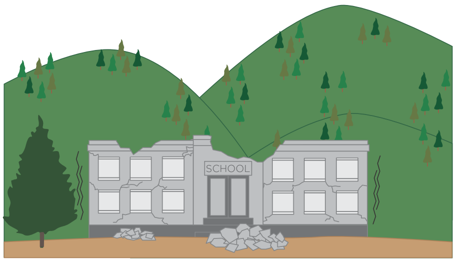
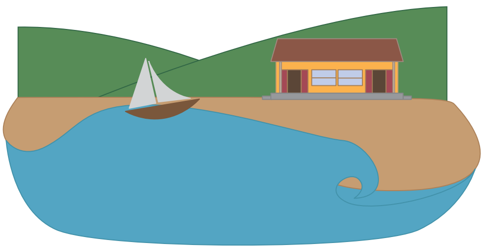
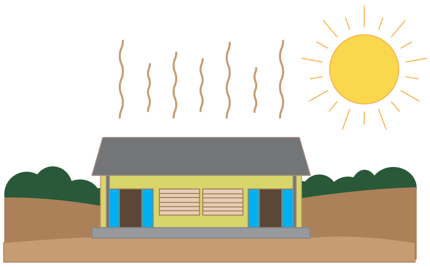
The ActionAid's *Participatory Vulnerability Analysis* guidance aims to provide field practitioners with step-by-step guidance on how to assess vulnerability, with a particular focus on how to link development and emergencies, and how to use local analysis to influence national policy.

Plan International's *2010 Child-centred DRR Toolkit* outlines how to take a child-centred approach to hazard, vulnerability and capacity analysis.

Both hazard specialists and local communities can also consider large-scale changes that may increase the severity or frequency of hazards. For example, on a global and regional scale, climate change will cause important shifts in the frequency and severity of temperature extremes, cyclones and flood events. At the local and regional scale, deforestation may increase erosion and flooding. Accounting for imminent changes during project planning is essential to sustain the safety of school buildings.

A mandate for safety

In community-based construction, program managers have a crucial role to play in the hazard assessment process. They can facilitate dialogue between locals and hazard specialists and, more importantly, they can provide a clear mandate for safety. Where hazard exposure is routine and may be underplayed by local communities, program managers should hold safety as the paramount criteria for site selection, design and construction.

Hazards	The impact on schools
	**Flood:** Flood and heavy rains can damage school supplies, books and furniture. Fast-moving water erodes soil and undermines building foundations. Floodwaters seep into walls, weakening them and potentially leading to collapse.
	**Landslides:** Landslides can crush and bury schools and people. Pressure from rocks, snow or soil can damage walls and foundations and break underground utilities near or in the school.
	**Earthquakes:** Earthquake shaking can collapse weak school buildings or cause enough heavy damage so that the building is not safe to be occupied. In small earthquakes, shaking can cause non-structural damage – large furniture can topple, cleaning and chemistry supplies can spill, electronic equipment can slide off desks and window glass can shatter. These damages can injure students.
	**High winds:** High winds can cause the complete collapse of weak schools. Even without collapse, winds can rip roofing off, blow out glass windows and carry debris through the air at speeds that can pierce school walls. When accompanied by rain, the wind and rain can seep in through poorly constructed buildings – ruining books, equipment and other building contents.
	**Tsunami and flash floods:** Rushing water can destroy building exteriors, pile up toxic debris in and around schools sites, and cause water damage to the interior of schools. High inundation can sweep facilities off their foundations and destroy them. Students and staff caught in the waters can drown or be crushed by debris.
	**Extreme temperatures:** Extreme temperatures within school buildings can make learning impossible. These conditions can also be physically unsafe for students traveling to and from school. School designs that incorporate ventilation, insulation, building material and orientation relative to the sun can increase student comfort inside classrooms and enhance their ability to learn.

Site assessment and selection

Site safety is the main constraint on adequate school placement. Selecting a safe school site is a technical decision where hazard exposure, accessibility and availability are optimised. Program managers should facilitate a dialogue between school management committees, the wider community, donors and implementing agencies and government actors. They should especially create dialogue with technical specialists to facilitate the best option for site safety.

In community-based school construction, local communities are often directly involved in providing a school site. In fact, often the school management committee needs to identify a site, through direct purchase or donation, before implementing agencies provide support. At other times, government agencies transfer allocated public land to a committee for the use of a school. In either case, site options may be remote or dangerous because the land is in low demand. Stakeholders, communities and committees can avoid the selection of poor sites by contractually agreeing to limit exposure to hazards based on a hazard assessment.

When school construction involves adding classrooms to existing schools or rebuilding on an established site, school management committees may not think to evaluate site safety. However, especially in case of rebuilding on an established site, input from hazard specialists helps to identify which hazards are likely to occur over the next several decades. Technical specialists should then evaluate this information to determine if hazard-resistant design and construction sufficiently reduces the risk to students and staff, or if rebuilding at the site is unsafe.

Flagging problems early

Beyond safety, site selection can impose constraints on school design or increase construction cost. A site with poor soil or a steep slope needs more expensive foundations or extensive levelling. A site with narrow or low-capacity access routes hinders the movement of construction materials. The shape of the site dictates the dimensions and layout of the school. When construction specialists are part of the school management committee or serve as local resource persons, they can help flag potential problems before construction begins.

When a safer schools program focuses on retrofitting existing school buildings, site selection takes on different complexities. While school sites are pre-defined, selecting the best buildings for a safer school program requires the assessment of a large number of buildings to identify the most critically weak structures. The case study at the end of this section considers one such process (see the *Community Planning Stage* case study).

IN CONTEXT

Some gifts are not free

Land tenure is important to consider in community-based school construction. School buildings cannot provide a safe and functional educational space if the land they are built on is later claimed for other purposes.

In El Salvador, many school sites are seemingly donated by wealthy patrons when in reality they have been given as a loan. Upon the death of a patron, heirs may reclaim the land or demand rent at a moment's notice, putting children out of school and burdening the state with unexpected costs.

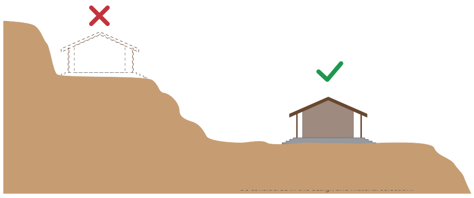
Direct purchase and government appropriation provide the most straightforward path to secure land tenure. In other cases, long-term lease or use agreements may provide some security when school sites are donated. Formal agreements reduce the chance that the owner will reclaim the site after school infrastructure investments have been made.

In informal settlements or slums, where securing formal rights to a site is impossible, school management committees can seek written commitments. Nearby households and local and regional governments can agree to refrain from building or encroaching on the proposed school site over a set number of years.

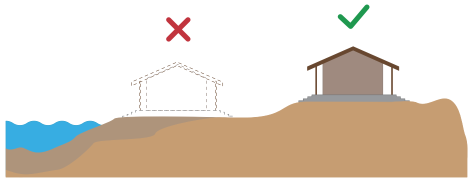
Community members walk a transect to identify local hazards together. These hazards will be placed on a map in order to select safer sites for reconstruction. Photo: Seki Hirano/CRS.

Key considerations for site selection

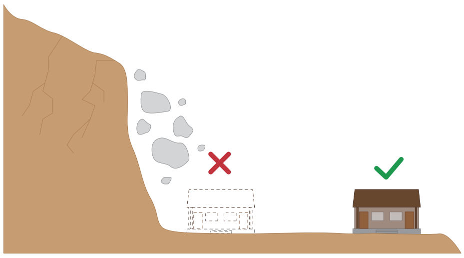
Comparing potential sites can help stakeholders select the safest school sites available. This comparison should assess natural hazard risks but also site characteristics that could threaten students' wellbeing or their capacity to learn. Possible questions may include:



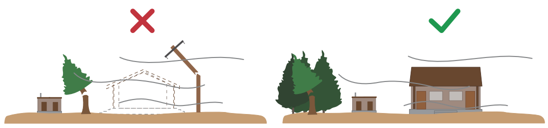
Steep slope: Is the proposed site on or near a steep slope where a landslide, rock fall, avalanche or similar hazards could injure students or damage the building? If steep slopes are unavoidable, will monitoring strategies and evacuation plans be in place to keep occupants safe?



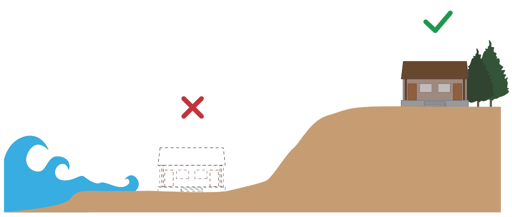
Near rivers: Does the proposed site become flooded from rivers, streams, drainage overflows, high tides or coastal storms? If flood sites are unavoidable, will the school building be elevated above expected flood levels, or will flood resistance be considered in the design and material selection?



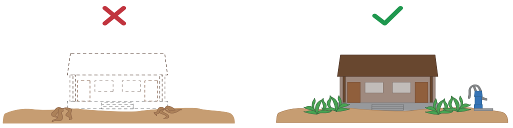
Unstable soils: In seismic areas, does the site avoid known or suspected soils that could become unstable in an earthquake?



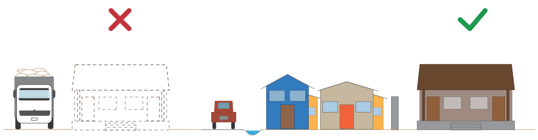
Falling objects: In high-wind areas, is the site and nearby areas devoid of objects that could become wind-born (poorly secured signs, utilities, building parts, trees) and damage the school building or its occupants?



High ground in high water: On tsunami-prone coastlines, is the site outside of the expected tsunami inundation zone for probable worst-case events? If not, is the site close enough to high ground for students and staff to safely evacuate in time, or will upper floors of the school be above inundation?



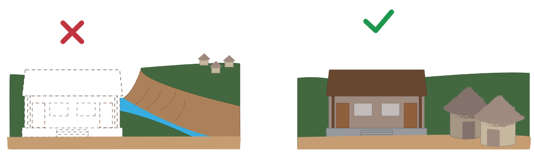
Drinking water: Does the site have access to potable water for drinking and water for sanitation?



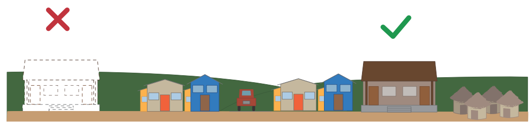
Safe transit: Will children walking to school need to pass along busy highways or cross dangerous waterways? If unavoidable, will students' transit to and from school be supervised? Especially in urban and conflict areas, will students going to and from school have adequate security to protect them from molestation, kidnapping or attack?

Key considerations for site selection

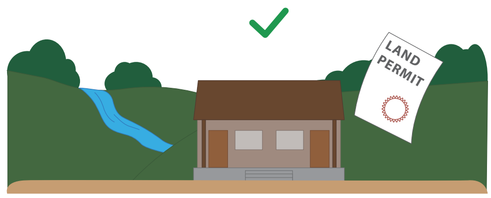
Comparing potential sites can help stakeholders select the safest school sites available. This comparison should assess natural hazard risks but also site characteristics that could threaten students' wellbeing or their capacity to learn. Possible questions may include:



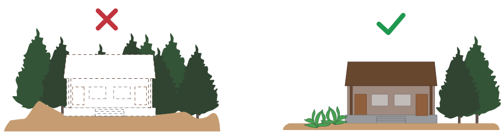
Transitory community: In nomadic communities, is the site a recognised site that they return to year after year? Is it likely to remain accessible to them in the future?



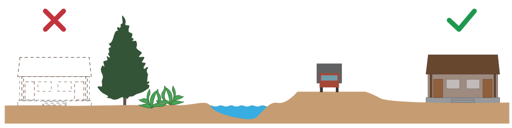
Equitable access: Where conflict exists, will the site promote equitable access to all groups within a catchment area?



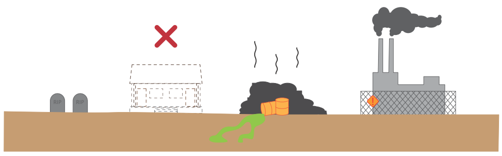
Land tenure: Can formal lease agreements or land tenure be secured for the proposed site? If not, does the community and other stakeholders agree to preserve the site for use as a school?



Unobstructed site: Does the site require expensive clearing, levelling or compaction that will add to cost and construction time?



Site accessibility: Can construction vehicles, equipment and workers easily access the site? Will landowners give permission for these people to cross their land? Is the access route free of obstructions or poor soils that could trap heavy construction vehicles?



Community usage: Is the site too close to special-use sites such as burial grounds or areas considered sacred or supernatural? Is the site near dangerous industrial activity? Is it near rubbish heaps or other toxic waste sites that may expand or have accidents that would put students at risk?

Further guidance on site selection in areas exposed to earthquake, flood, high wind, and landslide hazards can be found in *Technical Principles of Building for Safety*, listed in the references at end of this manual and purchasable online.

IN CONTEXT

Site selection in post-conflict zones

Keywords: conflict, site selection, team building, equal representation, DRC, NGO

Careful project and site selection is essential when conflict threatens school communities.

On the High Plateau region of South Kivu, in the Democratic Republic of Congo, communities are recovering from a war that officially ended in 2003 but that has continued in the region to this day. Open conflict is now rare, but the deep animosity has been hard to overcome. Intermarriage, communal work and tribally mixed churchgoings are rare.

Cross-tribal interactions are typically confined to the marketplace and schoolhouse. Yet frightened by rumours from their parents, children rarely play with other ethnic groups in the schoolyard, work together in class or sit together during breaks.

Children in Crisis – an NGO working in the area to construct and renovate schools – slowly and carefully built relationships with local partners who could represent the different tribal, ethnic and religious communities on the High Plateau. Since these identities were often used as a socio-political wedge, equal representation was essential for a successful project and for successful relationships with stakeholders and beneficiaries. During initial meetings with school communities, Children in Crisis explained their physical and political guidelines to site selection. For them sites should:

- **Be accessible and centrally located.** The school should be for all children in the area and should not belong to a church or a particular group within a community.
- **Prioritise safety and protection.** The school building should not be isolated or located on a thoroughfare.
- **Avoid hazardous locations.** School buildings should not be in the path of prevailing winds, potential landslides, mudslides or other natural hazards.

Children in Crisis relied on local expertise to identify and select sites that met these and other community-identified criteria. An engineer and the project team then analysed the choice to make sure the site was safe and unavoidable risks were mitigated. When needed, the organisation offered facilitation to help decrease tension that may occur during the safer school construction project.

Unlike natural hazards, which can be measured empirically, conflict-related threats need strong political expertise. Locals were rightfully identified as the experts on local politics. At minimum, the community partnership avoided projects that would incite violence. At best, it facilitated projects that bridged social barriers.

Today, schools constructed or renovated through Children in Crisis hold tribally mixed teacher trainings, are managed by cross-community parent-teacher associations, and provide a safe and secure learning environment for local children. Along with gaining increased mutual trust, locals helped Children in Crisis choose projects that not only circumnavigated violence, but also increased opportunities for meaningful interaction.

Key takeaways

- Create teams to represent different community and ethnic groups. This will improve relationships with local communities, stakeholders and beneficiaries.
- Choose sites in partnership with all ethnic and religious groups to mitigate tension.
- Listen to local partners for political analysis – they are the experts.

After years of conflict and regional poverty, schools in the DRC Plateau region were deteriorating. The original schools, built from bamboo and thatch, were cold and wet in an area that experiences seven months of rainfall per year. They were cramped, and noise from adjacent classrooms disrupted learning. Building safer schools started with a community consultation – an opportunity for women and children to be included in discussions and decisions.
Photo: Amy Parker/Children in Crisis.

Materials and capacity assessment

One of the major characteristics of the community-based approach to school construction is that the design and construction are tuned to local context through use of local materials and construction techniques. Although local practices can decrease costs, these reductions must be evaluated alongside impacts on school safety.

The choice of materials needs to account for:

- **Cost.** Many materials can be designed for safety but may not be cost-effective in all contexts.
- **Quality.** Material choices should be excluded if they are unlikely to result in a safe school, especially in light of labour capacity.
- **Labour capacity.** Community approaches tend to have more success when local skilled tradespeople and unskilled labourers are familiar with most of the materials and construction techniques. Likewise, new materials and construction techniques can be successful when coupled with adequate training.
- **Material availability.** Where communities supply part of the construction material, the quantity *and* quality of these materials needs verification before Design Stage. Where the quality of material is unknown, engineers may first need to test the material strength to determine whether and how it can be incorporated into school design.

  In post-disaster contexts, construction materials are in high demand. Program managers need to assess if and how salvaged materials can be used safely and what materials can be readily acquired. When material needs to be imported, program managers also need to take care these materials are appropriate for environmental conditions. For example, timber and plywood imported into tropical climates may deteriorate rapidly or be highly susceptible to insect attack, undermining the safety of the school after a few years of use. Even if they are environmentally appropriate, imported materials may not be harvested sustainably or may be difficult to repair without the costly exercise of importing more materials.
- **Community preference.** Communities often have strong preferences about building materials. Their preferences may stem from familiarity and availability or from an appearance of wealth and modernity associated with some materials. These preferences should be valued highly, but where such preferences compromise the hazard resistance of school buildings, minor adjustments or substitutions may be necessary. A community's understanding of modernity may need to shift, as was the case in one Ghanaian project highlighted in the Construction Stage (see the *Community Design Stage case study*).

IN CONTEXT

Safe construction and cost

Keywords: cost, building practice, community perception

Community members may initially turn hazard-resistant construction down, thinking of it as too costly and complex. Yet safe construction is often more about doing construction differently rather than simply investing more in brick, cement and reinforcing steel. While some hazard-resistant construction may add marginal costs to school construction, at other times it may result in cost savings. Traditional construction practices pour resources into the wrong elements – for example, building thick walls and slabs rather than adding more reinforcing steel shear ties to the columns. Helping communities understand what aspects of design are most important to safety can increase their confidence in safer construction practices.

- **Capacity-building potential.** The fourth key principle of the community-based approach is ensuring school construction builds local knowledge and skills for hazard-resistant construction. New materials and hazard-resistant construction techniques should be transferable to other construction projects, like housing and small-scale commercial construction (see *In context: Building too fast in the Community Design Stage section*).

The school management committee, with support from the program manager, should consult with local builders and other identified local resource-providers to better understand the local materials and construction capacity in their community. If the program manager or committee has already identified the design team, the committee should work closely with them to complete this assessment. If a design team has not been identified, local engineers, master builders, or construction specialists within the implementing agency may provide good support.

IN CONTEXT

Planning for remote regions

Keywords: remote, design, planning, earthquake, winter, steel frame, humanitarian response

Community-based school construction projects in remote communities pose unique challenges compared to projects in urban centres or accessible rural areas. Often, remote areas are more affected by disasters because immediate relief is more difficult and slower to deliver.

Catholic Relief Services (CRS) built 104 schools over seven years in the Khyber Pakhtoonkhwa and the Pakistan-Administered Kashmir provinces of Pakistan following an earthquake with a magnitude of 7.6. During the earthquake, community infrastructure crumbled and many villagers were buried beneath stone and earth. Overall, 4,500 schools were partially destroyed and 500 schools were completely destroyed.

In this project, many communities were remote, some located at an elevation of 5,000 feet. Narrow mountain paths, unfit for vehicles, were the only routes to reach these communities. Compounding the difficulty, the disaster struck in autumn just before the harsh winter, and CRS was pressured to erect the schools before the paths became impassable and concrete became un-pourable. Although the project continued for six more years, the winter always constrained the amount of time for construction.

To overcome these challenges, CRS worked with villagers to help with transportation. Since cars or trucks were not an option, the villagers had to transport building materials as they always have – by foot or by donkey. However, using labour or livestock curtailed the viable materials and, in turn, the design options.

In response to the transportation restrictions, CRS adopted a light, steel-based design that was prefabricated. It could be delivered in manageable pieces and assembled on site. Materials were locally sourced through a bidding process, even though the structures were prefabricated. Timber was not a viable option, as the Forest Department restricted logging at that time.

Site selection was challenging in the mountainous terrain. CRS aimed to avoid building alongside banks, sloping areas and under the heavy electric lines that route electricity from micro-hydroelectric power plants to remote communities. To avoid and mitigate these dangers, CRS looked to the Parent-Teacher Committees (PTC) for their intimate knowledge of the landscape.

They also focused on building to better resist future hazards. For example, a raised plinth mitigated flood hazards, while earthquakes were mitigated through seismic bracing on alternate walls, the ceiling and the roof. These braces allowed the steel frame to bend under seismic force, but not collapse.

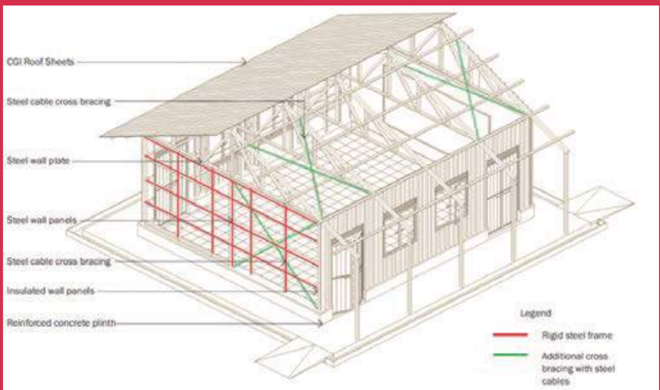
Four skilled workers – a mason, an electrician, a carpenter and a steel fixer – as well as four unskilled workers were needed to construct each school. Most teams comprised workers with previous experience, but CRS trained workers if no skilled workers were available. Although CRS provided both trained engineers and site supervisors, the villagers executed the bulk of the construction work.

Engineers and site supervisors inspected materials and trained skilled workers on how to inspect materials for future construction projects. Key structural elements were very consistent, making quality control easier. As part of their in-kind contribution, community members donated gravel. But there were construction challenges too. In the beginning, water systems in the remote areas had been damaged and were not available to contractors who needed to mix concrete, which delayed construction time.

After schools were completed, CRS ran operations and maintenance training for the PTCs to learn how to maintain and, when necessary, renovate the schools. CRS supported the PTCs in developing a maintenance plan, complete with assigned roles and responsibilities and the dates and durations of those activities. The buildings have an estimated lifespan of 20 years but are expected to function longer.

Key takeaways

- Remote schools can and should be reached by safe school construction projects.
- Seasonal climate patterns can hold up remote construction projects.
- Light materials decrease the burden of labour-intensive transportation.
- Modular, repeatable designs can make quality control more efficient.
- A well-defined maintenance plan is necessary for inaccessible communities where constant interaction is impossible.



Source: Amanda Rashid/CRS.

In a Pakistan mountain community, where roads are non-existent, donkeys are the only way to transport construction material over narrow hillside paths. Since stone is plentiful in these mountains, local villagers supply the gravel as part of their community contribution to the school-building effort. Photo: Joe Lapp/CRS.

School reconstruction following a devastating earthquake in Pakistan deployed prefabricated steel panel elements that could be transported piece by piece and fixed to an in-situ reinforced concrete foundation. The prefabricated design enabled easier quality control of important structural elements and made best use of local resources. Photo: Joe Lapp/CRS.

Key activity 3: Drafting an implementation plan

Following a feasibility assessment, the school management committee and program manager should collaboratively draft an implementation plan. This plan should include a draft timeline of dates and key activities, deliverables, as well as the roles and responsibilities of each actor.

A financial plan is also an important strategic aspect of achieving a safer school building. Financial plans that directly link payment to safety checks – verification that disaster risk reduction strategies have been successfully incorporated into site design, site preparation and key points in the construction process – can create incentive and sustain attention to safety. Resources for community-based management of construction projects can be found in the Design Stage (see *In context: Technical support and construction oversight in the Community Construction Stage section*).

Because a community-based approach seeks to increase community capacity during the construction process, a communication and capacity-building plan is necessary for implementation. Risk-awareness activities implemented in the Mobilisation Stage may need to continue throughout the project, especially in coordination with design and construction activities. Capacity-building activities, especially around hazard-resistant construction techniques, also need to be planned. Because these activities may take significant time and, if done on a regional scale, coordination, it is a good idea to start them at the Design Stage.

During the early stages of the recovery efforts after Typhoon Haiyan in the Philippines, carpenters are trained on techniques for including cross bracing in reconstruction efforts.
Photo: Adam Kalopsidiotis /Save the Children.

IN CONTEXT

Selecting materials for safer construction

Keywords: tsunami, reconstruction, materials selection, timber

After the 2006 Indonesia tsunami, residents wanted to rebuild houses and other community infrastructure with brick, but the cost of hazard-resistant confined masonry was higher than many households could afford. Build Change – an NGO providing technical building assistance – helped some households turn to timber construction, which could be built to be hazard-resistant with less cost. When residents made errors in timber construction, the mistakes were easier to see and rectify. A mistake made in a confined masonry building could require tearing it down and starting over.

Even with this step toward safer material selection, Build Change noticed a decrease in endemic timber stock as demand grew in the housing sector. As a result, NGOs working in the region began importing timber without natural pest resistance. Houses built with these imported materials will deteriorate more rapidly. Building materials must be researched in-depth to mitigate the creation of new problems.

Key considerations for the Community Planning Stage

Early decisions about project scope, site and materials require dialogue between funders, school management committees, local tradespeople and external experts with knowledge of hazard-resistant construction practices. Forming a joint fact-finding group to assess needs and determine feasibility can help identify key constraints in a project and ensure these constraints are addressed in an implementation plan that maximises the safety and functionality of the finished school building.

Safety	**Is the site safe from natural hazards or will these hazards be addressed through design, construction and school emergency management procedures? Will students be able to travel safely between home and school?** A hazard assessment is a crucial part of any safer school construction or retrofit project. These assessments are best when they are done through a participatory process that elicits community knowledge of local hazards and external knowledge of regional and infrequent hazards and climate change. Communities can identify and suggest solutions for dangers that arise from conflict, during transit to and from school and frequent environmental hazards. **What adaptations may be needed to make existing construction practices hazard-resistant?** Local construction practices may not include important hazard-resistant features, especially for hazards that occur infrequently or are changing in nature. Even if hazard-resistant techniques are present in traditional and vernacular architecture, resource depletion, shifts in material availability, migration and government policies can inadvertently result in the use of new materials without incorporating hazard-resistant techniques. **What local materials will ensure safety while also being cost-efficient and easy for communities to maintain after construction?** Choosing the right material should be a consideration of cost, safety and long-term maintenance. The lowest-cost material able to achieve safety and other performance objectives may be the best choice. However, if this material will degrade quickly or require maintenance the community cannot do, the long-term cost may outweigh any immediate cost savings.
Capacity building	**Does the community need support or training to plan the safer school construction or retrofit project?** When school management committees take a lead role in project planning, they may need support or training in facilitation, development and use of criteria in decision-making processes, and in the integration of local and external knowledge. Teaching them planning tools such as SWOT analysis, criteria checklists and hazard mapping can help. **What new knowledge and training do communities need to begin hazard-resistant school construction?** Skilled and unskilled labour need training in new construction techniques. They need to be provided with opportunities to practise these new techniques under close supervision. The greater the difference between current practice and the new technique, the more training and support they will need.
Sustainability	**Is the proposed project feasible within the funding, time, resource and capacity constraints of the community and other stakeholders?** In a community-based approach, planning is a community-wide activity. The process should seek broad community input about community needs, hazards and local capacity, as well as solutions for challenges. Participatory planning helps ensure the project is feasible and will reach completion. However, a community-wide planning process can be complex and raise competing priorities. Facilitation can ensure all voices are heard and that necessary compromise does not result in marginalisation or an undermining of commitment to safety.

CASE STUDY

Rapid visual assessment for retrofitting

Country: El Salvador

Organisation: UNESCO, University of El Salvador, University of Udine, Italy

Hazards: Earthquakes

Keywords: VISUS, rapid visual assessment, information communication technology, government, retrofit, triage, training

Summary: Before school retrofitting or reconstruction programs can begin, weak buildings need to be identified and prioritised, and retrofit or replacement designs calculated. Rapid visual assessment is typically the first step in this process. In El Salvador, UNESCO and two universities piloted a tablet-based rapid visual assessment tool. The project assessed 100 school buildings in 10 days and built the capacity of government officials, professionals and engineering and architecture students along the way. For many, the pilot was their introduction to building assessments and the fundamental principles of seismic-resistant design.

Country and hazard overview

El Salvador is both populous and seismically active. In 2001, two earthquakes struck, causing landslides and damaging 1,700 schools – more than one in three in the country. Ten years later, many school buildings remain in disrepair, in sites that leave them vulnerable to earthquakes and other natural hazards, or they do not comply with seismic building codes.

School buildings in El Salvador are mostly one story of confined or reinforced masonry. Although some buildings were traditionally constructed from adobe (mud brick), it has not been used for schools after many children and a teacher died during an earthquake in 2001.

When existing school facilities have not been built to withstand hazards, they need to be identified and strengthened. In contexts like El Salvador, where resources are insufficient for a full detailed assessment of every school, a rapid visual assessment can quickly collect proxy data from a brief site visit. From these assessments, the MoE can develop school retrofitting programs based on a triage action plan that prioritises the weakest buildings and those with the most students first. Detailed assessments can then determine whether school facilities should be retrofitted or replaced.

Using rapid visual assessment

Rapid visual assessment approaches have been developed in many countries. These assessments do not empirically determine the structural integrity of a building. Instead they rely on proxy data to determine fragility.

Originally, the proxy data was collected by engineers after earthquakes or other hazards. Noting the intensity of the hazard, they recorded the damage to buildings and organised the results by the building typology and other defining characteristics. Over time, enough data was collected to be able to predict damage based on a visual assessment of a building's characteristics and the expected strength of the hazard.

Rapid visual assessment only provides a general prediction of damage. After the rapid visual assessment is conducted, engineers still need to perform in-depth assessments to develop appropriate retrofit designs, but only for those identified during the rapid assessment for an in-depth analysis. This strategy reduces the cost of doing in-depth assessments for every school.

Planning school retrofits through rapid visual assessment

Faculty and students of a Salvadoran engineering program, along with researchers from the University of Udine in Italy, pilot-tested the VISUS tool as a rapid visual assessment methodology in 2014. VISUS is an expert-based methodology that organises and collects rapid visual assessment information for school facilities through a tablet-based application. It then uses collected data to judge the overall safety of school facilities. VISUS has been designed to quickly aggregate data through photographic evidence and prioritise the most appropriate action for achieving school safety based on risk and cost. These actions are listed as nothing, repair, retrofit or replacement.

Even though El Salvador has a relatively robust university system, civil engineering students are not required to take courses in evaluating existing buildings for seismic safety. For one month, VISUS developers from the University of Udine in Italy, together with UNESCO personnel, communicated with a Salvadoran professor who spearheaded the pilot project. He provided pictures from previous earthquakes and information detailing the technical aspects of typical school construction in El Salvador. Over time, this initial contact snowballed into a steering group, which maintained the project throughout its lifespan.

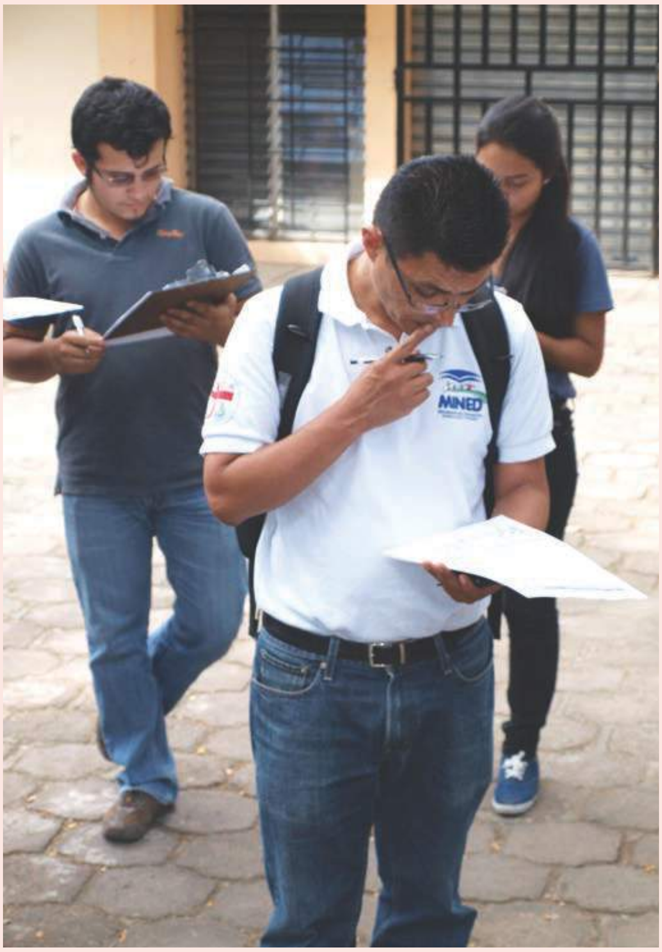
After establishing a base of operations at the University of El Salvador, the VISUS developers trained more than 60 people to perform the assessment, including personnel from the MoE, Engineers Associations and a small team of 15 students and 8 professors. The first half of the three-day training was in the classroom learning the concepts of rapid visual assessment and the VISUS tablet application for collecting data. In the latter half of the training, the trainees got hands-on experience in the field. A day was added for evidence-based photography so experts could verify the team's assessments after the fact.

The VISUS pilot project assessed school buildings in the departments of San Salvador, La Libertad and La Paz. Ultimately five groups of three university students and a professor visually assessed 100 buildings in 10 days. The VISUS evaluation of the school took as little as a half an hour and occasionally as long as three hours. When school staff were available to guide the team, the evaluation process was much faster.

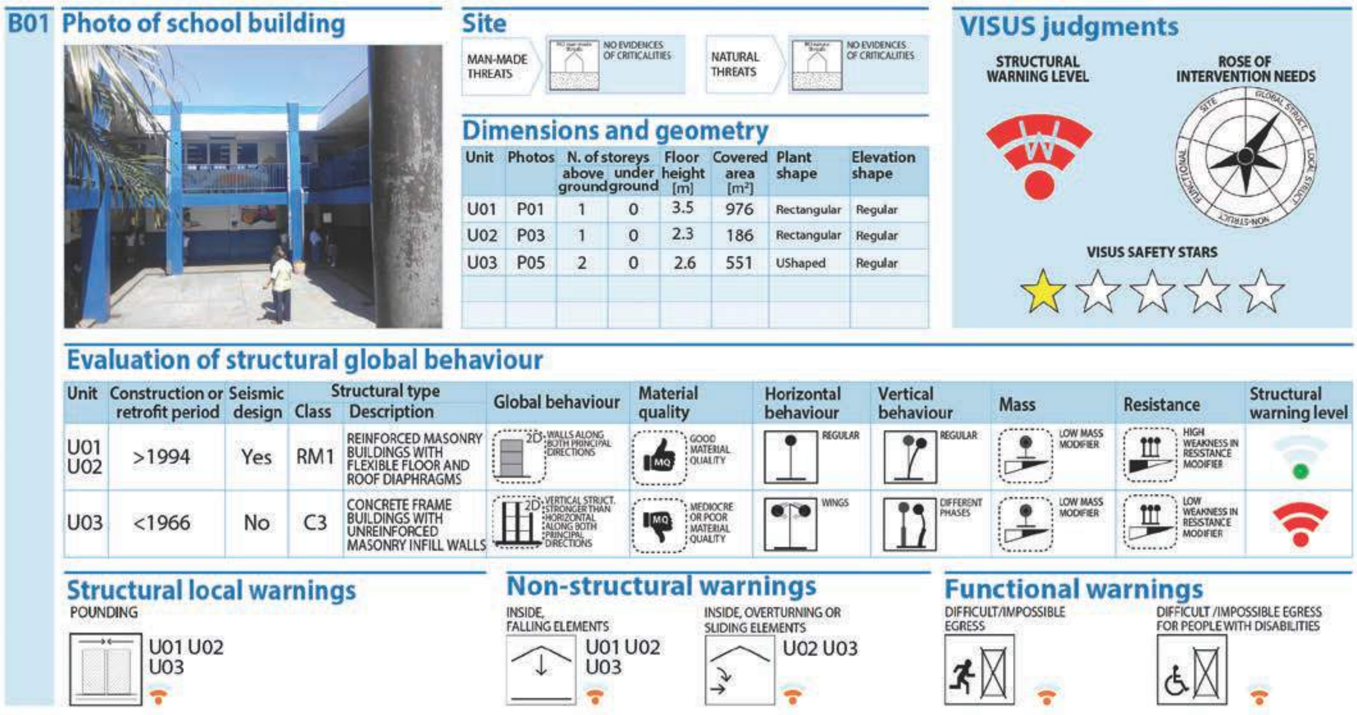
The VISUS methodology could be divided into three broad chronological sections: characterisation, evaluation and prescription for school safety upgrades. Teams used tablets to photograph structural and non-structural characteristics of schools and then match what they saw to a set of pre-defined alternatives. The methodology related each alternative to different damage levels the school would likely experience in an earthquake.

The newly trained surveying team did not always have sufficient expertise to correctly perform the matching. However, the photo documentation was sent to a scientific committee who vetted on-the-ground data, filling in any gaps in experience. This double-checking helped verify the congruence of the collected data. An algorithm then rated school building on a 1-5 star system ranked by risk and retrofit cost.

VISUS was able to effectively train and immediately rely on local students and professors for site visits because of its rigorous review protocol. By producing detailed and functional pictorial evidence, the oversight could be exported off-site, increasing speed and reducing costs.



Personnel from the MoE, engineering associations, students and professors of civil engineering practice rapid visual assessment of school buildings to determine which are most vulnerable to earthquakes. Photo: Jair Torres/UNESCO



A summary view of the rapid visual assessment of a school building with three blocks – Unit 1, 2 and 3. Using a series of screens to compare the unit to photos of different building typologies and characteristics, the team has categorised the units, considering global building behaviour, material quality, horizontal and vertical behaviour, building mass and lateral resistance. The tool also asks teams to assess non-structural and functional issues. Following a rapid visual assessment, VISUS engineering experts review field assessments and the accompanying photographs to ensure accuracy.

Challenges to this approach

In the pilot stages, the tablet was not fully functional in the field. Rather than allowing the users to assess the safety of the facility as issues were discovered, the tablet-application forced the user into a rigid linear progression of the five sections of the VISUS method. Realising this problem, teams quickly began recording the information on paper and enter the data once they returned to university. The pictorial comparisons provided in the application were still essential, but the tablet application needed modification to be fully functional in the field.

Rapid visual assessment is only the first step. The work in El Salvador identified school buildings that were likely to be the weakest, and because the VISUS tool was used, it provided initial estimates for retrofitting or replacing them. Yet even though the results of the pilot study are promising, the long-term impacts to Salvadoran schools are still unknown. The MoE and other actors still need to fund retrofitting and replacement. Engineers still need to complete detailed assessments, including sampling materials from the schools and testing their strength, before creating retrofit or replacement designs. And of course, the work then needs to be carried out.

Designed in Italy, VISUS focuses on structural typologies common in southern Europe. Applying this technology to other contexts requires adaptation. The tool needs to be expanded to include traditional building materials like adobe. It also needs to respond to a broader range of hazards to be applicable in other contexts. Currently, the team is conducting other pilot applications in Laos and Indonesia. This requires adapting the tool to entirely new building types and hazards – including floods, tsunamis and high winds.

Key takeaways

- Retrofitting programs can improve the hazard resistance of existing unsafe school buildings.
- When resources are limited, rapid visual assessment tools help quickly identify the weakest schools and the schools with the most vulnerable students.
- Local engineers may have little formal training in methods for assessing existing structures for vulnerability to hazards.
- Partnering assessment experts with local universities can build the capacity of engineering students, faculty and government officials.

SECTION III: DESIGN

The Community Design Stage

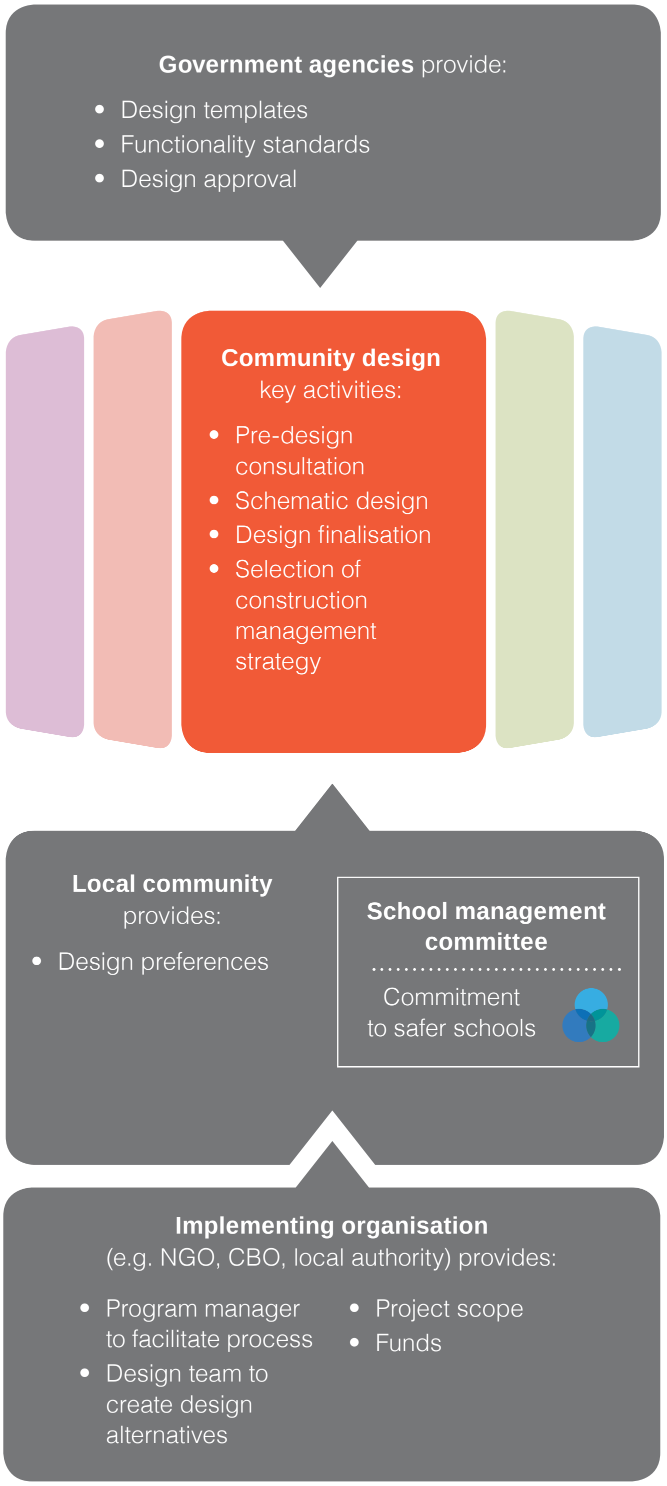
The Design Stage is when the shape and function of a school building emerges. Design teams – often composed of an architect, engineer or both – consider the layout, strength and size of construction materials needed to create a functional and safe school that can withstand daily use and the force of hazards.

A community-based approach to safer school projects is a collaborative process, even in the technical design phase. The design team may begin with a template design, or a series of design options, dictated by the MoE or the development organisation initiating the project. Alternatively, the team may create a completely new design. In either case, the school management committee and other community stakeholders should be encouraged to make as many of the design decisions as possible, within the constraints of safety, budget and country guidelines for schools. As such, the design team should have an iterative consultation process with the community.

In a community-based approach, the design team has one important additional task. They should effectively communicate the design, especially the hazard-resistant elements, to the community and accommodate their concerns in the final design. This task demands that the design team be trained and effective in public communication.

The design team bases the design of the school building primarily on the following requirements:

- **Structural safety of school buildings.** The building's ability to withstand natural and other hazard events, minimising danger to occupants, takes precedence over all other considerations. Where robust building codes exist for available materials, the design team can ensure structural safety by designing according to these standards. Where building codes do not address local materials or where codes are known to be insufficient for on-site hazards, the team must look to international guidelines and good practice. Even with international guidelines, testing the strength of local materials may be necessary.
- **Functionality.** Schools need to be structurally safe and friendly, and need to provide supportive learning environments. They should be designed to invite children in and support them in their emotional and intellectual growth. Choices of architectural shape, layout and material can provide a welcoming atmosphere,



During the Community Design Stage, school management committees work with design teams during an initial consultation and the selection of an appropriate design alternative. Together with the program manager, the committee also selects a construction management strategy.

encouraging students to play creatively and learn, and building a connection between the school and the wider community. The design should draw from good practice, such as child-friendly school guidelines, and adhere to the minimum standards required in the region. However, findings from the needs and community assessments in the Planning Stage should be particularly important in shaping the form of the school.

- **Addressing social conditions.** Achieving structural safety and functionality is constrained in relation to the particular context of a community, which can put realistic limits on design options. In particular, the design should account for findings from the local material and capacity assessments conducted in the Planning Stage. Using available construction material from the local market and minimising the use of foreign material ensures the design matches local construction practice, available skill sets and the community's capacity for maintaining the building. It also increases the likelihood that the hazard-resistant techniques used in the design are readily transferable to other construction projects within the community. Other constraining factors may include:

- The size and location of the school site.
- Local construction practice.
- The availability of equipment and other technology.
- The capacity of local contractors and skilled labourers.
- Available materials.
- Funding.

The design team should develop a set of design drawings and construction specifications that meet safety, functionality and social criteria that is identified by the school management committee.

All three conditions are necessary for children to have safe, inviting and engaging spaces for learning. However, safety should always be prioritised as an essential condition.

IN CONTEXT

Building back better

Keywords: Myanmar, cyclone, reconstruction, compressed earth block, breakaway walls, UNICEF

Following Cyclone Nargis in Myanmar, UNICEF constructed school buildings ready for the next storm surge by elevating key portions of the building above recorded flood levels at each community.

The top of the foundation – the plinth level – was raised, in some cases, 2m above the surrounding rice fields. Classrooms were further elevated above cyclone storm-surge levels on a reinforced concrete frame, which was designed to resist cyclone winds, pounding waves and seismic shaking in parts of the region.

In the later phase of the reconstruction process, UNICEF adapted their design even further. They began adding breakaway walls made of loosely attached timber to portions of the walls rather than compressed soil blocks. When floodwaters pushed against the building the timber portions could break away. This allowed the water to flow through the building. When the water was able to flow through, the structural integrity of the building remained unaffected. Such a design provided additional educational space on the lower floor, and upper floors remained functional even when heavy storm surges struck. Communities were organized to evacuate all educational materials to the second floor during flood events.

After flooding, community members knew they could find and reattach any lost timber wall pieces. Rebuilding with remnants of destroyed structures was familiar to local community members, who commonly salvaged materials after disasters.

Now, communities trust the safety of the school structure. During unusually strong winds in 2009, almost all villagers took shelter in the upper floors of the safer school rather than sheltering in the local temple as they had traditionally done for decades.

In addition, UNICEF provided some school communities with simple new technology that would enable speedy construction. UNICEF worked with HABITECH, a research group from the Asian Institute of Technology in neighbouring Thailand. HABITECH developed manual machines that produced interlocking compressed earth blocks. These blocks could be manufactured on site using local soil mixed with cement – the interlocking feature made mortar unnecessary. After the blocks were made, school walls could be erected in just three weeks. Although thorough long-term evaluation and monitoring stopped when UNICEF's construction team disbanded, residents in the communities have use the earth-press to build houses.

A safer school in Myanmar built following Cyclone Nargis. Photo: Carlos Vasquez/UNICEF.

Key activity 1: Pre-design community consultation

Prior to designing a school building, the design team needs to understand the outcomes of the Planning Stage – the needs assessment, feasibility study and draft implementation plan. They need to meet with the school management committee and potentially other community stakeholders. They also need to visit the selected site to conduct detailed investigations of its characteristics. This pre-design consultation phase, which for smaller projects may occur as part of the Planning Stage, should address three major design considerations:

- **School site investigation.** The design team needs to confirm some of the assumptions made at Planning Stage by visiting the selected site. They may conduct a local site survey to verify hazards, the shape of the site and soil characteristics. From this, they can layout classrooms and other facilities to fit within the site, and they know how big the foundation needs to be to support the building on the specific soils found at the site. The design team also needs basic information, such as the height of the water table and vegetation on the site, to determine what type of site preparation and drainage is needed.

  In seismically active and landslide zones, the softness of the soil defines how intensely a school building will shake or whether the soil under the building will destabilise the structure. Regional and local soil maps may provide a general overview of site conditions, but often these maps are insufficient for structural design. Geologists or geotechnical engineers should investigate local site conditions.

- **Building performance objectives.** Performance objectives define how well the school building will perform during hazard events. Buildings, at minimum, should be designed to be 'life safe' for known hazard events. For example, national design codes or other guidelines may require all school buildings to withstand high winds or earthquakes of a certain size or frequency. A building designed to be 'life safe' in these events would not collapse (partially or completely) or cause fatalities during that event. However, the building may sustain high damage and need extensive repairs or complete replacement after the event.

  The school management committee and wider community stakeholders may decide a 'life safety' performance objective is insufficient. Higher performance objectives, such as 'cyclone shelter' or 'immediate occupancy' could make more sense when the school building is intended for shelter during or after a disaster. It is also important for enabling students to resume education in the building immediately after the disaster. Buildings adhering to these higher standards have higher construction costs but experience much less damage in disasters.

  The community needs to understand the performance objective options and weigh them against resources and community needs. The implementing actors may also require higher performance objectives based on regional or emergency response planning.

- **Community context.** Design teams should also meet with the school management committee to understand the needs and aspirations identified by the committee during the Planning Stage. The committee's vision for the school should shape what the design team prioritises. The design team should understand the local materials, construction practices and labour capacity. Local tradespeople may not have the expertise to execute sophisticated construction techniques – for example, dampers in a frame or composite construction materials – no matter how hazard-resistant and innovative they may be. Designs that build on local practice and make only moderate adaptations to local building styles and materials are more effective because they ensure communities can retain these good practices and apply them elsewhere.

Balancing cost and performance objectives in flood plains and storm surge zones

Schools in flood plains and storm surge inundation zones can be built so they remain structurally intact even when inundated. However, inundation precludes the use of the school as a shelter. Stakeholders may decide to invest in a more costly, elevated school so that it remains undamaged in a flood event. Built to a higher performance objective, this school could serve as a community shelter post-hazard.

Alternatively, stakeholders may decide to construct a less costly school, with the knowledge that they will need to clean mud and debris out of the school before using it again. Staff and students can evacuate and save educational supplies, but the building will not be suitable for shelter or immediate occupancy.

Development actors and government agencies may take a regional approach, ensuring communities can all access a school designed to higher performance standards in their region, even if the schools closest to them are designed to lower standards.

Key activity 2: Schematic design

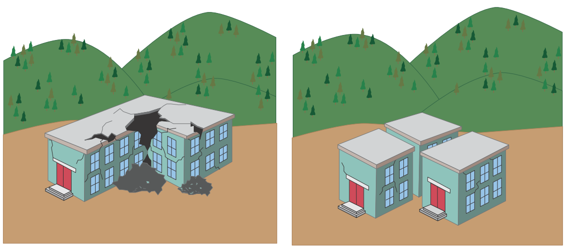
Following pre-design community consultation, design teams should develop preliminary design alternatives based on budget, performance objectives and community preferences.

The design team should develop feasible alternative designs that leave room for modifications. They should then communicate these alternatives to the school management committee and other stakeholders through culturally appropriate means. For some communities, artistic renderings may be appropriate. For others, simplified plan drawings may be closer to the way people discuss new construction. For some communities, oral descriptions and on-site visits allow stakeholders to visualise themselves in the new school better than drawings. Paper models of the building and their layout also help people understand the configurations.

The program manager should not forget community capacity-building during this process. As the design team describes feasible design alternatives, they should highlight how each design incorporates hazard-resistant design practices. Communities should understand how each design choice ensures their children's safety and access to education. Even when a community's aspirations for a school design do not initially align with hazard-resistant design decisions, conversations about schematic designs provide an opportunity to continue raising community awareness about hazards and the importance of prioritising safety. Discussing how the design achieves 'life safety' or higher performance objectives helps communities understand that schools and other buildings can be built to protect them. Although the approach may require several iterations of schematic design, the educational component of the process helps build a culture of safety within and beyond the school community.

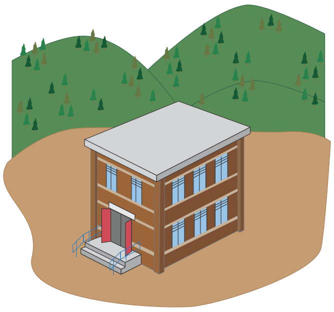
Safer school design principles

Community members can learn to identify some key hazard-resistant design choices, such as those shown here. Local builders will need more detailed guidance provided by well-qualified engineers (see *Resources for safer design* in the *Community Design Stage*).



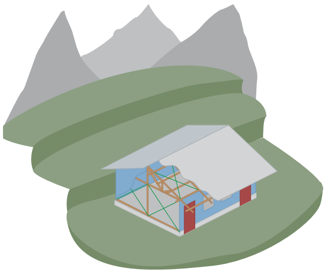
High winds and earthquakes: Buildings with irregular plans – long and narrow buildings, buildings with complex layouts – tend to be more damaged. Buildings with regular plans – square layouts or with gaps left between different wings of a building with complex layout – tend to be less damaged.

High winds: Designing buildings to have 'hipped' or flat roofs without overhangs and providing window coverings helps prevent high winds from blowing roofs off. Strong connectors between the roof and columns or walls are also necessary.



Earthquakes: Small window and door openings, placed at least a 1.2m from building corners reduce the likelihood that cracks forming at doors and windows will reach and weaken building corners. Buttresses or cross-walls reduces support walls so they do not fall over. Earthquake 'ring beams' that wrap around masonry buildings also help hold the masonry building together.

Safer school design principles



Earthquakes: Buildings with timber or steel frames need sufficient diagonal bracing to resist shaking and high winds.

Flood: Elevating buildings on top of piles or columns, or building on top of compacted earth, can raise the building above damaging floodwaters. Where elevation is not possible, using materials that can get wet is the next best option.

Safe evacuation: Clear passageways and exits, doors that open outward, and stairways with sturdy hand railings can help students and staff evacuate quickly and safely.

Key activity 3: Design finalisation

The last activity of the Design Stage is to finalise the design of the new school building. This task should be carried out by professionals, including a qualified engineer who can ensure the design adequately addresses natural hazard forces and meets the agreed performance criteria. Once the final design is developed, the design team should present it to the school management committee and community stakeholders. The design team should explain each key feature of the design. They should show how the design addresses the community's concerns and the goal of protecting students and staff. As appropriate, the design team may also discuss the cost and implementation schedule.

Detailed design may take several forms, depending on the policy context of the country:

- **Template design.** In many contexts, the MoE or a development actor may provide template designs that mandate specific dimensions and materials. Some even provide full structural design.

  When a project follows a template design, it may be pre-approved requiring no additional engineering design. This can simplify the design task. However, such template designs generally do not adequately address local site conditions and are not properly designed for all probable hazards. Beyond safety, these templates generally do not create inviting learning environments or appropriate adaptations for local climates. For example, the same standardised design could be incorrectly recommended for cold mountainous highlands and stifling tropical coastlines.

  When templates are available, the design team should modify the design as needed and seek appropriate approval. When the template originates from a development actor, professional engineers should approve the changes and indicate that performance objectives are met. Local authorities with responsibility for overseeing school construction should approve all designs, whether they originated from development actors or government agencies.

- **Direct design for standard materials.** In other contexts, design teams may separately calculate a new design for each project. The engineers responsible for design should ensure their calculations comply with local building codes and/or structural design guidelines. They should also seek design approval from appropriate authorities. Where local codes are inadequate, the engineer should comply with international codes or guidelines.

- **Direct design for non-standard materials.** In many development contexts, building codes may not cover local materials or vernacular construction practices. This situation occurs most often in rural and remote communities, where the construction practices are different from standard building codes, or where using materials required by codes is not feasible, impractical or unsustainable. In these cases, the design team and school management committee need to develop innovative designs that suit locally available materials and resources, with due consideration for structural safety in hazard events.

Once the design is finalised, the team should develop detailed construction drawings and specifications. These drawings and specifications may need to be developed in multiple formats – including standard blueprints, artistic drawings or cartoons of key elements – so school management committees can monitor or take part in the construction. Even if a local contractor is hired for the construction, he or she may need simpler versions of the drawings and specifications. Local communities may find scale models and cartoon drawings especially important when they need to use unfamiliar hazard-resistant techniques.

Considering non-structural building components

Non-structural building components – like wall coverings, interior and infill walls, architectural elements, stairwell guards and signage – are usually not part of formal structural design. Engineers may not give much attention to these building details. However, in earthquakes and high winds, these components can become loose and fall, or become high-speed projectiles that endanger students and staff. In high wind and earthquake zones, the design team should consider ways to secure these components or eliminate them from design. The program manager should ensure the school community learns how to reduce any remaining risks during the post-construction phase.

Key activity 4: Selection of construction management strategy

Different forms of construction management allow for various levels of community involvement. The school management committee and program manager, in consultation with the design team, should select an appropriate strategy and level of community involvement. The design team should also develop schematic and final designs based on the proposed construction management strategy. If the committee and program manager want high community involvement, the construction material used in design should be highly familiar so the school management committee and local tradespeople can easily understand the construction specifications. If the program manager elects to use a direct-build approach, materials and construction drawings may not need to deviate as much from international construction practices.

Moral responsibility for safety

Communities without formal training and professional experience cannot be required to take on the technical oversight and moral responsibility of ensuring schools are constructed safely. Ensuring safety remains the responsibilty of the implementing agency.

- **Community management: High community involvement.** School management committees may manage construction projects directly. This strategy assumes the committee oversees all construction management roles, including purchase of material, hiring of skilled tradespeople and unskilled labourers, and day-to-day execution. However, it is fundamental for the committee have technical support. A community leader without formal training and professional experience cannot be required to take on the technical oversight or the responsibility of ensuring schools are constructed safely.

  When this strategy is used, the program manager should ensure the school management committee has the support of qualified technical people, such as third-party engineers, as discussed in the Construction Stage. These people should provide technical guidance, ensuring construction monitoring is robust and that the instalments of funds are released only after monitoring shows the construction is compliant with the design.

- **Contractor management: Moderate community involvement.** Other strategies of community-based safer school construction engage the school community to a lesser extent. The program manager or school management committee may put the construction out for tender and select a contractor. These contractors are often community residents with professional construction management experience. The hired contractor carries out the construction of core structural components. A wider number of community members may participate in some construction tasks that are not directly tied to structural safety.

  The school management committee should still be part of construction monitoring and serve as a local reporting body for construction progress.

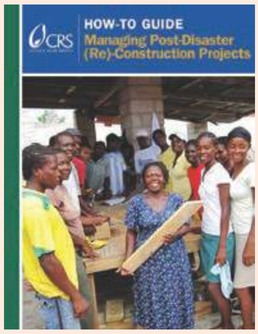
  In an alternative approach to contractor management, a school management committee may hire a local labour contractor but retain the responsibility of purchasing materials.

- **Agency direct build: Low community involvement.** In some situations, development actors or government agencies may retain considerable control over the construction process. They may hire the contractor or use trained in-house contractors. This strategy may be desirable when speed is essential, when they are managing a program with many school construction projects, or when community familiarity with the selected construction technology is particularly low (see *In context: Building back better in the Community Design Stage section* and the *Section 1 case study* on Haiti for examples of this approach).

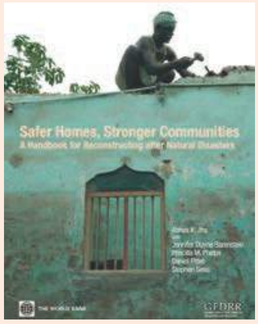
Even when a direct-build strategy is used, the program manager should retain some aspects of the community-based approach to maximise hazard awareness. Local community members may still provide a portion of unskilled labour to boost their income and build a sense of ownership. More familiar aspects of the construction should be subcontracted to local tradespeople if available. The school management committee and others should support the non-technical aspects of construction monitoring. These tasks should be selected in ways that build community familiarity with hazard-resistant construction and, ideally, enhance their capacity to use it in their community.

RESOURCE BOX

Resources on community-based project management



The 2013 Catholic Relief Services' *How-To Guide for Managing Post-Disaster (Re)-Construction Projects* provides detailed advice for and successful examples of owner-driven and contractor-built construction using a community-based approach. For each type of construction, the guide covers important topics such as procurement, tendering, scheduling, construction monitoring, payment procedures, project completion and required staff for successful construction projects.



Although focused on post-disaster housing reconstruction, *Safer Homes, Stronger Communities: A Handbook for Reconstructing Housing and Communities after Natural Disasters*, published by the World Bank and the GFDRR, offers an overview on project governance and accountability action plans. Such plans can support transparency and reduce corruption in large-scale construction projects.

Construction tasks communities can perform as unskilled labour

- Site clearing
- Drainage ditch digging
- Planting and landscaping
- Transporting materials
- Setting up classrooms
- Painting or surface finishings
- Reporting construction progress when appropriately trained

Local labourers install sacks of coconut husks in the roof for thermal and acoustic insulation. Photo: Jack Brockway.

Teachers and labourers are consulted during the design development of a prototype kindergarten school in Ghana to create local ownership and gain an appreciation of the local context to ensure an appropriate design solution. Photo: Arup & Sabre Trust.

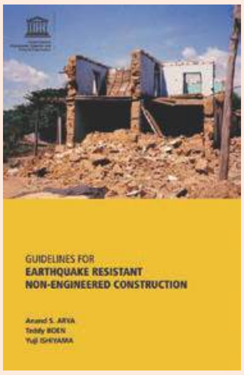
Teachers and labourers are consulted during the design development of a prototype kindergarten school in Ghana to create local ownership and gain an appreciation of the local context to ensure an appropriate design solution. Photo: Arup & Sabre Trust.

RESOURCE BOX

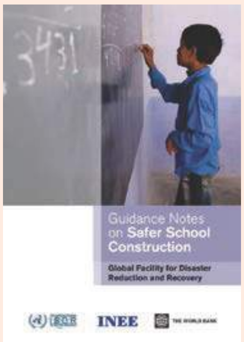
Resources for safer design

When national and international building codes do not cover the materials and construction techniques used in school design, design teams may find international construction guidelines that address several non-engineered construction system useful. All are available online; links are provided in the appendix.

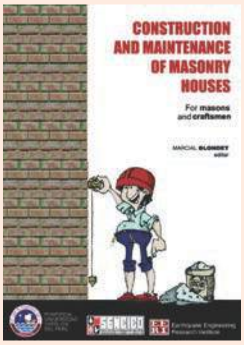
Guidelines for Earthquake Resistant Non-Engineered Construction, published by UNESCO in 2013, provides technical details for designing and constructing un-engineered buildings. These are buildings which are spontaneously and informally constructed without any, or very little, intervention by qualified architects and engineers in their design.



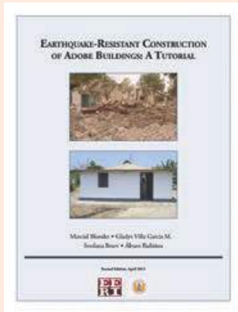
Guidance Notes on Safer School Construction, published by UNISDR, INEE and the World Bank, provides process guidelines and design principles for hazard-resistant school construction. Many aspects are relevant to community-based approaches.



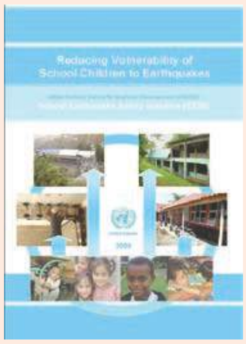
Construction and Maintenance of Masonry Houses for Masons and Craftsmen, edited by Marcial Blondet and published by Pontificia Universidad Catolica Del Peru, SENCICO and EERI, provides guidance on confined masonry, including information in an easy-to-understand cartoon format.



Earthquake-Resistant Construction of Adobe Buildings: A Tutorial, published by EERI/IAEE World Housing Encyclopedia in 2003, provides guidelines on adobe construction in seismic regions.



Reducing Vulnerability of School Children to Earthquakes, published by UNCRD, explores the use of community-based approaches to safer schools as a tool for community and regional development. It includes many case studies of projects that constructed safer schools and built local risk awareness and capacity.



The 2011 and 2013 *Compendia on Transitional Learning Spaces*, produced by UNICEF's education sector, provide on-site selection and building layout choices based on safety and child-friendly design principles. Many of these site selection, design and construction choices are also applicable to permanent school construction. Case studies provide architectual drawings and details about cost, materials and implementation at more than 20 sites affected by natural hazards and conflict.

Key considerations for the Community Design Stage

Safety	**Has the design team considered hazards that may not yet be represented accurately in building codes and available hazard maps?** Building codes and hazard maps may not be up-to-date. It is important to complete a site investigation before designing a school. Community stakeholders can help identify local hazards and provide a qualitative assessment of their severity and frequency. **Does the school design follow appropriate local and international building codes or guidelines for non-engineered structures?** National or international building codes may not cover local materials and construction practices. Many good practices have been developed through trial and error with traditional materials. These have been documented in guidelines for non-engineered construction. Even template designs should be modified to suit the local site conditions. **Does the design and configuration of the school buildings on the site take into account hazards?** Long and narrow school blocks, as well as those in L and T configurations, tend to be more heavily damaged in earthquakes. When buildings are placed too close together, they may also smash into one another, causing unnecessary damage. In floods, closely spaced blocks may channel water and increase soil erosion around building foundations. Careful layout of school blocks can reduce damage. Extreme temperatures can also be alleviated through careful design. **Will the local community help set the performance objectives for design and understand the risks the design does not address?** Some safer school designs may ensure the school will be "life safe" but heavily damaged in an anticipated hazard. Other safer school designs may reach higher standards, ensuring a performance objective of little or no damage in anticipated hazards. Communities should help determine the appropriate level of safety a school design will achieve. All should understand what damages may still occur and what risk the safer school design is unable to mitigate. **Will non-structural building components be secured to avoid posing a threat to occupants?** Design of non-structural components like parapet walls, veneers, partition walls and railing guards are usually not part of formal structural design. Earthquakes and strong winds can knock these components down unless they are properly secured.
Capacity building	**Do stakeholders understand the cost-effective strategies for safe designs of school buildings?** Community members may turn hazard-resistant construction down, thinking of it as costly and complex. Design teams can help communities understand that hazard-resistant construction means using materials effectively. Rather than pouring resources into large walls and foundations, simple changes like a higher portion of cement in concrete or shear ties with hooked ends can be more effective. **Does the local community understand design elements used to create hazard resistance?** Communities in remote regions or in informal urban settlements may design buildings through informal discussions with master builders. Sometimes there can be a distrust of engineers. However, they will need to understand the value of formal engineering design and be able to ask questions about materials, dimensions or construction techniques with which they have little familiarity.
Transparency and sustainability	**Will communities be able to make decisions about school design and layout that do not affect structural safety, both now and in the future?** Some design choices are limited to ensure school safety. Other design choices are a matter of aesthetics and preference. Communities should have full responsibility for making design choices that do not affect safety, such as the material for doors and windows, paint and wall finishings. They should also make some decisions about the school block layout. In the future, communities may want to expand or modify the school. These changes should be accounted for in the design and site layout. **Will communities be able to replicate the materials and construction techniques proposed in housing and small-scale commercial construction?** When techniques used in safer school construction are transferable to housing and commercial-sector construction, the safe school program can serve as a community learning opportunity. Local tradespeople should be consulted about the constructability of the design and the transferability of the construction techniques. New techniques, when coupled with risk awareness and training, are likely to be replicated, greatly extending the long-term impact of the program.

CASE STUDY

Sustainable design: Building from the ground up

Country: Republic of Ghana

Organisation: Sabre Charitable Trust, Arup International Development

Hazards: High winds, earthquakes, extreme temperature

Keywords: environmental sustainability, functionality, research, building trust, Ghana

Summary: Sabre Charitable Trust and Arup International Development incorporated local building materials and design preferences into kindergartens for Central and Western Ghana, paying special attention to sustainability principles. Through prolonged research and community interaction, the team created a design that used both modern preferences for concrete and local materials to create safer schools.

Country and hazard overview

With a rapidly growing population, Ghana's education sector has struggled to keep pace with demand. Nearly 30,000 public sector classrooms are in need of major repair and the country has a shortage of nearly 10,000 kindergarten classrooms.

In the country's decentralised system, the process of constructing schools often begins with a community parent teacher association (PTA) or elder petitioning the district assembly or district line ministry. The government body will then seek funds for construction, either from their own coffers or by identifying a development actor willing to fund or even oversee a school construction project.

Communities typically contribute to the building of public schools, providing in-kind labour, materials, or cash to support a hired contractor. Community elders may also attempt to monitor construction to ensure contractors meet contractual obligations, but safety remains a concern given the technical nature of construction.

One common problem is when the contractor fails to properly attach roof trusses to the building frame. Many schools have lost their roofs when high winds blow across the region; similar damage can result from seismic tremors present in the south of the country.

School construction: Incorporating sustainability principles into design

In 2008, Sabre Charitable Trust teamed up with technical experts from Arup to design and construct safe, affordable, replicable, maintainable and environmentally sustainable kindergarten buildings that met the needs of communities living in the central and western regions of Ghana.

In the design process, the first step was in-depth research about vernacular design and the local construction skills.

The design team ensured the materials were not just local, but also readily available, even checking in the local markets to see first-hand what was for sale. They also aspired to 'build from the ground up', meaning they were literally attempting to pull resources from the earth and incorporate them into the school building.

When local building practices and conventional materials were not likely to produce a safe building, the team turned

Innovative façade made using pivoting bamboo shutters to allow optimum amount of natural light and ventilation. Photos: Arup & Sabre Trust.

to research. They tested local building materials, focusing on the strength and durability of local soil-based materials. Some communities used soil to produce bricks but the quality of the soil and fabrication process varied. These and other local practices needed to be informed by tested engineering options that increased safety and durability.

Challenges: Perceptions of local materials

Convincing communities to build with soil and other local materials proved challenging. In Ghana, communities wanted to use concrete and other materials they associated with development. Building school buildings completely out of natural and local materials, and following vernacular practices, put the school at risk of being seen as undesirable. Rather than disregarding the community's notion of progress and pushing local materials for the sake of environmental sustainability, the team had to build trust over time.

The community saw some value in vernacular design but also wanted modern materials. The team opted for a compromise in material choice consisting of a concrete frame, with traditional materials like bamboo and stabilised soil blocks used as infill walls.

At first, the prospect of building with mud seemed dismal to community members. But after being trained on how to manufacture the blocks properly, which included sifting the soil and mixing it with locally available stabilising agents like portland cement and pozzalana, the community members saw the outcome as an improvement. The improved soil blocks became more desirable and proved stronger than the local concrete blocks. In addition, going through the entire process of design and fabrication gave the community a vital sense of ownership.

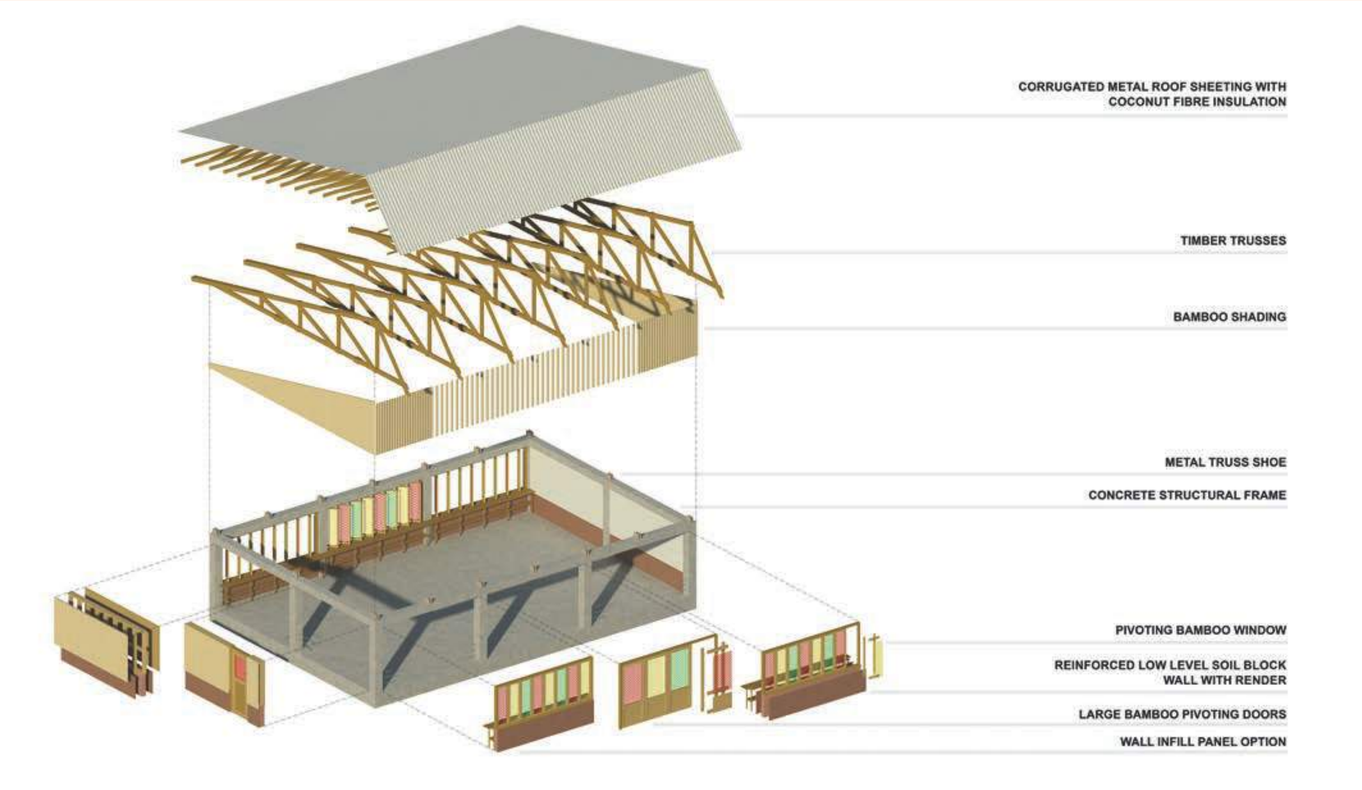
By using a concrete structural skeleton designed to resist seismic loads, infill walls could be made from renewable and locally sourced materials. This design feature and the concrete frame's modular form ensured the design was scalable and replicable. Locals were already erecting concrete frames, but the construction quality was poor. This provided an opportunity to increase local skills in creating vital structural components for future infrastructure.

The concrete was made from using locally sourced pozzolana – a mix of clay and palm kernels – as a 30 percent substitute for portland cement. Using locally available materials for the infill walls also increased the sustainability of the building and made it easier for communities to contribute to the construction process and do routine maintenance. The durable concrete frame is designed to bear the force of shaking, high winds or other hazards. This provided the team with an opportunity to use different or new materials for the works without fear of compromising safety.

Design specifications did not only focus on sustainable material choices. The design team went to great lengths to design the building for functionality. They created classroom layouts to meet performance-based criteria for daylight, temperature and acoustics. This provided a high-quality learning environment without the need for external energy. Every building element had at least two functions so that no materials were wasted and add-ons were unnecessary.

Key takeaways

- Be sure the design team has done in-depth research into local building materials, processes and aesthetics.
- Understand the gaps in safety that may exist in traditional building techniques or current practices.
- Develop sufficient trust to show communities they can improve and refine traditional building techniques.
- When appropriate, draw materials from the natural environment. Be sure to extract at a sustainable rate.



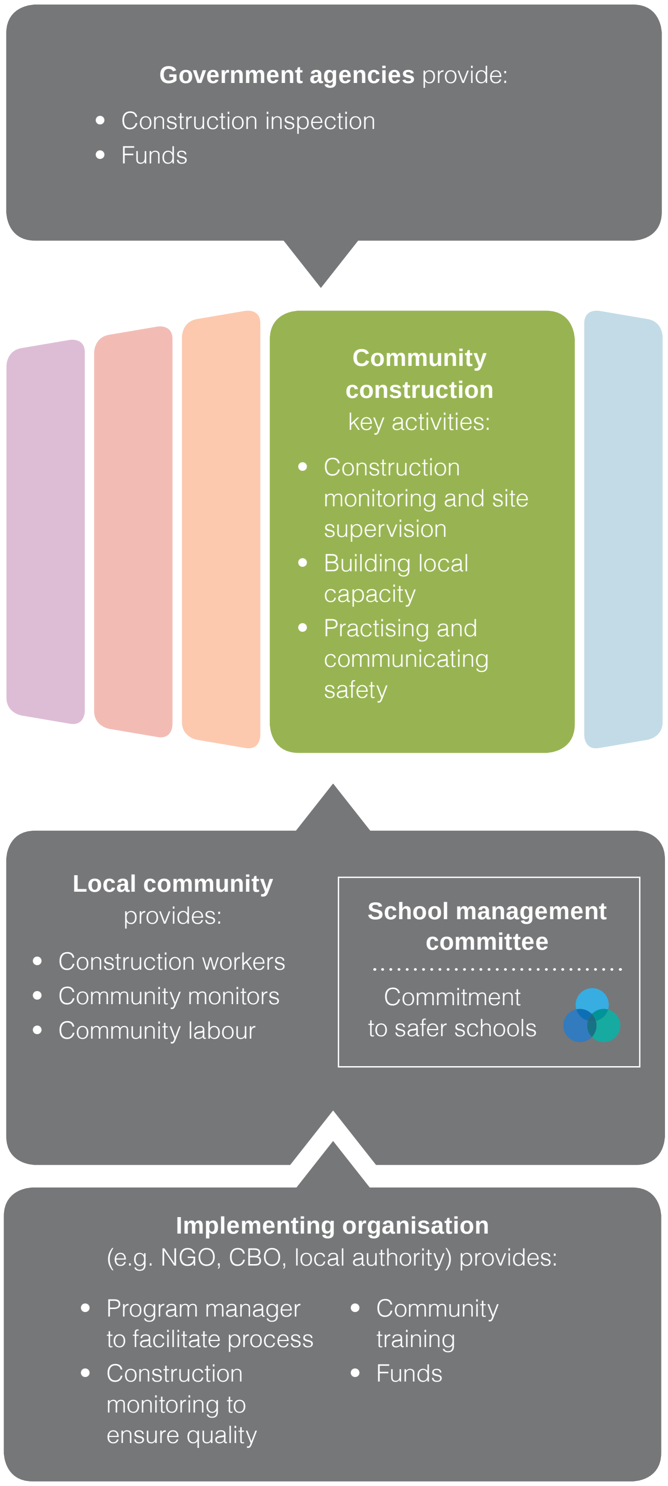
SECTION III: CONSTRUCTION

The Community Construction Stage

Community mobilisation, planning and design are important steps for producing safer school buildings. But when floodwaters rise, earthquakes shake or high winds blow, the physical construction matters most. Without quality workmanship and materials, the work of the previous stages is undermined. Good design, when poorly implemented, leaves schools highly vulnerable under normal circumstances, and especially vulnerable when hazards strike. To achieve good design and good construction, those doing the construction need to understand the design and implement it correctly using good quality materials. Effective construction management, drawings and specifications, adequate financing and availability of skilled tradespersons, and construction monitoring are important to achieve safe, quality construction.

In a community-based approach, construction must be carefully paired with an investment in training and a transparent process of oversight. Without these aspects, a community-based approach can quickly devolve into community-based unsafe school construction.

Community-based safe school construction must also be a transparent process. School management committees and community stakeholders should receive communication – through signage, public hearings and other communication mechanisms – about the status of the project and the steps to reach completion.



During the Community Construction Stage safer schools are achieved by putting a construction monitoring and site supervision process in place, building local capacity, and practising and communicating safety. The program manager facilitates training and ensures construction quality through independent monitoring. School management committees may also be involved in construction and monitoring.

IN CONTEXT

Building too fast

Keywords: speed, poor oversight, development, EFA

Community-based construction does not eliminate poor construction. In fact, if done quickly and without appropriate technical input, the results may be unsafe or unusable schools.

In one South-East Asian country, 400 schools were built in rural communities under the Education for All Fast-Track Initiative. The MoE, in partnership with development actors, initiated school projects across the country using a community-based construction framework. In their newly decentralised school construction process, the MoE provided practical design templates but tasked the districts with project implementation. The districts passed the responsibility to local communities who mobilised their members to provide much of the unpaid construction labour and construction materials, despite extensive poverty in the area.

The MoE provided little technical support or construction administration. Parents and grandparents of students had to decipher the technical design documents, often even though they had limited or no formal education. While they did know how to build their own homes, the school construction required using unfamiliar materials. Neither the MoE nor the district conducted regular construction inspections.

While the schools built by local communities were devoid of any reference to the rich cultural heritage of the country, at completion they appeared well built. However, many were later found to be structurally unsound and functionally deficient.

A team of engineers and architects hired to assess the schools after their completion found many were built in locations exposed to multiple hazards. Some were built near landslide-prone hills, and some had difficult or inaccessible pathways between the schools and villages.

In the Planning Stage, neither communities nor technical experts engaged in a hazard assessment and site inspection. Communities who were responsible for construction were not provided any training or oversight on why and how to build using hazard-resistant design and prevention techniques. Upon technical review of the completed roof structures, engineers found every school to be inconsistent with the technical drawings provided to construction teams. With such poor execution, the roofs would blow off in the frequent high winds or even collapse under their own weight.

Proper water and sanitation facilities were also lacking. All schools were built without running water and latrines. Without water, children could not wash their hands. Without safe latrine facilities, students were likely to contract worms, diarrhoea and other communicable diseases that could result in preventable illnesses, missed school, and even malnutrition leading to stunting.

The speed and scale of the project, coupled with a lack of effective technical oversight, created a poor environment for successful community-based construction. Immediately after completion, school buildings and roof structures had to be retrofitted to achieve minimal levels of structural strength, hazard resistance and functionality.

Key takeaways

- Although swift construction is valuable when communities lack schools, it cannot come before proper oversight and training.
- Community-based school construction may not be appropriate for every context.

School safety club members reach out to the community to teach risk awareness and to search for hazards that might affect the community. Photo: NSET.

Key activity 1: Construction monitoring

Observations of school damage in past disasters indicate school weaknesses were most likely due to the poor quality of workmanship and materials. Both factors are important in regular construction, but are absolutely essential in hazard-resistant construction.

The program manager needs to ensure that competent tradespeople are hired or that those who are hired have been given sufficient training.

Even with an effective training process, local tradespeople may lack the years of experience necessary to quickly pinpoint errors and know when a small adjustment can be made, when work needs to be redone, or when construction must be halted all together.

Even with sufficiently trained tradespeople, the material type and quality used in construction needs to be consistent with design specifications. Construction materials need to be verified on delivery. They then need to be tested to ensure they meet strength requirements and appropriately stored so they are undamaged when used.

- **Monitoring a site.** Program managers – whether from a development or government agency – are responsible for establishing and coordinating a robust system to independently monitor materials and workmanship. This usually means they need to hire a third-party technical expert to monitor construction, check the quality of workmanship and materials, and ensure design is compliant. If substandard work or materials are identified, the expert should suggest actions that avoid costly or time-consuming repairs in the future. While having this technical expert consistently on the construction site is ideal, at minimum they should thoroughly inspect the school construction at each key stage of the construction process.

  Day-to-day community monitoring can supplement the construction monitoring carried out by technical experts. The local school management committee and neighbours near the construction site are often most aware of the construction activities, especially when sites are remote and technical experts visit only periodically.

  An appropriate orientation on safe school construction can teach community members basic tips for identifying good quality materials and workmanship. They can tell when the contractor has stopped working for weeks, when masonry bricks crumble if dropped, when reinforcing steel is smooth rather than deformed, when timber boards are deformed, and when too much water is being added to a concrete mix. They may also be able to identify unsafe construction site conditions that pose a risk to themselves or the workers.

  In a community-based approach, unqualified community members – including the school management committee – should not be responsible for ensuring school construction complies with design and national standard. However, they should have the power to raise informed concerns and even halt construction when low-quality construction is suspected. A compliance checklist can greatly aid communities monitoring school construction sites (see the *Community Construction Stage case study*).

When to inspect

Local government offices are typically responsible for inspecting construction sites and verifying the construction complies with national regulations. Yet in many countries, government inspectors are overworked, under-qualified or both. They may not be able to verify that the materials and workmanship are to standard.

Program managers need to ensure qualified technical experts monitor school projects at key stages in the construction process.

Important inspection points include:

- **Site and foundation preparation.** An inspection at this time ensures the building has been sited according to plan, and that utilities and foundations have been properly laid.
- **Post-foundations.** After laying foundations, a check will ensure foundations have adequate strength and are placed at an appropriate depth.
- **Wall or framing.** Checks at this point ensure material strength, and that the wall and structural frame dimensions meet design specifications. It also ensures walls and framing are properly anchored to foundations.
- **Roofing.** This inspection point makes sure roofing and building exteriors provide specified weather-proofing and that roof structures are properly secured to walls or the frame.
- **Completion.** This final inspections ensures all aspects of construction are complete and the school is safe for occupancy

Monitoring is especially useful when it is conducted by a third party, preferably a qualified technical expert without financial or other ties to the construction team. When third-party technical experts verify the construction complies with hazard-resistant design before the next instalment of payment is released, it provides strong incentive for getting the construction details right (see *In context: Technical support and construction oversight in the Community Construction Stage section*).

Incentives for high quality

Raising awareness about construction quality should be part of the ongoing community development that began in the Mobilisation Stage. Community orientation about safe school construction should highlight the benefits of quality construction for the community and construction workers. Doing so will ensure:

- Enhanced reputation.
- Safety of students and staff.
- Longevity of the school building.
- Project remaining on time and on budget as work done right the first time does not need to be redone.

The telephone number of a 24-hour hotline service allows community members in West Sumatra to notify program managers of problems during a post-disaster reconstruction project. Photo: I. Boyd/CRS

- **Construction management strategy.** Good project management requires considerable skills in funds tracking, efficient record keeping, personnel management and scheduling. Training in these skills helps school management committees better oversee the school project and can increase their ability to manage, or support the management of, other development projects in their community.

  However, placing school management committees in this role may also place an unwarranted burden on them. In many contexts, the new skills acquired to manage the school construction project may never be used again. While in other contexts – such as where school infrastructure management has been decentralised to the community – the committee may use these skills repeatedly in the construction, maintenance and expansion of their school over many decades.

Key activity 2: Building local capacity

The Construction Stage provides a rare opportunity to invest in developing local construction skills through on-the-job training. In many contexts, the opportunity to enhance skills also extends to local technical specialists and government officials.

- **The importance of training construction workers.** Traditional skilled tradespersons in remote, rural and marginalised communities are often familiar with conventional construction techniques. What they can lack is experience of specific hazard-resistant details, such as special reinforcement detailing, joint connection and other techniques required for hazard-resistant construction.

  These skilled tradespeople and unskilled labourers need training programs that build their knowledge of hazard-resistant construction and enhance their ability to put these techniques into practice. They also need a broad orientation in hazard-resistant design principles so they can connect their technical construction techniques with the broader goals of safer school construction. Without the connection between technique and goal, local skilled labourers may assume a new technique is unimportant, too time-consuming or too expensive. As a result the local labourer may fail to fully implement the hazard-resistant construction techniques and unintentionally undermine the safety of the school.

- **Training local technical specialists and officials.** Local engineers and architects, including those who inspect construction for MoEs and MoPWs, may have insufficient knowledge of hazard-resistant design and construction.

  A community-based safe school program should, where necessary, also build the capacity of local technical specialists and government officials. These individuals can be invited to participate in parts of construction worker training or be trained to teach parts of these courses. They may be especially keen to learn how to test material quality and which aspects of a construction inspection are most crucial for ensuring safety.

Teaching new techniques

Local labourers learning new hazard-resistant construction techniques might not be easily convinced to change. They may be confident their own techniques are sufficient.

For example, concrete mixers may argue that increasing the cement ratio will make the mixture too stiff to place in forms. Steel reinforcement bar benders may complain that bending column reinforcement ties to a 135-degree hook will cause the bars to snap or will make them harder to place in forms. Each of these concerns needs to be addressed respectfully and the proper technique explained in terms of school safety.

IN CONTEXT

Women in construction

Traditional gender roles can be a barrier for capable women wanting to be involved in technical and non-technical aspects of construction.

Build Change, an American-based NGO, supports gender parity by actively hiring and training local women for technical assistance in their community- and homeowner-based construction programs. Often already proficient in their trade, Build Change trains these female engineers, architects and builders on hazard-resistant construction.

Build Change has found women particularly interested in spreading safe construction techniques to better their community, and they excel in training others on safer construction techniques too. Seeking self-employment, many of these women put their skills to work after disaster reconstruction. They become breadwinners and, in some cases, start their own businesses.

Reinforced concrete bands in a masonry school building are highlighted with bright white marks in Nepal. Parents now use these techniques in the construction of their own homes. Traditionally, the community built masonry houses without reinforcement. Photo: Bishnu Pandey.

Developing effective training

Training should be developed and implemented by appropriate technical experts with extensive experience in hazard-resistant construction. Technical experts should collaborate with potential recipients of the training – construction workers and technical specialists – to ensure the training adequately addresses their concerns and is tailored to their learning needs. The training should provide plenty of hands-on exercises and confidence-building activities.

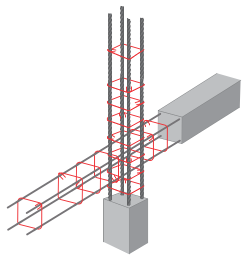
The development of training programs should take into account the local context and the intended recipients. Local tradespeople and unskilled labourers may only have basic literacy, and some may have none at all. Few labourers have experience reading technical drawings or understanding technical terms. Those who have a little experience with proposed materials and techniques may struggle learning the new concepts. Conversely, those with some experience may be overly confident in their abilities and reluctant to adjust their practice by incorporating unfamiliar hazard-resistant construction techniques.

Beyond teaching new construction techniques, training should support participants as agents of change in their community. In many communities, skilled tradespeople have the highest available construction knowledge in the neighbourhood. Their specialised knowledge, even when limited, places them in a position of extraordinary influence. They can strongly advocate for hazard-resistant construction in a way that their neighbours respect.

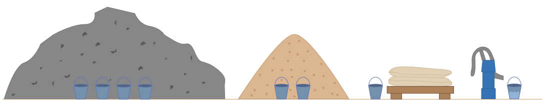
By building construction skills and building institutions for continuing education and development, these tradespeople can begin to promote hazard-resistant construction as part of their service, promoting a broader culture of safety in their communities.

Some hazard-resistant construction techniques

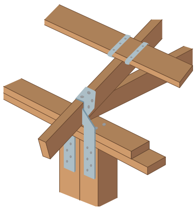
Some of the key hazard-resistant construction techniques that community members can learn to identify are shown below. Construction workers will need more detailed guidance provided by well-qualified engineers.



Earthquake shear ties: Reinforcing steel shear ties, shown here in red, loop around the reinforcing bars in columns and beams. The shear ties allow columns and beams to bend but not crumble apart in earthquakes. To be effective in earthquakes, shear ties need to be closely spaced where columns and beams intersect. The ends of the shear ties also need to be bent so they point inward at a 45 degree angle towards the center of the column or beam.

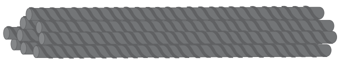


Concrete mix proportioning: Exact measurements of cement, sand, gravel and water ensures concrete mixed on-site meets design specifications.

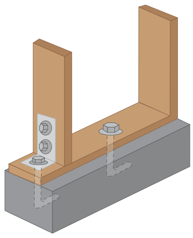


Tie-down straps: Simple metal straps that attach roof trusses to wall frames help keep roofs from blowing off in high winds.

Fire-resistant materials: Removing flammable vegetation on the ground and trimming lower branches of trees can lessen the intensity of fires near school buildings. Non-flammable metal or clay roofs can further protect schools as wildfires sweep across a site.



Deformed steel bars: When reinforcing steel has bumps and deformations, concrete grips to it better than when the steel bars are smooth.



Foundation anchors: Plates or bars connecting columns or walls to the foundation help keep a school building from sliding off its foundation in high winds, fast-flowing water or earthquakes.

Technical specifications for hazard-resistant construction are addressed in the International Building Code for many materials. For local materials not well covered by this code, see the guidance documents listed in the Resources for safer design box in the *Community Design Stage section*.

IN CONTEXT

Technical support and construction oversight

The NGO Build Change gives homeowners technical support for safe reconstruction and rehabilitation after disasters, in partnership with development actors and government agencies providing reconstruction grants to homeowners. Homeowners are in charge of aesthetics, home layout and functional features. This way, homeowners are able to use their reconstruction grants to suit their needs while Build Change ensures the home design and construction is safe.

During reconstruction, Build Change deploys an engineer from their local team to oversee key steps in construction. This includes design finalisation, laying the foundations, building key structural components and attaching the roof. After Build Change engineers approve each step, the homeowner is given another instalment of the reconstruction grant. If the construction is of poor quality, the engineer gives options to rectify the mistake but does not provide the next grant instalment until the mistake is fixed.

To give homeowners incentive to build safely, the grant must pay a large portion of construction costs. If only 30 percent of the money required to build a home is tied to Build Change's inspection process, the owner may forgo the grant and spend their own money on other design features. Similarly, the organisation has found that the last grant instalment must be more than 15 percent of the total grant. Otherwise, the homeowner may revert to cheaper construction techniques for the roof and undermine the safety of the building during high winds and earthquakes.

A local construction worker preparing the steel reinforcement prior to the pouring of concrete for a new school. Photo: Arup.

Essential elements of construction training programs

Disasters worldwide have helped technical experts hone in on hazard-resistant design and construction techniques for a wide array of local materials – including adobe, bamboo, stone and timber. Yet local tradespeople and technical specialists may not have access to these hard-earned lessons.

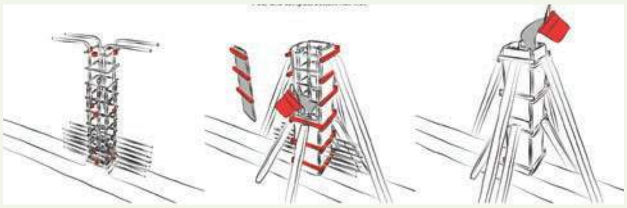
Illustrated construction manuals, especially when paired with training programs, transfer important lessons to communities. The reference manual remains in the community long after training is over and the safe school project is complete.

The most effective manuals:

- Provide a strong connection between hazard-resistant construction techniques and the outcome – safe buildings.
- Are based on local construction practice but teach adjustments necessary to achieve safety.
- Correspond to national building codes or international guidelines for good practice.
- Take into account local culture, climate, materials and economy.
- Address new and retrofit construction.
- Rely heavily, even exclusively, on illustrations, photos and visuals that construction workers with low literacy and without technical training can understand.

Construction manuals, and associated training, should be developed by technical experts in consultation with tradespeople in the target communities. The process should mirror that of community-based safe school construction. It should:

- Identify natural hazards to which the community is prone.
- Survey the construction practice of the community and identify weaknesses through engineering analysis or a review of past disaster damages.
- Propose modifications to current practice, seeking feedback though surveys and workshops with local skilled labourers.
- Develop multi-hazard safe construction guidelines and training manuals.



An illustrated construction sequence reminds construction workers how to attach concrete block spacers before building formwork. It also reminds them to pour and compact concrete in the bottom half of the column before forming and pouring the top half. When combined with construction-worker training, drawings like these can remind workers of the important hazard-resistant construction techniques they need to use on a safe school project. Graphic: Arup

An illustrated poster reminds Bangladeshi owners about key aspects of column construction and column-to-roof connections during post-disaster construction of transition shelters. Graphic: CRS and Caritas Bangladesh.

Key activity 3: Practise and communicate safety

Safer schools are an opportunity to both practise a culture of safety and showcase hazard-resistant building practices long after the school building is completed.

During construction, program managers should ensure appropriate health and safety procedures are in place to protect construction workers and the wider community. Fencing or other methods of securing the site should be used to protect community members, especially curious children, from dangerous construction conditions. Construction materials should be safely stored to protect people but also to ensure materials do not deteriorate or go missing. Community members can contribute to the construction by acting as security guards.

Workers should also understand and practise construction safety. Where needed, program managers should ensure they have training on health and safety risks and that construction managers, whether hired contractors or school management committee members, talk with construction workers each morning about safety. Because community members serve as unskilled labour on many community-based project sites, they may not fully understand the risks associated with the day's construction activities. Highlighting the risks and protective actions emphasises the importance of safety. The goal of a safer school is not relegated to the school building only. It is part of a culture of safety that goes beyond the safer school construction process.

A safe school building can communicate safety for years to come if labels and signage draw attention to its safety features. Ring beams and reinforcements around windows can be brightly painted and labeled as earthquake safety features. Braces used to connect roof trusses to walls can likewise be labeled as protective features against high winds. Signs on raised foundations can show flood or storm surge heights and how they keep schools above damaging waters.

The safe school construction site becomes a community-wide learning opportunity when posters and signs highlight key hazard-resistant construction techniques used.

CASE STUDY

Training masons to build seismic-resistant schools

Country: India

Organisation: India's national and state governments, UNDP, World Bank

Hazards: Earthquakes

Keywords: cascading training, rural and remote oversight, community oversight, large-scale

Summary: In 2006, the Uttar Pradesh State Government in India sanctioned a hazard-resistant design for a massive school construction project that aimed to build thousands of schools at the same time. At the time, there was government capacity but local capacity was low, creating a good opportunity to institutionalise a community-based approach. There were too few engineers to be present across thousands of construction sites and many of the schools were remote. This emphasised the need for community involvement.

Because thousands of schools were being built simultaneously, construction oversight was challenging. But the state government saw it as an opportunity to raise the capacity of thousands of communities through cascading training. By 2007, the state government, in partnership with UNDP and with a loan from the World Bank, constructed almost 7,000 seismically safe schools and 82,000 additional classrooms in Uttar Pradesh.

Country and hazard overview

The Indian subcontinent presses into the Eurasian tectonic plate in the north, causing India – along with other nations in the region – to have experienced many small and a few devastating earthquakes during the last century. After witnessing the pattern of earthquakes and other natural hazards that resulted in a series of abrupt but predictable disasters, SEEDS began working with communities, technical universities and government authorities in 1994. They helped communities retrofit unsafe schools and adopted strategies for reducing losses from future crises, using schools as a catalyst for community-wide change.

State-wide school construction program

In 2004, the Uttar Pradesh State Government was planning a massive school construction project in response to the widening education gap. At this time, the UNDP Disaster Risk Management Program (DRMP) as well as the Education for All (EFA) initiative were both underway at a national level. Some UNDP and MoE officials saw the school construction project as a chance for disaster risk reduction and decided to teach the MoE and state government about safer schools.

Influenced in part by devastation in the 2001 Gujarat earthquake – in which 15,000 schools collapsed – and two historic earthquakes in Uttar Pradesh, the state government decided to change their existing school design, which lacked earthquake safety measures. Under the DRMP the Indian Government created the position of National Seismic Adviser who was responsible for updating the existing design. Uttar Pradesh contained multiple levels of seismicity, but given the large scale of the project, the government decided to create a design suitable for the highest earthquake probability in the state.

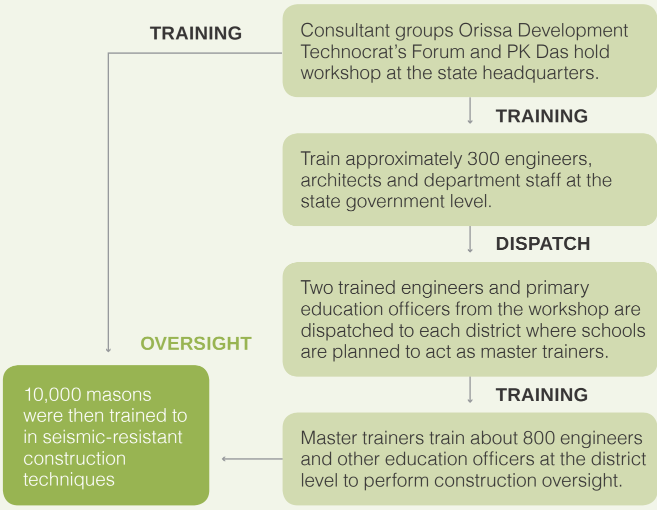
The National Seismic Adviser changed simple features in the school design to increase its seismic resistance. These included:

- Moving doors 60cms from vertical joints.
- Adding rebar to tie foundations and slabs together.
- Placing three horizontal 'earthquake' ring beams that circumscribe the walls (at the foundation, below the window, and above the window).
- Increasing the proportion of cement to sand and stone blast in the foundation.

After determining the changes would add an additional 8 percent to construction costs, the MoE entered a year of negotiations with the World Bank to increase their long-standing loan that had supplemented national and state funding for EFA. With funds in hand, the easy part was over. Now the state needed to train masons to build safer schools.

Challenges: Training masons and inspectors in safe school construction

In 2005, the MoE and MoPW organised a massive cascading training program to teach hazard-resistant construction techniques to their government engineers. These engineers then taught or supervised thousands of contractors and masons at the district level. Amid other DRMP activities, it took a few years to complete the training. In the process, the state government had to deal with a lack of knowledge and the staggering breadth of construction.



When Uttar Pradesh changed its school design to incorporate seismic-resistant features, the state needed to train masons in the new practices. Five-day trainings that included practice on a mock building taught one or two masons for each new school site how to construct earthquake ring beams in the walls. These trained masons then spread the knowledge to other masons on the construction site. Photo: Sanjaya Bhatia.

UNDP hired the consultants ODFT and PK Das to lead five-day trainings for masons in communities where new schools were to be constructed. The first portion of the training was a lecture to introduce masons to hazard-resistant construction and show them new techniques for earthquake safety. The latter portion of the training was the application of all-new, hazard-resistant construction techniques on a mock building, giving the masons a chance to translate the abstract theory into tangible practice. The mock building was only constructed to the window level and was left in the community as a reference for masons to recall what they had learnt. During the training, masons were paid their daily wages. Because of the scope of the project, only one or two masons were trained for each school construction site. However, they were able to pass their newly acquired knowledge to other masons working with them.

Tight quality control

Construction was overseen by trained engineers and implemented by the trained masons. Masons and a school oversight committee knew the stages that required engineering inspection, the criteria for approval, and the tests that would be conducted to ensure quality. Engineers monitored the masons as they poured the foundation, casted earthquake ring beams and placed the roof.

Yet with so much knowledge transfer over such short time, the Uttar Pradesh Government knew the application of the new techniques would be inconsistent and would need further oversight. To solve this problem, the team created a wordless manual with very simple pictorials to show villagers what should be present at the foundation and sill levels. The manuals also showed community members how to determine the quality of cement. Then, the village head was issued pre-stamped postcards with a checklist of poor construction practices. If there was no problem, the village head would send nothing back. But if the government received a postcard, it would immediately send a trained inspector to determine whether a mistake had been made.

Through this method, many errors were caught early, and several buildings were actually torn down after finding irreversible mistakes. If the constructor simply made a mistake, it was corrected. However, if the responsible party was corrupt, the constructor was blacklisted from future government construction projects.

By 2007, the state government had constructed 6,500 seismically safer schools and 40,000 additional classrooms. Programs of this scale only manifest when countries are attempting to fill large gaps in access to education. Even though programs on this scale are rare, they can be an opportunity to infuse new knowledge about hazard-resistant construction principles into communities and government agencies.

Key takeaways

- Countries addressing education gaps can institutionalise hazard-resistant construction into their rollout.
- Cascading training is an effective model for spreading new, hazard-resistant construction techniques to skilled tradespeople.
- During training, new construction techniques need to be tuned to the literacy level of skilled tradespeople
- Training programs should include hands-on practice so skilled tradespeople can apply new concepts.
- Postcard monitoring systems can supplement traditional construction inspection in rural and remote school communities.

Key considerations for the Community Construction Stage

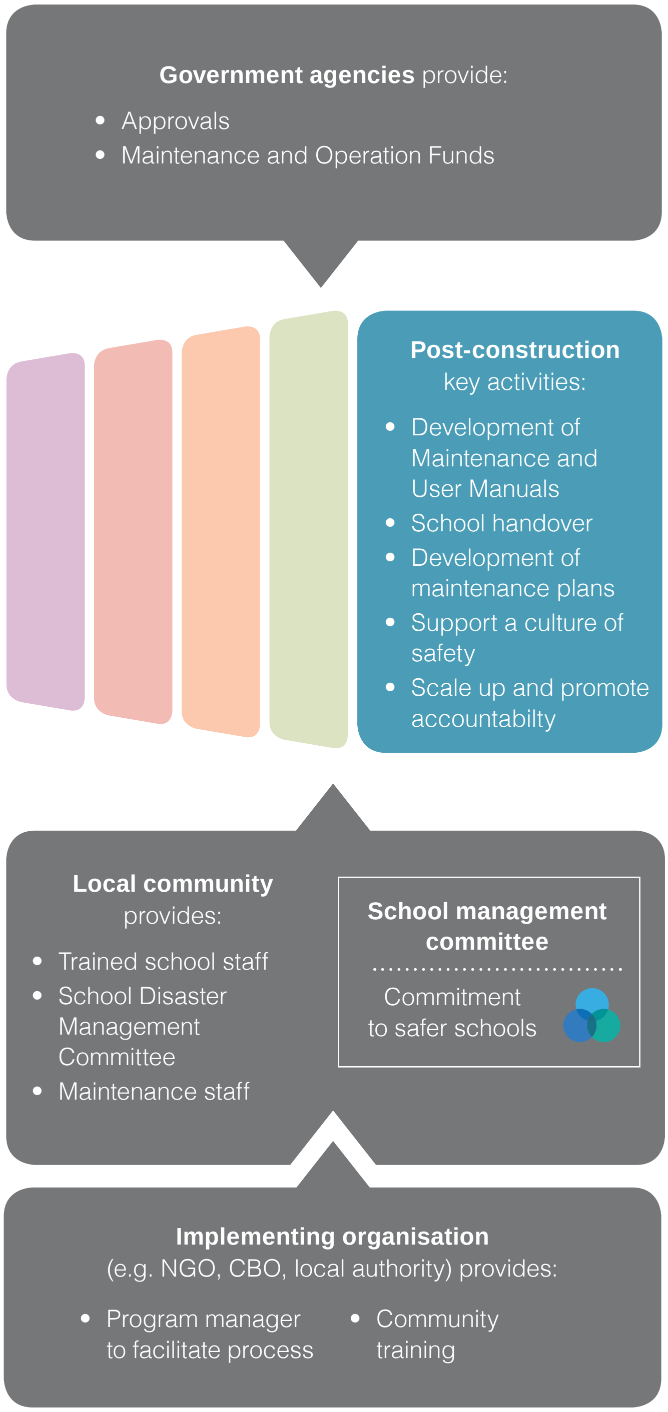
Safety and capacity building	**How will skilled tradespeople and local labourers gain sufficient training and practise in new techniques, so as to not fall back into traditional practices?** Skilled tradespeople and labourers who have engaged in construction for many years may struggle with new techniques. Training should include hands-on exercises and on-site apprenticeships to change behaviour. These techniques can be reviewed at the start of each construction workday. **What level of construction oversight will be needed to ensure construction follows the school hazard-resistant school design?** If the local community does not have appropriate technical experts who can monitor the construction process, the program manager will need to support an external construction monitoring process coupled with community monitoring. **How will construction safety be addressed?** Construction of safe school buildings includes safe construction practice. Workers should understand and practise health and safety procedures. The construction site should be properly secured and guarded to ensure community members, especially children, cannot injure themselves.
Transparency	**Do communities have a mechanism for monitoring construction and reporting problems?** Use of mobile technology makes it possible to have effective, daily construction monitoring. Community members, such as the school management committee, can instantly report problems or wrongdoings using SMS or other mobile technology. Inspectors or agency representatives can then be dispatched to the site. Yet while communities can support construction monitoring, they rarely have the expertise to ensure construction is in compliance with the design and national standards. It is the program manager's duty to ensure construction compliance. This is typically done through a system of third-party construction monitoring. **Is the transfer of funds sufficiently tied to independent construction monitoring?** Accountability on the construction site is crucial for school safety. Payment for the next stage of construction should occur only after an independent inspection shows that construction meets the design intent and is of high quality. Be sure all stakeholders – construction workers, the school management committee and the program manager – agree on what requirements need to be met for payment at each stage and who will certify that these requirements have been met. Field experience shows that withholding the last 15 percent of the contract until the final inspection provides sufficient leverage, even during the last stage of construction when roof connections and other important activities are completed. **Can the hazard-resistant features that will be incorporated into the school be displayed for site visitors using signs or even a small model of the school?** Orientations can educate the wider community about hazard-resistant construction techniques and explain how these techniques can be transferred to other projects, such as housing. Construction site displays can help visitors and students review safety concepts as they watch the school building take shape.
Sustainability	**What strategies are in place for recognising and rewarding skilled labourers who become trained in hazard-resistant techniques during and after the project?** If trained tradespeople are not properly recognised or motivated, they may not continue hazard-resistant construction techniques. Certifications and support in promoting their new skills can encourage their continued use of the techniques. **Can hazard-resistant features in the schools be highlighted or remain visible to the community as a reminder of the school's safety features?** Painting braces, connectors and ring beams bright colours or labelling these hazard-resistant features can turn a safe school into a permanent teaching tool on hazard-resistant construction.

SECTION III: POST-CONSTRUCTION

The Post-Construction Stage: School operation, maintenance and safety

Once construction is completed, school communities have the opportunity to take on a larger role in school safety. Efforts shift towards maintaining the building and grounds, as well as investing in a more holistic culture of safety through Pillars 2 and 3 of the Comprehensive School Safety Framework. A community-based approach to safer school construction can catalyse initiatives for broader school safety – tasks for which school management committees and staff, parent-teacher associations and students have partial or full responsibility.

As construction nears completion, the person(s) or contractor responsible for construction must develop maintenance manuals for the school handover. Government agencies need to integrate the school in their system and provide resources for operation and maintenance. Program managers also have a role – they should ensure maintenance manuals are produced and disseminated appropriately and that the school community has the capacity to effectively operate and maintain the school before they disengage. At a strategic level, the implementing actors should assess successes and challenges in the construction process, looking for ways to further perpetuate school safety.



During the Post-Construction Stage, manuals and plans for maintenance are formalised and program managers hand the school over to communities. At the school level, school management committees foster a broad culture of safety founded on comprehensive school safety. At the programmatic and strategic level, implementing organisations and government agencies work to scale-up safer school construction.

Key activity 1: Development of maintenance and user manuals

As construction draws to a close, attention should turn to maintenance and future use of the school. The design team and construction workers best understand the building materials and structural system. They should draft a schedule for maintenance. For example, how often the roof cover should be repaired or replaced, when to re-plaster or paint walls, when floors and windows may need replacements, and how often latrines need to be emptied. While the maintenance manual may be an extensive reference document, the school management committee needs simpler checklists so that maintenance staff can perform routine work and school staff can monitor maintenance activities over time.

Maintaining safe schools incur costs. When MoEs or MoPWs oversee school maintenance, school management committees should establish the maintenance schedule and determine what funds, from which sources, will be allocated to these activities. Government agencies may seek to coordinate the school maintenance with other sites to increase efficiencies and cost savings across their jurisdiction.

Also needed are user manuals, covering permissible usage and alteration to the building. For government-run schools, usage is typically the responsibility of the MoE or their district offices. These agencies need to indicate if the building can be used as shelter in times of crisis or for community activities after school hours.

The government authority should, in consultation with the design team, also specify which aspects of the building and grounds the school staff can alter without seeking further approval. As needs change, staff may naturally want to modify the school but such actions can seriously endanger the lives of students and staff. Adding or removing doors, walls, floors, columns and beams is particularly concerning. Changes to the site, such as removing vegetation, can also alter drainage or increase erosion around school foundations. The user manual should stipulate when modifications need approval, technical review or both.

The user manual serves as the written, institutional memory for the school building and grounds. As such, it should include any results from the site investigation and hazard assessment completed during the Planning Stage. If alterations are made, the manual should be updated to reflect the changes.

Key activity 2: School completion and handover

The completion of a safer school should be a community-wide celebration. These projects are not merely about the construction but also about strengthening a community's ability to engage as equal partners in their own development and in providing a safer and more resilient community for their children.

Commemoration of the completion of a safe school should go beyond thanking donors and welcoming students. It can and should be a time where the safety of the structure is noted and the community acknowledges the decisions and actions that led to this safety. The message of the commemoration should clearly focus on how safety-conscious choices about site, design and construction resulted in a school that protects children and remains an educational resource even after a disaster.

The handover has both legal and celebratory aspects:

- The contractor should first hand over the school to the contract holder – the implementing actor funding the school construction – by submitting a completion certificate. The contract holder should sign the certificate after ensuring the work is completed to the desired standards.

  Where the community has been heavily involved in the construction process or community monitoring, the completion certificate signing should be an important event where all acknowledge the effort and dedication needed to complete a safe school. Safety features of the school should be identified through guided tours or photo presentations. Ideally these features should be permanently highlighted and notated so the community has a constant reminder of safety.

- When the contract holder is not a government agency, the completed school should then be passed to the appropriate local government agency for formal steps to open the school. The agency needs to add the school to national and sub-national databases and task local emergency services with reviewing the school and integrating it into their disaster management procedures. On the operational side, the government agency needs to assign students and staff to the site and provide operation and maintenance funds. School boards or other oversight committees may also need to be established or ratified.

- The final handover is to the school community – to the principals, management committees or school boards. As they begin operating the school, they should continue maintaining the commitment to safety that began with the construction of a safe school building. They should define the roles and responsibilities for monitoring deterioration and repairing it. They should also complete any non-structural mitigation needed to protect students and staff from the dangers posed by the school's interior contents.

  To maintain safety during operations, the school staff should also address Pillar 2 and 3 of the Comprehensive School Safety Framework. They should establish a standing committee and give it the task of coordinating school disaster management with key internal and external stakeholders.

Non-structural mitigation

Even when a school building is safe – when it has been designed and constructed to withstand hazards – its interior contents can injure or even kill students and staff. School management committees and older students can identify these hazards and reduce risks.

- Heavy furniture can be secured to walls.
- Cleaning and laboratory chemicals can be placed in locked cabinets or containers that hold them tight.
- Handrails can be installed along stairwells.
- Fire suppression equipment can be strategically placed throughout the building.
- Large kitchen equipment can be bolted to floors or walls.
- Light fixtures can be secured with wire to ceilings.
- Computer equipment can be strapped to tables or secured on floors.
- High shelves can be installed for fragile educational materials to be stored during flood events.

School completion ceremony of Cirateun Primary School, Bangdung, Indonesia. Photo: Bishnu Pandey.

Key activity 3: Development of a maintenance plan

In order for community-based schools to remain safe over decades of use, a maintenance plan must be established. Ideally, this plan should have first been discussed in the Planning Stage and only needs to be reviewed and finalised.

Program managers should support the school management committee in understanding how maintenance protects and extends the safety of the school building. Government agencies with school oversight responsibilities should provide appropriate funding mechanisms. The school management committee should establish a maintenance plan that defines roles and responsibilities for maintenance on a routine, seasonal and annual basis. Those responsible for maintenance should be trained in how to carry out their responsibilities.

Strategies for community-based maintenance of schools with minimal resources

While government agencies are typically responsible for funding maintenance, allocation is often woefully inadequate. School communities may need to develop strategies for supplementing government allocations.

- Establish an annual 'safe school' day where students and families play an active role in assessing and repairing the school premises.
- Have older students provide ongoing monitoring as a classroom activity.
- Use World Disaster Risk Reduction Day – on 13 October – to review school safety and address problems.
- Use a Community Work Day – a day when people give voluntary labour for activities that benefit the wider community – to support school maintenance.
- Establish income-generating activities with oversight by the school management committee and use these funds for maintenance.
- High shelves can be installed for fragile educational materials to be stored during flood events.

SCHOOL MAINTENANCE PROGRAMME ORGANIZATIONAL STRUCTURE	
Name of school:	Date of inspection:
Name of community:	Name of person who filled out the form:
Area	Person Responsible
General Coordinator	
Fund-raising	
Structure team	
Roofing team	
Building exterior team	
Building interior team	
Plumbing team	
Electrical team	
Ground team	
Furniture and equipment team	

Checklists, such as this excerpt from a maintenance manual for school buildings in the Caribbean, can help staff maintain buildings and ensure the safe school remains safe after construction.

Key activity 4: Support for a culture of safety at school

Safe schools, especially those built through extensive community participation, are the physical symbol of a community's commitment to their children. These commitments need to be remembered and renewed regularly.

To achieve and maintain a culture of safety within and beyond a school, communities should create opportunities to proactively remind themselves about school safety. The possibilities are many and ripe for creativity and student leadership.

- **Safety committees and clubs.** Under staff guidance, students can form safety clubs to regularly discuss and address school safety. Students can be quite competent at identifying non-structural hazards from a checklist and can even participate with school staff and community members in maintenance audits. However, students should not be made responsible for assessing or addressing structural safety as they do not have the formal technical training required to do so effectively.
- **Disaster risk reduction curriculum.** Geography, science and social studies offer good opportunities for introducing hazard awareness and safe construction concepts. As part of their assignments, teachers can have students explore how hazards are avoided or safely accommodated in their community. Students can identify hazard-resistant features of their school and interview maintenance staff about how ongoing repairs continue to protect the building.

In Nepal, youth organised a student summit in 2012 and invited students from other schools to join. Together they held a rally to raise awareness about natural hazard risks and disaster risk reduction. Photo: NSET.

Students in Nepal work on different building models for earthquake-resistant design. Photo: Bishnu Pandey.

- **School safety events.** Students can hold youth safety rallies, inviting other schools to come and participate. These events can be days for students to voice their desire for safer schools to each other and the wider community. Parent-teacher associations can organise welcome events that orient incoming families to the school's commitment to safety. Students, parents and staff can annually review and revise a community hazard map and evaluate how changes have affected their school site.

Key activity 5: Scaling up and promoting accountability

Even as school communities need to continue their commitment to safety, implementing actors need to build on good practice. They should identify successful examples of safe school construction and enhanced community capacity.

To scale-up and promote safer school construction, humanitarian and development organisations should:

- **Make a public commitment.** Commitments to safe school construction affirm children's right to safety and education. These commitments also acknowledge the organisation's moral duty to ensure every school built or retrofitted is safe.
- **Educate funders.** Proactive aid is more valuable than reactive aid. Organisations should educate donors to be more nuanced in their expectations. Rather than count classrooms built with donor funds, donors should learn to count only safe classrooms built and insist on appropriate auditing practices that verify this safety.
- **Share lessons learnt.** Organisations should document and share lessons learnt in community-based school construction, especially noting how decisions at each stage impact school safety and community capacity. When innovation emerges, they should pilot these new ideas and scale-up successful projects elsewhere. When failures occur, they should analyse the problems and identify necessary changes.
- **Enhance internal capacity.** A commitment to every new school being a safe school means a commitment to knowing the extent of one's expertise. Organisations should work with external experts to identify their own limited capacity and, where appropriate, develop training to build it.

In addition to these actions, government agencies should also:

- **Establish policy tools and mechanisms for regulation and funding.** For communities to manage or build safer schools, government agencies should provide communities with appropriate technical support during all stages of the process. They should also ensure funding and accountability are tailored to a community-based context and should develop targets and indicators for monitoring progress toward safer school construction (see the *Decentralisation of school construction case study* in *Section II*).

IN CONTEXT

Working towards a culture of safety

Nepal is a multi-hazard state. Many development organisations and the MoE and MoPW have spent more than two decades educating the Nepalese people about the inherent dangers of their homeland. Because of annual awareness exercises that are maintained with multilateral coordination, the people of Nepal have begun to invest their own money and resources into retrofitting projects. In Nepal, the government provides anywhere from 40 to 75 percent of school retrofit funds. The rest is up to community education programs and their ability to collect community contributions.

In regions where private and government engineering capacity is not sufficient, community assets supplement the MoE's efforts to complete projects. Nepal's MoE along with the NGO National Society for Engineering Technology (NSET) have trained masons, bar benders, engineers and architects in hazard-resistant design and construction. At the same time, they have exposed school staff, parents, students and other community stakeholders to basic disaster risk reduction principles. They hold shake table demonstrations, bring engineers to schools and celebrate Earthquake Safety Day.

Key considerations for the Post-Construction Stage

Safety	**How will the safety of the school be maintained through years of operation?** School staff may want to make substantial changes to the safer school years, even decades after construction. Some changes, such as adding classrooms, removing walls or adding doors and windows, may affect the structural integrity of the building. User manuals and maintenance plans can help clarify which changes require the approval of qualified engineers and what ongoing maintenance is needed to preserve the safety of the school. **What special events, curriculum and committees can be developed to highlight the school site as an example of safer school construction?** A safe school should remain a permanent teaching tool for safe construction and disaster risk reduction in the community.
Capacity building	**What training or support does the community need to execute routine maintenance?** The staff charged with routine school maintenance may not have been part of school construction. They will need to be trained in the hazard-resistant features of the school so they understand how best to maintain them. Maintenance schedules can help automate routine activities. **What training or support does the community need to conduct non-structural mitigation?** In earthquake zones, school staff and students should secure non-structural hazards – heavy furniture, flammable materials, and important equipment that could fall, break or injure occupants during earthquakes. In flood zones, evacuation plans should include securing loose items, covering windows, bracing doors and elevating education material that could be damaged in floodwaters.
Sustainability	**How will all stakeholders reflect on, share and build on good practice and lessons learnt?** Agencies implementing community-based school construction should make a public commitment to safer school construction. This requires a regular process of evaluation and donor education. Lessons learnt should be shared and internal capacity should be built. **What agreements and funding are in place for school maintenance, use and alteration?** A safe school can easily become an unsafe one through lack of maintenance or dangerous alterations. While maintenance is a routine aspect of operations, without a sufficient funding stream, it will be postponed and the school will slip into disrepair. At completion, stakeholders should draft maintenance and user manuals. They should also establish roles, responsibilities and funding for routine maintenance and safe building alteration.

CASE STUDY

Leveraging for comprehensive school safety

Country: India

Organisation: SEEDS, Nayang Technical University, Ministries of Education and Public Works, Temasek Foundation

Hazards: Earthquakes, flash floods, landslides

Summary: This project was created to sensitise communities in earthquake-prone regions of India by engaging the community, partnering with the local government, training engineers and masons, and providing necessary retrofits to schools. Although the number of retrofitted schools was low, SEEDS spent more than a year in each community in an effort to change the culture as well as increase the safety of the school building. Newly trained local masons retrofitted schools while engineers provided oversight during the process.

Country and hazard overview

The Indian subcontinent presses into the Eurasian tectonic plate in the north, causing India – along with other nations in the region – to experience many small and a few devastating earthquakes in the last century. After witnessing the pattern of earthquakes and other natural hazards that resulted in a series of abrupt but predictable disasters, SEEDS began working with communities, technical universities and government authorities in 1994. They helped communities retrofit unsafe schools and adopted strategies for reducing losses from future crises, using schools as a catalyst for community-wide change.

Creating a culture of safety

In a retrofit pilot project spanning the three Indian provinces of Himachal, Gujarat and Assam, the NGO SEEDS used the retrofitted schools as focal points to organise the community around comprehensive school safety. They especially focused on Pillar 2 – school disaster management. Each state is in a moderate to high seismic risk zone and has a history of disasters.

To effectively build community buy-in, SEEDS held basic orientations at schools to create awareness about comprehensive school safety. These orientations were a necessary primer before retrofitting but were also necessary for explaining the school community's role in school safety even after the retrofit was complete. The school community would be responsible for operating and maintaining the retrofitted building, performing non-structural mitigation and regularly conducting school disaster management activities. In conjunction with mason training and other mobilisation activities, this phase often took six months. SEEDS expected the school retrofit and the school disaster management activities with the school communities to serve as a channel for promoting a culture of prevention and preparedness in the local community.

The retrofit of schools in Shimla, India is part of a broader comprehensive school safety approach. After retrofitting is complete, the school and wider community engage in a mock drill to test their preparedness. Photo: SEEDS.

After a school was retrofitted, SEEDS facilitated trainings in disaster preparedness for community members, school staff and students. The trainings included search and rescue, fire safety, first-aid, safe evacuation and mapping contingency plans. Students were also trained in 'duck, cover and hold' methods in case of earthquakes and safe evacuation. Special training was also provided to school staff to create a school disaster management plan. Together, the school retrofit and the accompanying 'soft' activities with the school community were expected to serve as a channel for promoting a culture of prevention and preparedness in the local community.

SEEDS then formed school disaster management task forces based on the trainings, which were divided into functional groups. These were search and rescue, first-aid, fire response, and a group to connect with the local government offices. The task force members included representatives from local leaders, parent-teacher associations and school clubs.

Establishing a Joint Action Plan

After the school community became aware of disaster risk reduction principles, SEEDS established a Joint Action Plan, which connected the school task force with the larger community. They performed outreach to ensure the wider community knew the school could be a gathering point in a flood, earthquake or other sustained hazard. By strengthening this connection, SEEDS was attempting to ensure the community benefited from the training and disaster management planning at the school.

Even though the school was likely to operate as a safe haven and school task forces would take leadership roles during a disaster, SEEDS also taught communities emergency preparedness skills and basic hazard knowledge in case the school became incapacitated.

The Joint Action Plan was designed to help the task forces react to disasters as well as proactively protect children during their routine interactions with school. One proactive measure included consistent updates for parents on the whereabouts of their children. Disaster or not, if a bus was late, parents were sure to get a call explaining why.

For the school communities, the experience culminated with a large mock drill where the school, fire department, the hospital and local government played the part they would function in a real emergency. SEEDS identified mock earthquake drills as the most useful exercise for students, staff and communities to check their preparedness levels. They encouraged the local government to mandate the mock drill to ensure everyone participated.

After being given a predetermined signal, students responded with 'duck, cover, and hold' as they had been taught during the disaster preparedness training. They then evacuated the school buildings following the practice of 'don't run, don't push, don't talk, don't turn back'. Students left the building by class and organised at a set assembly point.

Realistic conditions involved certain students that were 'trapped' in the school or generally missing. The Search and Rescue task force then had to respond by finding the missing people and providing aid. If the missing students were injured, they would be connected with the hospital. It was not just the adults that role-played. Students also practised their response skills, identifying damaged buildings, rescuing each other, performing first-aid and putting out fake fires. The mock drills were both realistic and exciting.

The biggest challenge for the students was to evacuate quickly and to establish coordination among the task forces. However, they became more efficient through multiple practices of the mock drill.

Overall, the process of engagement, retrofitting and practising mock drills took a full year. On completion of the project SEEDS handed the project details – including the disaster management plan, guidelines for retrofit and other project details – to the local education department for implementation in other schools. The governments in several provinces have adopted the initiative for wide-spread replication.

Key takeaways

- Safe school construction should be integrated into a comprehensive school safety program.
- Non-structural mitigation is an integral part of Comprehensive School Safety, and a part in which students and staff can actively participate.
- Safe school construction projects provide impetus for engaging communities in school disaster management.
- School mock drills, especially when coordinated with the wider community, can provide good opportunities for practice and affirmation of a culture of safety.

In 2011, officials from Shimla's police, education and public works department meet with the SEEDS project manager during an advocacy workshop. Photo: SEEDS.

Some resource documents

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