MAKING THE ECONOMIC CASE FOR SAFE SCHOOLS

Plan

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Front cover: Children in Cambodia practise an emergency simulation exercise

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Executive Summary

Children are one of the most vulnerable groups to the impacts of disasters – they typically represent 50-60 percent of those affected. When a population at risk is predominantly children, each death represents an entire lifetime of lost life and productivity, and therefore the economic gains of protection are going to be very high. One of the most systematic ways to protect children is to protect their education – safe schools include measures to protect children's lives by building safe infrastructure, as well as educating children around early warning, evacuation, and wider disaster risk reduction.

The purpose of this report is to investigate the economic argument for investing in safe schools. The report specifically looks at evidence around the three pillars of the Comprehensive Safe Schools Framework (CSSF), namely: 1) safe learning facilities; 2) school disaster management; and 3) risk reduction and resilience education.

The interventions under the CSSF are designed to complement each other, and are likely to result in a variety of quantifiable benefits that help to make the case for greater investment in safer schools, namely avoided infrastructure reconstruction costs, reduction in lost lives/injuries, reduction in lost school days, and wider risk reduction benefits. However, the evidence for these impacts is surprisingly slim. Broadly speaking, the following lessons are taken from the literature:

- **Retrofitting is often going to be the most expensive solution and can be very cost ineffective.** This is particularly true when compared with the cost of other life saving interventions for children. Therefore, retrofitting should be prioritised for schools that are in a high risk area and that are highly vulnerable. Rather, investment in safe school structures should heavily focus on improved building code and better site selection for new schools.

- **Pillars 2 and 3, which focus on school disaster management and risk reduction education, are likely to be a more cost effective approach to safer schools and should be prioritised.**

- **Focusing on the whole child may be the best way to ensure educational outcomes.** Educational outcomes are impacted by many factors – some of the determining factors for education in emergencies relate to income, credit, and health status. Therefore safe schools programming can usefully incorporate measures that focus on the whole child as the evidence suggests that this in turn is strongly correlated with improved educational outcomes in emergencies.

1. Introduction

1.1 A Child Centred Approach to Risk Reduction

Children are one of the most vulnerable groups to the impacts of disasters.

Disasters have a direct and disproportionate impact on children and the fulfilment of their rights. For example:

- By the end of the decade, up to 175 million children are likely to be affected every year by the kinds of disasters brought about by climate change[1]. This is an increase from an estimated 66.5 million children per year in the late 1990s[2].
- Children face heightened protection risks during disasters, including psychological distress, physical harm, trafficking, exploitation, child labour and gender-based violence[3].
- Disasters have detrimental effects on the fulfilment of children's right to education. Approximately 875 million schoolchildren are living in high seismic zones[4] and hundreds of millions are exposed to regular floods, landslides, and extreme wind and fire hazards.
- Twenty-eight million of the world's 61 million out-of-school primary-school aged children live in conflict-affected poor countries, while enrolment rates in secondary schools are nearly one-third lower in conflict-affected countries compared with other developing countries[5].

While children are the most vulnerable to the impact of natural disasters, many of the methods to decrease their susceptibility are widely known and low-cost. A child-centred approach needs to be prioritised in disaster risk reduction as children are impacted in sudden disasters and chronic crises. Impact includes the inability to attend school, a greater risk of morbidity and mortality, and psychological and social implications. Children miss school because they are sent out to work, help out with household activities, or are too weak to attend. Physical injury and inaccessible roads also prevent children from attending school. Psychological and social implications include separation of parents, loss of family members, or tension over resources. A sound economic argument also supports a child-centred approach. Since children are one of the largest groups at risk, there are potential economic gains from targeting this group as skills taught to children, such as evacuation, contingency planning, and first aid, as well as longer term disaster risk reduction measures, are developed across a larger population group and over a longer period.

In order to develop these skills, education is vital. Education plays a unique role in disaster risk reduction because, while disasters affect this sector, education also has the ability to decrease disaster losses. It provides the public with greater awareness and youth with critical thinking skills and wider capacity building. By increasing public awareness, individuals have a better understanding of their roles and responsibilities in disaster risk reduction. Critical thinking skills allow youth to make

1. Save the Children (2006) Legacy of Disasters http://www.savethechildren.org.uk/sites/default/files/docs/legacy-of-disasters_1.pdf
2. Penrose, A. and M. Takaki (2006) Children's rights in emergencies and disasters" The Lancet. 367, 698-699.
3. Chew, L. and K.N. Ramdas (2005): 'Caught in the Storm: impact of natural disasters on women'. San Francisco, CA: Global Fund for Women.
4. Wisner et al (2004) School Seismic Safety: Falling between the Cracks? http://www.ilankelman.org/articles1/wisneretal.2004.pdf
5. UNESCO (2011) EFA Global Monitoring Report The Hidden Crisis: Armed conflict and education p.132

informed decisions and create innovative solutions. By utilising education as a platform, there is also a secondary impact as children teach their family members what they have learned.

1.2 Purpose of this Report

The purpose of this report is to make recommendations on how to make 'safe schools' programmes more cost efficient in general and to identify specific activities with high cost-benefit ratios.

The report will address the following questions:

1. Is safe schools programming cost effective?
2. Within the most common activities implemented in the 3-pillar approach to safe schools programmes via the Comprehensive School Safety Framework, which activities are most cost effective?
3. Which programmatic practices can make safe schools programmes more cost effective?

A girl stands in front of a school destroyed by Typhoon Haiyan in Basey, Philippines

Section 2 – Making the Case for Safe Schools

2 Making the Case for Safe Schools

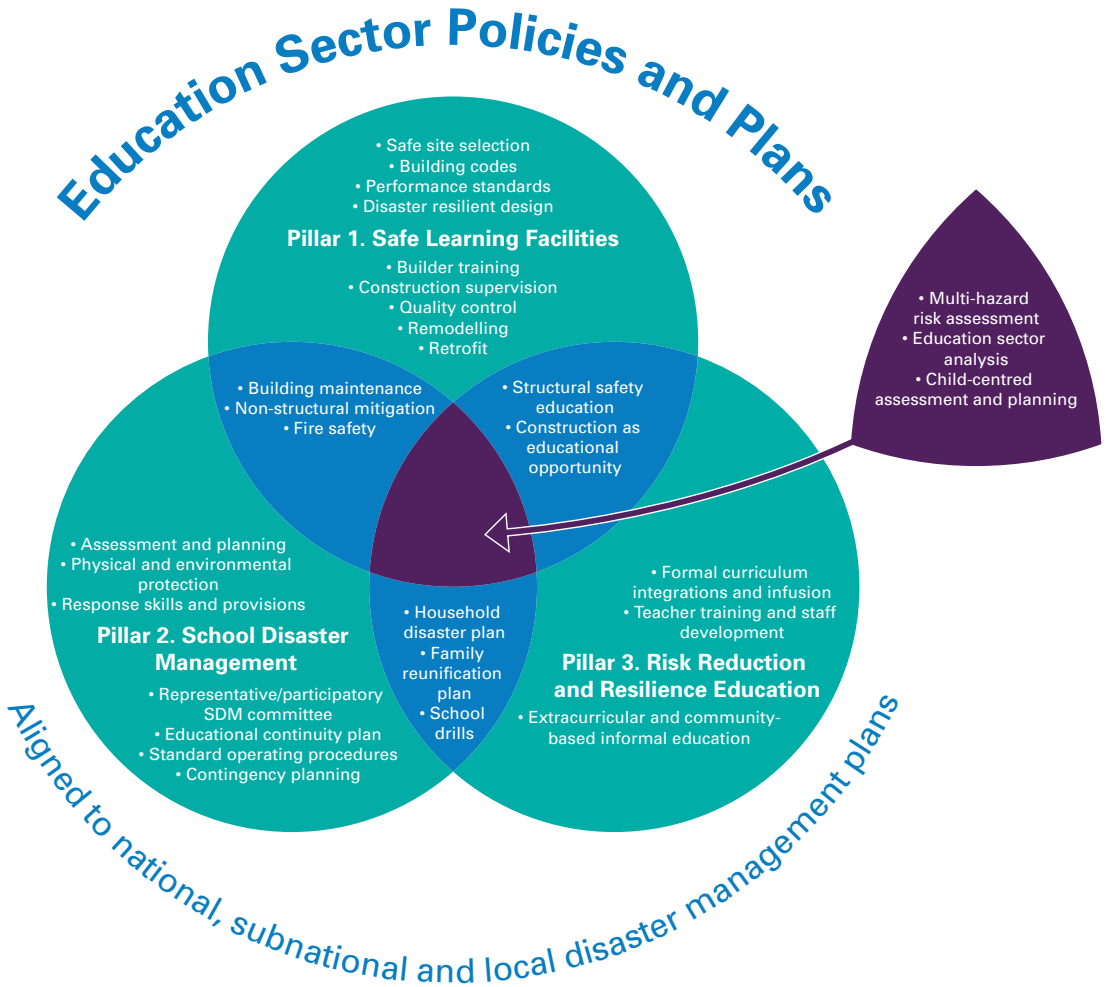
2.1 Introduction to the Comprehensive School Safety Framework

Throughout the past decade, efforts to improve children's rights to education, protection, and survival have increased. Children's advocates have joined to support these efforts to promote disaster risk reduction and assure universal access to quality basic education. The purpose of the Comprehensive School Safety Framework is to unite these advocates, within the education sector and other sectors, for a specific focus in order to increase effectiveness.

The framework is composed of three pillars and is summarized in Figure 1 below:

1. **Safe Learning Facilities** involves education authorities, architects, engineers, builders and school community members in safe site selection, design, construction, and maintenance (including safe and continuous access to the facility).
2. **School Disaster Management** is established via national and sub-national education authorities and local school communities (including children and parents), working in collaboration with their disaster management counterparts at each jurisdiction, in order to maintain safe learning environments and plan for educational continuity, conforming to international standards.
3. **Risk Reduction and Resilience Education** should be designed to develop a culture of safety and resilient communities.

Figure 1: Comprehensive School Safety Framework[6]



6. Comprehensive School Safety Framework (2014) endorsed by, inter alia: UNESCO, UNICEF, UNISDR, IFRC, INEE, Save the Children, Plan International and World Vision http://www.preventionweb.net/files/31059_31059comprehensiveschoolsafetyframe.pdf

2.2 Benefits of Comprehensive School Safety

The potential benefits of comprehensive school safety are numerous, and can be broadly categorised as follows:

- Safe school infrastructure, disaster management planning and risk reduction education should result in a reduction in loss of life and injuries, as school infrastructure will be less likely to collapse on children, and teachers and children will have contingency planning in place and the knowledge and skills to evacuate effectively.
- Safe school infrastructure will be less likely to collapse in a disaster, and therefore reconstruction costs will be mitigated.
- Safe school infrastructure will ensure that children are able to return to school faster, and therefore lost school days will be reduced.
- Risk reduction and resilience education can have far reaching benefits for the entire community, as skills and knowledge are passed along to stimulate wider risk reduction initiatives in the community, particularly in the face of climate change.
- As a result of all of the above, children as well as their families and the wider community should have a greater sense of security and safety.

The benefits, and hence the economic case for investing in comprehensive school safety measures, will differ depending on the type of emergency. Most of the benefits of safe schools arise in rapid onset events, including earthquakes, cyclones and floods. More specifically, the benefits that arise from safe learning facilities and school disaster management plans are primarily relevant in rapid onset events where damage to infrastructure is highly likely, and evacuation and other contingency planning is necessary.

By contrast, risk reduction and resilience education will be applicable across all disaster events, notably encompassing drought and other slow onset events as well.

Under climate change, the frequency and intensity of hydro-meteorological events are likely to increase and result in greater damages and losses associated with education. Hence the benefits from safe school measures are likely to increase under climate change.

2.3 The Economic Argument for Safe Schools Programming

Generally speaking, there are a number of benefits and multiplier effects that make the economic argument for integration of safe schools programming particularly compelling:

1. Children are one of the largest and most vulnerable groups to disaster risk – they typically represent 50-60 percent of those affected by disaster.[7] Therefore disaster losses are high within this group, both in terms of the total population affected, as well as the losses per person. It therefore also stands to reason that the gains from protecting children in disasters will be some of the greatest. Schools, in turn, are one of the easiest ways of targeting and protecting children.

7. UNICEF (n.d.) "UNICEF and Disaster Risk Reduction". http://www.unicef.org/files/DDR_final.pdf

2. When a population at risk is predominantly children, each death represents an entire lifetime of lost life and productivity, and therefore the economic gains of protection are going to be very high. Each death represents 40-70 years of lost life and productivity, and each injury represents 40-70 years of potentially expensive medical care. The protection of schools will result in several generations of children being protected. Health economics and medical ethics agree that the greatest social benefit comes from investment in the health and capacities of children.[8]

3. When children are educated around disaster risk management and wider resilience building measures at school, there is often a strong multiplier effect, as the children in turn pass this learning onto their family members. As a result, any measure in this area will have strong efficiency gains as it can be replicated to a wider population for little cost.

However, whether safe schools programming is cost effective will very much depend on the specific context. The following section looks in more detail at some of the specific factors that influence cost effectiveness, and how this affects the different pillars under a safe schools approach.

8. Wisner, B. et al (2004). "School Seismic Safety: Falling Between the Cracks?" Chapter for C. Rodrigue and E. Rovai (eds.) Earthquakes, London: Routledge, 2004, forthcoming (Routledge Hazards and Disasters Series).

A boy hides under his desk as part of an earthquake drill in the Dominican Republic

Section 3 – Cost Effectiveness of Comprehensive School Safety Measures

3 Cost Effectiveness of Comprehensive School Safety Measures

3.1 Introduction

Cost effectiveness analysis looks specifically at the cost per unit of outcome or impact. So, for example, if our goal is to save a life, cost effectiveness looks at the relative cost of a variety of measures to identify those that save a life for the least cost.

The most significant outcomes of a safe schools programme are likely to be:

- Reduction in infrastructure reconstruction costs;
- Reduction in lost lives/injuries;
- Reduction in lost school days; and
- Wider disaster and climate risk reduction benefits in the community.

Within the most common activities implemented in the 3-pillar Comprehensive School Safety Framework approach to safe schools programmes, which activities are most cost effective?

The interventions under the framework are designed to complement each other, and as a result, it is far more effective to consider the suite of measures as a package rather than trying to assess them independently. So, for instance, if you build a strong school, but you don't teach children and youth what to do in an emergency, they may endanger themselves regardless. Likewise, if you teach children what to do in an earthquake or a cyclone, but they are in a weak building, they may not even have a chance to implement what they have learned.

A discussion of each of these major areas of impact, in relation to the activities included under the three pillars, is presented below. The discussion unpacks the factors that could potentially affect cost effectiveness.

3.2 Cost Effectiveness of Safe Schools Programming

3.2.1 Infrastructure Reconstruction Costs

The damage to school infrastructure from disasters can be extensive and expensive. For example, the 2006 Super Typhoon Durian in the Philippines caused $20 million in damage to schools, including to 90-100% of school buildings in three cities and 50-60% of school buildings in two other cities.[9]

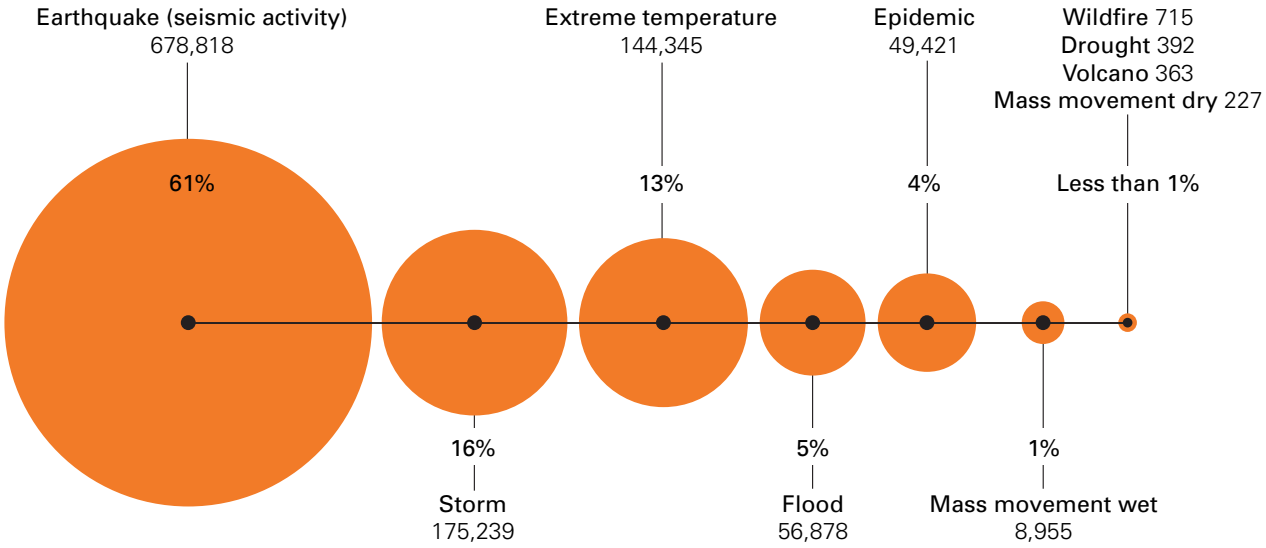
Retrofitting and better planning/construction will result in buildings and infrastructure that are less likely to collapse or experience damage in a disaster event. Therefore the cost of retrofitting/better planning will most likely be recovered by averting the cost of reconstruction and repair. However, this will very much depend on the degree of retrofitting required (which can be very expensive, whereas protection measures such as elevating, reinforcement, and building protection walls can be much less expensive as compared with retrofitting). It was also depend on the probability of infrastructure being damaged or destroyed in a disaster. For example, in the case of earthquakes, economic losses are very high, and therefore the benefits of avoiding these losses are potentially large. However, there is a great deal of uncertainty over where and when an earthquake will occur, and therefore the costs of protecting infrastructure are also very high, as you have to retrofit many buildings while only some may be affected.

9. UNISDR (2008). "Disaster Prevention for Schools: Guidance for Education Sector Decision-Makers." Geneva: UNISDR.

3.2.2 Reduction in Lost Lives/Injuries

The reduction in lost lives is going to depend on the type of emergency. Figure 2 shows the number of people killed by disaster type, demonstrating the very high impact of earthquakes, followed closely by storms and extreme temperature.

Figure 2: Number of People Killed by Disaster Type, 2003-2012[10]



Certainly the number of lost lives in specific instances, particularly in earthquakes, is high. For example:

- The 2008 earthquake in Sichuan, China, killed around 5,335 children because school classrooms collapsed, in many cases while buildings around them stood firm.[11]
- The 2005 earthquake in Kashmir left 17,000 students dead inside their classrooms, with at least 20,000 more disabled or severely injured.
- The 2012 earthquake in Haiti left hundreds of teachers and thousands of students dead when more than 3,000 school buildings in the earthquake zone were destroyed or damaged, according to estimates by the UN Children's Fund (UNICEF).[12]

The major activities under the three pillars that are likely to lead to a reduction in the number of fatalities are:

- Retrofitting of existing school infrastructure, to bring it up to building code (where building code exists).
- Ensuring that new schools have disaster resilient building codes in place and are built according to disaster resilient building code, and/or sited in less vulnerable locations/protected by retaining walls, etc.
- Providing education around disaster risk management and school safety.

These are largely listed in order of cost: retrofitting existing infrastructure is by far the most expensive, improving building codes for new build and/or protecting infrastructure is relatively less expensive, and education programming around evacuation, contingency planning and other themes tends to be the least expensive.

10. Development Initiatives, "Global Humanitarian Assistance Report 2013"
11. Branigan, T. (2009) 'China Releases Earthquake Death Toll of Children'. The Guardian, 7 May. In Mitchell T, L Jones, E Lovell and E Comba (eds) (2013). "Disaster Risk Management in Post-2015 Development Goals". Overseas Development Institute, UK.
12. Romero, S. (2010) 'With Haitian Schools in Ruins, Children in Limbo'. The New York Times, 6 March.

This cost then needs to be offset against the number of people whose lives could be potentially saved through one of these measures. This will differ depending on the type of disaster: most people die in earthquakes due to collapsing buildings, and therefore measures to improve infrastructure are likely to have significant impacts on lives saved. By contrast, effective evacuation is more likely to have a significant impact on lives saved in flooding and extreme weather, such as storms/typhoons/hurricanes.

Cost effectiveness is also going to be higher where disasters are likely to happen more often (increased probability of an event). However, this has to be balanced with the fact that earthquakes are low probability/unpredictable, but extremely high impact in terms of death toll. This suggests that high seismic areas need to prioritize safe schools measures on infrastructure, but this is not always politically palatable because it requires a very long-term view (i.e. investment today may not yield benefits for decades).

Further to this, climate change can increase the probability of some hydro-meteorological events, raising the imperative for disaster risk reduction education and increase adaptive capacities.

Table 1: Relative Cost and Benefits for Measures to Reduce Lives Lost

Activity	Cost	Number of People Benefiting
Retrofitting existing school infrastructure	Most expensive	• Earthquake – significant • Storm – some • Extreme temp - minimal
New build – safe site selection and construction	Expensive	• Earthquake – significant • Storm – some • Extreme temp - minimal
School disaster management/risk reduction education	Least expensive	• Earthquake - some • Storm – significant • Extreme temp - significant

3.2.3 Reduction in Lost School Days

Another important outcome of school safety is the protection of educational continuity during disasters and emergencies, thereby ensuring that school attendance is not interrupted and therefore keeping children and youth in school. Education has significant economic gains – each year of education is estimated to result in an 8-10% increase in earnings.[13] It also has important impacts for the household, freeing up family members to work while the children are at school. The impact of disasters on lost school days can be significant. For example:

- In Cambodia's flood-prone areas, the annual swelling of the Mekong River reportedly caused 60% of schools to close for 2.5 months each school year.[14]

- In Nepal since 1991, the number of days off has increased by up to 65% in both the hills and the Terai, though slightly more in the former. Much of this increase is attributed to extreme weather and natural disasters and to the use of schools as shelters in the aftermath of such occurrences. The number of days off is so great that it threatens to reduce school attendance to below the required 220 days.[15]

- Pakistani children reported schools staying closed for six months after the 2010 Attabad landslide disaster, as school buildings became refugee camps'.[16]

13. Orazem, P., P Glewwe, H. Patrinos (2008). "The Challenge of Education". Copenhagen Consensus.
14. Risk RED (2008). 'Disaster Prevention A Safe Foundation for Full Inclusion'. Prepared for the UNISDR Thematic Platform on Knowledge and Education, the Coalition for School Safety and Disaster Prevention Education and the International Conference on Education.
15. Plan International (2012). "Impact of Climate Change on Children in Nepal." Woking: Plan International.
16. ODI and Plan International (2012) 'Climate Extremes and Child Rights in South Asia: A Neglected Priority'. Briefing. London and Woking: ODI and Plan International.

However, disasters typically close schools for days or weeks, not for an entire year. It is not always clear whether missing school for a short period of time is going to result in students dropping out. Further, school attendance at times of crisis is driven by many factors that are outside of the remit of the CSSF approach – economic pressures resulting from disaster often result in children being sent out to work, and issues such as health/malnutrition can often override any potential learning.

A report on natural disaster risk and human capital accumulation[17] found that geological disaster risk is a very robust variable for explaining differences in secondary school enrolment rates across countries. The effect is sizeable and well estimated. However, this effect is less due to the availability of school infrastructure. Rather, income volatility is the most important role as a determinant of secondary school enrolment rate changes over time. Over a 10-year timeframe, income and access to credit are the strongest determinants.

Along similar lines, an analysis of the long term consequences of an earthquake in Guatemala in 1976 found significant, long-lasting detrimental effects on human capital outcomes – specifically years of schooling - of individuals who were in early childhood or school-age at the time of the earthquake.[18]

While disasters may have an impact on wider human capital outcomes, human capital also has an impact on the effect of disasters. A study using household surveys conducted by the International Food Policy Research Institute (IFPRI) in Bangladesh, Ethiopia, and Malawi found that the accumulation of human capital prior to disaster helps children maintain investments in the post-disaster period. Biological human capital formed in early childhood (nutritional status) helps insure children against disasters by increasing schooling investments and outcomes, even though the disasters may negatively impact the investment itself. For example, in Malawi, droughts reduced schooling completed among less healthy children, and healthier children were better able to invest in human capital after a disaster.

As cash transfers are becoming more widespread as an early humanitarian response, there is evidence that conditional cash transfers, which are given on the requirement that children attend school, can have a very strong impact on school attendance. The evidence suggests that conditional cash transfer programmes can act as safety nets that enable poor children to attend school.[19] However, if there is no school to attend because it is damaged or destroyed, the full effectiveness of such a conditional cash transfer programme is compromised.

3.2.4 Wider Risk Reduction Benefits

Investment in risk reduction has benefits that impact on communities well beyond the disaster. For example, investment in boats for flood evacuation can also act as a resource for income generation such as fishing and other activities in "normal" times; identification of clean water sources for disaster times can also result in promotion of cleaner water and resulting health benefits in normal times; and training youth in first aid will help them to treat injuries year round.

A 2013 study[20] commissioned by Oxfam and Tearfund reviewed the outcomes and impacts of 23 studies that used cost benefit analysis to quantify the effectiveness of measures used to promote disaster risk reduction and climate change adaptation. The studies included a wide range of countries and interventions, including investment in livelihood opportunities, embankments and other protective measures, preparedness and early response training (such as early warning, evacuation and first aid), WASH, education, etc. Across all the studies, the vast majority of inventions presented a positive benefit to cost ratio. Those with positive returns ranged from ratios of 1:1 to double digits, with the highest yielding a return of 87:1 (in other words, every dollar spent yields $87 in benefits).

17. Cuaresma, J. (2009). "Natural Disasters and Human Capital Accumulation". The World Bank, Global Facility for Disaster Reduction and Recovery Unit.
18. Hermida, P. (2010). "The Long Term Effect of Natural Disasters: Health and Education in Guatemala after the 1976 Earthquake." University of Essex and University of Bristol, UK.
19. Orazem, P., P Glewwe, H. Patrinos (2008). "The Challenge of Education". Copenhagen Consensus.
20. Tearfund and Oxfam GB (2013). "Applying Cost Benefit Analysis at a Community Level: A review of its use for community based climate and disaster risk management."

The range of interventions and outcomes that could arise from this type of programming are so diverse; as a result it is not possible to define what the potential outcomes will be. However, key lessons related to how to use this type of programming to make safe schools programming more cost effective are incorporated in the section below.

The particular area of benefit really only pertains to the second and third pillars which focus on DRM practices.

3.3 Existing Evidence for Safer Schools

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

The following section presents some of the evidence around investing in structural investments. The review presented here is not comprehensive, but gives a good sense of some of the findings. This is followed by a discussion around some of the wider cost effectiveness lessons learned.

Retrofitting a Hypothetical School

A study by Smyth et al. at Columbia University[21] used cost- benefit analysis to assess seismic mitigation measures on a hypothetical school. They highlight that in many regions, schools are designed using similar building methods, and therefore it would not be necessary to perform a detailed analysis for each individual structure. Rather, a probabilistic structure could be considered to represent a class of school structure type.[22]

Three retrofitting measures were considered, and four damage levels. The replacement cost of the entire structure is assumed to be 160,000 USD. The social discount rate is assumed to be 3%. The fact that children would typically only occupy a school for one-third of the day (eight hours) was also factored into the calculation. The assumed value of human life is 400,000 USD, and it is assumed that 15 lives would be lost if collapse occurred. In all cases, the break-even point occurs rather quickly simply because the retrofitting options are inexpensive relative to the potential loss of life due to collapse.

Retrofitting Schools in Colombia

A World Bank study[23] used the earthquake vulnerability reduction project in Colombia to present a probabilistic cost benefit analysis for retrofitting public buildings, including schools. Simulations from the probabilistic earthquake risk assessment model show that structural investments generate an average annual return equal to 14.5 percent for retrofitted schools.

Structural (i.e. retrofitting) and functional investments (i.e. protection of people and assets so that they remain functional during and after an emergency) not only provide for reduction in property losses, but may also save lives and reduce the number of injuries. In the case of an earthquake with a return period of 50 years, these risk mitigation investments are assumed to save about 5,000 lives (1,000 lives in schools and 4,000 lives in hospitals) and avoid about 50,000 injuries. Under these assumptions, the average annual return of structural and functional investments is estimated at 7.7 percent for schools.

21. Smyth, A.W., G. Deodatis, G. Franco, Y. He, and T. Gurvich (n.d.) "Evaluating Earthquake Retrofitting Measures for Schools: A Cost-Benefit Analysis." Columbia University, NY.
22. Their structural model consists of a two-storey building with a footprint of 10 m × 40 m and a storey height of 3 m. To mimic possible poor design practice in developing countries, no lateral loads such as seismic loading were considered in the design. The material is assumed to be reinforced concrete of average quality. As designed, the structure is vulnerable; it is capable of appropriate standard service loads but unfit to sustain any strong loads other than gravity.
23. Ghesquiere, F, L. Jamin, and O. Mahul (2006). "Earthquake Vulnerability Reduction Program in Colombia: A Probabilistic Cost-benefit Analysis." World Bank Policy Research Working Paper, 3939.

Retrofitting in Turkey

A study by Charles Kenny[24] uses a case of retrofitting in Turkey to look at the various issues involved in cost benefit analysis of school retrofitting.

The base case scenario uses estimates drawn primarily from an exercise that compared the benefits and costs of retrofitting apartment buildings in Istanbul, Turkey, to make them earthquake resistant. The buildings have reconstruction and retrofitting/ strengthening (to prevent any damage in an earthquake) price tags of 250,000 USD and 80,000 USD, respectively. The probability of an earthquake in any year is set at two per cent and the chance that the building will collapse in an earthquake is 10 per cent. If it does collapse, the assumption is that 10 people will lose their lives, with a statistical value of life of 250,000 USD. The discount rate is set at five per cent and a 30-year span is employed to assess benefits and costs. Under this scenario, the benefits of retrofitting are about equal to the costs—the benefit–cost ratio is one.

Kenny then goes on to highlight some of the significant caveats that accompany this type of analysis:

1) All of the numbers that underpin the analysis are subject to high degrees of uncertainty.
2) As a result, in order to conclude that the economic case for investment in retrofitting schools is in favour of moving ahead, decision making will need to rely on conservative assumptions and a robust benefit to cost ratio.
3) The above analysis does highlight the potential importance of an initial focus on the most vulnerable schools and buildings, alongside those buildings that are most vital in the aftermath of a disaster (not least hospitals).
4) It also suggests the importance of an initial focus on the most efficient disaster risk reduction measures, which may involve disaster planning, emergency communications and public infrastructure measures rather than retrofitting of individual buildings.

The analysis also usefully provides a cost effectiveness analysis of retrofitting against other measures that can save children's lives. The figures modelled in the analysis suggest an approximate cost per disability-adjusted life year of 2,600 USD. Note that this does not include the benefit of injuries avoided by building collapse—but even if avoided disability accounts for a considerable part of total disability-adjusted life years saved, costs are still considerably higher than an array of other interventions. By comparison, millions of people die each year from diseases that can be cured by a simple regime of oral antibiotics, costing as little as 0.25 USD.

Furthermore, it is worth comparing the cost of resistant construction to school budgets in developing countries. Educated mothers see considerably lower child mortality among their children than do mothers who have not attended school. One estimate from Desai and Alva (1998) indicates that maternal primary education is related to a 14 per cent lower rate of child mortality. If girls are denied education, it is more likely that their own children will die. Thus, if school retrofit/earthquake-proof construction comes at the cost of building fewer schools and excluding girls and boys from education, the long-term negative impacts could offset the benefits.

In areas of very high earthquake risk, where cheap engineering solutions are available, the benefit–cost ratio of such projects can look very good. If the risk of an earthquake is lower, or the costs higher, retrofitting in particular may look less attractive than other methods of preventing child deaths. This is especially the case where overall levels of child health are poor, and particularly in cases where earthquake proofing will come at the expense of additional school construction and the exclusion of children from education opportunities.

24. Kenny, C. (2012). "Disaster risk reduction in developing countries: costs, benefits and institutions. Disasters, 2012, 36(4): 559–588.

Children in Sikka district, Indonesia, where disaster risk reduction has been included in the school curriculum

Section 4 – Implications for Programming and Recommendations

4 Implications for Programming and Recommendations

4.1 Implications for Programming

Which programmatic practices can make safe schools programmes more cost effective?

This third question is perhaps the most compelling and useful research question. In many instances, all three pillars are designed to work together, and therefore an analysis of the cost effectiveness of each pillar is, to some degree, a disputable exercise. Rather, understanding the drivers for cost effectiveness across the different activities can be very helpful.

The evidence on the economic case for safe schools programming is sparse. Some evidence is reported on the economics of retrofitting, and some studies have attempted to examine the longer-term human capital impacts related to disasters and education.

Based on the evidence, albeit limited, the following implications for programming should be considered.

With respect to avoided loss of life and injury:

- Retrofitting is often going to be the most expensive solution and is very cost ineffective as compared with other child interventions that can result in similar outcomes.
- Therefore, retrofitting should be prioritised for schools (or other buildings that hold larger numbers of people who could potentially be affected), that are in a high risk area and that are highly vulnerable.
- Rather, investment in safe school structures should heavily focus on improved building code and better site selection for new schools. These measures are significantly less expensive than retrofitting and can ensure that all new build is done to a proper specification. This cannot be emphasized enough as safer structures and locations will have a very significant impact on loss of life.
- Careful risk assessment can ensure that this area of programming is most cost effective, with priority given where there is high risk of earthquakes, in areas with high risk of storms, and where new build can be made more risk proof in terms of structure and location.
- In addition, Pillars 2 and 3, which focus on school disaster management and risk reduction education, are likely to be a more cost effective approach to safer schools. These measures are significantly less expensive, and while they can't protect a child if a building falls on them, they can be very important in mitigating the impacts of a disaster by providing youth with information about what to do to protect themselves and their communities. While they can't be taken in isolation from Pillar 1, they offer a cost efficient approach to safer schools that can sit alongside carefully prioritised retrofitting and protection of infrastructure.

With respect to education and longer term outcomes:

- Focusing on the whole child may be the best way to ensure educational outcomes. Educational outcomes are impacted by many factors – some of the determining factors for education in emergencies relate to income, credit, and health status. Therefore safe schools programming can usefully incorporate measures that focus on the whole child as the evidence suggests that this in turn is strongly correlated with improved educational outcomes in emergencies.
- Refocus from "what" to "how". Most measures (other than retrofitting) are very likely to be cost effective. However, even measures that are designed to be very cost effective can fail at delivering benefits if they are not focused on long term sustainability and actively engage the participation of the community. Therefore a focus on how you design interventions (incorporating long-term sustainability and community driven measures) is as crucial as what you invest in.
- Interventions should be designed in consultation with communities to ensure buy-in and longevity; should be designed as part of a holistic and integrated approach; and should be integrated into a longer term pathway of change.

About Plan International

Plan has been working for and with children for more than 75 years. We currently work in 50 low and middle income countries across Africa, Asia and the Americas to promote child rights and lift millions of children out of poverty. We focus on the inclusion, education and protection of the most marginalised children in partnership with communities, local and national government and civil society.

Plan works with more than 90,000 communities each year, covering a population of 78 million children.

Plan is independent, with no religious, political or governmental affiliations.

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