SAVING LIVES AND PROPERTY BY MAINSTREAMING DISASTER RISK REDUCTION INTO THE EDUCATION SECTOR OF BHUTAN

A case for safer development planning and implementation

Department of Disaster Management

adpc

Cover photo credit Gelay Jamtsho (top) and Yang T. Dorji (bottom)

Abbreviations and glossary

ADPC	Asian Disaster Preparedness Center
CCA	Climate change adaptation
DRR	Disaster risk reduction
EIA	Environmental Impact Assessment
Dzongkhag	District (administrative unit)
FYP	Five Year Plan
Gewog	Block (administrative unit)
GDP	Gross domestic product
GLOF	Glacial lake outburst flood
NEC	National Environment Commission
NU	Ngultrum
SAARC	South Asian Association for Regional Cooperation
SPBD	School Planning and Building Division (Ministry of Education)
UNICEF	The United Nations Children's Fund
USD	United States Dollars

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Foreword

Disasters are on the rise globally causing huge losses, both in terms of lives and property. While it is well known that developing countries are disproportionately affected by disasters, the 2011 Tohoku earthquake and tsunami sent a clear message that developed countries are also vulnerable.

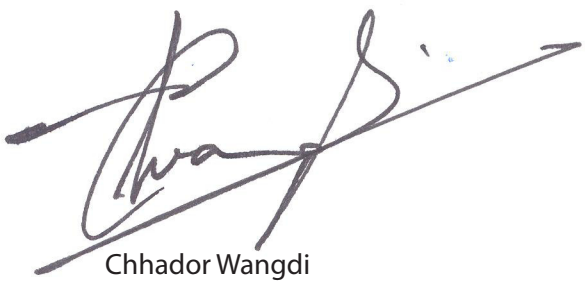
It is said that the impact of disasters on societies and economies has increased considerably over the last two decades and is likely to increase further as a result of climate change and increasing economic development in high-risk areas, especially the developing and poor countries. In Bhutan over recent years, we have experienced more severe floods and storms and this could be linked to climate change.

The concept of mainstreaming disaster risk reduction into development is just few years old in Bhutan. Many people think that disasters are caused by Nature alone, but this is not true. Disasters are caused by our society, by the types of decisions we take when we build roads and towns. It is about how we manage our economies and communities. It is therefore essential that the process of development planning and policy making identifies and analyzes the underlying causes of disaster risk, including the possible impacts of natural hazards on development, and takes steps to reduce the disaster risk wherever possible. This is best achieved by mainstreaming disaster risk reduction into the development framework, including socio-economic and physical planning at all levels.

Over the few years since the introduction of this concept, we have made good progress. The National Disaster Management Act of Bhutan (2013) specifies that mainstreaming disaster risk reduction is a very important aspect of any development plan or project. The Act mandates every agency both at local and national level to not only mainstream disaster risk reduction into their development plans but also to keep necessary budget for this. Mainstreaming disaster risk reduction is also one of the 16 National Key Result Areas, under the Gross National Happiness Commission. Similarly, mainstreaming disaster risk reduction is an important aspect of the Policy Formulation of Protocol Gross National Happiness Commission.

This advocacy document is part of a pair developed in partnership with the Asian Disaster Preparedness Center, Bangkok. These documents are aimed at creating awareness of the importance of considering disaster risk reduction as an essential part of any new development project in the education and road sectors, both of which are among the two most important sectors in our country.

It is our hope that this document will facilitate the advancement of our task of mainstreaming DRR into development planning and help achieve our vision of a "**Safe and Happy Bhutan**".



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Introduction

Reducing disaster risk is now considered an essential component of reducing poverty, safeguarding development and adapting to climate change.[1] However, in many countries, disaster risk is increasing due to changing hazard profiles and the increasing vulnerability of human systems and society. In particular, the reports of the International Panel on Climate Change repeatedly confirm that global climate change is altering the geographical distribution, intensity and frequency of meteorological hazards, particularly with respect to rainfall patterns.

Compared to developed countries, developing countries experience disproportionately high mortality rates and economic losses. In particular, small island developing states and land-locked developing countries not only suffer higher levels of economic loss (with respect to their gross domestic product), but also have lower levels of resilience. Similarly, poorer households and communities suffer disproportionately – especially in terms of income and consumption levels.

RESILIENT SCHOOLS ENSURE CONTINUED EDUCATION FOR STUDENTS

South Asia is highly populous and its cities have some of the highest population densities in the world. It is also one of the most disaster-prone. According to the South Asian Disaster Report 2009 released by the SAARC Disaster Management Center, the South Asian region experienced 42 events of natural disasters in 2009 resulting in the death of 3379 people – some 31.7% of the total deaths due to natural disasters globally for 2009. The region also suffered considerable damage to infrastructure and property.

Bhutan is a small country located in the eastern Himalayas and bordered by China to the north, and by India to the south, east and west.

1 UNISDR. 2009. 2009 Global Assessment Report on Disaster Risk Reduction: Risk Reduction and Poverty in a Changing Climate. Geneva.

Bhutan's estimated population for 2013 was 750,043 people[2], with a population growth rate of 1.15%, and as of 2013 has an overall life expectancy of 68.44 years[3]. The country is administratively divided into 20 dzongkhags (districts) and 205 gewogs (blocks). The Bhutan Living Standards Survey sets the average household family size at 4.5 members[4] and the country's general literacy rate at 63.0%[5]. The unemployment rate was 2.10% in 2012 with an average inflation rate was 11.31% as of 2013[6], and approximately 12.0%[7] of the total population was living under the poverty line. The United Nations calculates that as of 2011, Bhutan's population in urban areas account for 35.6% of the total population, with a 3.65% annual rate of change and a rural annual population growth rate of 0.3 for 2010-2014[8].

Bhutan is vulnerable to multiple hazards ranging from earthquakes to flash floods, fires and windstorms. The Eastern Himalayas is one of the most seismically active regions in the world, and as a result, Bhutan is particularly exposed to seismic activity. The country regularly suffers setbacks due to earthquake events (see Table 1).

Earthquakes Events in and around Bhutan (1713-2011)

Year	Magnitude	Location
1713	7.0	Arunachal Pradesh/Bhutan
1806	7.6	Tibet, near eastern Bhutan
1906	6.5	Bhutan-China-India border
1910	5.7	North of Punakha, Bhutan/India border
1934	8.0	Bihar-Nepal border
1941	6.7	West of Trashigang, Bhutan-India border
1947	7.3	Arunachal Pradesh-China border
1950	8.69	Indo-China border

2 NSB. 2013. National Statistics Bureau. March. Consulted July 2014. http://www.nsb.gov.bt/main/main.php#&slider1=1.
3 CIA World Factbook. 2013. The World Factbook. Consulted on July 2014. https://www.cia.gov/library/publications/the-world-factbook/geos/bt.html.
4 ADB; NSB-Bhutan. 2012. Bhutan Living Standards Survey 2012 Report. Mandaluyong City, Philippines: ADB.
5 NSB. 2013. National Statistics Bureau. March. Consulted July 2014. http://www.nsb.gov.bt/main/main.php#&slider1=1.
6 Trading Economics. 2013. Bhutan News. Consulted on July 2014. http://www.tradingeconomics.com/bhutan/news.
7 NSB. 2013. National Statistics Bureau. March. Consulted on July 2014. http://www.nsb.gov.bt/main/main.php#&slider1=1.
8 UNData. 2014. UNData Country Profile - Bhutan. Consulted on July 2014. http://data.un.org/CountryProfile.aspx?crName=Bhutan.

1954	6.4	Bhutan-China-India border
1960	6.59	Near Tsirang
1980	6.39	Near Sikkim
1988	6.8	Udaypur Gahri, Nepal
2003	5.5	Gunitsawa, Paro
2006	5.0	Arunachal Pradesh
2006	5.7	Gangtok, Sikkim
2006	5.8 and 5.5	Trashigang, Bhutan
2009	6.1	Narang, Mongar
2011	6.9	Sikkim, India

Magnitude is measured on the Richter scale.

Source: Royal Government of Bhutan, Department of Disaster Management and Asian Disaster Preparedness Center. 2011. A Study on the Importance of Mainstreaming DRR in Development Planning. Impact of May 2009 Cyclone Aila precipitated floods and 21st September 2009 earthquake on Education and Road Sector in Bhutan. Thimphu.

Another pertinent hazard related to climate change is the risk of glacial lake outburst floods (GLOF). Bhutan has 2,674 glacial lakes and 25 of them have been identified as potentially dangerous according to studies conducted by the Department of Geology and Mines in collaboration with various regional and international agencies. According to the National Adaptation Plan of Action (2006), the threat of glacial lake outburst floods is increasing due to evidence of temperature increase from global warming and the rapid and unprecedented rate of glacial retreat. Bhutan has experienced major glacial lake outburst floods and flooding events in its past (Table 2).

Table 2: Flood Events in Bhutan 1957-2009

Year	Cause	Impact
1957	Flood due to glacial lake outburst	Damaged the Pho Chu River sub basin.
1960	Flood due to glacial lake outburst	Damaged the Pho Chu River sub basin.
1994	Flood due to glacial lake outburst	Damaged more than 1,700 acres of agriculture and pastureland, a dozen houses, six tons of grain and washed away five water mills and 16 yaks.

2000	Flood of Doteng Chu River	Much of Phuentsholing was impacted.
2005	Flood due to heavy rainfall.	More than 200 people lost their property in Phuentsholing and Pasakha.
2004	Flood due to heavy rainfall	The flooding affected 1,437 households across six eastern dzongkhags, nine people died, 664 acres of wet and dry land were destroyed, and hundreds of tons of crops were lost.
2009	Flood due to heavy rainfall	Almost all 20 dzongkhags were affected, 13 people died and properties worth BTN 594 million (USD 12.3 million).

Source: Royal Government of Bhutan, Department of Disaster Management and Asian Disaster Preparedness Center. 2011. A Study on the Importance of Mainstreaming DRR in Development Planning. Impact of May 2009 Cyclone Aila precipitated floods and 21st September 2009 earthquake on Education and Road Sector in Bhutan. Thimphu.

In addition to these major hazards, windstorms and fires regularly affect the country. For example, windstorms occur annually and damage houses, schools and government facilities. In 2011, windstorms damaged 2424 houses and 57 schools across the country. Similarly, 2010 and 2011 saw the outbreak of two major fires each year.

This advocacy note focuses on the 2009 and 2011 earthquakes listed above, as well as the 2012 and 2013 windstorms. The note seeks to provide an evidence-based case for mainstreaming disaster risk reduction (DRR) into the education sector as a cost-effective choice supporting local and national development. Since the foundation of the first school in Bhutan in 1913, the Royal Government continues to accord priority to its social sectors concentrating efforts on accessible education.

As of 2012, there were 553 schools in Bhutan, with 176,647 students enrolled at primary, secondary and tertiary levels in both private and public institutions. The total enrolment in 2012 was 80,154 for males and 81,249 for females,

Yet, disaster events are directly affecting the education sector. School facilities were damaged during almost all major disaster events due in part to low quality building materials and weak enforcement of building standards. Most of these factors can be tackled through awareness raising and mainstreaming of DRR into the education sector. During the 2009 earthquake, the education sector suffered extensive physical damages totalling Nu. 594 million (USD 12.3 million). As a result, reconstruction funds were sought and diverted from planned development projects and programmes.

Given the importance of future generations for the development of Bhutan, and acknowledging the promising achievements of the education sector in the country, it is essential to ensure safe school facilities and safe schooling environments in order to avoid losses in the future.

What is Mainstreaming Disaster Risk Reduction into Education Sector

In Bhutan the importance of disaster preparedness and mitigation has been recognised at various institutional levels. Ensuring the incorporation of DRR concerns into development policies, plans, and activities is of paramount importance for both the Ministry of Education and the Department of Disaster Management. This is critical, as landlocked countries – such as Bhutan – have been found particularly vulnerable to disasters. Not only do they suffer higher relative economic losses with respect to the size of their gross domestic products, but such countries also appear to have a particularly low resilience to losses, which represent major setbacks to national economic development[9].

Under the current 11th FYP, there is heavy emphasis on education, not only for its long-term benefits to society, but also as a strategic means to reduce poverty. The key issues and challenges of this sector include improving access to education, addressing disparities in education outcomes at the local levels, catering to the special needs of children with disabilities and improving the quality and relevance of education to facilitate the entry youth and young adults into the workforce[10].

The national goal was to achieve near 100% enrollment by end of the 10th FYP (end of 2013). Strategies such as the building of community schools, extended classrooms, mid-day meals, living stipends and inclusive education have been outlined to enroll and retain the last 10% to 15% of school age children. The plan addresses a variety of concerns including a mismatch between the skill sets of countryside youth and labor market requirements, to achieve gender parity at higher secondary and tertiary levels and to maintain the quality of education while enhancing enrollment.

The creation of a resilient education sector can reduce the impact of specific hazards on all aspects of education. Mainstreaming DRR into the education sector means reducing the vulnerability of people and educational facilities to hazards. This requires the identification of appropriate measures to avoid and limit losses while also introducing adequate standards during development planning and

9 United Nations. International Strategy for Disaster Reduction. 2009. Risk Reduction and Poverty in a Changing Climate. Invest today for a safer tomorrow.

10 Gross National Happiness Commission, Royal Government of Bhutan. 2013. Eleventh Five-Year Plan: 2013-2018. Thimphu.

implementation. In order to integrate DRR into the education sector, disaster risk concerns need to be considered and addressed during the relevant stages of school design and construction, school management and operations (including emergency planning), and education curriculum.

Consequently, mainstreaming DRR into the education sector brings two long-term benefits:

- It reduces damages and economic losses linked to disasters affecting schools.
- It contributes to establishing a required culture on disaster preparedness and mitigation.

Such mainstreaming of DRR into the education sector has been successfully undertaken in several developing countries in Asia (see Box 1). In Bhutan, a number of DRR initiatives have been implemented within the education sector and this positive trend needs to continue. The high levels of economic loss and increasing cost of post-disaster reconstruction pose significant burdens to the education sector in many countries. They pose major constraints on development budgets and resources, and the achievement of development goals and objectives are delayed.

Box 1: Mainstreaming Disaster Risk Reduction in the Education Sector

Regional project in Cambodia, Lao PDR, Philippines

In 2008, ADPC launched the Mainstreaming DRR into the Education Sector Project. This initiative was the result of the 5th meeting of the Regional Consultative Committee on Disaster Management (RCC) in Hanoi, 2005. The RCC identified that following sub-themes as key to the project:

- mainstreaming DRR modules into school curricula;
- promoting hazard resilient construction of new schools;
- introducing features into schools for their use as emergency shelters.

The Mainstreaming DRR into the Education Sector Project was implemented in three Southeast Asian countries: Cambodia, Lao PDR, and the Philippines and included four main activities:

- Mainstreaming DRR into secondary school curricula;
- Undertaking a study on the impacts of disasters on the education sector;

- Delivering advocacy workshops on mainstreaming DRR into the education sector; and
- Undertaking stakeholder consultations as a follow up to the advocacy workshop.

Under the project, the National Committee for Disaster Management, Cambodia, the National Disaster Management Office, Lao PDR, and the National Disaster Coordinating Council[10], Philippines, together with the respective Ministry/Department of Education and other relevant organizations in the three countries developed country-specific DRR curricula. The studies focused on the socio-economic and physical impacts of disasters and provided information on building codes, structural design and construction materials for schools and educational facilities.

This project is a good model for the mainstreaming DRR into education, through the development of research studies, tools, inter-agency cooperation and linkages which help facilitate the process of mainstreaming.

Process and outcomes of the project in Lao PDR

Within Lao PDR's National Development Framework, the government strives to achieve "Education for All" by accomplishing three major tasks: making access to education equitable; improving the quality and relevance of education; and strengthening education management. The objectives of mainstreaming DRR into the education sector supports Lao PDR's major tasks. Mainstreaming DRR into the school curriculum improves the quality of education. It also strengthens education management by improving the awareness of teachers and students to various hazards. Similarly, mainstreaming DRR into educational facilities and infrastructure improves and supports the goal of equitable and safe access for children.

In Lao PDR, the project, in synergy with Save the Children Australia, developed DRR modules, training materials and education and communication materials on the subject of mainstreaming DRR into the education sector..

11 Now called the National Disaster Risk Reduction and Management Council (NDRRMC)

As a foundation for the project, and in collaboration with Save the Children Australia and National Research Institute for Education Sciences, a training was held for Grade 6 teachers for Natural Sciences and Social Science subjects to integrate DRR. School principals and district and provincial education officials also participated in the training. A total of 738 students from 15 different schools were taught the DRR module in the pilot provinces in 2008 (i.e. Khammounae, Syaboury, Bolikhamsay, Savaarn, Attapue and Vientiane Provinces). The DRR module was taught using a range of teaching methods, including songs, competitions, posters and plays. The teaching of the DRR module was monitored by curriculum specialists from Ministry of Education, the National Disaster Management Office focal person, the Technical Working Group members and school principals.

Improving the hazard resilience of school construction was identified as a priority by the national government. The Ministry of Education's Division of Design and Construction Management, together with ADPC, formed a Technical Working Group to develop the country's school construction guidelines. These guidelines were intended for use by all stakeholders involved in the construction of school facilities focused on setting guidance and meeting standards of inclusive, child-friendly and hazard-safe schools in Lao PDR. Under the project, the School Construction Guidelines (2009) were published. The construction guidelines cover all future school construction undertaken by the Ministry of Education at the national, provincial and district levels, and by any donor or development partner. The guidelines set minimum standards that have to be met by anyone engaged in school construction in Lao PDR. Furthermore, the guidelines cover the entire school construction process, from site planning, design, construction and maintenance.

Over 2009 to 2013, a total of 2,309 schools was built using the guidelines. This accounts for 42.4% of the total number of schools in Lao PDR. In this way, Lao PDR has made significant progress in improving the resilience of its schools, protecting long-term investment in the education sector and protecting the lives and health of students and teachers.

	Total Number of Built Schools		Total schools built between 2009-2013	
	Baseline (2009-2010)[12]	Total (2012-2013)[13]		
Schools	1284	1802	518	40.3%
Pre-primary	1421	1878	457	32.2%
Nursery	239	417	178	74.5%
Kindergarten	2505	3661	1156	46.1%
Total	**5449**	**7758**	**2309**	**42.4%**

Education Statistics Information and Technology Center. 2010. Annual School Census - Annex Matrix - School Year 2009-2010. Ministry of Education.

Education Statistics Information and Technology Center. 2013. Annex Matrix: School Year, 2012-2013. Ministry of Education.

Sources:

ADPC. 2008. Mainstreaming Disaster Risk Reduction in the Education Sector in Lao PDR. Bangkok: ADPC.

ADPC. 2010. Safer Education: Mainstreaming Disaster Risk Reduction in the Education Sector in Lao PDR. Bangkok: ADPC.

Education Statistics Information and Technology Center. 2013. Annex Matrix: School Year, 2012-2013. Ministry of Education.

Education Statistics Information and Technology Center. 2010. Annual School Census - Annex Matrix - School Year 2009-2010. Ministry of Education.

12 Education Statistics Information and Technology Center. 2010. Annual School Census - Annex Matrix - School Year 2009-2010. Ministry of Education.

13 Education Statistics Information and Technology Center. 2013. Annex Matrix: School Year, 2012-2013. Ministry of Education.

Impact of Disasters on Bhutan's Education Sector

Since the approval of the 10th Five Year Plan, Bhutan has witnessed both major and minor disaster events. Two events stood out due to their geographical spread and the extent of damage and loss: the nation-wide floods caused by heavy precipitation due to Cyclone Aila in the Bay of Bengal in May 2009, and the 6.1 magnitude earthquake on 21 September 2009 in Eastern Bhutan.

The 21 September 2009 Earthquake

On September 21, 2009, a 6.1m earthquake with its epicentre in Narang struck Bhutan and caused damage across the country. The quake lasted for 95 seconds, and was followed by more than 100 minor after shocks and two earthquakes with a magnitude of 5.3 and 5.5. This earthquake significantly impacted the education sector in Bhutan causing damage to community schools built by local masons, as well as engineered school facilities designed and implemented under government supervision (Table 1).

Table 3. Structures Damaged and Estimated Loss (Earthquake 21 September 2009)

Sector	Structures damaged	Loss (NU million)	Loss (USD million)
Shelter	4,950 rural homes	1,119	23.3
Education	**117 schools**	**594**	**12.3**
Culture	539 stupas 281 monastery 8 dzongs	650	13.5
Health	45 basic health units	124	2.6
Government	29 Renewable Natural Resource Centers 26 gewog (block) offices	14	0.3
	total	**2501**	**52**

Source: Royal Government of Bhutan, Department of Disaster Management. 2009. National Recovery and Reconstruction Plan: Building Back Better. Thimphu.

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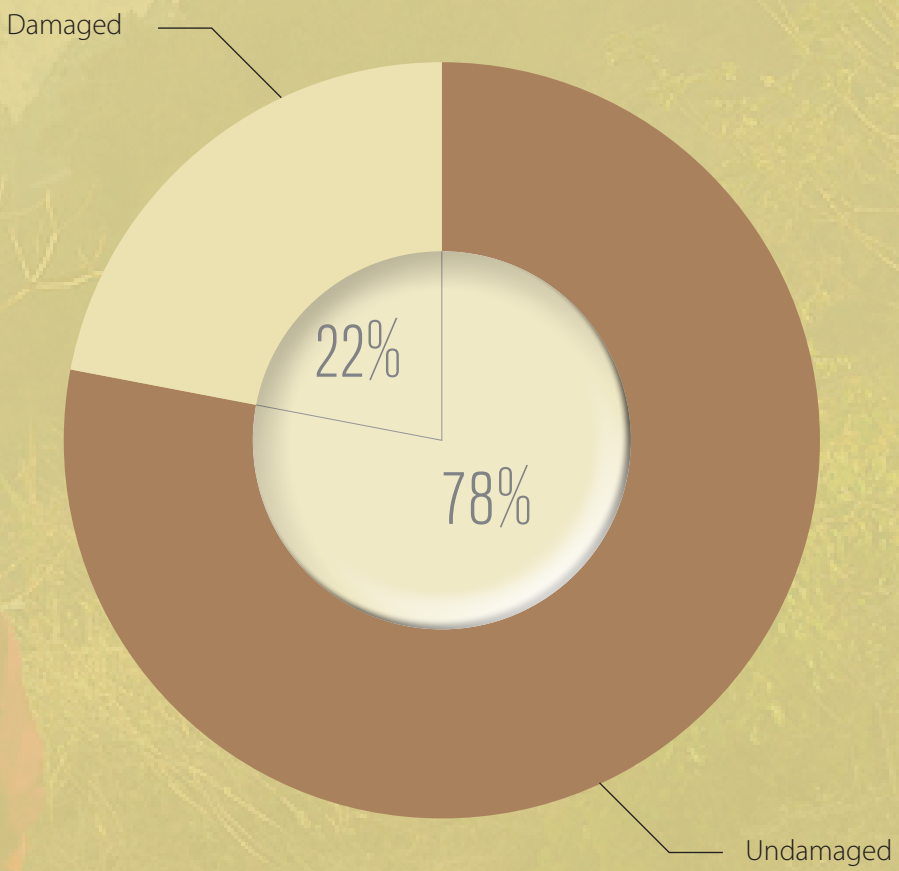
The earthquake damaged a total of 117 schools across 12 dzongkhags. This equates to 22% of the total school facilities of Bhutan (Figure 1).

Figure 1. Percentage of the Bhutan's Schools Damaged by the Earthquake



Source: Royal Government of Bhutan, Department of Disaster Management. 2009. National Recovery and Reconstruction Plan: Building Back Better. Thimphu.

While most schools suffered partial or minor damage, the most affected dzongkhags (Mongar, Trashigang and Pemagatshel) reported damages classified as major and beyond repair. In particular, community-built schools were badly affected.

According to the Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction developed in 2009, the majority of damage to educational infrastructure was sustained by schools under the Ministry of Education. Educational institutions such as institutes and colleges under the Royal University of Bhutan, as well as institutes under the Ministry of Labour and Human Resource, suffered less damage.

BUILDING RESILIENT SCHOOLS SAVE THE GOVERNMENT MONEY IN RECONSTRUCTION COSTS

The Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction, "extensive damages to schools point to an urgent need for improving school construction practices throughout the country."[14] Mainstreaming DRR into the school sector can facilitate this process.

The Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction also mentions that, schools are typically designed as a cluster of blocks and generally, only one or two blocks per school suffered damages in the earthquake. As a result, for costing purposes in the assessment, instead of including the cost of the whole school, only the cost of the damaged blocks were considered. This was found to be a more realistic approach based on the field visits. The unit costs of the educational blocks were based on the 2008 Guidelines for School Buildings prepared by School Planning and Building Division (SPBD), Ministry of Education, Royal Government of Bhutan. A 20% increase was applied to the 2008 guideline costs to account for the increased cost of material and labour. For primary schools, the estimated construction cost of two blocks was Nu. 3.0 million, and for secondary schools, it was Nu. 5.0 million.

14 Royal Government of Bhutan, World Bank and United Nations. 2009. Joint Rapid Assessment for Recovery, Reconstruction and Risk Reduction. Thimphu.

However, the Joint Rapid Assessment, 2011 found that the standard school building designs developed by the SPBD, are not strictly adhered to during construction.. This observation from 2011 was also made in 2013, in the National Action Plan for School Earthquake Safety.[15] The plan found that schools which suffered the most damage were community schools, which were non-engineered and lacked structural integrity. The report also noted that major damage was also found in government-built, engineered schools, which pointed to an "urgent need to improve school construction practices throughout the country." Both the Joint Rapid Assessment and the National Action Plan indicated that part of the problem is the adjustments made to the original design due to a lack of funding to meet the design specifications or a lack of timely and adequate supervision due to human resource constraints in the dzongkhags. Therefore, it is important to set up a system of monitoring during the recovery and reconstruction phase to ensure adherence to structural safety. During a field visit to a school in Kamji, Chhukha Dzongkhag, for example, the assessment team considered that the new blocks under construction used columns which were too slender, lacked continuous lintel bands and had very large openings in the load bearing walls.

According to the National Budget for the Financial Year, 2013-2014, the budget accorded to the education sector (Nu. 6,791.3 million/USD 112.8 million) accounts for 17% of the total national budget. Given the importance of this sector within the national budget, the protection of education capital works is a priority.

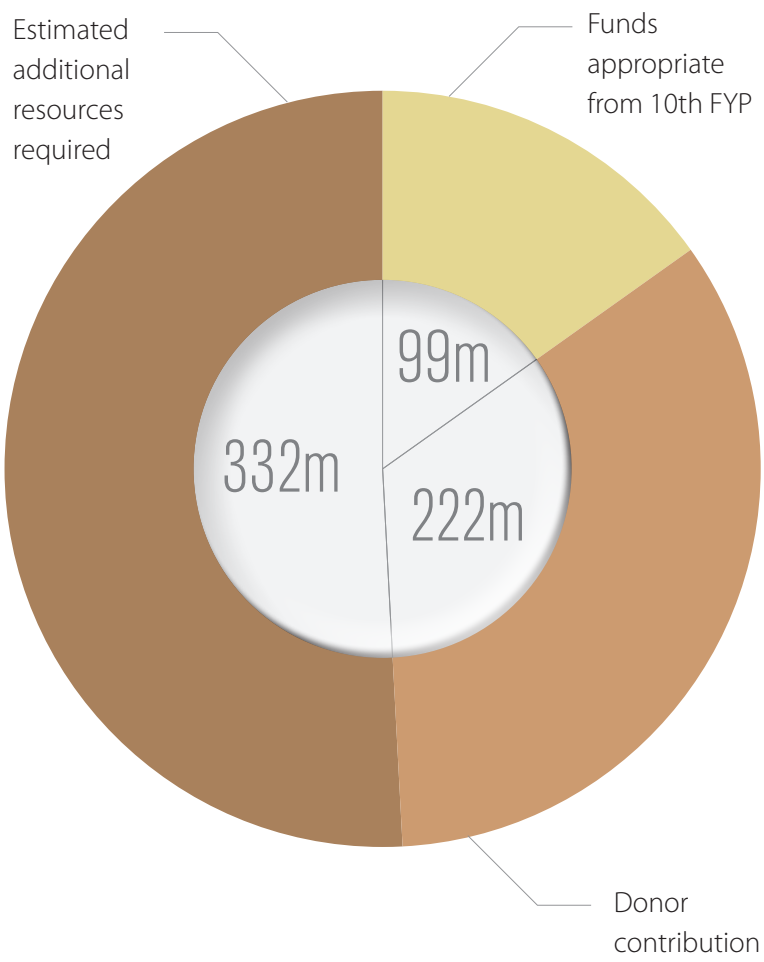
Social impacts

It is estimated that 4,500 students and 280 staff were affected in 37 of the more severely affected school, fortunately, no students or teachers died in the 2011 earthquake. However, the Joint Rapid Assessment considers that the assessment of psycho-social impacts have been largely focused on children, particularly those in the schools that the assessment team has visited. Children who were present at the field visit sites were interviewed and indicated that children and adults were affected by shock and anxiety during and following the earthquake. Children who had witnessed damage to their houses were more frightened than children who did not witness such events. However, there does not seem to be any long-term trauma as a result of the earthquake.

15 GFDRR, Department of Disaster Management. 2013. National Action Plan for School Earthquake Safety. Thimphu.

According to the Department of Disaster Management, in the wake of the earthquake damaged schools were obliged to suspend some lessons as well as provide classes in temporary structures, such as tents[16]. The disruptions of lessons can have an enduring effect on the education of students.

Figure 2. The cost and availability of budget for reconstruction (in million Nu)



Source: Royal Government of Bhutan, Department of Disaster Management. 2009. National Recovery and Reconstruction Plan: Building Back Better. Thimphu.

16 Royal Government of Bhutan, Department of Disaster Management and Asian Disaster Preparedness Center. 2011. A Study on the Importance of Mainstreaming DRR in Development Planning. Impact of May 2009 Cyclone Aila precipitated floods and 21st September 2009 earthquake on Education and Road Sector in Bhutan. Thimphu.

Economic Impact

According to the Department of Disaster Management's report on the National Recovery and Reconstruction Plan, within the education sector, damages from the earthquake were estimated at Nu 594 million (USD 12.3 million), and the cost of reconstruction was estimated at Nu 653 million (USD 13.5 million)[17]. Given the amount of estimated reconstruction costs, different Ministries in Bhutan had to prioritise reconstruction activities. In the education sector priority was given to destroyed schools and to the ones reporting major damages. The Ministry of Education was able to prioritise the 10th FYP planned activities according to the required reconstruction costs appropriating Nu. 99 million (USD 2 million), while donors contributed for an additional Nu 222 million (USD 4.6 million) in reconstruction costs, totalling Nu 321 million (USD 6.6 million)[18].

The importance of schools and other infrastructures vital to development was recognised by the Royal Government of Bhutan. The government gave priority to the education sector in recovery and reconstruction activities allocating 46% of its financial budget to schools. By 2011 the education sector has implemented re-construction works worth more than Nu 221 million (USD 4.5 million) during the financial years 2009-2010 and 2010-2011. In the financial year 2011-2012 half of the national recovery and reconstruction budget was allocated to the education sector and this reached 86% in the following financial year. These features clearly show the economic impact of the earthquake while highlighting the trade-off between resources available and necessary to restore the education sector.[19]

According to the Department of Disaster Management in 2011, while some funds were appropriated from the national budget in order to cover reconstruction costs, reconstruction took place more slowly than anticipated[20]. The same report identified that successful and swift implementation of reconstruction activities depends on the existence of local government capacities and expertise, availability of reliable contactors, and community support and fund availability.

17 Royal Government of Bhutan, Department of Disaster Management. 2009. National Recovery and Reconstruction Plan: Building Back Better. Thimphu

18 Royal Government of Bhutan, Department of Disaster Management. 2011. National Recovery and Re-construction Plan: Building Back Better. Thimphu.

19 Royal Government of Bhutan, Department of Disaster Management. 2011. National Recovery and Re-construction Plan: Building Back Better. Thimphu.

20 Royal Government of Bhutan, Department of Disaster Management and Asian Disaster Preparedness Center. 2011. A Study on the Importance of Mainstreaming DRR in Development Planning. Impact of May 2009 Cyclone Aila precipitated floods and 21st September 2009 earthquake on Education and Road Sector in Bhutan. Thimphu

The 18 September 2011 Earthquake and Recent Windstorms

Since the 2009 earthquake, the education sector has suffered additional disaster events including an earthquake in 2011 and regular windstorms. On 18 September 2011 an earthquake of magnitude 6.9 on the Richter scale shook the Himalayan region. All of Bhutan's 20 dzongkhags were affected to varying degrees, suffering damage to a range of facilities. Damages in the education sector were estimated at Nu. 50.18 million (USD 1.03 million) .

Recurring windstorms affect the education sector, but in recent years the hazard has been less severe. In 2011, 57 schools across Bhutan were affected by windstorms, but in 2012, only one school was damaged and in 2013, 12 schools were damaged were affected and in 2014, two schools were damaged. While windstorms generally do not cause extensive and significant damage to the education sector, the frequency of these disaster events calls for enhanced preparation and inclusion of risk-sensitive measures in the construction of all kinds of building, especially educational facilities.

Voices from the Field: Narang Community School

The epicenter of the 21 September 2009, earthquake was in Narang, in Mongar dzongkhag, in the east of Bhutan. As a result, Mongar was the most severely affected dzongkhag in the country reporting major damages to schools. "I was preparing for the Blessed Rainy Day when suddenly everything was shaking," remembered one victim of the quake a year later. "I was thrown sideways and couldn't move. My family members and I escaped when my colleagues called from outside."[21]

RESILIENT SCHOOLS PROTECT THE LIVES OF STUDENTS AND TEACHERS

According to the Department of Disaster Management, Narang Community School was almost completely destroyed in the quake[22]. Only the teachers' quarters remained partially intact. In addition to teachers and administrative staff, the school counted 192 students including 74 boarders who were severely affected. The boarders were the hardest hit since they had been living on campus in facilities that were completely destroyed by the earthquake.

In 2014, the Department of Disaster Management interviewed Mr. Sonam Zangpo, the Assistant Principal at Narang Community School who remembers the day the earthquake struck. "Most classrooms collapsed," said Zangpo. "We even lost our school furniture and textbooks." School children in several schools were housed in relief shelters constructed by the army as a result of the destroyed school facilities. Tents served as temporary classrooms, offices and storage units.

"The disaster impacted most of the schools in Bhutan, either directly or indirectly," confirmed Mr. Yang T Dorji, Deputy Chief Program Officer, Education in Emergencies Unit, Ministry of Education. However, Dorji also noted that it was a good test of the school preparedness plans .

21 BBS. 2010. Narang, a Year After. 22 September http://www.bbs.bt/news/?p=1256%29

22 Royal Government of Bhutan, Department of Disaster Management and Asian Disaster Preparedness Center. 2011. A Study on the Importance of Mainstreaming DRR in Development Planning. Impact of May 2009 Cyclone Aila precipitated floods and 21st September 2009 earthquake on Education and Road Sector in Bhutan. Thimphu

At Narang Community School temporary solutions were also sought. "The government and the international organizations reacted very quickly," Zangpo said. "The army was very helpful in building temporary learning spaces, and UNICEF gave us tents called School In Tent."

Despite relief efforts, providing quality education was difficult in these conditions. Adjacent classes could clearly hear the lessons in other classrooms due to the lightweight construction materials, and this made it difficult for both teachers and students to concentrate[23]. In some schools, these temporary facilities have been up for almost four years. "We have only recently been able to take our classes out of the tent," Zangpo said.

Zangpo sees the need for increased preparedness and school safety in order to reduce the negative impacts of disasters. "Everyone should get prepared. Students and teachers should practise drills and builders and government officials should build safer schools," he said.

23 Ibid.

Taking Action to Mainstream Disaster Risk Reduction into Plans and Policies

Given the impact of disasters on the education sector in Bhutan, mainstreaming DRR into the education sector represents a viable and cost-effective alternative to avoid losses in the future. In effect many of the factors that worsened the impact of the 2009 earthquake could have been tackled through mainstreaming as better preparation and recovery systems can reduce people and infrastructures vulnerability to hazards.

THE BENEFITS OF RESILIENT SCHOOLS SPREAD TO THE COMMUNITY: PARENTS AND FAMILIES OF STUDENTS ARE BETTER PREPARED, AND SCHOOL FACILITIES CAN SERVE AS EVACUATION AND RELIEF CENTERS

In order to minimize the impact of disasters on the country's progress towards achieving these education sector goals, greater attention must be paid to mainstreaming DRR into the sector and ensuring a culture of school safety. The following actions can be undertaken by both national and local level governments to achieve these goals.

Strengthening checklists and construction guidelines

More must be done in addition to improved use and compliance with the Building Code. The use of school-specific building checklists need to be implemented, construction specifications and guidelines need to be strengthened. The School Planning and Building Division (SPBD) was established in 1985 to undertake Bhutan's first major school construction program funded by the World Bank. Under the program, 12 primary schools each were established during the 7th and the 8th Five Year Plans. The SPBD is the central construction

unit in the Ministry of Education, undertaking school construction works. As such, the SPBD is responsible for developing school building standards, designs and technical specifications for school construction at various levels, including the development of standard furniture designs. In addition to implementing and monitoring centrally executed projects the division is also responsible for liaising and coordinating with the dzongkhags for the construction of education facilities. As Bhutan is in a high seismic risk zone, having seismic resistant features in school standards and designs has been a concern for the SPBD. Depending on the availability of local materials and resources, the SPBD has provided technical support in terms of designs and standards, including Bill of Quantities for the use of local government engineering cells. However, further action could be taken by the SPBD and other relevant agencies, as follows

- Strengthening the existing project screening, evaluation and assessment process to ensure proposed schools are compliant with the Building Code and the technical specifications of the SPBD. For the case of privately built schools the SPBD is tasked with approving the school design, but not with regulating construction. Therefore, the thromde and other relevant agencies which are tasked with monitoring private school construction may also look at the improvement of project screening and monitoring.
- Revising technical specifications for DRR and climate change adaptation and resilience. Such an activity may involve modifying existing designs and standards, bills of quantities, or other technical provisions, in order to address flood, glacial lake outburst flood and windstorm risk, and improve seismic resilience. Similarly, this activity may involve the establishment of new tools for resilient construction.
- Strengthening the use of School Disaster Management Planning Guidelines by the relevant stakeholders can help them prepare and respond to various disaster events which can help minimize undesirable consequences.
- Engaging contractors to raise awareness and capacity building of masons and companies involved in the building of schools.
- Improving school maintenance programs. Criteria for the allocation of maintenance budgets provided by the Ministry of Education may need revision to include DRR to ensure that maintenance allocation recognizes the need for protecting resilient schools through adequate upkeep.

The School Planning and Building Division can revise its technical specifications so that schools are built to better withstand multi natural hazards and seek to liaise with relevant agencies for improved monitoring of construction in the field.

Adapting impact assessments for disaster risk reduction

Bhutan has an Environmental Impact Assessment (EIA) system that is monitored by the National Environment Commission (NEC). This process is to ensure:

- The opportunity for the public to review potential environmental impacts of projects.
- Projects are in line with the sustainable development policy of the government.
- The opportunity to consider all foreseeable impacts on the environment and ensure that all feasible means to avoid or mitigate damage to the environment are implemented.

This process has served as an effective tool for the government in ensuring that development projects take environment concerns into consideration. The EIA focuses on how the proposed project may impact the environment in order to protect it. However, the EIA does not consider the way the environment may affect the project, nor the need to protect the project against environmental hazards. In this way, the NEC could revise and enhance the EIA to specifically include risk reduction considerations. This would act as a project-screening tool. In order for a project to gain approval from the EIA it must include DRR.

Such a modification has been successfully completed in a number of other countries in Asia, where resilient EIAs are now established. This would involve the modification of specific components, sections, checklists, questionnaires and associated information requirements of the EIA to reflect risk concerns.

The National Environmental Commission can revise its environmental impact assessment to include natural hazards

Building the capacity of dzongkhag officials

Dzongkhags are not always able to fully realize their roles and responsibilities for resilient development. This is the case when it comes to construction. The technical capacity and monitoring arrangements, especially for government constructions at the local level, need to be improved. Such capacity building might involve:

- Delivering general trainings to dzongkhag officials on why resilient construction and development is important – both in the education sector and in other important sectors.
- Developing a learning workshop that builds off previous workshops led by the Department of Disaster Management and builds the capacity of dzongkhag officials for safe and resilient development.
- Delivering workshops on how to use construction standards, revised EIA or other project screening and monitoring tools developed for increased resilience of schools.

Dzongkhag officials need to ensure that the construction and operation of schools in the dzongkhag comply with regulation.

Building a culture of safety and preparedness in schools

Successful resilience within the education sector must involve the establishment of a safety culture in schools. This involves:

- Building a culture of leadership in emergency response and preparedness amongst all members of the school, including students, teachers, operations and management staff.
- Ensuring the student and staff body of schools are adequately prepared for a disaster and regularly engage in mock emergency drills and evacuations.
- Ensuring that safe sites and evacuation routes are clearly marked and that student and staff are familiar with them.

Adapting a curriculum for disaster risk reduction and climate change

Schools can be used for teaching and integrating DRR and climate change adaptation (CCA) into the education sector. The traditional curriculum needs to be changed to include lessons on natural hazards or risk reduction. This would involve greater partnership between the Ministry of Education and the Department of Disaster Management through which the following actions can be taken:

- Integrating DRR and CCA into relevant classes that are already taught. For example, teaching students about natural hazards can be a part of a class on Bhutanese geography.
- Teaching the appropriate ways to prepare and respond to disasters through additional special classes.
- Integrating DRR and CCA into the national curriculum and associated teacher manuals and guidelines.

The Ministry of Education can develop classes on natural hazards and disaster risk reduction in Bhutan for different age groups

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In view of the negative impacts of hazards on Bhutan's national development, the Department of Disaster Management of the Ministry of Home and Cultural Affairs, and the Asian Disaster Development Center launched a joint collaboration within the framework of the Priority Implementation Partnership (PIP). This aims to formulate tangible steps to integrate disaster risk reduction in national and local development planning. These efforts are in line with Bhutan's Five Year Plans (FYP) for development planning and activities. As all previous plans, the current 11th FYP running through 2013-2018 places the education sector on its Central Plans. In which, the education sector seeks to ensure the quality of education service delivery; ensure education sustainability; and achieve universal secondary education under the Millennium Development Goals Plus (MDG+). The National Disaster Management Act of 2013 mandates al the agencies to engage in safer and resilient development by mainstreaming disaster risk into development plans, policies and projects.

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