Disaster Risk Reduction
School Safety

Presentation at South Asia UNICEF Regional Education Officers’ Meeting 2010
21 September 2010

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Worldwide, approximately 1.2 billion students are enrolled in primary and secondary school; of these 875 million school children live in high seismic risk zones and hundreds of millions more face regular flood, landslide, extreme wind and fire hazards.

INEE guidance  Notes on Safer School Construction
‘Reducing vulnerabilities by building resilience’

• Increasingly people are forced to inhabit land that is vulnerable to a range of hazards, natural and man-made, caused by climate change, population increase, urbanisation and conflict

• Essential to anticipate the risks and hazards school children are exposed to:

Regional Externalities:
• Floods
• Landslides
• Earthquakes
• Windstorms
• Fire
• Pollution

Site specific conditions:
• Ground condition
• Climatic conditions
• Topography
• Urban/rural
• Accessibility
• Pollution
• Insecurities
Regional Negative Externalities

- Deforestation
- Landslides
- Land erosion, flooding
- Pollution
- Climate change
- Urbanization
Territory size is proportional to the number of all children enrolled in PRIMARY EDUCATION that are enrolled in that territory.
Territory size is proportional to the world distribution of the excess male over female enrolment in primary education.
MDG 2
universal primary education
spending on education

MDG 7
ensure environmental sustainability
forest loss
earthquakes taking place on the 7/9/2010

http://www.iris.edu/seismon/
Reported victims in natural disasters_2007
What we would like to explore today;
Through case studies from our own experience.

Myanmar

Tropical Cyclone Nargis
2-may 2008

138,366 killed
2,420,000 affected
Myanmar: route of storm
Myanmar:

- Flying roof sheets
- 6m tidal surge waves
- People clinging onto palm trees
- Livelihoods destroyed
Myanmar: Masonry school destroyed by 12ft flood tidal wave and 190mph winds
What we would like to explore today:
Through case studies from our own experience.

Indonesia, Sumatra

30.09.2009 earthquake Richter scale 7.9 struck West Sumatra. Followed by landslides
241 schools severely damaged and 175 moderately damaged
- 30·09.2009 earthquake Richter scale 7.9 struck West Sumatra.
- 241 schools severely damaged and 175 moderately damaged
Indonesia, Sumatra
Pakistan

Affected number over 20.5 million. Over 1.8 million houses have been damaged or destroyed. The death toll is at 1,752.

total number of damaged schools has reached 9,088 with more damages reported from Punjab and Sindh

The number of schools used as shelter has also increased, from 5,603 to 5,790. **Gaps and Constraints:** Funding continues to be the largest constraint for the cluster. Huge numbers of flood affected children still require educational support through establishment of additional TLCs
What we would like to explore today;
Through case studies from our own experience.

Central America

Series of Natural Disasters this year:
- Eruption of Volcano Pacaya in May
- Tropical storm Agatha in June
- Heaviest rains in 60 years have

-42 people killed so far
-$500,000 USD damage so far
Mexico, Tlacotalpan

Tropical storm Hermine in North East Mexico, 180 flooded schools in Veracruz, Mexico past weeks
An anticipating approach is essential

Disaster Risk Reduction (DRR) should permeate all stages of construction

Hazard + vulnerability = risk

Externalities:
- Pollution
- Earthquake
- High winds
- Floods

Specific site conditions
- Climate
- Ground condition
- Topography
- Accessibility
- Pollution

+ Urban/rural
  + Insecurities
  + Demographics
  + Attendance
  + Community/culture
  + Distance to school
  + Individual vulnerability of each child/teacher

= Individual risk
An anticipating approach is essential

Disaster Risk Reduction (DRR) should permeate all stages of construction
Objectives at this stage:

Community engagement
- Stakeholder support

Project stage
- Identifying key partners and collaborators to form a coordinating group

Programme stage
- Feasibility
- Budget
- Initial planning

DRR strategy
- What hazards pose a risk to existing and proposed school?
- Macro Hazard Assessment, risk mapping
- School demographics
- Preliminary review of school building structure
Earthquake hazard mapping in Indonesia:

The colours show the minimum level of ground shaking that scientists expect to see in a 475 year period. This map will become part of Indonesia's revised building codes and will save lives through safer buildings. The map was produced by a team of Indonesian scientists with the support of AIFDR, BNPB, Department of Public Works and Ministry for Science and Technology (Irsyam et al., 2010).
Objectives at this stage:

**Community engagement**
- Community based hazard mapping with local community/school community
- Qualified engineer

**Project stage**
- Site Analysis and Planning
- Existing Building Analysis

**DRR strategy**
- Uncover the interactions between hazards and the site environment
- Site must satisfy adequate for school facilitates
- What could make the site less vulnerable?
- Determine whether to retrofit or reconstruct buildings

Conduct site specific assessment of potential hazards and conditions that make site more or less vulnerable.
Site analysis/planning

Wind direction

Erosion protection

On hillside

Secure distance

Secure distance

Flooding direction

Flooding/ high wind

Wind breaker

Flooding

Raising ground
Objectives at this stage:

Community engagement:
- Design working group with stakeholders
- Public meetings to ensure broader community is involved
- Setting up maintenance group to give input into design, operation manual

Project stage:
- Design stage
- Retrofit Design Plan

DRR strategy:
- Structural drawings and tech. drawings
- Design for worst case scenario
- Designing to national building codes
- Designing to best practice guidelines/standards
- Designing to reduce vulnerabilities

Design a new school or retrofit plan that satisfies performance objectives and design requirements
Design stage:

Design with escape procedures in mind

Design working group with stakeholders
Building analysis/design

Earthquake resistant construction

Shape of plans = Simple volume
Building analysis/design

Earthquake resistant construction

Strong corners

Ring beams
Typhoon Resistant Schools, Philippines
Structural design

(1) Reinforced Concrete Footing, Ground Beam and Retaining Wall Foundation
(2) Timber post, walling, flooring, vertical & Horizontal runner, tie, cross bracing, single/double trusses
(3) Metal Sheet Roof Covering with over heat protection paper fix by wood screw.
(4) Light weight Ceiling
Construction guidelines:
High wind
Construction guidelines: High wind

Strengthening and stiffening of house by:
- Roof sheeting/covering firmly fixed to rafter, purlin
- Proper fixing details of rafter, purlin, tie beam, post plate to wall and column
- Provision of strong bracing at wall and roof structure
- Column/post firmly anchored to the ground
- Regular repair and maintenance

- Use of strong rope (e.g., nylon rope), bolts/nuts/washers for tying and fixing roof structure, tie beam, post plate, column, and cross bracing
- Through adequate bracing that ensure walls including gables are strong enough to withstand strong wind

Avoid:
- low land
- long house
- weak joinery between rafter, purlin, post, plate, beam, and column
- shallow burial of post/column into the soil
- permanent ventilation openings
**objectives at this stage:**

**community engagement**
- Community lead monitoring
- Establish Community led evacuation procedures/meeting points/allocation of responsibility
- School maintenance committees
- Plan site specific DDR principles/procedures into teaching curriculum, Emergency preparedness measures

**project stage**
- Construction stage
- Retrofit construction
- Certification
- Maintenance stage

**DRR strategy**
- Construction according to contract Documents/drawings
- Supervision by site engineer
- Clear monitoring Procedures
- Clear lines of accountability
- As built drawings user/maintenance+ operational manuals
DIAGONAL BRACING REQUIRED
Example: Philippines

In late 2006, the Philippines suffered widespread devastation brought by series of strong typhoons. The typhoons destroyed thousands of primary and secondary school buildings and hundreds of day care centres.

UNICEF Philippines Initiative entitled "Building a Safe Learning Environment (BSLE) for Children"

The Project consist of:

1. promoting awareness on school safety
2. integrating disaster management into school curricula
3. training and building the capacity of school students, teachers and non-academic staff on basic life saving skills
4. Building school facilities that are resilient to disaster impact

"Principal-Led School Building Program“ School principals or school heads take charge of the implementation management of construction with the assistance of a DepED project engineer

Timely project completion , empowers school communities to manage and eventually own and sustain projects.
Community Maintenance

A Well Maintained School building:

• last longer, are safer and healthier for all users

• Most effective investment, cost of rebuilding a deteriorating school greater than cost of maintaining one.

• minimises damage in disaster prone areas

• minimises danger to users

• Maintenance programme is important part of life skill development

• Creates community ownership
Establish school maintenance committees and a general coordinator including children, parents, teachers and community

Organisation

Establish Maintenance Budget

Consider Fund raising events

Seasonal maintenance procedures, parent/craftsmen lead

Create action plans + emergency procedures, safety drills, evacuation drills

DRR school initiatives including school children (tree planting, swimming lessons etc)

Daily, weekly maintenance procedures, Children lead

Quarterly maintenance procedures, teacher/parent lead

Time
Literature:


- Child led disaster risk reduction

http://www.preventionweb.net/english/professional/trainings-events/edu-materials/v.php?id=3820 - useful for introducing ways of getting children to be aware of DRR and specific risks to their community

- Effective education for DRR-teachers network

http://www.edu4drr.org/page/drillsplans-1 - exercises and plans to help teachers bring awareness of natural disasters into the curriculum, but focus more on emergency drills and response etc. includes complete teachers guide.

- Tools for community assessment and risk planning

http://www.proventionconsortium.org/?pageid=32&projectid=8 - database with links to many documents and assessment toolkits for community use across the world and includes a complete teachers guide

- Rapid Visual screening of buildings for potential seismic hazards.

http://www.fema.gov/library/viewRecord.do?id=3556

The target audiences for this guide are building officials, engineers, architects, building owners, emergency managers, and interested citizens.
Literature:

- [www.ineesite.org/.../Guidance_Notes_Safer_School_Constructionfinal.pdf](www.ineesite.org/.../Guidance_Notes_Safer_School_Constructionfinal.pdf)

  community participation in construction, not assessment.

  DRR conceptual framework for education, guidance about structure and location on pg 57-58

- **Community Capacity Building through the Development of Community Based Hazard Mapping** By Hiroyuki Watabe, Etsuko Tsunozaki, and Makoto Ikeda
  [http://drh.edm.bosai.go.jp/Project/Phase2/1Documents/8_Proceeding/7_PT3_P.pdf](http://drh.edm.bosai.go.jp/Project/Phase2/1Documents/8_Proceeding/7_PT3_P.pdf)
  how to run CBHM sessions in japan and sri lanka

- **APELL for schools and educational buildings: a community-based approach**
  for school safety and education for disaster reduction

- [http://www.preventionweb.net/files/5473_apellschools.pdf](http://www.preventionweb.net/files/5473_apellschools.pdf)

- **“Criteria and standards for child-friendly schools”. UNICEF Iraq 2006**

- **School Building Assessment Methods**
  By Henry Sanoff, Celen Pasalar, and Mine Hashas

- [www.edfacilities.org/pubs/sanoffassess.pdf](www.edfacilities.org/pubs/sanoffassess.pdf)
  Very clear guide and questions but geared towards UK education environment