basin–South Asia

Regional Knowledge Platform

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Building a Safe Habitat

Editorial

Build Back Better

More than half of the South Asian countries' population live in rural areas. These rural areas being agrarian in nature, the rural population is the primary contributor to the economic stability and GNP. The housing and living conditions of this population, is generally abysmal, lacking basic amenities of life such as safe homes, clean water, sanitation, clean indoor environment, electricity, secure livelihood opportunities etc. These are essential indicators to measure people's well being and it is disappointing that the state of habitat in which the rural masses live is rather bleak in developing countries. This is brought to the fore especially after every natural disaster like earthquake, floods, tsunami that affect a vast number of lives, houses, water sources, productive assets. The worst affected always are people dwelling in *kuchcha* (temporary) houses.

There are several obstacles to the promotion of safe habitat especially in the rural areas as the policies enforcing safe construction do not usually exist and even if they do (a) there are hardly any institutional mechanisms and systems to support the implementation of such policies, (b) not much attention is paid to the engineering designs/ structural solutions for safer seismic resistant construction, (c) construction skills of the available resources need enhancements, and (d) communities are not educated and trained for hazards.

Governments in South Asian countries need to improve existing policies and introduce mechanisms to ensure that rural housing and structures are better planned, designed, built, operated and maintained in a safe manner. It is also essential that such changes respond to the expressed needs and reflect the regional dynamics. New constructions must be safe and existing ones need to be assessed and retrofitted. Capacity development and improvement of skills for safer construction is required at all levels. Formal and informal education organizations can be used to provide and/or improve the skills to the various partners in the construction process. Construction and management standards need to be revised by professional bodies endorsed by the government and the capacities of government offices that deal with approval, monitoring and control need to be strengthened so that approved standards are met. The integration of Disaster Risk Management in formal and informal education is essential for the planning, building, operation and maintenance of safe buildings and their environments. Communities need also to be trained on Disaster Risk Reduction concepts and application.

This newsletter is an illustration of some of these issues mentioned above. There are initiatives taken by various civil society organisations in the region to promote safer habitat. These initiatives help local communities to overcome their environmental and social challenges, reduce risks and losses and make the communities disaster resilient and more productive.

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Focus

Marrying Indigenous Knowledge with Contemporary Building Practice

In the last few decades, earthquakes have been one of the main reasons for the heavy loss of life and property in South Asia. Post earthquake damage assessments have revealed that much of the damage has been due to the poor quality of built fabric, which made the buildings structurally weak and incapable of resisting even mild lateral forces. This vulnerability of structures can be attributed to various factors such as the poor quality of construction, lack of maintenance etc. In most cases, however, the blame is laid squarely on "non-engineered" vernacular structures using traditional construction materials and techniques, which are perceived as weak. This results in their outright demolition in post-earthquake rehabilitation, to be replaced with modern structures using contemporary materials and construction practices.

However, a detailed investigation of earthquake prone regions in the sub-continent has revealed that many vernacular structures have actually performed remarkably well during earthquakes. Unfortunately, most such structures are growing increasingly vulnerable due to the gradual loss of traditional knowledge. The crucial challenge now is to make traditional knowledge relevant to contemporary building context, including lifeline buildings such as schools.

In two recent earthquake cases of India – Gujarat in 2001 and Kashmir in 2005, both modern and vernacular structures suffered heavy damage. Many Reinforced Cement Concrete (RCC) structures did not follow even the basic rules of construction. Roof slabs had been cast without reinforcement; some did not even rest directly on beams! On the other hand, several traditional constructions such as wooden log houses employing well designed arches, well laid masonry with through-stones and intricate dovetail joints performed well against the earthquake. Also, the extensive use of wood on the upper floors as wall paneling, balconies, staircases etc. significantly reduced weight and improved the earthquake performance of the building. Other earthquake safe features found in vernacular construction include ceilings with joists resting on wooden bands running all along the walls, well designed trusses, tongue-and-groove joinery and balconies resting on projecting wooden joists.

In Gujarat, the traditional houses (known as *bhungas*), have withstood the test of time. Thanks to their circular form which performs well in earthquake situations! These *bhungas* are not only earthquake safe, but also demonstrate a sensitive understanding of the locally available resources and climatic conditions. They contain features like tie beams, knee bracing and tongue-and-groove. Hence perform better than modern multi-storey constructions.

A traditional* bhunga *in Gujarat, India
Source: www.designflute.wordpress.com

Challenge of Integrating Traditional and Modern

Due to the introduction of materials such as concrete and brick, the original strength of traditional materials tends not to be utilized optimally. These materials are used in combination with traditional materials such as stone and wood, thereby adversely affecting their structural performances. One example of this can be found in Assam, a state in north-east India, where light bamboo structures are being gradually replaced with concrete piers with little or no reinforcement resting directly on the soft soil, thereby creating extremely vulnerable soft-storey structures. These structures do not have the lightness and flexibility of bamboo framework, which allows for easy dismantling and relocation in case of floods and even resists earthquakes more efficiently.

Considering these trends, the contemporary building character in the sub-continent is pretty confusing since it is unable to draw upon the traditional knowledge or adapt to modern materials and construction systems. Both traditional and modern technologies for disaster mitigation have their own benefits, when considered with respect to the specific objectives and different context within which they are produced. Although one cannot overlook the impact of modern practices; the real challenge lies in marrying it with traditional practices by building on the vast local experience on one hand and rapid technological development on the other.

A traditional bamboo structure in Assam, India
Source: karbianglong.nic.in

The Way Forward

The improvement in construction practices during disaster preparedness as well as recovery phase can be addressed in two ways. Firstly, by developing innovative and sustainable technological ideas for new constructions through traditional knowledge. Secondly, by developing workable alternatives for repair and retrofitting of traditional structures. This will require us to consider the following questions:

1) How can we repair and retrofit poor/ damaged traditional construction systems?
2) How can we repair and retrofit "hybrid" vernacular structures by using traditional construction techniques?
3) To what extent (if at all) can we use modern materials/techniques without compromising on their safety as well as local cultural values?

It is essential to engage with the community for mutual sharing and development of knowledge through dialogue with the local craftsmen and trained professionals and not merely transfer technology.

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Focus

Technical Solutions for Creating Safer Schools

As very rightly said by Japanese scientist Dr. Torahiko Terada, "natural disasters will hit us by the time people have forgotten about it". Over a period of time, construction methods to ensure adequate seismic resistance have been either overlooked or abandoned. Stone masonry buildings of the recent past have been built in an extremely casual manner without incorporating even the most basic safety features.

Typical stone masonry, one of the most vulnerable types of construction, is commonly employed along one of the world's seismically most sensitive zones. i.e. the Himalayan belt. This is because stone is available locally, which makes it cheap and affordable for the people living here. People have developed ways and means to improve the seismic capacity of such buildings, through their intuition and common sense. For example, the use of horizontal timber bands and corners/ junctions strengthened by timber laces and posts. The importance of "through" stones is also known to them.

The British, during their rule in the Indo-Pak subcontinent built seismically sound and safe stone masonry buildings in the northern areas of Pakistan. They used properly dressed stones and employed strengthening features to enhance the lateral load carrying capacity of stone masonry construction. Strict supervision ensured good quality of material and workmanship.

Reconstruction activities in the earthquake affected areas of Pakistan present a healthy picture of compliance with international standards. Schools are given special attention. But there is a need to extend good construction practices to areas which are not yet affected, but could be in the future. Where school buildings have not been designed by structural engineers. Governments should take stringent but practical measures to force the relevant authorities to get their schools strengthened.

Minimum Requirements for Safe Schools

1) School buildings built with stone masonry should be provided with horizontal and vertical confinement of timber, Reinforced Concrete (RC) or steel elements to improve their seismic capacity.

Stone masonry with timber bands in Rai Kot Valley, Gilgit survived the earthquake while all other stone masonry without such seismic features failed
Source: schoolsafetyconference.org

2) Stone masonry buildings can also be strengthened by Galvanised Iron (GI) wire mesh jacketing on both sides of walls, anchored with bolts followed by cement sand plaster.
3) 1:6 cement sand mortar has to be used.
4) Mortar within two hours of adding water to cement-sand mix has to be used.
5) Design of schools needs to be square or rectangular shape with length not more than 4 times the width.
6) Light steel truss or timber roof with corrugated galvanized iron sheets should be used.
7) Foundations must be at least 3 feet deep and 2 feet wide for single storey buildings.
8) School buildings should be located on firm soil not prone to sliding.

Confined Masonry

Confined masonry is a structural system consisting of un-reinforced masonry wall panels surrounded by vertical and horizontal "confining members" such as bond beams and tie columns. The masonry panels consist of masonry units bonded with mortar. In this system, the masonry wall panels are relied upon to transfer all lateral loads, including earthquake loads, to the foundation. The confining elements work to hold the wall together under earthquake shaking and distribute lateral load within and in-between wall panels. They also help improve wall-to-wall, floor-to-wall and roof-to-wall connections. Schools can be built using the same technique as it is equally good for all types of masonry; stone, block and brick.

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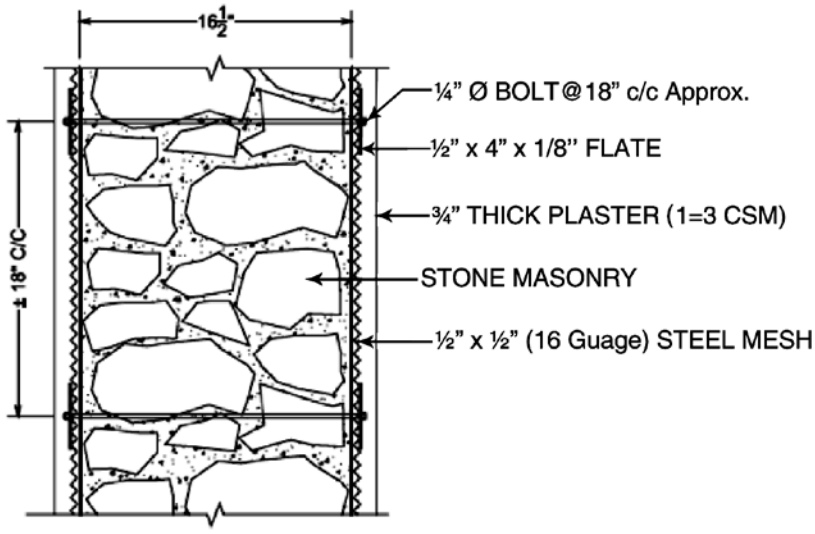

GI wire mesh jacketing followed by cement and plaster.
Source: schoolsafetyconference.org

Report

International Conference on School Safety

Destruction caused by major earthquakes in South-East Asia in recent years reminds us of insufficient progress towards construction of safe schools. One of the most tragic aspects of the October 2005 Kashmir Earthquake was the disastrous collapse of school structures. Over 8,000 schools were destroyed. About 17,000 children perished (approximately 23% of the total deaths) in this earthquake, of which over 9,000 died while attending school in the morning. Another 20,000 children suffered serious injuries.

With the objective of promoting safe schools – a pivotal component leading to safer habitat and communities, Aga Khan Planning and Building Service, Pakistan in collaboration with Focus Humanitarian Assistance, organised a three-day 'International Conference on School Safety' at the Islamabad Serena Hotel, Pakistan. Conference partners included Government of Pakistan, Aga Khan Foundation (Pakistan), Aga Khan Education Service Pakistan, **basin**-*South Asia*, UN-HABITAT/ One UN Programme in Pakistan, UN/ISDR, UNCRD, ADPC, SDC, ADC, Alcan Prize for Sustainability and Institute of Architects of Pakistan.

The Conference provided a platform for like-minded people and organisations to share their experiences, lessons-learnt and discuss various school safety issues such as formulation of policies enforcing school safety on a government level, better technical designing of school buildings, improving in construction skills, educating and preparing children and communities against hazards. There were approximately 125 participants from about 15 countries which included regional policy makers, government agencies and ministries, academia, experts, disaster management agencies, national education agencies from various countries, local and foreign NGOs, applied research institutions, bilateral and multilateral funding agencies, private sector, civil society, communities, school teachers and students.

The Conference was aimed at highlighting the risks from school structures following natural disasters and finding ways which can enhance safety of children from collapsing school buildings. Six different school safety related themes: Policy and institutional mechanisms; Technical aspects of seismically safer schools; Capacity development require-ments for safer construction; Integrating disaster risk reduction in formal/ informal education; Community preparedness; and Public-Private partnerships were discussed and practical follow up action plans were developed.

Deliberations of the Conference, through Islamabad Declaration on School Safety, proposed the urgent need of governments to develop mechanisms to provide technical, financial and capacity support as needed to design and implement School Safety Action Plans. The Declaration also highlighted and suggested means for communities, civil society and private organisations as partners with critical roles in implementation of the action plans. With their extensive discussions and knowledge sharing exercises, the international participants presented a set of practical recommendations for submission to the Federal Government as well as to the private stakeholders to build safe schools in order to ensure the safety of lives of our future generations. These recommendations included: devising policy supplements and mechanisms; ensuring that schools structures are earthquake resistant by carrying out the assessment of existing schools for retrofitting; strengthening capacity and enhancing skills by identifying entities that provide education of construction skills and technical training and implementing local and community level training programmes; reviewing/ modifying current national and local educational

Zeenat Niazi, Programme Director, Development Alternatives and Advisor, ***basin****-South Asia delivering a speech at the Plenary Session of "Capacity Development for Safer Construction"*

material on Disaster Risk Management; reviewing/ formulating Community-based DRR programmes and outreach mechanisms for school safety; organising national, provincial and local level workshops to promote public-private-community partnerships.

Much can be done to guide future school planning and construction and to reduce school vulnerabilities through proactive mitigation programmes. School safety needs to become a national priority. Policies, guidelines, implementing and monitoring mechanisms are needed. This translates

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Chief Guests at the Closing Session of the Conference (Left to Right: Amyn Dosa, Chairman FOCUS; Hafiz Sherali, Chairman AKPBS,P; Ahsan Iqbal, Member National Assembly, Government of Pakistan; Iqbal Walji, President, Aga Khan Council; Earl Kessler, Leader of the Consolidation Group of the Conference; Sálvano Briceño, Director of the Secretariat, UN/ISDR; H.E. Markus Peter, Swiss Ambassador to Pakistan)

Case Study

Beyond Safe Construction

At about 09:20 hrs IST on October 8, 2005 a devastating earthquake of Richter scale 7.6 jolted the Kashmir valley leaving a trail of death and destruction. Tremors were felt up to a distance of 1000 km from the epicenter Muzaffarabad and the effect was spread across a radius of 140 km.

Most construction in the area was not earthquake resistant and there was large scale destruction of schools, houses and other buildings. A total of 846 schools were destroyed in the Kashmir Valley. Luckily, since the earthquake struck before the school opening time, there were no casualties inside the schools.

CEE Himalaya team immediately visited the earthquake affected areas and conducted a rapid need assessment. Among all districts, Uri was the worst affected with major losses to life and property.

Children were the worst affected category. Most were under tremendous stress, anxiety and depression. Procuring food, clothes and shelter was a priority for the families and hence psychological and emotional care to the children was overlooked. Children were deployed by their families for procuring relief materials instead of being sent to school. The education system was badly affected as a majority of the schools had collapsed. Also, children had been traumatized to such an extent that they refused to go to school.

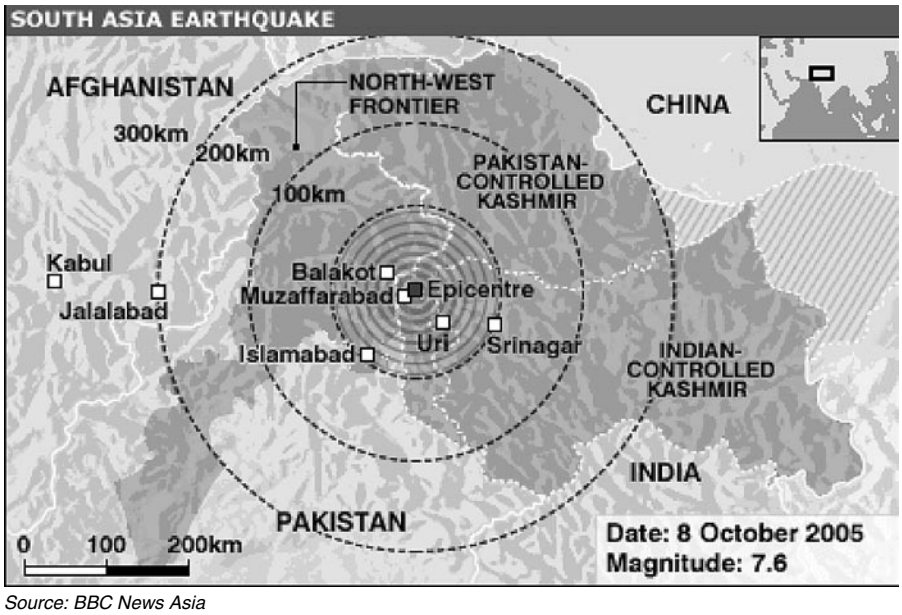
Interim Classrooms

The need for interim classrooms was felt strongly since the construction of permanent schools was expected to take time and winter was approaching. Interim classrooms were constructed using earthquake resistant technologies for 12 schools in 3 villages. These classrooms proved to be an ideal place to get children to resume their studies. Engineers and Architects from Center of Environmental Planning & Technology (CEPT), Ahmedabad, were called to Kashmir to design suitable prototypes that were appropriate for local conditions, low-cost and adequate for conducting classes. They were 12'x10'x8' in size with corrugated roof and walls, insulated with foam with a lining of plywood. During the construction of these prototypes, hands-on training was given in earthquake resistant construction to village technicians.

Umang-Psycho-Social Care and Earthquake Awareness

"Umang" was a program in which classes were conducted in the open and not inside the four walls of classrooms. Its emphasis was on learning with fun and joy. The main aim of these open air schools was to bring children back to schools, since both children and their parents were afraid of using damaged schools. The program also helped teachers to overcome their fears.

The methodology adopted was a combination of formal and informal learning with curriculum based activities. Mock drills were practiced in some selected schools. Children and teachers were motivated to identify the safe places in and around the schools where they would be secure in case of future tremors.



Source: BBC News Asia

Teacher Training

For creating a multiplier effect and also to reach out to all the children in need, teachers from Uri and Tangdar tehsils (administrative division) were trained. These teachers conducted Umang in their schools. The training module comprised of tips on identification of trauma symptoms and ways to minimize the impact; the science of earthquakes, do's and don'ts; participatory teacher learning methodologies and the "what, why and how" of environmental education.

Earthquake Resistant School Construction – *Anandshalas*

Seven damaged schools were selected for reconstruction using earthquake resistant techniques. These are being developed as model schools known as *Anandshalas*, meaning "schools of joy", which would attempt to provide children with an environment congenial to their overall development.

During the construction phase students, teachers and parents were all involved as monitoring agents for quality control. Students chose the colors for walls, doors, the position of blackboards and other interiors.

These schools are also being developed as resource centers for disaster response. Teachers and students will be trained in preventive techniques like first-aid, evacuation plans, fire fighting etc.

The Role of Education

Disaster preparedness can save many lives and prevent loss to property. Efforts are being made by the local government to set up disaster preparedness and mitigation cells at district level. Education is a very important tool in this direction which not only ensures the safety of students but also in preparing a brigade of trained youth to in dealing with future disasters even before the arrival of outside help.

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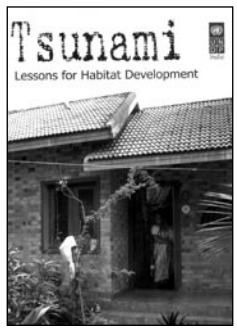
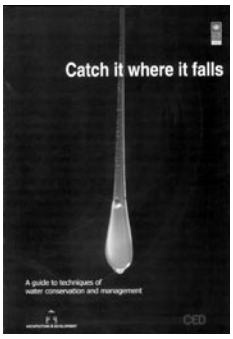
Publication

Books: New Arrivals



Title: ***Tsunami – Lessons for Habitat Development***

This book is about the experiences of various agencies working in post-tsunami rehabilitation. Documented by Development Alternatives, and compiled by **basin**-*South Asia*, the book attempts to identify key components with respect to risk reduction, community participation, capacity building and mitigation of environmental impacts. It assimilates and analyses good reconstruction practices from selected cases in the affected countries.



Title: ***Catch it where it falls***

It is a guide that provides techniques of water conservation and rainwater management. It has been prepared by Architecture & Development and Center for Education & Development, as a guide for activists, architects, engineers, local leaders, government bodies and all those who are interested in understanding water related issues. It documents techniques, concepts, basic design principles and various preventive and control methods for managing rainwater.

Title: ***Sanitation for You & Me***

This book is a technical overview of the sanitation scenario. It documents sanitation issues, waste management, sanitation units and the technical details of construction. Prepared by Architecture & Development and Center for Education & Development, the book offers insights that will enable users to solve vital problems in their fields, while at the same time highlighting the pitfalls that need to be avoided.

These books have been published by UNDP INDIA.

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International Conference on School Safety

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into actions that address identifying resilient school needs, retrofitting existing structures, creating evacuation plans and safe havens, improving community and student awareness through outreach and simulations. Selection of safe sites, design and construction technologies and materials also apply to the larger built environment. Fortunately, there now exists ample information in the form of knowledge and technologies for making schools safer well within the affordability of governments and communities alike. AKPBS,P is applying this information and has started retrofitting schools in the Northern Areas of Pakistan and is in the process of preparing programme mechanisms for more comprehensive implementation of the Action Plan.

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Participants having discussion at the Working Group Session of "Public-Private Partnerships for Safe Schools"

Participants attending the Keynote Speech at the Opening Session of the Conference

Regional Knowledge Platform

South Asia

Auroville Earth Institute aims to research, develop, promote and transfer earth-based technologies which are cost and energy effective.

Aga Khan Planning and Building Service, **Pakistan** works to improve the built environment through the provision of technical assistance and construction management services.

Centre for Ecocentric Development and People's Action, Nepal is a non-profit, non- governmental organization working for "People Centered, Eco-Centric Development."

Coastal Area Disaster Mitigation Efforts, India is a network of twenty voluntary organizations working for disaster preparedness of Fishing Communities in India.

Exnora International, India works as a catalyst in bringing about local initiative and community participation in overall improvement in quality of life.

Grambangla Unnayan Committee, **Bangladesh** is a non-profit, non-governmental organization working for people affected by extreme poverty, exclusion and disease.

Orissa Development Technocrats' Forum, India works to facilitate an effective rural housing delivery system through appropriate technologies and sustainable livelihoods.

Trust for Village Self Governance, India is a charitable trust focusing on local self governance in villages for creating sustainable employment through habitat development.

Practical Action, Sri Lanka, works with poor communities to develop appropriate technologies in food production, energy, transport, shelter and disaster mitigation.

Swiss Agency for Development and Cooperation (SDC), **India** is Switzerland's international cooperation agency within the Swiss Foreign Ministry.

Secretariat

Development Alternatives is a not-for-profit sustainable development enterprise that designs and promotes programmes and products which, through the use of alternative technology, contribute to the enrichment of human life.

Gram Vikas, India is a rural development organization, working with poor and marginalized communities of Orissa since 1979 making sustainable improvements in the quality of life.

Unnati is a non-governmental organization working over the last 15 years for "civic leadership promotion and strengthening local self governance."

basin-*South Asia* Regional Knowledge Platform (basin-*SA*) is committed to *"developing knowledge systems and promoting collaborative action within South Asia to enable access by the poor to sustainable habitat and livelihoods."*