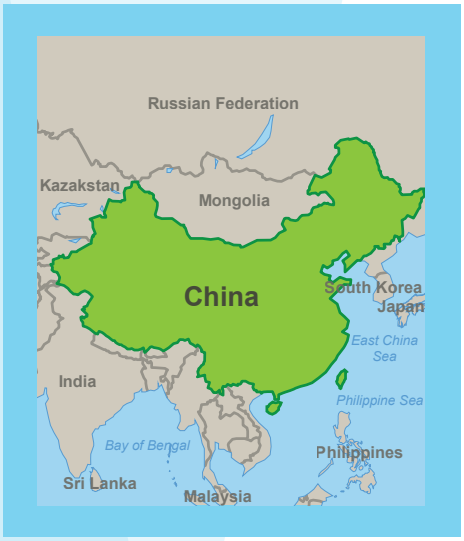
Global Alliance for Disaster Risk Reduction & Resilience in the Education Sector

GADRRRES Comprehensive School Safety Policy Case Studies Series

Assessing and Implementing Structural Interventions for Schools in China



China

Pillar 1: Safe Learning Facilities

Organisations:

- *Ministry of Education (MoE)*
- *United Nations Children's Fund (UNICEF) China*

Schools Impacted:

- 322,938

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Overview

In 2009, the Ministry of Education (MoE) developed a program that mandated the seismic assessment and, as needed, the retrofit or reconstruction of every primary and secondary school in China within three years. The National Primary and Secondary School Building Safety Project was developed a year after the 2008 Sichuan earthquake, also called the Great Wenchuan earthquake, which resulted in the deaths of approximately 87,000 people, including 10,000 schoolchildren (Shuanglin, 2016; Sheth, 2008). The M_s 8.0 earthquake revealed widespread seismic susceptibility among China's school building stock, with 7,444 school buildings damaged or destroyed (Chen & Booth, 2011).

The School Building Safety Project mandated the assessment and retrofitting or reconstruction of weak primary and secondary schools nationwide, including those unaffected by the Sichuan earthquake. (The total number of school construction projects completed is unavailable at the time of publication. However, over 90 percent of school projects slated for retrofit, repair, or reconstruction have been completed.) The project followed on the heels of the central government's generalised recovery and reconstruction plan in earthquake-affected areas, which involved around 4,600 school reconstruction projects across the three affected provinces of Sichuan, Gansu, and Shaanxi (State Planning Group of Post-Sichuan Earthquake Restoration and Reconstruction, 2008). The School Building Safety Project, which is ongoing, is an example of how states with strong central governments may approach the issue of unsafe school structures where the problem is geographically expansive. Though the project is an initiative of the central government, it has relied heavily upon coordination with provincial and local governments, school administrators, as well as international organisations for planning and implementation.

Keywords: China, school facility assessment, school retrofit, earthquake

Hazard and Education Context

China, a country with vast territory, is susceptible to earthquakes, landslides, floods, droughts, winter storms, and typhoons. China's earthquake risk is especially concerning, with fault zones underlying parts of the country's western and eastern regions, including the capital.

China first established national seismic building codes in 1974, but these were soon revised with higher standards following the 1976 Tangshan earthquake, which killed over 240,000 people (UNCRD, 2009; Chen & Booth, 2011). Since the adoption of the Code for Seismic Design of Buildings in 1989, which was updated in 2001, China's written seismic building code has been consistent with international standards (Ministry of Construction of the People's Republic of China, 2001). The building code rates each region on the Chinese Seismic Intensity Scale (CSIS), a 12-point scale based on ground movement and on

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subjective observations of earthquakes. The code requires buildings in regions with high CSIS ratings to be designed to withstand more intense seismic shaking. In 1997, The Law of the People's Republic of China on Protecting Against and Mitigating Earthquake Disasters — colloquially known as The Earthquake Act — gave the seismic building code national legal status (Ke et al., 2015).

Despite the presence of a robust seismic building code, the Sichuan earthquake revealed gaps between building code standards and building construction practices. The gap was particularly problematic in rural areas, where economic development lags behind that of urban areas. Schools in rural areas often also have insufficient budgets for structural assessment and repair.

Urban students enjoy significant educational and socioeconomic advantages over their rural peers. Urban schools tend to have higher levels of funding for school repairs and educational materials, and urban families often have more resources to support their child's basic needs. Many buildings in rural areas, however, are older than the country's building code and were never subject to seismic regulations. In rural areas of the Sichuan region, many school structures were unreinforced masonry brick buildings with multiple storeys, which were highly susceptible to collapse in earthquake. In some case, buildings lacked any formal engineering design at all, which often led to buildings collapsing and killing or injuring students and teachers inside. The Sichuan earthquake revealed that even newer buildings in rural areas were built far below standard, or with substandard material (Chen & Booth, 2011).

The Sichuan earthquake also revealed inadequacies in the application of the building code. The Sichuan region was assigned a CSIS rating of VII, yet some areas of Sichuan experienced intensities of up to XI during the earthquake. Even buildings built to conform to the legal standard were vastly under-strength for the Sichuan earthquake (Chen & Booth, 2011). The earthquake highlighted major problems with both older school buildings and newer ones constructed without sufficient adherence to seismic building codes or designed to inadequate shaking intensities.

Problems:

- High earthquake risk
- Seismically weak existing school building stock

Goals:

- Reduce risk of earthquake-related injury and death in schools

Intervention:

- National seismic assessments of school buildings and prioritisation for retrofit and reconstruction

Developing a Process for Nationwide Assessment

Following the Sichuan earthquake, it was clear that China's schools needed to be evaluated for structural safety and that many would likely need to be retrofitted or replaced. In September 2008, China's United Nations Children's Fund (UNICEF) office brought technical experts and policymakers from the Ministry of Education (MoE) to Japan to study international practices in disaster risk reduction, with a focus on school building safety (UNICEF, 2009). In December of 2008, China coordinated with the OECD to organize an international training conference on post-earthquake reconstruction of public facilities, which drew on international experience with planning and implementing post-disaster reconstruction. Over two dozen Chinese officials from all levels of government attended, bringing their knowledge back to their respective jurisdictions (OECD, 2009). The following year, the MoE established the School Building Safety Project, a nationwide project to 1) assess how well each school building could withstand the hazards to which it was exposed and 2) retrofit or reconstruct public and private primary and secondary school buildings that were assessed as unsafe. The programme's focus was earthquake risk, but school assessments also considered other natural hazards such as landslides, floods, fires, typhoons, and lighting. The programme received financial and logistical support from UNICEF's China office.

The National School Safety Office supervised the project and managed data on a nationwide scale. However, with nearly 300,000 schools to assess for potential retrofitting or reconstructing, the project coordinated with local governments

Major Impacts:

- Reconstruction and retrofit of weak schools

Greatest Insights:

- Use of national school building inventory to aid in prioritisation and monitoring

What's Next:

- Ensure future school construction meets new standards of design, construction, and construction monitoring
- Ensure schools maintain school facilities

to direct their own project management and implementation. Provincial governments primarily played an administrative role, managing data, funds, and helping local governments with school assessments.

Each province was required to submit a project "road map" to the central government, which outlined deadlines for assessments and school construction. City and county governments were responsible for coordinating the assessments with schools and technical teams, collecting and providing school data to provincial authorities, and implementing the retrofitting or reconstruction projects (Ministry of Education, 2009a). The central government allocated approximately 30 billion yuan over three years toward the School Building Safety Project while approximately 350 billion yuan came from provincial governments (Yinfu, 2014).

The devastation of the Sichuan earthquake created high levels of social support for policies aimed to protect adults and children from future earthquake events. There was no notable opposition to the School Building Safety Project. The project had substantial support from outside organisations and universities. For example, the Ministry of Education collaborated with UNICEF to develop the "National Guidelines for Safe School Construction after the Sichuan Earthquake," which was used as a guideline for school design and construction. The MoE also consulted with Beijing Normal University in designing mechanisms for project organisation and data management.

Ensuring Safe School Construction

One of the first steps in the assessment process was the creation of provincial databases for the storage of school assessment data. These provincial databases supported a national database known as the National Primary and Secondary School Buildings Information Management System, also known as the School Building Database. Within three months of creating provincial databases, city and county governments were expected to provide basic data about their school inventories, often in the form of photographs and videos of the schools (National School Security Office, 2010).

Professional teams assessed the schools using uniform technical standards outlined by the MoE. School buildings were compared to their original designs and to current building codes and the teams conducted field tests to assess their structural integrity. Assessment teams then recommended whether the school was safe, or should be retrofitted or demolished (Guo et al., 2014).

Based on these recommendations, the individual school worked with a design company to create a school design plan and accompanying project budget. The school then applied for the necessary funding from the local government (Guo et al., 2014). School assessments, recommendations, and proposed projects were incorporated into the School Building Database. City or county authorities then prioritised school project funding and allocated a specific amount to each school's project. After the local government approved a school's design plan and budget proposal, the school would contract a private company to complete the construction plan.

The Earthquake Act, which codifies the seismic building code, was amended so that schools would be built to a higher standard than other buildings in the region (Chen & Booth, 2011). Furthermore, program guidelines mandated that local governments had to select geologically stable school sites outside of landslide and flood-risk areas (Ministry of Education, 2009). Contractors for school construction were required to not only meet the "National Guidelines for Safe School Construction after the Sichuan Earthquake," but the relevant building codes for schools as defined by their seismic intensity zone.

The central and provincial governments placed great emphasis on construction monitoring to ensure that school buildings were constructed to the standards defined by the MoE's guidelines and by the building codes. While provincial

governments carried out formal inspections of school construction projects, a system of “social supervision” was institutionalised whereby private citizens were encouraged to report concerns and complaints about school construction to authorities.

Policy-Enabling Factors and Remaining Challenges

High levels of organisation and coordination between governments and a large budget from the central and provincial governments helped the project develop quickly. Over 90 percent of schools slated for retrofit, repair, or reconstruction have been completed. Though the School Building Safety Project has already created thousands of safe schools, and can largely be considered a success story, governments struggled to meet the ambitious goal of completion within three years. The division of such a large budget among nearly 300,000 schools was a complex process; some schools navigated the complexity quicker than other schools, either due to the technical state of their buildings or a greater availability of provincial funding.

In the coming years, China will need to ensure that the new standards of design, construction, and construction monitoring continue to be applied to new school construction. New and retrofitted schools, especially those in rural areas, will need sufficient funds for school maintenance and repair to ensure that the successes of the School Building Safety Project are sustained.

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Child-centred DRR and CSS Bibliography at:
https://www.mendeley.com/community/C-CDRRandCSS/

Comprehensive School Safety (CSS) is a framework for advocacy and action aligning policies and plans across education and disaster management sectors at all level. It uses child-centred all-hazards risk assessment and context analysis as the evidence base for action in three overlapping areas: Safe Learning Facilities, School Disaster Management, and Risk Reduction and Resilience Education. For more information, see http://www.gadrrres.net/

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