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

GADRRRES Comprehensive School Safety Policy Case Studies Series

Uzbekistan

Pillar 1: Safe Learning Facilities

Organisations:

- *Ministry of Public Education (MPE)*
- *Uzbek Research and Design Institute of Standard and Experimental Design of Residential and Public Buildings (UzLITTI)*
- *United Nations Centre for Regional Development (UNCRD)*

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Seismic Renovation and Reconstruction of Schools in Uzbekistan

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Overview

Old Soviet-era buildings are widespread and seismically unsafe in Uzbekistan. For post-Soviet states with substantial earthquake risk, many school buildings are prone to damage or collapse in an earthquake event. In 2004, Uzbekistan established the National Programme on School Education Development for 2004-2009, which required unsafe school buildings be retrofitted or rebuilt. In response, the Cabinet of Ministers of Uzbekistan organised a working group of government agencies to oversee the project. The group — which included the Ministry of Public Education (MPE) and the State Committee of Architecture and Construction — oversaw over 10,000 primary and secondary school building assessments nationwide during a three-month period. The assessments revealed that an earthquake could seriously damage 25 percent of school buildings and cause another 10 percent to collapse. Over a six-year period, the national government worked with national, provincial, and local agencies to retrofit, repair, or rebuild 8,501 school buildings according to new anti-seismic school designs.

Keywords: Uzbekistan, earthquakes, school assessment, school retrofit

Hazards and Education Context

Uzbekistan is located on a tectonically active region of central Asia. The capital, Tashkent, sits above the Karzhantau fault system, putting the city at high seismic risk. The city was the epicentre of a devastating magnitude-5.3Mb earthquake in 1966, which destroyed many traditional adobe buildings and damaged brick and unreinforced concrete buildings (Mavlyanova, 2004). After the 1966 Tashkent earthquake, Soviet authorities rebuilt schools using masonry and reinforced concrete frame designs (UNDEA & UNCRD, 2008). Many of the reinforced concrete frame systems were of the Soviet RC IIS-04 series. This style of building eventually proved seismically weak and experienced heavy damage and collapse in earthquakes in other parts of the Soviet Union during the 1980s.

In 1996, the United Nations International Decade for Natural Disaster Reduction secretariat launched the Risk Assessment Tools for Diagnosis of Urban Areas against Siesmic Disasters (RADIUS) to promote seismic risk reduction in urban areas. A RADIUS study of Tashkent's building stock generated increased awareness of the seismic fragility of Tashkent's building stock, including its school buildings (Mirjalilov, 2000). This study stimulated the national government to make earthquake risk mitigation a policy priority.

Studies found that many schools in Uzbekistan had been constructed without geological studies examining the integrity of the soil beneath and with poor construction material. Schools in Tashkent sometimes had been built on alluvial deposits, a soil often found in former riverbeds and canals. This soil can liquefy during earthquakes and severely damage buildings constructed on it (UNDEA & UNCRD, 2008). Outside of Tashkent, in rural areas of Uzbekistan, many schools also had been built without engineering or geological studies, and had been built with earthquake-vulnerable materials like adobe, raw brick, adobe blocks, or natural stone.

The national government has taken several policy measures to address its disaster risk since the mid-1990s. In 1996, a presidential decree established the Ministry of Emergency Situations, an agency responsible for organising emergency response. The same year, the Uzbek Research and Design Institute of Standard and Experimental Design of Residential and Public Buildings (UzLITTI) — a government institute that researches structural earthquake mitigation and develops building codes — replaced the Soviet building code. The current building code incorporates seismic resistance measures into new building construction. However, many weak buildings constructed before the new building code remained. The country saw a need to address pre-existing schools that were seismically unsafe.

Policy Development Process

In 2004, the first Uzbek president, Islam Karimov, established the National Program on School Education Development for 2004-2009 by a presidential decree. The programme aimed to improve all aspects of education in Uzbekistan. One of the programme's objectives was to improve structural school safety through capital rehabilitation and reconstruction of school buildings. The Cabinet of Ministers adopted a resolution developing a government working group to structurally assess all primary and secondary schools nationwide.

The State Committee for Architecture and Construction established a design working group to assist the assessment process. The group included 11 state engineering and design institutes under the leadership of Uzbek Research and Design Institute of Standard and Experimental Design of Residential and Public Buildings (UzLITTI). The design working group assessed the structural integrity of school buildings, determined a required structural intervention, and developed designs for retrofitting projects and reconstruction projects.

The Fund for the Development of School Education provided most of the funding for the programme. The fund was established in 2004, shortly after the adoption of the National Program for Education Development 2004-2009. Additional funding came from foreign donors, including the Islamic Development Bank, the Asian Development Bank, the governments of Japan and China, and the World Bank. In total, 1.4 trillion Uzbek soums went toward school construction work between 2004 and 2009.

The assessment process began in early 2004 and was primarily based on questionnaire responses from school officials. The Ministry of Public Education (MPE) sent questionnaires to all of the nearly 10,000 primary and secondary schools in Uzbekistan. The questionnaire asked school administrators for information, including:

- School name and address
- Construction date
- Capacity
- Number of floors
- Building area and volume
- Building materials
- Construction methods

Schools Impacted:
- 8,501

Problems:
- High earthquake risk
- Seismically susceptible school building stock

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

Intervention:
- Nationwide assessment of all schools
- Seismic retrofit or reconstruction of all schools requiring structural intervention

“...many schools had been built without engineering or geological studies, and had been built with earthquake-vulnerable materials...”

Schools were required to fill out the questionnaire and submit 10 photos of the school building from different angles. The questionnaires were due a week later.

The design working group assessed the questionnaire results and grouped each school building into a structural solution category. In cases of ambiguous questionnaire responses, the design working group sent a team of engineers to the school for a field assessment. Field teams reassessed questionnaire criteria on site and examined other characteristics, like existing anti-seismic measures, soil conditions, and existing damages to the school building.

The design working group used the questionnaire or field survey results to group each school building to one of the following categories:

1. **Demolition and new construction.** The school building was susceptible to collapse, it was more cost and time-effective to demolish and reconstruct than restore or retrofit the building.
2. **Operating repair.** The school met the current building code requirements and did not require strengthening, but some required light repairs.
3. **Rehabilitation.** The school required anti-seismic strengthening, also called retrofitting.
4. **Capital reconstruction.** The school building required strengthening and new construction, such as additional classrooms or sports halls.

The intervention category assigned to a school building was often related to the building’s age, because older buildings were associated with fewer or no anti-seismic structural standards. The oldest buildings in the inventory, many of which were rural schools, were often built with adobe or stone, and had sinking foundations and visible cracks in the bearing walls from previous earthquakes. These buildings were highly susceptible to heavy damage and even collapse in earthquakes. Older buildings of adobe and stone were typically slated to be demolished, while newer buildings tended to only need light repairs. Notably, 64 percent of the Uzbek population lived in rural areas in 2015 (World Bank, 2016).

The assessment process took just over three months. All school assessment data was collected and organised by UzLITTI. The design working group assigned schools to one of the intervention category and developed a group of design solutions for each of these categories. The group also made guidelines for conducting routine repairs within the defined budget. All of the designs were consistent with the most recent 1996 building codes that included anti-seismic measures.

Table 1. Recommendations following structural safety assessments of nearly 10,000 primary and secondary schools

Category	Percent
Demolition and new construction	7
Operating repair	24
Rehabilitation	42
Capital reconstruction	27

Table 2. Number of new designs created by UzLITTI for school retrofit, repair, and reconstruction

Category	Number of New Designs
Demolition and new construction	6
Operating repair	10
Rehabilitation	220

"The design working group assessed the questionnaire results and grouped each school building into a structural solution category..."

Construction Process

The MPE began implementing the plans in summer of 2004. The MPE delegated most of the implementation work to municipal and provincial governments. The MPE required that local governments prioritise school interventions based on each school's level of need compared to other schools in the area. Construction proceeded, first prioritising demolition of unsafe schools, then reconstruction of those schools. Rehabilitation of weak schools followed, with schools that needed only operating repairs being prioritised last.

Local governments organised public tenders for construction work according to technical and budget requirements defined by UzLITTI. Local construction firms bid for contracts and those firms that won the tender consulted with the design working group for guidance on how to implement their designs. The local branch of the State Architectural Construction Supervision (GASN) monitored contractors to ensure they were meeting the structural requirements. During a school building's construction work, students attended the closest open school. Construction costs for enhanced seismic resistance increased new construction

Major Impacts:

- All structurally substandard primary and secondary school buildings retrofitted or rebuilt

Greatest Insights:

- Cooperation among multiple government ministries and departments
- Establishment of mechanisms for monitoring school construction work

What's Next:

- Continued maintenance of school buildings
- Non-structural mitigation

costs by between 3 percent and 14 percent per school, depending on school capacity, seismic intensity zone, number of floors, and ground conditions.

The implementation coincided with a United Nations Centre for Regional Development (UNCRD) Global Earthquake Safety Initiative (GESI) project titled Reducing Vulnerability of School Children to Earthquakes in 2006. The UNCRD project targeted four international cities, including Tashkent. One of the project goals was to ensure that children living in seismic regions had safe learning spaces. In Tashkent, the UNCRD partnered with the MPE and UzLITTI to retrofit two model schools. During the retrofitting process of these two model schools, parents attended seminars on anti-seismic retrofitting strategies. Experts leading the seminars discussed the role of structural mitigation measures in reducing earthquake risk and the leaders encouraged parents to consider earthquake risk and risk reduction measures in their homes. The UNCRD — along with UzLITTI, the NGO HAYOT, the Tashkent Khokhmiyat Office, and the Red Crescent Society of Uzbekistan — also held a two-day technical training workshop for local engineers, technicians, and masons on seismically resistant construction methods. (UNDEA & UNCRD, 2008).

Between 2004 and 2009, 8,501 Uzbek primary and secondary schools — a total capacity of 3 million students — were retrofitted, repaired, or rebuilt under the National Program for Education Development 2004-2009. A total of 351 schools were reconstructed, 2,470 schools underwent capital reconstruction, 3,608 schools were rehabilitated, and 2,072 underwent operating repairs (Akhmedov, 2013).

Figure 1. Following structural assessment of schools, the MPE rehabilitated 3,608 schools using a variety of retrofit techniques; another 2,470 schools underwent captial reconstruction, a form of intervention that included a combination of new construction and retrofit. Photo credit: Bakhtiar Nurtaev

Policy-Enabling Factors and Remaining Challenges

Since the beginning of the National Programme for Education Development in 2004, all structurally substandard primary and secondary school buildings in Uzbekistan have been retrofitted or rebuilt to be seismically safe. In 2011, the national government established a new fund to maintain and improve primary, secondary, and higher education facilities to ensure that schools remain structurally safe into the future. The government will need to develop effective planning and implementation mechanisms for necessary retrofits and repairs to ensure that available funds translate into an effective school maintenance policy.

The assessment and structural intervention work in primary and secondary schools in Uzbekistan demonstrates the national government's commitment to child safety and disaster risk reduction. Its mechanism for implementing large-scale retrofitting and reconstruction projects serves as a model for other countries to follow. Much of the programme's success came from cooperation among government ministries and departments. Including schools and local governments in planning and implementation processes also helped the project succeed. The government's establishment of construction monitoring mechanisms ensured that construction was consistent with seismically safe designs. Finally, the national government was able to quickly complete the mandate of the National Programme for Education Development because it was a policy priority. The government saw school seismic safety as one of the most important and urgent projects on the national policy agenda. By ensuring a steady source of funding for ongoing school maintenance, Uzbekistan further protected the gains made during their school rehabilitation and reconstruction programme. The programme and ongoing maintenance ensures not only current, but future generations of Uzbekistan children will learn in safe school facilities.

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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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