SOUTH ASIA
INNOVATION
PROJECT BRIEF

ADB

More stable schools constructed. The Kalika Model School in Pokhara, Nepal was built to meet disaster risk-resilient standards (photo by Narendra Shrestha/ADB).

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Earthquake-Resilient Schools in Nepal

Setting the Scene: The Innovation Opportunity

On 25 April 2015, a devastating earthquake struck Nepal. The seismic event, which registered 7.8 on the Richter scale, caused widespread destruction, including more than 8,000 deaths, over 22,000 casualties, and hundreds of thousands of people left homeless. Aside from homes, the earthquake severely affected the country's infrastructure, including government buildings and schools. Almost 9,000 schools were damaged or destroyed, disrupting the education of almost 1.5 million students.[1]

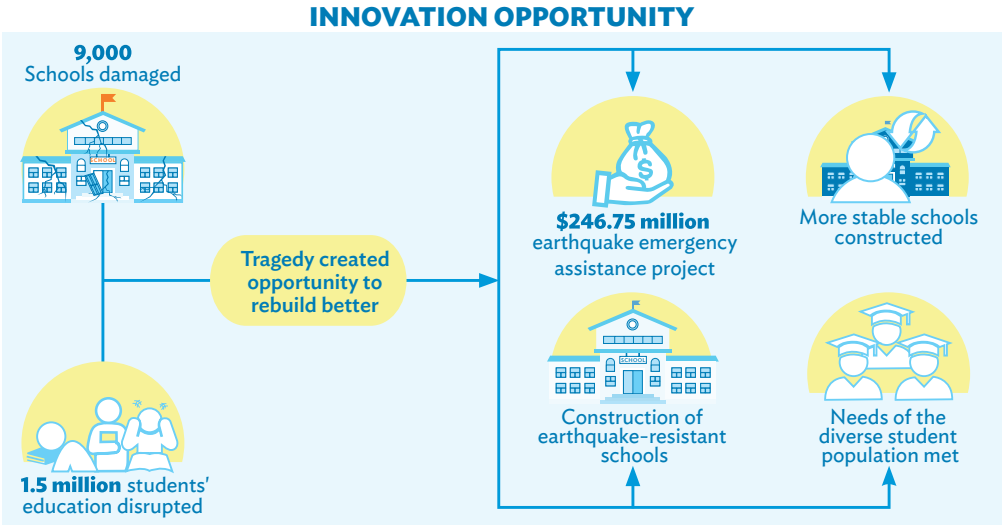
In the aftermath of the earthquake, the Government of Nepal established the National Reconstruction Authority to oversee and fast-track reconstruction work. The government sought development partner support for this, and the Asian Development Bank (ADB) approved the Earthquake Emergency Assistance Project with cofinancing from the United States Agency for International Development (USAID). The scale of reconstruction needed was overwhelming, including roads and other infrastructure such as schools. There were fears that the affected generation of children would never recover and would drop out of school.

However, out of this tragedy came an opportunity to rebuild better. The challenge was how to manage a complex, large-scale project across multiple construction sites happening at the same time, including in difficult-to-reach areas, on terrain that made it all but impossible to source typical disaster-resilient construction materials. But if these challenges could be met, there was also an opportunity to fold in other elements, such as soft-skills training in disaster resilience on the new school sites, which would then be shared with families and communities.

What ADB Did: Innovation in Action

The Earthquake Emergency Assistance Project, a multisector public rebuilding project under the purview of the National Reconstruction Agency, was supported by $200 million in ADB loans and $3.4 million in technical assistance (TA). The grants from USAID, and the People's Republic of China Poverty Reduction and Regional Cooperation Fund, as well as the Government of Nepal, took the total funding to just over $246 million. The TA element of the project was crucial because it brought in much-needed evidence-based construction technology, and ensured that both the construction and disaster resilience programs incorporated lessons learned from disaster recovery in other Asian countries. In addition, the project also repaired and improved about 135 kilometers (km) of strategic roads and about 450 km of rural roads damaged by the earthquake and landslides.

[1] Y. R. Paudyal and N. P. Bhandary. 2022. *Damage to School Buildings during the 2015 Nepal Earthquake and Reconstruction Strategy.* 11 January. https://doi.org/10.21203/rs.3.rs-1212791/v1.



Source: Asian Development Bank.

Key Innovations

Several key innovations ensured the principle of rebuilding better became a reality.

Innovative use of available building materials

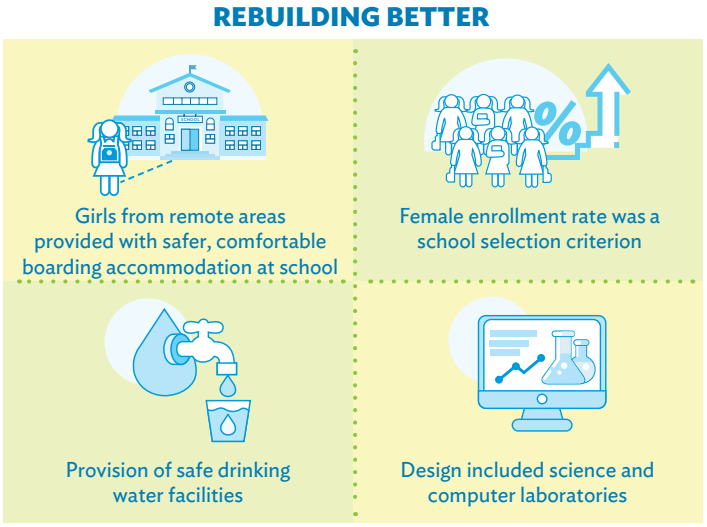
A significant part of the earthquake-affected area is in highly rugged terrains and is inaccessible by road, making it impossible to bring in modern construction materials. The TA provided in-depth research that showed how the construction materials that were locally abundant could be used in compliance with the national building code. Eight load-bearing, masonry-type design school buildings were developed using stone and mud. This included three earthquake-resistant stone masonry school building typologies and one cement-stabilized, compressed earth bricks in stabilized mud mortar. The Ministry of Urban Development has since approved these designs.

Expanded definition of rebuilding better

Not only were the new schools constructed to be resilient to earthquakes and other natural disasters, they also led to better access for more students. Gender equality and social inclusion are at the heart of the project, as the female enrollment rate was one of the main school selection criteria. The program not only constructed schools, it also created more disaster-resilient communities. Regular disaster preparedness drills are conducted at the new schools, emergency supplies are kept on hand, and the schools can be safe havens for locals to take shelter during an emergency. Moreover, the education of children in disaster preparedness filters back into the community through their families.

Real-time project progress monitoring

The school construction used a web-based project monitoring information system (PMIS) that enabled project managers to closely follow progress, remotely monitor implementation sites, and communicate directly and efficiently with engineers and contractors in the field. Because existing systems on the market lacked the required functionality, such as the ability to capture geo–coded spatial information and embed detailed surveys, safeguards, and quality assurance monitoring, the project team developed a tailor-made system.



Source: Asian Development Bank.

ADB also set up an extended monitoring hub with a situation room where monitoring agents, district engineers, and information technology experts monitored real-time, geo-tagged pictures from construction sites across Nepal. Parties, both on-site and remotely monitoring, could then use mobile applications (apps) to report a quality concern or an issue requiring immediate action.

Key Innovation Takeaways

Having gone through such a colossal disaster, Nepal is emerging with newfound expertise, and its success has valuable lessons that other countries can learn from and replicate. As an application of this innovation, two projects funded by ADB—the Disaster Resilience of Schools Project and the Regional Urban Development Project—are implementing the PMIS.

Getting children back into classrooms should not be at the expense of safety

The longer children are out of school, the more their education is at risk, but speedy and shoddy construction will create more problems in the long run if reconstruction is not disaster-resilient.

Rebuilding better goes beyond bricks and mortar

A fresh start for a construction project means buildings can incorporate accessibility and other provisions for gender and social inclusion from the start, avoiding costly and inefficient retrofitting later.

Project Voices from the Field

"At that time, it seemed like we would never recover from this disaster."

Sushil Gyewali
chief executive officer
National Reconstruction Authority

"Along with the construction of this disabled-friendly school building, a hostel, and drinking water facilities, ADB has also provided equipment for science and computer labs. With this support from the government and ADB, we are confident we can be a model school for others to follow."

Lokendra Dhakal
principal
Sanjiwani Secondary School

"We were concerned that a generation of students would drop out of school. We set a target to complete reconstruction of schools."

Naresh Giri
senior project officer
ADB Nepal Resident Mission

"It is beautiful, strong, and has modern facilities. The teachers regularly use multimedia projectors in the classrooms and it has made learning more fun and interesting."

Pratima Khadka
student
Sanjiwani Secondary School

Modern technology makes project oversight more manageable

The PMIS was one of the main drivers of success within the Earthquake Emergency Assistance Project and was strongly praised by stakeholders.

Involving the local community members pays dividends for them and for the project

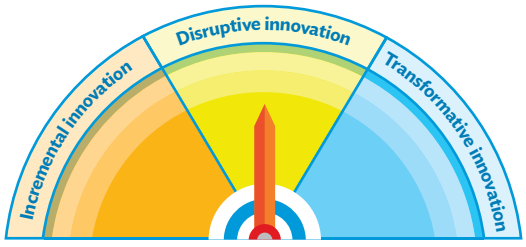
Many community members, particularly in rural areas, informally monitored contractors' work and observed the different earthquake resilience techniques used in construction. This raised awareness of construction quality among local people, and community members often adopted the new methods and practices for the reconstruction of their own private dwellings. This informal knowledge transfer helped build more resilient communities.

Faces of Impact: Naresh Giri

Question (Q): How did the innovations in this project help to overcome its challenges?

Answer (A): One of the key innovations was to have a monitoring hub with six consultants who were based in Dhulikhel, close to the construction area. All the information then came into a situation room where they monitored it using the PMIS system and were able to quickly distribute information to the government and ADB. The monitoring hub was able to alert us and the government when there were any issues. The decision to invest heavily in TA resources really paid off. It really helped complete the earthquake reconstruction project on time. Another important innovation was the use of vernacular building materials such as stone and mud, together with earthquake-resistant designs. These techniques, developed for use in remote areas, can also be used in cities to reduce a project's carbon footprint. Also, updating Nepal's building code and seismic code, which was another part of the TA, was a paradigm shift for building in Nepal.

LEVELS OF INNOVATION
EARTHQUAKE EMERGENCY ASSISTANCE PROJECT



Incremental innovation
improving on existing products, services, approaches, or processes, i.e., doing what is already done, but better

Disruptive innovation
"shakes things up" or subverts previous approaches. Instead using approaches that are new in the country context or are a demonstration project.

Transformative innovation
shifts the whole system over time to new viable approaches by scaling disruptions, new approaches, and pilots.

Source: Asian Development Bank.

INNOVATION AREAS
EARTHQUAKE EMERGENCY ASSISTANCE PROJECT

AREA	INNOVATION	THIS PROJECT
	Innovative financial products that help developing member countries finance complex projects and programs	☐
	Innovative technical solutions that improve sustainability, efficiency, and effectiveness	☑
	Innovative implementation design that help to overcome bottlenecks in institutional capacity or governance	☑
	Value-adding partnerships and collaborations that bring enhanced knowledge and skills	☐
	Innovative processes that make ADB more efficient and effective	☐

Source: Asian Development Bank.

Q: What did you learn from being the project officer?

A: I think one important lesson learned from this project was not to complicate things by building in many sectors. Originally, the project included roads, government buildings, and school buildings, and these were areas where ADB was already doing very well in Nepal, but in reality, all the attention in this project was on schools. In such an emergency project, the roads sector occupied our time in resolving the issues of compensation distribution and tree clearance rather than focusing on physical progress on-site. Next time, it would be better to reconsider this approach and go for a single focus sector. The second lesson learned is the importance of using a customizable PMIS tool based on project requirements. Additionally, this is really helping us even now in the coronavirus disease (COVID-19) situation to remotely monitor projects.

Naresh Giri is a senior project officer (Urban Development) at ADB's Nepal Resident Mission

Learn More

Project documents: Nepal: Earthquake Emergency Assistance Project.

Blog: Naresh Giri. New Technology Helping Rebuild Nepal's Quake-Hit Schools Better, and Faster. *Asian Development Blog.*

Video: Asian Development Bank. 2020. Building a Better Future – Five Years after the Nepal Earthquake. 24 April.

Case study: B. S. Khadka. 2020. *Five Years after the Nepal Earthquake – Building Back Better Schools for a Safer Future.* ADB.

South Asia Innovation Project Brief Series captures and disseminates knowledge on innovation embedded in ADB's operations in South Asia. This series promotes cross-project learning, improves project design and implementation, strengthens the understanding of innovation needs and trends, and enhances development effectiveness of ongoing and future projects and south-south knowledge cooperation. The South Asia Department administers the series. Please contact SARDKM@adb.org.

https://www.adb.org/publications/series/south-asia-innovation-project-briefs

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ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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