BUILDING RESILIENCE TO DISASTERS

Miyamoto Preparedness, Mitigation, Response and Recovery Expertise

70! ANNIVERSARY

miyamoto. EARTHQUAKE + STRUCTURAL ENGINEERS


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save lives, impact economies

Miyamoto International is a global earthquake + structural engineering and project management company providing critical services that sustain industries and safeguard communities around the world.

We are experts in high-performance engineering that reduces lifecycle costs and produces a positive net impact on a structure's operation. We assess the performance of structures to identify specific vulnerabilities, and prioritize solutions that limit business interruption and reduce property damage.

Built on decades of earthquake and structural engineering experience in the field, our expertise supports how clients address the economic, political, social, sustainability and resiliency challenges in earthquake risk reduction and post-disaster recovery and reconstruction.

Miyamoto offices are strategically located worldwide in earthquake-hazard regions to positively impact economies and save lives.

Sacramento
San Francisco
San Jose
Los Angeles
Orange County
San Diego
Reno
Washington, D.C.
Mexico
Costa Rica
Colombia
Haiti
Liberia
Italy
Turkey
India
Nepal
Japan
New Zealand

make the world a better, safer place.

MEET THE TEAM

DRR/DRM+ RESPONSE EXPERTS

Dr. Kit Miyamoto,

PRINCIPAL IN CHARGE

World's foremost expert in earthquake DRR/DRM.Lived in disaster zones for past 10 years. Expert consultant for the World Bank, USAID, UN agencies and numerous governments. California Seismic Safety Commissioner.

Dr. Tsutomu Nifuku

PROBALISTIC RISK ANALYST

Internationally known specialist in probabilistic portfolio analysis, exposure data collection, resiliency assessment and damage mitigation strategy. A developer of Miyamoto Quake, an advanced earthquake disaster assessment tool.

Dr. Amir S. Gilani

EXPERT EARTHQUAKE ENGINEER

Globally recognized expert in performance-based earthquake engineering; conducts field testing and advanced analysis to solve structural challenges.

Deepansh Kathuria, MS

STRUCTURAL ENGINEER

PROJECT MANAGER

Extensive international DRR/DRM project-management experience in USAID and World Bank programs.

Elizabeth Petheo, MA, MBA

DRR/DRM SPECIALIST

DC REPRESENTATIVE

Recognized leader in international development known for creating and executing world-class resilience-based programs worldwide. Expertise: Large-scale program management, DRR/DRM, capacity building and public private partnerships.

Sabine Kast, MBA

DRR/DRM SPECIALIST

PROGRAM DIRECTOR

Extensive management experience in disaster response and reduction projects. Winner of ENR Global Best Project. Expert in NGO, international agency and private-sector partnering and capacity building programs; facilitates and coordinates all aspects of administration, documentation and deliverables.

WHAT WE DO

INCREASE

The capacity of at-risk countries and communities to anticipate and adapt to disaster risk.

IMPROVE

The ability for vulnerable countries and communities to address and reduce risk.

RESPOND

In times of disaster to the needs of affected and at-risk populations.

Our goal is to reduce vulnerability and build resilience. Miyamoto is a technical leader and trusted global partner in preparedness, mitigation, response and recovery.

FEATURED PROJECTS

Miyamoto International partners with clients such as The World Bank, USAID, UNESCO and UKAID to provide expert earthquake engineering assistance to advance country-led and community-driven disaster risk preparedness, reduction, mitigation and response programs. Our approach is to work with stakeholders at all levels to strengthen their capacity to advance this important work sustainably, build resilience and share our knowledge with others to empower them to implement positive change.


MTC

Rapid Vulnerability Assessment of Earthquake Affected School Buildings

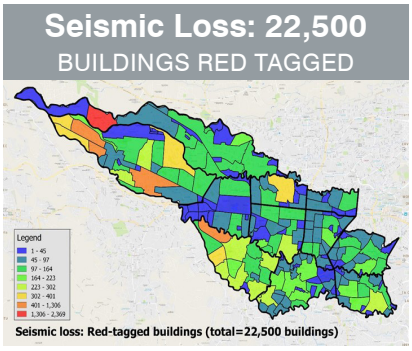
LOCATION:
Aceh, Indonesia

YEAR:
2017

CLIENT:
The World Bank

SCALE:
246 school buildings

Miyamoto conducted a seismic vulnerability assessment of 246 school buildings in Aceh, Indonesia following the 2016 Pidie Jaya earthquake. Current school building engineering, construction practices and techniques were found to be relatively unchanged over the past 40 years. The assessment found that a simplified prioritization for building strengthening was feasible and simplified strengthening of the existing buildings is achievable. Field survey data was collected for 246 school buildings to divide buildings into similar construction types, for which fragility functions and fatality ratios for each damage state were prepared. Probabilistic analysis was conducted to estimate fatalities. The overall fatality rate for the school buildings was about 1.2 percent, resulting in the anticipated loss of 180 lives. The 25 (10 percent) worst-performing school buildings would contribute to 25 percent of fatalities. It is imperative that action be taken to reduce the risk to the lives of schoolchildren. Miyamoto also recommended design standards for future design and construction.



PREPARE
Costa Rica/ Colombia
Vulnerability Assessment

LOCATION:
San José, Costa Rica
Pasto, Colombia

YEAR:
Ongoing

CLIENT:
USAID/OFDA

The PREPARE program for USAID/ OFDA was designed to provide city officials, national DRR/DRM officers and first responders with a better picture of the impact of an earthquake on their cities and to help them prepare and plan accordingly. Since implementing the program in 2016, Miyamoto has assisted local stakeholders marshal their effort since emergency-response planning takes political will, coordination, time and resources. Since launching the PREPARE program in San José, Costa Rica, municipal and national stakeholders have come together and identified capacity and planning gaps, collectively redefined their short- and longer-term preparedness goals, and expressed an eagerness to obtain the needed technical assistance to help them make further progress towards achieving these goals. Similarly, in Pasto, Colombia, momentum to tackle identified earthquake response planning gaps has been built up, leading the Mayor and municipal DRR/ DRM and response actors to request further technical assistance and support.

Rapid Vulnerability Assessment and Prioritization of Critical Public Facilities

LOCATION:
Republic of Myanmar

YEAR:
2017

CLIENT:
World Bank

Miyamoto International was commissioned by the World Bank to assist local strategies by conducting a rapid vulnerability assessment of public buildings in Yangon, including schools, hospitals, cultural heritage buildings and other public facilities. Engineers are working with local stakeholders to identify vulnerable structures and determine the cost and scope associated with a follow-up DRR project. The objective of assessing and then retrofitting vulnerable structures is to reduce the risk of injury and death in a design-level earthquake. Retrofit solutions produced will take into account local construction strategies and materials. The project began with a focus on large public markets because of the lives at risk in the antiquated buildings. Myanmar is highly vulnerable to the impact of natural disasters, ranking second on the global climate-risk index and experiences an earthquake of magnitude 5 or greater on the average of four times annually.

Vulnerability Assessment and Prioritization of Risk Reduction and Retrofitting of Public School Buildings

LOCATION:
Ulaanbaatar, Mongolia

YEAR:
2016

CLIENT:
World Bank

SCALE:
300 Public Schools

Miyamoto International was contracted by the World Bank to perform a preliminary assessment of the seismic risk to public school buildings in Ulaanbaatar, Mongolia. Recent research identified several active faults near the capital city capable of producing large earthquakes. Existing school buildings are in poor repair, with 30 percent being more than 40 years old. The oldest 75 percent have little or no seismic design consideration and many are built with non-ductile precast floor construction responsible for tens of thousands of deaths in schools collapsed by large earthquakes in other countries. Miyamoto performed a multi-hazard vulnerability assessment and also assessed the cost of retrofitting the most vulnerable school buildings. Taking into consideration the findings of the assessments, Miyamoto developed updated guidelines for the seismic retrofitting of public schools in Ulaanbaatar. Repairing schools will safeguard children's lives from earthquakes in Ulaanbaatar.

Ecuador Earthquake Disaster Response Initiative

LOCATION:
Ecuador

YEAR:
April 2016 (Ongoing)

CLIENT:
Various

The primary goal of this technical assistance initiative was to help strengthen the capacity of municipal governments and other partner organizations to respond to and mitigate against the impact of the 2016 April earthquake disaster. The activity responded to USAID/OFDA's objectives with the aim of providing technical assistance to at-risk and affected municipalities and communities in Ecuador. Additionally Miyamoto met with the municipal staff of Quito and Portoviejo, surveyed the cities, including informal construction in the city of Quito, which forms 60 percent of the residential construction. We also reviewed current and planned earthquake-response initiatives and provided recommendations for earthquake disaster-risk reduction. The recommendations included policy input aimed at reducing the risk in informal construction areas and establishing a coordinated damage-assessment program. Our work in Ecuador continues.

Nepal Earthquake Disaster Response Reconstruction and Mitigation

LOCATION:
Nepal

YEAR:
2015-2016

CLIENT:
Various

SCALE:
Magnitude-7.8

Miyamoto earthquake engineering experts landed in Nepal within three days of the April 2015, magnitude-7.8 earthquake to provide support to local entities responding to the crisis. In the immediate aftermath, many large organizations stepped up to provide immediate relief by supplying food and water, temporary shelter and medical support. While this support is critical, we provide expert earthquake structural engineering and reconstruction advice quickly, such as assessing whether homes and buildings are safe to re-enter and helping local government officials develop a plan for rebuilding or retrofitting to seismic standards that will withstand the next large earthquake. To date, we have more than 1,000 projects underway and completed ranging from damage assessments to retrofits for private and public clients. Our new office in Nepal advises local owners on structural assessments, urban and rural reconstruction, retrofits, structural design for new construction and quality control and construction supervision.

More than 600,000 houses in rural Nepal partially or totally collapsed as a result of the 2015 earthquakes. Located in the lower Mount Everest region, the village of Chhulemu also was badly hit. About one-third of the village houses needed to be demolished due to sustaining extensive earthquake damage. Repairs and retrofits are required for all of the remaining homes. The Himalayan Development Foundation (HDF), in partnership with Miyamoto, has taken on the task of rebuilding the Chhulemu village. Miyamoto designed rural house construction and repair guidelines per national code, which is being used by a local team of carpenters and HDF volunteers to reconstruct and repair the damaged homes. Miyamoto is providing technical advice and guidance, as well as ensuring that quality construction is maintained as part of a full-time QA/QC program. Chhulemu is a day's hike away from the nearest road and home to 30 families that are largely subsistence farmers.

Chhulemu Village Reconstruction

LOCATION:
Chhulemu, Nepal

YEAR:
2015

CLIENT:
Himalayan Development Foundation (HDF)

SCALE:
30 homes and a school

Miyamoto International is providing in-kind engineering services to repair and retrofit the Shree Shiladevi Madhyamik Vidhyalaya school in Nepal. This public school was red tagged because of structural damage in a column that ruptured in the April and May 2015 earthquakes that devastated Nepal. This is one of 495 schools in Nuwakot, one of the worst earthquake-affected districts in Nepal. The nonprofit Miyamoto Global Disaster Relief stepped in to help. This work is being done in partnership with the Government of Nepal's Department of Education and Round Table, another charitable organization. Miyamoto International analyzed and engineered a reinforced concrete shear wall retrofit system to strengthen the building to meet international standards for life-safety in schools. More than 300 students attend the school, which serves 10 grade levels.

Nuwakot School Repair and Seismic Upgrade

LOCATION:
Nuwakot, Nepal

YEAR:
2015

CLIENT:
Miyamoto Global Disaster Relief

SIZE:
5,622 SF

SCALE:
2 stories

Seismic Damage Assessment: Everest and Annapurna Trekking Regions

LOCATION:
Nepal

YEAR:
2015

CLIENT:
SAMARTH/UKAID, World Bank/IFC

SCALE:
Two trekking routes and
900+ structures

On behalf of the Government of Nepal, and with funding support from SAMARTH/UKAID and the World Bank/IFC, Miyamoto International conducted an earthquake damage assessment of Nepal's main trekking routes after the 2015 M-7.8 earthquake. The assessment of Annapurna included the structural evaluation of more than 250 village accommodations, 30 bridges and 250 kilometers of trekking routes for geotechnical hazards. At Everest, we assessed 710 village accommodations and residences, and 9 bridges. The Annapurna and Everest regions are among the most popular trekking regions worldwide. More than 100,000 trekkers and mountaineers visit the region annually. The project addressed life-safety issues for tourists and locals alike, and provided the government with needed information to safely reopen the Annapurna and Everest trekking routes in time for the subsequent tourism season. The revival of the tourism industry post-earthquake was critical for Nepal's economic recovery. The team also provided recommendations on repairs and risk mitigation.

In close collaboration with the World Bank and its effort to advance the Philippine government's overall natural disaster risk mitigation program, Miyamoto is developing retrofit guidelines and a multi-hazard prioritization methodology for Metro Manila's public schools and hospitals.

With the Philippines being among the Top 10 natural disaster hotspots in the world, a multi-hazard methodology that considers risks due to volcanos, typhoons, floods, tsunamis and earthquakes was deemed essential to ensure that available seismic retrofit funds ($400 million) are allocated appropriately. The multi-hazard prioritization includes a seismic retrofit cost-benefit methodology that Miyamoto developed based on international best practices.

The culmination of this assignment will include:

- Multi-hazard prioritization methodology
- Seismic retrofit cost-benefit methodology
- Seismic retrofit engineering and construction guidelines
- Prioritized list of the Top 100 candidate public school and hospital buildings for seismic retrofit
- Communication plan for stakeholders and the Filipino technical community (e.g., educational and/or training workshops)
- Community engagement and public relations plan to communicate the earthquake risk and need for a retrofit program

Metro Manila Structural Resilience Program

LOCATION:
Metro Manila, Philippines

YEAR:
2013

CLIENT:
World Bank

COST:
$400 Million

SCALE:
Approx. 4,000 public school and hospital buildings

Miyamoto provided engineering quality control for a World Bank and the European Union (EU) funded seismic risk-mitigation project in Istanbul involving more than 2,000 structures. Several hundred schools, hospitals, and emergency operation centers were seismically strengthened. With Turkish engineers and academicians, we developed guidelines for seismic rehabilitation by using the latest U.S., Japanese and Turkish codes.

By working with the Turkish government, we were able to assist with high-performance earthquake engineering, providing designs that achieve superior performance at reduced costs. Our international culture helped us work effectively with local and other international consultants.

Istanbul, Turkey
Seismic Risk Mitigation and Rehabilitation

LOCATION:
Istanbul, Turkey

YEAR:
2007–08

CONSTRUCTION COST:
$1 Billion

SCALE:
2,000 Structures

DONORS
World Bank, European Union Funded

Tohoku, Japan

Earthquake Disaster Mitigation, Response and Reconstruction

LOCATION:
Northeastern Japan

YEAR:
2011

SCALE:
Magnitude-9.0

President and CEO Dr. Kit Miyamoto was presenting at an earthquake disaster mitigation conference in Tokyo when the magnitude-9.0 earthquake occurred, followed by a 29.6-foot-high tsunami. He immediately traveled into the affected areas, investigating and analyzing the damage on behalf of the University of Tokyo to give the Japanese Government critical information to help in the repair of the affected communities. Investigations included the failure of seawalls, conditions of structures and infrastructure and the cause of damages. This knowledge was used to educate Japan and the international community on planning and preparation for similar disasters to come. A thorough analysis of the local tsunami warning system was executed, including the emergency transportation system, emergency shelter facilities, and isolation of hazardous materials. More than 11,000 fatalities occurred and 400,000 people were left homeless as a result of the earthquake.

Christchurch, New Zealand

Earthquake Disaster Mitigation, Response and Reconstruction

LOCATION:
New Zealand

YEAR:
2010

SCALE:
$40 Billion in Damages

In the challenging and uncertain months following the Canterbury and Christchurch earthquakes, thousands of commercial and residential property owners were left with damaged buildings and an urgent need for clear, accurate information. Calling on our expertise, Miyamoto assessed and identified the extent and severity of structural and cosmetic damage, which was widespread throughout downtown due to soil liquefaction and historical buildings with little to no seismic reinforcement. The government's policy of declaring the entire downtown a red zone and allowing the demolition of more than 2,000 buildings resulted in many businesses abandoning the central city. Five years later, downtown Christchurch had still not recovered. The city recently shared business-recovery "lessons learned" when a M-7.8 earthquake hit Kaikoura in 2016. In Christchurch, Miyamoto has assessed, repaired and reconstructed thousands of residential and commercial buildings.

Romania Hazard Risk Mitigation & Emergency Preparedness

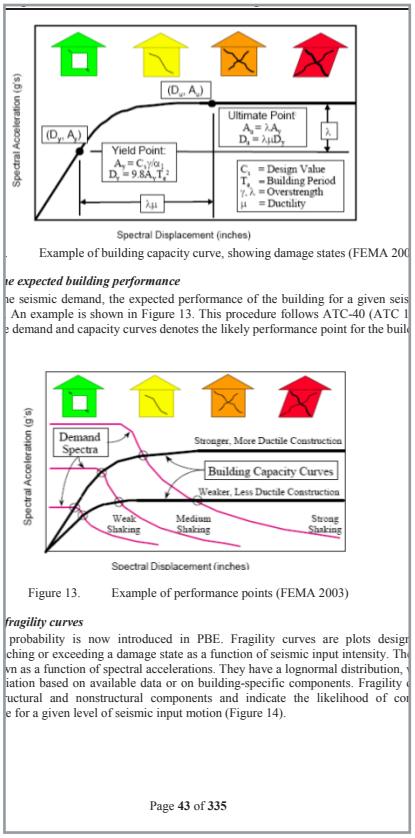
LOCATION:
Romania

YEAR:
2006-2012

CLIENT:
Ministry of Transport, Construction and Tourism

SCALE:
14 Counties

Miyamoto provided a quality-control program for the earthquake engineering and construction of 61 buildings in 14 different counties of Romania, from Bucharest in the south to Iasi in the north. The project included monitoring 20 design and construction seismic retrofit contracts, as well as monitoring the construction supervision of 84 seismic retrofit projects. Miyamoto also implemented and conducted a construction quality-assurance program for Romania. The buildings involved in this project were key public-sector institutions, including fire stations, schools, hospitals, historic or cultural heritage buildings, and emergency response centers. This program is considered to be the cornerstone of the earthquake disaster mitigation program for the region.



Example of building capacity curve, showing damage states (FEMA 200

he expected building performance

he seismic demand, the expected performance of the building for a given seis
An example is shown in Figure 13. This procedure follows ATC-40 (ATC 1
e demand and capacity curves denotes the likely performance point for the build

Figure 13. Example of performance points (FEMA 2003)

fragility curves

probability is now introduced in PBE. Fragility curves are plots design
ching or exceeding a damage state as a function of seismic input intensity. Th
vn as a function of spectral accelerations. They have a lognormal distribution,
iation based on available data or on building-specific components. Fragility
tuctural and nonstructural components and indicate the likelihood of co
e for a given level of seismic input motion (Figure 14).

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In collaboration with Romania's Ministry of Regional Development and Tourism (MRDT), with the financial assistance of the International Bank for Reconstruction and Development (World Bank) towards its Hazard Risk Mitigation and Emergency Preparedness Project, Miyamoto prepared a Handbook for Professional Training in Cost Effective and Innovative Retrofitting Methods. The MRDT intends to use the Handbook to organize professional training for the Romanian construction specialists, including designers, structural engineers, site supervisor specialists, architects and/or others in the local technical community. The Handbook covers the following topics:

- Alternative strategies for seismic design
- New materials for strengthening of buildings
- Introduction to the development and use of performance based criteria
- Actual design examples of strengthening schemes to be used later for retrofitting of buildings in Romania
- Current international and national developments in building codes
- Lessons from recent destructive earthquakes applicable in Romania
- Development and use of probable maximum loss estimates

The Miyamoto team included several key local (Romanian) consultants, experts in the field of regional seismology, structural and earthquake research and engineering, and local design and construction norms, standard practices and regulatory standards.

Handbook for Professional Training in Cost Effective and Innovative Retrofitting Methods

LOCATION:
Romania

YEAR:
2012-2013

CLIENT:
Ministry of Regional Development and Tourism (MRDT), World Bank

The earthquake in Haiti on January 12, 2010, called for extraordinary measures from the global community. As an earthquake engineering expert, Miyamoto had the privilege of partnering with the Government of Haiti and key recovery stakeholders to respond to the nation's immediate needs. Stakeholders include the United Nations Office for Project Services (UNOPS), World Bank, United States Agency for International Development (USAID) and the Pan American Development Foundation (PADF).

Our recovery and reconstruction efforts for the people of Haiti included the damage assessment of more than 400,000 structures and planning and implementing a reconstruction strategy for the affected area.

Port-au-Prince, Haiti Disaster Response Reconstruction and Mitigation

LOCATION:
Port-Au-Prince, Haiti

YEAR:
2010

CLIENT:
Government of Haiti, Pan American Development Foundation, UNOPS, World Bank

SCALE:
Magnitude-7.0

The Haiti Ministry of Public Works, Transport and Communications (MTPTC) conducted an earthquake damage assessment program on an unprecedented 400,000 buildings after the January 12, 2010 earthquake. Miyamoto International set up a technical platform and trained 600 Haitian engineers under extreme post-disaster conditions. We also managed 15 divisions of Haitian engineers to collectively provide building assessments. This was the world's first post-disaster assessment program to use a personal digital assistant (PDA) database management system to provide real-time information to key disaster response and recovery organizations.

The main objectives of the project were to: 1. Provide rapid safety assessments of damaged structures. 2. Develop a strategic reconstruction plan. 3. Build the local leadership and skills needed to respond to this disaster and rebuild the country. The information generated by this program allowed people to move from temporary shelters into adequate housing before the hurricane season began. The work included using the Applied Technology Council's detailed earthquake damage and safety evaluation procedures and adapting them to Haitian construction to identify any existing damage for the facilities being assessed.

Damage Assessment of 400,000 Structures

LOCATION:
Haiti

YEAR:
2010–2011

CLIENT:
The Pan American Development Foundation (PADF), United Nations Office for Project Services (UNOPS), United States Agency for International Development (USAID), and The World Bank

SCALE:
400,000 Structures

Hundreds of thousands of fatalities in the 2010 Haiti earthquake for the simple reason that the buildings were built poorly. To ensure the same mistakes would not be repeated, Miyamoto International worked closely with the Ministry of Public Works and its partners to develop and publish guidelines on how buildings could be properly repaired. Miyamoto International and its partners trained 5,000 masons and dozens of contractors in these improved construction techniques. With funding from USAID, the World Bank, the Caterpillar Foundation, the Clinton-Bush Haiti Fund and the American Red Cross, we repaired more than 10,000 houses.

Between the published manual, the classroom trainings and a rigorous quality-control program during construction, Miyamoto International and its partners were able to improve the quality of the construction in Haiti and help ensure that future earthquakes will be far less deadly.

The Yellow House Repair Program has been identified by many as one of the most successful housing projects in Haiti due to its efficiency and quality of work. It has been identified by the Haitian people as a program promoting immediate relief, technical advancement and long-term growth in the private sector.

Yellow House Repair Program, Repair of 12,000 Earthquake Damaged Homes

LOCATION:
Port-au-Prince and Leogane, Haiti

YEAR:
2012

CLIENT:
United States Agency for International Development (USAID), World Bank, Caterpillar Foundation, Clinton-Bush Haiti Fund, American Red Cross

COST:
$25 Million

SCALE:
12,000 Houses

AWARDS:
ENGINEERING NEWS RECORD “BEST GLOBAL PROJECT”, 2014

Community Resource Centers for House Repairs (CARMEN)

LOCATION:
Haiti

YEAR:
2012

CLIENT:
United Nations Development Programme (UNDP), Ministry of Public Works

The Community Resource Centers for House Repairs (CARMEN) was created in Haiti out of the need to provide accurate technical information to earthquake-displaced Haitians on how to make significant repairs to homes. Launched by United Nations Development Programme (UNDP) and the Ministry of Public Works (MTPTC), CARMEN set out to train and empower people in target areas to rebuild neighborhoods sustainably and safely through key services that facilitated self-repair and reconstruction. The majority of the trainees were female head of households. Establishing community resource centers provided the means to foster linkages of stakeholders at multiple levels and implement all plans necessary for repairs. Miyamoto's role was to develop relevant training packages for MTPTC engineers and homeowners, as well as provide up-to-date technical evaluations of all damaged homes. The project achieved remarkable results in a year with five fully operational centers that logged 28,000 direct beneficiaries the first year.

Miyamoto and Global Risk Miyamoto (GRM) dispatched a team of earthquake engineers to assess the structural integrity of existing buildings and infrastructure, and provided support to clients on damage assessment, loss estimation, and repair recommendations to mitigate further business interruption.

This data was utilized to promote earthquake risk reduction worldwide. More than 300 fatalities and 40,000 left homeless as a result of the damage caused by the M-6.3 earthquake near L'Aquila, Italy.

L'Aquila, Italy Disaster Response Reconstruction and Mitigation

LOCATION:
L'Aquila, Italy

YEAR:
2009

SCALE:
Magnitude-6.3

As an international earthquake engineering expert, Miyamoto provided quality control and risk mitigation studies funded by the World Bank. Conducting damage assessments in seven major cities, our engineers evaluated a variety of building types for future risk mitigation. Schools and hospitals were structurally deficient in construction, built with unreinforced masonry walls, with little or no connection between structural elements or soft story construction, leading to irrevocable collapse. China is in critical need of the latest engineering and construction methods such as a uniform building code and quality control checks for all building projects. As a result of the earthquake on May 12, 2008 near Sichuan, more than 70,000 were killed and more than five million were left homeless.

Sichuan, China Disaster Response Reconstruction and Mitigation

LOCATION:
China

YEAR:
2008

CLIENT:
World Bank

SCALE:
Magnitude-8.0

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