Mapping the Regulatory Environment for School Infrastructure in Japan

Overview

Country: Japan

Stakeholders: Ministry of Education, Culture, Sports, Science and Technology (MEXT), prefecture governments, local/municipal governments, schools, local communities, World Bank

Hazards: Earthquakes and tsunamis

Summary: Japan has a long history of seismic events that have caused significant loss of life and damage. The potential impacts of earthquakes and tsunamis on school buildings built before the 1981 Building Code put school children and teachers at an unacceptable risk. This situation gave shape to a country-wide program to improve the safety of school buildings. The Program for Earthquake-Resistant School Buildings aims to make all public elementary and junior high school structures compliant with the 1981 Building Code, and also covers other non-structural enhancements to school safety.

Japan's strong regulatory environment is continuously evolving in response to the experience of seismic events, which makes understanding and applying the regulatory documents and processes to safer school programs an ongoing process. This changing regulatory environment led to the Program combining a structural retrofitting component with supplementary policy-led initiatives which focus on non-structural elements of school safety. This resulted in a more holistic Program, directed by a strong regulatory environment that guided action in a coordinated and standardised manner.

CONTEXT

Seismic risk from the 'Pacific Ring of Fire' addressed

Japan is an industrialised, developed and democratic nation of 127 million people, located in the world's most seismically-active zone; the Circum-Pacific belt known as the Pacific Ring of Fire. Annually, Japan experiences more than 2000 earthquakes of intensities that people can detect normally, making seismic events a part of everyday life for most Japanese people.

The history of earthquakes and tsunamis experienced in Japan has led to constantly evolving regulatory documentation and policies as the understanding of hazards, building vulnerability and risk increases. With significant levels of public and political support for effective safer schools action, the Program for Earthquake-Resistant School Buildings in Japan (the Program) was initiated in 2003 and involved nation-wide retrofitting and reconstruction activities. It focusses primarily on pre-1981 public elementary and junior high school structures which are not compliant with the 1981 Building Code.

OBJECTIVES

Regulations as a driver of safer school construction in Japan

Japan's regulatory environment includes building regulations, policies, and guidelines. The safer schools Program carried out in Japan aimed to upgrade the school infrastructure for public elementary and junior high school buildings. The Building Code was used to define, structure and drive efforts by mandating how new structures should be built and how existing buildings could be retrofitted. Understanding and applying wider aspects of the regulatory environment, including policies developed during the Program's implementation, and guidance which addressed non-structural elements of school safety, is important to identify strengths and weaknesses. This highlights possible enhancements to mitigate risk from lack of enforcement and to assist in guiding stakeholder implementation in a coordinated and standardised manner.

METHODOLOGY

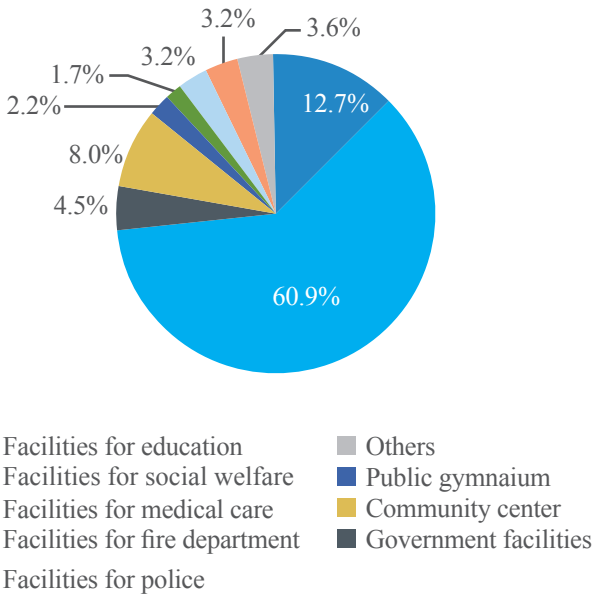
Earthquake experience and the continuous improvement of the regulatory environment

Japan's regulatory environment served as the backbone to the Program. The modern and robust current Building Code is based on the major changes introduced in 1981 following a long history of regulatory changes which reflect the increasing understanding of natural hazards that post a risk to buildings. Earthquake records in Japan date back as far as 600-700AD, making them some of the oldest records of their kind. The first introduction of seismic design into building standards followed the Great Kanto Earthquake in 1924, with a seismic coefficient of 0.1 requiring buildings to withstand a horizontal acceleration of 10% of gravitational acceleration.

Since then they have been updated after every major event, with the seismic coefficient rising to 0.2 in the 1950s

to accompany an improvement in structural material properties. In 1971, the building code was updated to incorporate the ultimate strength design approach, and also to introduce a procedure for the seismic safety of existing buildings. In response to the 1978 Miyagi Offshore Earthquake, the last major revision of the building code in 1981 introduced the new seismic design method which considers dynamic amplification of building and soil responses. Updates to the Building Standards Law and Law Enforcement Orders accompanied the Building Codes to ensure minimum loading and design requirements are met at a national scale. This process of experiencing disasters, observing effects, and re-evaluating standards, techniques and materials has resulted in an existing Building Code that is considered a best-practice, modern building code.

Given that the majority of public facilities used for community disaster management are school buildings, the Building Code requires seismic design loads of 125% for regular school buildings and 150% for gymnasiums.



Source: PADECO 2016

School buildings provide a significant proportion of public facilities used as community disaster management bases

While compliance with the Building Code was the centre of the Program, the evolving regulatory environment continued to inform the Program throughout the implementation phase (2003-15) as new policies and guidance regularly emerged. Policies developed by the MEXT throughout the Program were informed by the results of technical studies commissioned by the MEXT in response to the experience of earthquakes and various technical advancements, and tended to focus on non-structural elements of school safety.

CHALLENGES & OPPORTUNITIES

A systematic approach to assessing thousands of buildings

The Government of Japan initially used the Program to address structural vulnerabilities but realised, through the ongoing experience of earthquakes and tsunamis, the need to also address non-structural elements became apparent. The challenge of establishing a regulatory environment sensitive to non-structural elements was met with the targeted commissioning of studies by the MEXT that went on to inform new policies that would broaden the Program's focus during implementation.

After establishing the Program around the Building Code and developing guidelines to assist local governments implement the required upgrades, the challenge of ensuring local level action became an issue. This was addressed during the Program in 2008 when the Government of Japan required local governments to disclose the results of assessments done on schools' seismic capacities to the public.

OUTCOMES

Effective regulatory environments

Strong regulatory documents, policies, and processes have helped to shape and support effective Program outcomes, including:

- The identification and understanding of the national Building Code informed retrofitting and reconstruction measures that saw the number of more resilient schools rise from 44.5% at the beginning of the Program to an expected 98%.
- The Program included action on non-structural elements such as the functionality of school buildings as evacuation centres (2011), the earthquake resistance of non-structural members (2012), and the importance of increasing the lifespan of buildings (2013).

Learning

- Strong regulations, like Japan's Building Code, can function as effective benchmarks (for structural safety) at a national scale.
- Programs can adapt to and address evolving regulatory environments that are responding to learnings from the ongoing experience of seismic events, achieving more holistic safer school outcomes that cover both structural and functional elements of school safety.

Find out more

Read: Making Schools Resilient at Scale, World Bank, 2016, www.goo.gl/CqTyyS

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