

# Rebuilding Schools after the Wenchuan Earthquake: China Visits OECD, Italy and Turkey

*Following the May 2008 earthquake in China, government officials visited the OECD, Italy and Turkey to draw lessons from international experience in seismic safety.*

As the reconstruction efforts continue in China in the wake of the Great Wenchuan earthquake in May 2008, the China Development Research Foundation, with the support of the OECD Centre for Effective Learning Environments, organised an International Training Programme on the Post-Earthquake Reconstruction of Public Facilities from 1 to 11 December 2008. The programme involved 25 central, provincial-, city- and county-level officials responsible for the reconstruction work in the most affected provinces of Sichuan and Shaanxi. The programme's objective was to enhance participants' understanding of how to plan, regulate and implement the reconstruction and retrofitting of public facilities by drawing lessons from international experience (see *PEB Exchange* article "[OECD/PEB Follow-up to the Wenchuan Earthquake](#)").

The programme commenced with a meeting at the OECD Headquarters in Paris; participants then visited Italy and Turkey, two highly seismic countries. The programme addressed the following issues:

- How to formulate a comprehensive plan for reconstructing and retrofitting public facilities and infrastructure such as schools, hospitals, bridges and reservoirs.
- How to organise time-wise a reconstruction programme for public facilities, and how to establish priorities (*i.e.* what should be done first: formulate technical earthquake resistance standards for new facilities, retrofit existing facilities or enhance government supervision?).
- How to finance earthquake reconstruction and retrofitting programmes. (For example, how can the financial burden be shared among levels of government? How can local and central governments raise the required funds? How can the central government distribute, transfer and manage central funds in this regard?)
- How to manage earthquake reconstruction and retrofitting programmes, and how to co-ordinate work among levels of government, as well as among the departments involved at both the central and local levels. (For example, what should be the role of the central government and local governments?)
- How to monitor reconstruction efforts, how to ensure that the set standards are respected effectively, even in remote rural areas, and how to prevent corruption.
- How the public and non-governmental organisations can play a role in the reconstruction of public facilities.

## OECD MEETING

OECD Deputy Secretary General Thelma Askey welcomed the Chinese delegation and five international experts in the field of seismic safety to the OECD Headquarters on 1 December. The OECD Secretary General, Angel Gurría, took this opportunity to pledge his continued support for the Chinese reconstruction efforts.

Members of the Chinese delegation described the scale of the Wenchuan earthquake disaster and presented their priorities for the next phase of reconstruction. According to the delegation, immediately after the earthquake the Chinese government was able to evaluate the damage done to 90% of the area's houses and within three months had built more than 660 000 temporary houses. Over 270 counties were affected, and all began planning post-earthquake reconstruction while managing disaster relief work.



School hit in the Wenchuan earthquake



Robin Spence of the Cambridge University Centre for Risk in the Built Environment, United Kingdom, presented European countries's experience in assessing and upgrading existing school buildings as well as common issues between China and Europe. He outlined possible reasons for a disproportionate rate of school collapses:

- Many school buildings are old and have been altered since construction to accommodate increased pupil numbers.
- Building control by government departments may be of poor standards.
- Some buildings have large spans which lack structural support.
- Precast concrete building systems are used, with poor continuity at joints.

Spence explained that while retrofitting would be less costly and could be completed faster, demolition and reconstruction would provide for greater long-term safety and the chance to incorporate non-seismic upgrading. He added that in China, as elsewhere, establishing a cadre of trained specialists would be a high priority, for design, construction and inspection. Spence also affirmed that the European Association for Earthquake Engineering was ready to support the Chinese authorities in putting appropriate programmes into place.

Tom Tobin from GeoHazards International described California's School Earthquake Safety Programme including requirements for new buildings, dealing with existing buildings and financing retrofitting. He underlined the importance of an independent review of construction documents, continuous inspection, unannounced visits by inspectors, construction observation by a design engineer, and public accountability and auditing of expenditures.

Jean-François Sorro and Vincent Courtray from France's Department of Ecology, Energy, Sustainable Development and Town and Country Planning provided information on their efforts to protect the 700 schools in the seismic-prone French West Indies.

Jorge Proença shared initiatives from Portugal's Higher Technical Institute (Institute of Structures, Territory and Construction Engineering) to assess and reduce the seismic risk of educational buildings in their country as well as in Romania. This work included strengthening existing schools and developing earthquake-resistant design specifications for new schools.

## ITALY

The Chinese delegation visited the Italian Civil Protection Department (CPD), whose mandate is to protect citizens from natural and man-made hazards. Dr. Mauro Dolce, General Director of Evaluation Prevention and Mitigation of the Seismic Risk, and Dr. Agostino Miozzo, General Director of International Relations Office, received the delegation and gave them a tour of the Civil Protection Center. Dr. Dolce and his colleagues described the structure and functions of CPD. They pointed out that past devastating experiences made Italy realise how zoning areas and lack of adequate seismic codes could seriously worsen the natural earthquake hazard; the CPD therefore established a working group to upgrade both seismic zoning and codes and to assess the seismic vulnerability of buildings and other strategically important infrastructure.

Ruins of the primary school in San Giuliano after the devastating earthquake in 2002





Temporary settlements built in San Giuliano after the 2002 earthquake

To better understand Italy's seismic efforts, the delegation visited a school in San Giuliano, in the company of its mayor. This school collapsed in a 2002 earthquake, killing 27 six-year-olds and a teacher and bringing substantial grief to this little town. To rebuild the school, San Giuliano used base isolation, a mainstream seismic technology. The delegation was able to examine the base isolation device in the school's basement, following a presentation by Italian experts specialised in this technology. The delegation also visited both the construction sites of San Giuliano's new housing and its temporary settlements built after the 2002 earthquake which, to avoid waste, will be converted into university dormitories in the future. This was particularly interesting for those delegates in charge of China's post-earthquake reconstruction who are looking for cost-effective solutions.

The delegation then travelled to Naples to meet with authorities from the Campania Region and the local Civil Protection Bureau. Officials and experts described the retrofit programme for its public and educational buildings as well as its programme on "High Quality Educational Buildings". The latter incorporates ten principles of quality into the design and construction of educational buildings, adding new functions to the buildings in addition to seismic safety; among the principals are flexibility, multi-purpose capability, a safe and secure environment, and active disaster management. The delegation also visited a hospital under construction in Naples which has adopted the base isolation technology and is regarded as the safest hospital in Europe.

## TURKEY

The first organisation that the delegation met in Turkey was the Istanbul Project Coordination Unit (IPCU). Its officials, together with Polat Gülkan, the President-elect of the International Association for Earthquake Engineering, gave a brief but comprehensive introduction of the Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (ISMEP). This project is financed by the World Bank and the European Investment Bank and has the following aims: strengthen the institutional and technical capacity of emergency management; increase emergency preparedness and response awareness; support retrofitting or reconstruction of priority public buildings; identify vulnerable cultural and historical heritage assets; and take supportive measures to efficiently implement development laws and building codes.

As far as public facilities are concerned, ISMEP has retrofitted and reconstructed 512 facilities for education, health, administration and social services, with another 214 to be completed. The IPCU staff took the delegation to visit two retrofitted schools in Istanbul and explained the specific retrofit process for each.

On the second day in Turkey, Prof. Gülkan accompanied the delegation to Gölcük, where an earthquake had inflicted tremendous loss in 1999. The group drove along the coastline of the Marmara Sea and visited the relics of temporary and permanent housing built following that earthquake. A volunteer search and rescue organisation, Gesotim Arama Kurtarma, enthusiastically welcomed the delegation at Gölcük and introduced their activities. Established in the aftermath of the 1999 earthquake, this organisation offers regular training and emergency-preparedness classes to volunteers. In addition, it works to raise public awareness of seismic safety.



A school building in Istanbul being retrofitted by ISMEP

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The next day, a representative from the Turkish Ministry of Public Works and Settlement (MPWS), Demir Akin, came from Ankara to meet the delegation at the local Office of Public Works and Settlement. He outlined the workings of the MPWS and reviewed Turkey's general seismic hazards, as well as the government's post-earthquake reconstruction effort after 1999. According to Mr. Akin, the Turkish government's Emergency Restructuring Work Programme offers an institutional framework to improve living conditions, to develop and support the economy, to manage earthquake risk, and to reduce the loss of lives in earthquakes, with assistance from the World Bank. The 1999 earthquake resulted in the establishment of the General Directorate of Emergency Management, the central co-ordination agency directly under the prime minister, as well as the Natural Disaster Insurance System. Importantly, Turkey is trying to change its disaster management paradigm from response and recovery to mitigation and preparedness and to integrate disaster management into its development policies.

## LESSONS LEARNED

- Up-to-date and comprehensive seismic codes and micro-zoning are needed to adequately plan post-earthquake reconstruction. Specifically, government should carefully select an area far from fault zones and with sound soil conditions to build permanent housing. Government should also make school building codes more stringent and raise seismic resistant standards for schools.
- In addition to improving building codes, government should guarantee they are implemented, in order to ensure the quality of buildings, particularly public facilities. California is a good example as it relies on an independent agency to supervise school construction, from reviewing the construction plans at the outset to continuously inspecting the construction sites. Public accountability and expenditure auditing can be effective tools for quality supervision.

- Government should refer to Italy's and Turkey's successful experience and establish a unified and effective procedure to assess the seismic vulnerability of buildings before their retrofitting or renovation. The number of damaged buildings in the area affected by the Wenchuan earthquake is too great to envisage rebuilding them all in a short time; a feasible, cost-effective solution is to identify the most vulnerable buildings for retrofitting/renovation and then expand the scope of this project until all buildings throughout the country are retrofitted.
- It is inspiring to see that Italy adopts mature and effective seismic technology such as base isolation, together with quality materials, to guarantee the seismic safety of public facilities such as schools. China should seize the opportunity for reconstruction to encourage local governments to apply proven seismic technologies, using an incentive mechanism based on each area's economic development and cultural preferences.
- The conventional reactive seismic strategy should be changed to a proactive one. The focus of disaster management should be shifted from recovery-oriented to mitigation-oriented.

Based on the above lessons learned, the Chinese delegation suggested in a report to China's central government that the government should improve its disaster management mechanism and build an integrated platform shared by the various departments concerned to facilitate information sharing and emergency preparedness. The delegation also recommended designing public facilities like schools and hospitals as multi-functional buildings which can serve as shelters or rescue and relief headquarters in case of emergency.

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## RESOURCES

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