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Earthquake early warning system helped save lives in Japan

An early warning system in Japan that notified millions of people of an earthquake helped reduce injuries, save lives and prepare responders for the crisis that followed. Japan had invested \$500 million for sensors designed to detect the first waves, called P waves that are given off by earthquakes. Once detected, the wave is immediately registered on computers that determine its size and broadcast warnings via TV, radio and mobile phones. The system also alerts industrial facilities and transportation services.

Though earthquakes can't be predicted, experts say an early warning system that detects the earth's rumblings before they can be felt saved countless lives when Japan's once-in-a-millennium disaster struck two months ago.

Millions of Japanese live in areas, including Tokyo, that are in high risk of being hit by major quakes at virtually anytime, and over the last decade or so Japan has invested heavily in its early warning system, which is the most advanced in the world.

Despite the massive destruction wrought by March's magnitude-9.0 earthquake and the tsunami it spawned, experts say it could have been worse had Japan not been so prepared. "I think it saved many people," Kunihiko Shimazaki, a

Editor's Comment

Several of our readers emailed their appreciation for last month's special article, "Looking for Leadership" by The Rev. John Ander Runkle, R.A. Thus encouraged I have included two articles this month that I think you'll enjoy. Much of my career over the past 39 years has supported the local community church, and I agree with what James Williamson, FAIA shares in his article, along with a companion article by Jean Carron, FAIA. - Dan Kinnoin, AIA

Must We Lose Our Historic Religious Buildings?

By James F. Williamson, FAIA, Editor, IFRAA Journal



Union Ave. United Methodist Church, Memphis, TN
Photo credit: James F. Williamson

In Memphis, the diminishing and ageing congregation of the 87 year-old Union Ave. United Methodist Church, listed on the National Register of Historic Places, recently voted to sell the property to a drugstore chain for some \$2.3 million. A lawsuit by local preservationists proved unsuccessful, and the landmark structure is currently undergoing demolition. It will be replaced by a CVS Pharmacy and a parking lot.

A letter from church leaders to the congregation explaining the decision stated, "We regret that our old property is beyond repair at any reasonable cost, and we acknowledge the temptation we have faced toward sentimentality, or to value the past and physical surroundings over the deep needs of people here in Memphis.... We have come to conclude that sale of the property and the use of the proceeds for genuine ministry is clearly the direction in which God has led us."

"It is a building that has been on the National Register for a long time; its value has been recognized," countered John Hildreth, director of the National Trust for Historic Preservation's Southern Office. "So some kind of use that would bring vitality back to that building—that would help anchor that key intersection in Midtown—would be good. And that can be a church, that can be an adaptive use, a retail use, or some mixed use ... any number of things, and it can be done sensibly." However, no such potential user was able to match the CVS purchase price.

Meanwhile in Haverhill, Massachusetts, a campaign is under way to prevent demolition of the 163-year-old St. Gregory the Illuminator Armenian Apostolic Church, also listed on the National Register, to make way for a Burger King restaurant. Church officials claim that the cost of restoration would be some \$1.5 million, which the congregation cannot afford.

In communities across the nation a similar pattern is emerging. As members age and flight to the suburbs continues, dwindling inner city congregations find themselves saddled with the burden of unacceptably high costs for continuing to maintain their historic religious buildings. Developers, uninterested in the costs and complexities of adaptive reuse, are attracted to these landmark structures by the prospect of profitable new construction on prime sites. Preservationists may lobby against demolition, but too often prove unable to

leading seismologist and head of the government's earthquake prediction advisory board, said Thursday. "Particularly with the tsunami warning, it gave people time to act."

Japan has poured some \$500 million into a sophisticated network capable of detecting the first vibrations of an earthquake, called "P waves." These initial pulses do not create a lot of shaking and travel much faster than the killer shock waves that follow. The network of sensors, launched as the world's first in 2007, record the P waves and relay the information to computers that then calculate how big the quake will be.

Before the ground ever started rocking on March 11, warnings a huge quake was about to strike flashed across TV screens, were broadcast over radio stations and arrived on mobile phones. Alerts were also sent to halt trains and factories. The heads-up it gave was brief - in Tokyo, about 230 miles (370 kilometers) from the epicenter, messages with alarms interrupted TV programming only about 10 seconds before the hard jolts began. But those 10 seconds could be vital, said Roger Musson, a seismologist at the British Geological Survey.

"In terms of the safe shutdown of mechanical systems, factory outputs and bullet trains, then it seems to have worked really well," he said. "Ten seconds is time to turn the gas off if you're cooking, and that could make all the difference between your house burning down or not."

Still, Shimazaki warned that completely quake-proofing a country like Japan is impossible, and said the early warning system had its faults. Many of its sensors were quickly knocked out by the quake or the waves, and, because of the intensity and number of shocks, the ones that worked provided an overwhelming amount of information that made interpretation difficult. "There were some really simple problems that need to be fixed," he said, and scientists are

propose a financially viable alternative. City officials, eyeing the prospect of new jobs and increased tax revenue and wary of the constitutional separation of church and state, may refuse to stand in the way of the demolition of even the most historic religious buildings. And even in cases where demolition is not an issue, too often the prospect remains of a vacant historic structure slowly deteriorating from neglect.

Is there an alternative? Even when abandoned by their congregations, can these landmark buildings still be saved through imaginative strategies for adaptive use? Or must we be resigned to a steady attrition in our stock of historic religious architecture, which often includes the very best buildings in a community? In a world of pollution and shrinking natural resources, does a commitment to sustainability offer any new arguments for the preservation of religious structures?

James F. Williamson, FAIA is a professor of architecture at the University of Memphis, where he teaches design, theory, and professional practice.

The Environmental Value of Historic Religious Buildings

By Jean Carron, FAIA



*Extending the service life of buildings through regular maintenance avoids the very substantial environmental impacts of new construction.
Photo credit: Jean Carron*

Sustainable development, if taken seriously, will shift economics and policies to value existing heritage religious buildings for the beneficial social and environmental role they play in our communities even when adaptive reuse becomes the only recourse. Sustainable development, as described by the AIA, "extends our definition of quality to include social and environmental value. . . ." The social value of historic religious buildings is in the physical memory, visual delight and place making they contribute to. This has long been the primary argument for retention and reuse, but is often counter to the economic realities. The environmental value of building reuse is just beginning to be recognized and is of such urgency that it should be the tipping point that makes reuse the preferred and even mandatory option supported by new policies and economic incentives.

Reuse of any existing building avoids the substantial environmental impact of new construction. New construction in the United States, although only 1-2% of all buildings, uses 49% of all natural resources consumed. The magnitude of this excessive consumption is framed by the humbling realization that the United States, with only 5% of world population, uses 30% of all world resources, more per person than any country in Europe and twice as much as a citizen in the United Kingdom. As overall resource consumption climbs, the percentage considered renewable is dropping - from 41% in 1900 to 6% in 1995. The reliance on minerals and petroleum as fundamental ingredients in manufactured products continues to expand.

Consumption of non-renewable resources is only part of the problem. Every product, regardless of how "green" it might be, creates widespread environmental degradation through the many converging and repeating threads of material acquisition, transportation, processing, waste, water and energy use. For instance, although embodied energy, or the amount of energy used to create a product, has been discussed for decades, embodied water is rarely mentioned; yet a typical new house requires as much water to make as a family uses in 15 years. The estimated waste stream created by every product varies from a low of 70 pounds waste to one pound of product to the estimated one ton of toxic mining waste for each ounce of gold extracted.

The building community has been slow to recognize product consumption as the root cause of environmental problems, but in February 2011, Architecture 2030 expanded its call to reduce green house gas (GHG) emissions to include products, noting that "The raw resource extraction, manufacturing, transportation, construction, usage and end-of-life stages of building products each generate significant GHG emissions" and "slowing the growth rate of GHG emissions and then reversing it is the key to addressing climate change. . . ." Yet the Architecture 2030 Challenge addresses only the carbon-equivalent footprint of what is consumed not consumption itself.

The most effective strategy for reducing GHG emissions created by new building products is to reuse what already exists in its existing functioning form. Carnegie Mellon's Green Design Institute estimates new construction creates 1.5 times more greenhouse gas than renovations. Studies by Parks Canada and the

working on improving protections for sensors and the means of interpreting data.

Surviving an earthquake, however, largely depends on preparedness, and Shimazaki said few experts had foreseen the possibility of a magnitude-9.0, the most powerful quake in Japan's history. While Japan maintains strict building codes and has financed the construction of high sea walls in coastal areas, they were overrun by the tsunami. The quake and tsunami left 25,000 dead or missing, and more than 100,000 remain in temporary shelters.

Shimazaki said the Fukushima Dai-ichi nuclear plant - which suffered explosions and fires, spewed radiation and continues to be unstable - was a good case of underestimated risk. He said experts had long thought Fukushima was a relatively low-danger area because over the past 400 years it had only been hit twice, in the 1930s, by jolts in the magnitude 7 range. He noted that another plant in an area considered much more volatile, has been shut down until safety improvements can be made.

"We are gradually getting to a point where we can understand things much better," he said. "We have many things to reflect on, and regrets about things that we might have done differently. But our role is to see that improvements are made."

Associated Press writer Margie Mason in Hanoi contributed to this report.

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Empty Homes Agency of Great Britain have also demonstrated the reduction in GHG emissions achieved through renovation rather than new construction.

Facts about carbon equivalent reductions are not yet changing policy and new products, unweighted by the cost of environmental degradation, are often less expensive than repair and renovation solutions. This is exacerbated by a culture and economy that does not value or incentivize maintenance, so that many historic religious buildings suffer from years of deferred maintenance. In a sustainable society, maintenance is embraced as a necessary act to extend the service life of an object (especially a building) for future generations. Many historic religious buildings are made from durable, repairable high quality materials with the potential to provide shelter for many future generations. Years of monitoring the effects of the Historic Tax Credits have shown that renovation is good for the local economy creating 20-30% more jobs.

The pressing need to reuse our existing resources is not yet a part of policy, but it is our responsibility as practitioners and advocates for religious buildings, to understand how critical reuse is and to educate those who might too quickly replace the old with new. Analytical tools are emerging daily to help quantify the environmental impacts of our decisions including the ATHENA Impact Estimator and EcoCalculator for Assemblies and the even simpler online tool of buildcarbonneutral.org. Putting it in terms that address the modern understanding of environmental good, economist Donovan Rypkema has stated that demolishing 10,000 square feet of an existing building wipes out the environmental benefit of recycling 2,688,000 aluminum cans.

Clearly, retaining and reusing historic religious buildings is about more than aluminum cans. Sustainable development is holistic and celebrates the spiritual as well as the ecological. Understanding and valuing both is part of the ongoing conversation that will shift policy and awareness towards a world that "meets the needs of the present without compromising the ability of future generations to meet their own needs." This is the oft-quoted description of sustainable development from a 1987 United Nations Report. In speaking of social needs, the report recognized sustainability as an overarching goal that requires the preservation of cultural heritage and environmental stewardship to achieve emotional well-being in a community. Reuse of historic religious buildings is the epitome of sustainability.

Jean Carroon, FAIA, LEED(r) AP, is a principal in Goody Clancy's highly regarded preservation practice, based in Boston. She has earned national recognition for her expertise in applying sustainable-design technology to historic buildings, including more than a dozen National Historic Landmarks. She has directed the adaptive reuse and preservation of signature buildings in a broad range of sectors, including educational, civic and cultural projects for clients such as Harvard University and the National Park Service. She is currently working on the renovation of more than 50 historic structures on the St. Elizabeth's West Campus in Washington, which will become the home of the Department of Homeland Security. She is the author of Sustainable Preservation: Greening Existing Buildings (Wiley & Sons, 2011).

I encourage you to contact me personally with any questions you may have.

Sincerely,

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