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How to build a tsunami-proof home

By Megan Ogilvie



ED WRAY / AP

A Sri Lankan woman whose two children

were killed in the E

It may seem like an impossible task, but researchers from M.I.T. and Harvard have designed a house that they think has a good chance of withstanding the gale force winds and pounding surf of a tsunami.

Dubbed the Tsunami-safe(r) house, their model for a Sri Lankan house is a unique combination of high-tech design and low-tech assembly that would allow waves to wash through it rather than knocking it flat.

Instead of four solid walls, the new house will have four core columns made of concrete reinforced with metal rods (or rebar) about three metres wide. Walls of wood or bamboo will be built in between the columns.

In addition, the foundation is raised one or two feet off the ground to let water pass underneath the house and drain through the floor.

Each house will be about 400 square feet, have one or two bedrooms, a bathroom, and an open-area kitchen/living space.

Traditional houses in Sri Lanka have two windows and one door, are made of concrete blocks, and have either a tiled or tin roof, says project co-initiator Tenzin L.S. Priyadarshi, MIT's Buddhist chaplain, who worked with Carlo Ratti of MIT's Sensible City Laboratory.

Construction on the first Tsunami-safe(r) house could begin as early as this week.

"The new design is not as rigid as traditional houses, giving more room for water to flow," he says.

According to simulations by British engineering firm Buro Happold, the design should be able to withstand a wave more than five times higher than a traditional house can.

Also crucial to designing a Tsunami-safe(r) house is its position in relation to the ocean, says Priyadarshi.

Research groups have discovered that structures built parallel to the ocean were either severely damaged or washed away by the tsunami that hammered the region on Boxing Day last year. Structures built perpendicular to the ocean remained reasonably intact.

While the design uses high-tech engineering principles, it entails low-end building costs.

All materials used to make a Tsunami-safe(r) house can be found locally in Sri Lanka, and each house will cost about \$1,500, comparable to traditional Sri Lankan houses.

One of the primary goals of the design is to provide a cost-effective solution to re-settling regions devastated by the Dec. 26 tsunami, said Priyadarshi.

According to a report by the World Bank, more than 30,000 people died and more than 1 million people were displaced by the tsunami, with costs to rebuild the island nation pegged at more than \$1.9 billion.

Last week, former U.S. president Bill Clinton, recently appointed United Nations special envoy for tsunami recovery, toured the tsunami-ravaged regions of Asia. He said enough money has been raised to help rebuild the nation but co-ordination between aid groups and local governments is necessary to move the process forward.

Despite worldwide relief efforts, there continues to be a desperate need for houses in Sri Lanka. Many tsunami victims are still living in tents, temples or on the streets, said Priyadarshi, who is also the founding director of the Prajnopaya Foundation, a Buddhist humanitarian organization.

Days after the December tsunami, the Prajnopaya Foundation was on the ground in Sri Lanka helping to rebuild communities with money raised from donations. They have already built 76 houses based on the traditional model.

Now, the foundation wants to build 1,000 Tsunami-safe(r) houses along the southern and eastern coastlines of Sri Lanka.

A community centre based on a similar design as the house is also in the works. Priyadarshi hopes it will be used as a gathering point for the

community and as a classroom.

But Sri Lankans, who don't live in houses raised off the ground, are wary of the new design, said Priyadarshi.

"We will create one prototype and see if it works," he said. "Depending on the reaction, we'll modify the design based on the needs of people. We can't have a structure that people don't want to live in."

Toronto engineer David Bowick, a partner at Blackwell Bowick Partnership Limited and adjunct professor of structural engineering at the University of Toronto, says the Tsunami-safe(r) design is an effective way of keeping the most significant structural element — the foundation and concrete cores — intact. This would allow the house to be rebuilt quickly, providing shelter after a disaster.

That the design also uses reinforced masonry — concrete cores with rebar — will improve the house's ability to absorb energy, which, he said, "would be beneficial both during the tsunami and in the event that the tsunami is accompanied by a seismic event (an earthquake)."

However, while the structure of the Tsunami-safe(r) house may survive a tsunami the design doesn't guarantee the survival of its occupants.

MIT's Ratti is working with the University of Moratuwa in Sri Lanka to design an early warning system using cellphones.

[Back](#) [to Press Gallery](#)