GEOPHYSICS

India Barred Entry to U.S. Author Of Seismic Review

Seismologists have been buzzing in recent meetings about the harsh treatment of peers who give public advice—the L'Aquila effect, some call it. It's a reference to the jail sentences given to experts who gave overly reassuring advice that a major earthquake was unlikely to strike L'Aquila, Italy, just days before a quake devastated the town and killed 308 people. Some scientists say they have seen a flipside effect as well: sanctions for public warnings that seem too dire.

This happened in India recently, according to seismologist Max Wyss, director of the World Agency of Planetary Monitoring and Earthquake Risk Reduction in Geneva, Switzerland, who's scheduled to discuss the topic on 6 December at the American Geophysical Union meeting in San Francisco, California. He says that Roger Bilham, a geophysicist at the University of Colorado, Boulder, was detained at the New Delhi airport in May and sent home like a "criminal." Bilham's misdeed, Wyss believes, was to go public with his view that seismic hazards in India are underestimated, and that a nuclear project needs more review.

Bilham, who has a Ph.D. in geophysics from the University of Cambridge in the United Kingdom, described what happened: "I was on my way to Bhutan," stopping over in New Delhi to change planes on 18 May, he says, when "I was forcibly escorted back to the U.S. flight I had just arrived on." At customs, he says, "I was told I was on 'a list.' I was given no reason what the list was, or why I was on it." His round trip took 29 hours and halted field work on the seismicity of Bhutan.

When *Science* asked why Bilham was denied entry, the Indian Ministry of Home Affairs (MHA) indicated that Bilham, traveling on a tourist visa, was not in compliance with regulations. The official response: "Activity of visitor not commensurate with the type of visa granted, hence entry denied." Bilham says he has been to India more than 10 times since 1967—always traveling on a tourist visa—and has written 81 articles on Indian tectonics. He hasn't tried to return since.

A top MHA official, speaking on condition of anonymity, dismissed Bilham's seismic warnings as "scare-mongering" and claimed that Bilham and a co-author were unfair to target "only India." Bilham's assessment that a magnitude-8.7 earthquake could strike in the Kashmir Himalayas—more than 10 times stronger than the widely accepted upper bound of magnitude 8—has irked some in the Indian disaster management community.

Bilham also co-authored a review in the 25 November 2011 issue of *Current Science*, an Indian journal, with Vinod K. Gaur titled, "Historical and Future Seismicity Near Jaitapur, India." Jaitapur is the proposed home of a 9900 megawatt nuclear plant in western India, potentially the world's largest single nuclear electricity producer. Gaur, a leading seismologist at the CSIR Centre for Mathematical Modelling and Computer Simulation in Bangalore, and Bilham wrote that the seismic record near Jaitapur is too scant to support a long-term hazard assessment, which would require data reaching back 1000 years. They concluded that the present "seismic quietness of Jaitapur does not mean that a severe earthquake cannot occur there." To highlight the issue of seismic risk, Bilham spoke at a press conference organized by Greenpeace in Mumbai on 12 January, explaining how a magnitude-6 quake might lead to intensity VII shaking at the plant.

AREVA, the French company that's supplying six EPR reactors for Jaitapur, sees nothing new in this analysis. In an e-mail, the company wrote: "The EPR can definitely resist intensity VII shaking and is designed to withstand a peak ground acceleration of 0.25g, which would correspond to a 6.5 magnitude earthquake occurring 15 kilometers away from the plant site." The Nuclear Power Corporation of India Limited, the responsible utility, also dismissed concerns early this year, saying that "seismic aspects have been addressed" at Jaitapur. In July, B.K. Rastogi at the Institute of Seismological Research in Gandhinagar rebutted Bilham and Gaur in *Current Science*, pointing to "many errors" and concluding that the paper's concerns had all been previously considered.

Bilham concedes there were "factual errors" in the paper but emphasizes that the seismic risks at Jaitapur are not well understood and may be larger than people assume. "Scientists have a duty to inform the public of their findings," Bilham says. Silencing the "discussion of large future earthquakes will not prevent their occurrence." "The site at Jaitapur is safe for a nuclear park," says Ratan K. Sinha, chair of the Atomic Energy Commission in Mumbai, adding that the nuclear establishment had nothing to do with Bilham's expulsion.

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Blacklisted? Roger Bilham was marched onto a return flight to the United States after landing in New Delhi in May.

India's decision to hustle Bilham out of the country was "a travesty—but of a different kind [from L'Aquila]," Wyss says. Bilham was denied entry for "speaking out about seismic hazard not for hiding it." Gaur agrees, saying the deportation was a "draconian step to silence science." But "nobody has asked for my head," Gaur says.

Bilham and Gaur seem to be right on one point—the seismic risk map of India is based on meager data, says Khadg Singh Valdiya, a specialist on neotectonics at the Jawaharlal Nehru Centre for Advanced Scientific Research in Bangalore. "The country has thousands of hidden and locked faults, all waiting to break free, but we have not cataloged them." There is an "urgent need to map the geodynamic hot spots," before building on them he says. As for Bilham's deportation, Valdiya thinks it was an error: "We should have the courage to stand up to open criticism." He thinks that India may have seismic studies held in secret that would answer some of the many questions about earthquake risk at Jaitapur. If so, Valdiya says, they should be declassified. **–PALLAVA BAGLA**

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