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Storm Surges, Rising Seas Could Doom Pacific Islands This Century

Atolls and other low-lying islands in the Pacific Ocean may not slip under the waves but they will likely become uninhabitable due to overwhelming waves

By Julia Pyper and ClimateWire | Friday, April 12, 2013 | 3 comments

As ice caps melt and sea levels rise, islands around the world could eventually become completely submerged, like real-world cities of Atlantis.

Scientists have determined that the tides could consume low-lying islands in the next 50 to 150 years. But they'll become uninhabitable well before they're underwater, and that day might not be in the too distant future.

A study by the U.S. Geological Survey released yesterday finds that the two northwestern Hawaiian atolls of Midway and Laysan and Pacific islands like them could become inundated and unfit to live on during this century.

A fierce storm in 2008 drew researchers' attention to the issue of overwash, where ocean water comes ashore, damages property and natural resources but doesn't permanently submerge the island. On islands that are less than a thousand feet long and where fresh water turns brackish less than a dozen feet deep, overwash can have a crippling effect.

"If you have an overwash event, all of a sudden, you're salinating that fresh water; you basically kill the agriculture due to salt loading, and if you get [salt concentrations] over a few parts per thousand, it's no longer fit for human consumption," said Curt Storlazzi, a research oceanographer at the USGS Pacific Coastal and Marine Science Center and lead author of the study.

"You may have an island, but without fresh water and agriculture, you can't live there, anyway," he added. "It's like, do you care that in 100 years your house will be underwater? Or do you care that in 20 or 30 years ocean water is going to come through the side of your house a couple times every year?"

Not drowned, but uninhabitable

To measure sea-level rise, scientists have historically used passive "bathtub" models that flood a given area in a concentric range. To better understand the effects of overwash, USGS used dynamic modeling that takes into account storm winds and wave activity coupled with sea-level rise of between 0.5 and 2 meters (1.6 and 6.5 feet).

Following the current trajectory toward a 2-degree-Celsius temperature increase in the atmosphere, experts say sea levels could rise between 3 and 6 feet by 2100.



U.S. protectorates like the Republic of the Marshall Islands and the Federated States of Micronesia can also expect to become increasingly uninhabitable. Pictured: Kwajalein Atoll, Marshall Islands.

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Dynamic models show that sea-level rise could inundate twice as much land on the Midway and Laysan atolls than the passive bathtub models do. In the 2-meter, sea-level rise scenario, 91 percent of Midway's Eastern Island is projected to be inundated, compared to 19 percent in the passive model.

Waves on Midway during a normal high-end winter storm are also expected to be three to four times higher than they are today, due to the combination of deepwater wave energy and wind-driven waves.

USGS specifically studied storms of regular magnitude and frequency to understand how everyday life on these islands would be affected. Severe 100-year storms make their mark, but give people and wildlife time to adapt, repair infrastructure and implement longer-term solutions. If regular storms become increasingly destructive, inhabitants won't have the time to recover, and staying on the island could become harder to justify.

"You're going to have to make big hard decisions like, 'I'm going to do what they did in the capital of the Maldives,' which was make a huge sea wall and build huge desalination facilities. Or you're going to give it up," said Storlazzi.

"That's a huge question, because now you're basically talking about some of the world's first climate change refugees," he said.

The option is moving out, not up

The Hawaiian atolls of Midway and Laysan have coastal features that are common to many Pacific islands. U.S. protectorates like the Republic of the Marshall Islands and the Federated States of Micronesia, as well as their island neighbors, can also expect to become increasingly uninhabitable, according to the report.

If overwash becomes too severe, populations will have to consider relocating to a different island or perhaps a different country. This would mean giving up not only their land, but also a major part of their lifestyle and identity.

"Relocation is not an option, because forced relocation is telling us you no longer have a country," said Tony deBrum, minister in assistance to the president of the Marshall Islands, at an event in New York earlier this year.

Coral reefs, which can grow at a rate of up to 1 centimeter per year, can protect low-lying islands and bolster their foundations to keep them above sea water. But the USGS study notes that vertical coral accretion is an order of magnitude smaller than expected sea-level rise through 2100. Coral growth has also been stunted by ocean acidification and thermal bleaching caused by climate change.

With no way to move up, moving out might be some island people's only option.

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