

World

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Rising Seas

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Kiribati consists of 33 tiny islands and atolls, some uninhabited, sitting just feet above sea level and spread over an expanse of ocean the size of India.



Kiribati

The low-lying islands of Kiribati, just a few feet above sea level, are on the front lines of climate change. Globally, sea levels have risen eight to 10 inches since 1880, but several studies show that trend accelerating. If carbon emissions continue unchecked, a [recent survey of experts](#) concluded, sea levels may rise about three feet by 2100.

That could inundate most of Kiribati by the end of the century, and the islands, home to some 100,000 people, are already feeling the impact. The [government of Kiribati says](#) the intrusion

of salt water caused by rising sea levels has contaminated fresh water supplies and crop soil, and President Anote Tong has predicted that his country will become uninhabitable in 30 to 60 years. According to the [United Nations High Commissioner for Refugees](#), all the residents of Kiribati, along with other low-lying island states such as the Maldives and Tuvalu, could be forced to flee as a result of climate change. “Entire populations could thus become stateless,” the agency wrote.

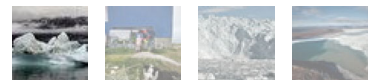


The remote nation, more than 1,200 miles south of Hawaii and 3,800 miles northeast of Australia, [has already purchased](#) 6,000 acres on the neighboring island state of Fiji to protect its food security as the sea encroaches on its arable land – and possibly, in the future, to relocate its residents.

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Icebergs in a channel between Greenland's Eqip Sermia glacier and Ilulissat Icefjord, the most active glacier in the Northern Hemisphere. Greenland's immense ice sheet is melting as a result of climate change.



Greenland

[A growing body of research](#) shows that climate change is rapidly melting the Greenland ice sheet. In 2012, satellite observations revealed an “[extreme melt event](#)” in which ice melted at or near the surface of 98.6 percent of the ice sheet. The summer melt



season has been lengthening as well: [Simulated reconstructions](#) show that it now lasts 70 days longer than it did in 1972, and the extent of the ice melt in 2010 was twice that of the average in the early 1970s.

All of these factors increase the contribution of Greenland's ice melt to the global rise in sea level. But while the effects of climate change threaten the lives and livelihoods of people in low-lying Pacific island states, they could be a boon in parts of Greenland. Some Greenlanders hope climate change will help them achieve independence from Denmark, which colonized the island in the 18th century.

The immense weight of Greenland's ice sheet pushes the island down into the ocean, so as the ice sheet melts and the weight decreases, the island rises. Melting ice and warmer weather are reshaping Greenland's geography, making once-frozen land arable. The thaw is also opening up access to formerly iced-over reserves of oil, zinc, gold, diamonds and uranium. There is a small but growing political movement in Greenland to harness the new wealth of resources as part of a push for independence.

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The Kuna — about 40,000 indigenous people living on dozens of islands off Panama’s Caribbean coast — fear that their ancestral lands could be submerged within a generation.



Panama

The San Blas archipelago, a chain of more than 350 white-sand islands sprinkled across the Caribbean coast of Panama, has been home to the indigenous Kuna people for thousands of years. Now, rising sea levels and higher storm surges are flooding their villages. Scientists at the [Smithsonian Tropical Research Institute](#) estimate that sea levels around the islands are rising at a rate of about three-quarters of an inch annually, and that the islands will be underwater in the next 20 to 30 years.

The Panamanian government is developing a plan to relocate the Kuna to the mainland, but the fiercely independent group is distrustful of the government, and many are resisting the proposal.

“The government of Panama recognizes that many of the people don’t want to move,” said Scott Leckie, director of [Displacement Solutions](#), a Geneva-based organization that works with people displaced by climate change. “The younger the person is, the more likely they are to accept the move. The most able-bodied and highly educated people will move first. Thus, the least employed, the most ill, the oldest and weakest and most disabled, the least willing to move, will be the ones left behind.”

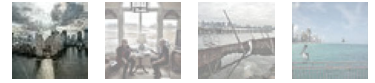


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Of the 50 states, Florida is the most vulnerable to rising sea levels, standing just a few feet above the current level. Miami is in an especially dangerous position because of its porous limestone foundation.



United States



While seas are rising globally, the phenomenon is not occurring at even rates around the world. A 2012 [study by the U.S. Geological Survey](#) concluded that sea levels along the East Coast will rise three to four times faster than the global average over the next century. While levels worldwide are expected to rise an average of two to three feet by 2100, they could surge more than six feet along the Atlantic seaboard. The study named Boston, New York, and Norfolk, Va., as the three most vulnerable metropolitan areas.

[Another study](#) found that just a 1.5-foot rise in sea level would expose about \$6 trillion worth of property to coastal flooding in the Baltimore, Boston, New York, Philadelphia and Providence, R.I., areas. That raises huge questions about the fate of Boston Harbor, where developers have poured millions into construction projects. Planners are steeling for a future in which storm surges flood huge swaths of Boston. They have put together a [climate action plan](#) outlining how the city can better prepare for disaster.

Miami, one of the nation's most populous cities, is built atop a porous limestone foundation on the South Florida coast, making it extremely vulnerable to rising sea levels, according to the federal government's 2013 draft [National Climate Assessment](#). As Arctic ice continues to melt, the waters around Miami could rise up to 24 inches by 2060, according to a report by the [Southeast Florida Regional Climate Change Compact](#). Residents say they are already experiencing the effects as roads and outdated sewage systems flood. The porous limestone creates a unique threat as seawater seeps through the city's foundations.

"You're not necessarily getting water pouring up over a barrier — instead, it's seeping through the limestone and coming up through drains," said Leonard Berry, co-director of the Climate Change Initiative at [Florida Atlantic University](#). "It's already happening. And it's not very pleasant."

[A study](#) by the Florida Department of Transportation concluded that over the next 35 years, rising sea levels will damage smaller roads in the Miami area, and that after 2050, major coastal highways will also experience significant flooding and deteriorate as the limestone beneath them becomes saturated and crumbles.





A submerged burial ground in Fiji's Togoru village, where the Dunn family has lived for generations. The family, of Irish descent, has built five seawalls, but each one has been knocked down by rising waters.



Fiji

Like its Pacific island neighbor Kiribati, Fiji is seeing the effects of the encroaching ocean, and the government has begun relocating residents from the archipelago's outer islands and low-lying coastal areas to the larger mainland.

The government moved residents from the coastal village of Vunidogoloa after salt water ruined the region's crop soil. Officials are also investing in other adaptation measures: They are building desalination plants and water tanks on the country's vulnerable northern islands, while continuing to make plans to relocate people.

At the same time, Fiji knows its plight is not as dire as that of nations like Kiribati and Tuvalu, which scientists say will probably disappear by 2100. Fiji's president, Ratu Epeli Nailatikau, has said he will welcome the fleeing populations of those countries, a gesture that could strain his nation's own waning land and resources.

