Warming Air, Rising Seas

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Twenty thousand years ago when the Ice Age froze an enormous quantity of Earth's water, sea level was nearly 400 feet (about 120 m) lower than today. Vast areas that are now seafloor were plains grazed by herds of animals. But the rise has been slow—literally a glacial pace. But now "glacial pace" is faster than it used to be, since nearly all the world's glaciers— about 90 percent—are melting, faster.

And because seawater expands as it warms, warming ocean water compounds ocean rise caused by melting ice.

During all of human civilization, neither sea level nor the rate of its rise has ever been higher, or faster, than now. Sea level has risen about 8 inches (20 cm) over the last 100 years. And the rate of rise is accelerating.

"There has been nothing like this rate of sea level rise in the last 1,000 years," says climatologist Stefan Rahmstorf, professor of oceanography at the University of Potsdam, Germany. "If there had been, Roman-built wharves would be four meters (13 feet) underwater—and they're not."

Sea ice can melt all it wants to; that won't raise sea levels. It's already in the ocean, displacing all the water its mass will ever displace. That's why a drink with ice in it doesn't overflow when the ice melts. Melting *land* ice—raises the sea. There's still enough land-ice worldwide to raise sea level another 240 feet (73 m).

The Greenland Ice Sheet is up to two miles (3 km) thick and a little smaller than Mexico. Melted, it would raise global sea level by over 20 feet (6 m). That would take centuries. But since 2000, some of Greenland's major glaciers—each draining enormous areas and already among the fastest-moving glaciers on Earth—have doubled their speed. Overall, Greenland's rate of ice loss tripled between 2001 and 2006, to about 50 cubic miles (200 cubic kilometers) a year. (The city of Los Angeles uses about one cubic kilometer of water per year.) It continues to accelerate.

Professor Rahmstorf says, "The current change is extremely fast compared to past global change."

"The *acceleration* of the melting isn't factored into most models designed to predict sea level rise," adds Julian Dowdeswell, who directs the Scott Polar Research Institute at the University of Cambridge in Great Britain. "Our minimum prediction for sea level is a half-meter (about 1.5 feet) rise over the next 100 years," Julian says, "but many glaciologists think it will rise much higher than currently predicted in this century, at least a meter (3 feet), maybe even a meter

and a half (5 feet).”

The slow tsunami of rising sea will inexorably sweep millions to higher ground. The World Bank says that as sea-level rises three feet or 1 m (likely early in the next century, possibly even in this century), in Bangladesh alone 30 million people will have to squeeze inland, while half of Bangladesh’s rice fields would be spoiled by saltwater. Already among the world's first climate refugees: 500,000 former inhabitants of Bhola Island in Bangladesh, left homeless after half of the island became permanently inundated in 2005.

The National Defense University, an educational institute overseen by the U. S. military in Washington, D.C., explored the potential impact of a hypothetical flood in Bangladesh that sent hundreds of thousands of refugees streaming into neighboring India. In real life, India is already racing to build a 2,100-mile (3,400 km) fence. “It gets real complicated real quickly,” said Deputy Assistant Secretary of Defense Amanda J. Dory, while helping the Pentagon try to incorporate climate change into national security planning.

The main cause of the warming temperatures that are causing the rise in sea level, remember, is the carbon dioxide that’s released when we burn fossil fuels. Lord Nicholas Stern, former chief economist and senior vice-president of the World Bank, warned that failing to reduce carbon dioxide and other world-warming gas emissions could bring "an extended world war."

Australia’s Defense Ministry warns that while Australia should ease suffering caused by global warming, if conflict erupts the country should use its military “to deal with any threats.” It won’t be pretty.

Many cities were situated to take advantage of—so they now depend on—meltwater from glaciers and snowpack. Water as lifeblood. As South America’s glaciers and snowpack shrivel, La Paz, Bogotá, Santiago—to where might these cities move? The summer weep of Himalayan glaciers feeds river water to 1.3 billion people, including 40 percent of the people from India to south China. Seventy percent of the Ganges River’s water comes from the Gangotri Glacier, which will likely disappear in a few decades, making the sacred Ganges an intermittent, seasonal river for the nearly half-billion people dependent on it. Glaciers that feed both China’s Yellow River (whose basin is home to 150 million people) and the Yangtze River (whose 370 million people rely heavily on river-irrigated rice) are shrinking at seven percent annually. Glaciers also feed the Indus, Brahamaputra, and Mekong Rivers. Chinese spokespeople often downplay environmental problems. On the issue of glaciers and rivers, Chinese Academy of Sciences representative Yao Tandong had this assessment: "The full-scale glacier shrinkage in the plateau regions will eventually lead to an ecological catastrophe.”

And the ensuing unrest will likely rise and widen, like the sea itself. It will cost us time and treasure—and probably blood.

So ask not for whom the bell tolls. Those warning gongs are for everyone. Refugees displaced by environmental problems (drought, deforestation, sea level rise—) now equal the number displaced by things like political oppression, religious persecution and ethnic troubles—about 25 million a year. Predicted droughts and coastal flooding from rising sea level would displace around 200 million. If climate changes really do create hundreds of millions of refugees, how will people avoid widening havoc?

Life will go on; it's not the end of the world. But we're running high-stakes risks because we're fundamentally messing with the stability that's prevailed during everything we call civilization.

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