

Melting at the Top

RAPIDLY WARMING ARCTIC WILL HAVE GLOBAL CONSEQUENCES BY RODGER DOYLE



2010–2030



2040–2060



2070–2090

The future impact of global warming lies in the Arctic. There temperatures have risen almost twice as fast in recent decades as in the rest of the world. The Arctic Council, an intergovernmental organization comprising eight nations—the U.S., Canada, Iceland, Denmark, Norway, Sweden, Finland and Russia—plus several indigenous peoples' organizations, issued a sobering report last November. It estimates that by late in this century, average Arctic winter temperatures will rise roughly four to seven degrees Celsius over land and seven to 10 degrees C over oceans, leading to profound changes by the end of the century.

Although most of the sun's energy reaches the tropics, the atmosphere and oceans redistribute the equatorial energy toward the poles. Unlike the tropics, where a large proportion of the energy received at the surface goes into evaporation, more of the energy received at the Arctic surface goes into warming the atmosphere. For several complicated reasons, including greater absorption of solar radiation, the Arctic is likely to heat up more than the Antarctic.

The maps, based on the average of five climate models, project the state of Arctic sea ice in September for three periods between 2010 and 2090. According to the Arctic Council, the Greenland ice sheet, the largest mass of land-based ice in the world, will probably cross the line into irreversible melting in this century. With additional melting of other

ARCTIC SEA ICE will shrivel, according to projections of the Arctic Council. The maps show the state of September sea ice for three periods in the 21st century.

land-based ice in the next few centuries, Greenland ice melting would raise ocean levels eight meters, threatening major cities such as Mumbai, Calcutta and Manila and wiping out Florida below Miami. Smaller rises would also be disastrous: 17 million people in Bangladesh live less than one meter above sea level. Moreover, as the Arctic permafrost shrank, the carbon stored there, about 14 percent of the world's total, would reinforce the greenhouse effect. Arctic warming would devastate polar bear and seal populations and disrupt the lives of the indigenous people.

On the positive side, the Northwest Passage would open within a few decades to regular summertime shipping, and opportunities for offshore oil and gas extraction would probably increase. Indeed, up to 25 percent of the planet's remaining oil and gas is in the Arctic. Natural gas hydrates, icelike crystal solids trapped below the permafrost, theoretically contain more energy than all conventional reserves of oil, natural gas and coal combined. But the full exploitation of Arctic resources to satisfy world energy needs is unlikely to be possible for many decades to come [see *By the Numbers*, September and October 2004].

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FURTHER READING

Intergovernmental Panel on Climate Change. IPCC Special Report on Emissions Scenarios, 2000. www.ipcc.ch

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Arctic Climate Impact Assessment. Arctic Council, 2004. www.arctic-council.org/