



## Arctic Trends Foreshadow Global Warming Impacts

by Margot Stiles and Jeremy Linneman

With reluctant but steady momentum, the scientific consensus on global warming and its relation to the burning of fossil fuels continues to grow. According to a 2001 summary report by the Intergovernmental Panel on Climate Change (IPCC),<sup>1</sup> the 1990s were the warmest decade in the history of recorded temperature (since 1861). Based on extensive synthesis of current research on global warming, the IPCC also concluded that sufficient evidence exists to point the finger at human activities as the primary cause of “most of the warming observed over the last 50 years.”

In our own short lifetimes, a few degrees of warmth may not sound like much or even necessarily a bad thing. But the overall effects on extreme weather, disease,<sup>2</sup> food production, and coastal cities<sup>3</sup> could reach deeply into the economy and our daily lives, from Bangladesh to New York City. Over half of the world’s population live along the coast, increasing the threat of damage caused by rising sea level.

Fisheries remain an important source of food and protein worldwide and are especially productive in the Arctic. The Bering Sea and the North Pacific provide nearly a third of the world’s seafood,<sup>4</sup> including over half of the fish produced by the United States.<sup>5</sup>

Climate change impacts have already begun to tinker with global weather patterns and the ocean currents that influence them. The details of how these impacts will play out in each region are still unclear, yet regional impacts are likely to affect individual people the most. In polar regions we are already finding

out how quickly global warming can dramatically alter natural conditions. Since 1950, Alaska has already warmed between four and seven degrees Fahrenheit, with projected warming of as much as five additional degrees by the year 2030 and 18 degrees by 2100.<sup>6</sup> Canada, Russia, Nunavut and other Canadian territories, and other areas near the Arctic Circle are already experiencing significant change to the oceans, forests, tundra, and animals they rely on, with detrimental repercussions for their human populations.

The most obvious sign of warming in the far north is the dramatic shrinking in size of mountain glaciers and polar ice caps. Worldwide, arctic glaciers have been on retreat during much of the past century.<sup>7</sup> In Alaska and northern Canada, glaciers have been thinning by an average of half a meter each year from the 1950s to the 1990s, directly contributing to rising sea level.<sup>8</sup> Submarine sonar records show that Arctic sea ice over the deepest waters has also thinned by more than 40 percent from the 1960s to the 1990s.<sup>9</sup> This retreating ice could actually speed up global warming as areas formerly covered with the reflective surface of the ice turn into open ocean and absorb more heat from the sun.<sup>10</sup>

Polar bears that live on coastal ice floes are increasingly becoming cut off from their food sources by melting and unstable sea ice. Long-term research on polar bears found a steady decline in their health in northern Canada’s Hudson Bay.<sup>11</sup> Polar bears forage for food from the sea ice in Hudson Bay and bulk up

every spring on ringed seal pups. During summer the ice is gone, the seals are inaccessible and the polar bear responds by conserving energy in a state of near-hibernation. For the polar bear, endless summer means starvation—and as spring air temperatures increase and the ice breaks up earlier, their condition has deteriorated. Some speculate that changes in their natural food supply could also increase scavenging by polar bears in garbage dumps—an interaction that usually ends badly for the bear. Thinning ice and earlier seasonal break-up also affects many other animals that depend on sea ice, including walruses, seals, sea lions, and migratory birds.

For many Native communities, global warming not only affects their surroundings but threatens their very way of life. People in rural Alaska rely on subsistence hunting and fishing for food to supplement the cash economy and, perhaps most importantly, to reinforce family, community, and cultural bonds.<sup>12</sup> Subsistence harvests are directly impacted by climate-induced changes in caribou, marine mammal, fish, and other animal populations. For example, in Nunavut the Inuit people have already noticed changes in the caribou herds with shorter, warmer winters that may be related to global warming.<sup>13</sup> Meat cellars excavated into the permafrost have thawed, leading many traditional communities to consider purchasing modern refrigeration units. This shift toward reliance on fossil fuels presents the unfortunate situation where the victims of global warming are forced to adopt polluting technologies to survive, thus furthering climate change.

Coastal villages are also threatened by increased erosion as permafrost melts and the diminishing buffer of sea ice no longer protects against severe storm damage. Erosion in the delta of the Yukon-Kuskokwim river has already required relocation of the entire village of Newtok, Alaska. Relocation is also being considered for another threatened Bering Sea village, Kivalina, at an estimated cost of up to \$50 million.<sup>14</sup>

Changes in climate and animal populations also affect economic activities in the Arctic, including commercial fisheries and oil extraction. Fishing fleets and supporting communities are highly sensitive to year-to-year fluctuations in salmon and other species. Given the dramatic changes in abundance of Pacific cod, Pacific halibut, herring, pollock, salmon, and Steller sea lions during decade-long warming periods in the North Pacific ocean,<sup>15</sup> it seems likely that continuing global change will have serious consequences for fisheries and marine life.

In addition to changes in abundance, many animal species are likely to shift their geographic distributions in response to changes in temperature and current patterns. For example, fish populations that are sensitive to temperature or climate-induced changes in predator populations may retreat to deep waters. Warming has already affected the distributions of marine animals from seabirds to tidepool organisms over different periods of time.<sup>16</sup>

Even oil companies on the subzero North Slope have had to change their practices as permafrost retreats and summer thaws get longer. Regulations administered by the Alaska Department of Natural Resources prohibit the oil industry from operating unless the ground is deeply frozen<sup>17</sup> in order to prevent irreversible damage from trudging heavy machinery across the tundra ecosystem. The industry relies on special roads made of ice—which grow thinner and more ephemeral as the climate warms.<sup>18</sup> Since 1970, the length of the summer thaw has cut available work time nearly in half.<sup>19</sup>

With an ironic twist of fate, the extraction and consumption of fossil fuels makes it more difficult to extract further fossil fuels. This is clearly not significant enough to stabilize global greenhouse gas emissions, but it could be an early warning of climate change's ability to affect how corporations do their business. However, industry advocates and state politicians may disregard ecosystem protections by opening the tundra to construction of more destructive gravel roads as a replacement for the melting ice roads.<sup>20</sup> Plans to re-evaluate the standard for what qualifies as "frozen"<sup>21</sup> may further undermine these regulations and are currently "in the pipeline."

Oil pipelines themselves rely on support pilings embedded in permafrost, pilings that become shaky and require additional engineering as the permafrost thaws.<sup>22</sup> Without this expensive retrofitting, the margin of safety is already being exceeded for pipelines and buildings in northern Russia,<sup>23</sup> where the load-bearing capacity of frozen ground in the Yakutsk and other regions has been halved by higher temperatures.<sup>24</sup>

While populations of the far north are the first to suffer its consequences, climate change is increasingly a global threat. Many changes currently taking place in arctic regions foreshadow upcoming impacts to more temperate latitudes. Even in the best possible scenario, circumstances are likely to get worse before they get better. Furthermore, changes in polar regions could tip important drivers of worldwide change in sea level,

ocean currents, and extreme weather, long after greenhouse gas emissions are curtailed.<sup>25</sup> Perhaps the destruction of our northernmost landscapes, the animals that we cherish, and the food and resources we depend on will provide the kind of cataclysmic disaster necessary to truly motivate policy and convince the human population to end its contributions to the warming of our planet.

## Endnotes

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- <sup>23</sup> U.S. GCRP 1999.
- <sup>24</sup> IPCC 2001.
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