Alaska

THE POTENTIAL IMPACTS OF GLOBAL WARMING ON ALASKA

Critical Findings for the State from the First National Assessment of the Potential Consequences of Climate Variability and Change

-- An Overview Prepared by Ezra Millstein, World Wildlife Fund --

Climate and changes in it – regardless of their cause – matter to people, communities and businesses. Global warming is likely to bring many changes to the nation. The United States as a whole is in a strong economic position to adapt to many of these changes, but adaptation is often expensive, not always possible or successful, and during transitions ecosystems, communities, and individuals could suffer. Moreover, national impact summaries disguise local dislocations and disruptions to the ways we live, work and recreate. Climate change adds a serious stress to our already threatened resources and treasured places. Overall impact statements also mask significant opportunities. To minimize the negative changes and make the most of the positive changes we need to take a close look at how climate change will affect each region. How will Alaska experience the effects of global warming? And how can we respond?

Climate Projections for Alaska

Alaska's climate varies greatly, from the wet southern coastal margin to the semi-arid northern slopes, yet permanently frozen ground (permafrost) underlies approximately 85% of the state except for a narrow band along the southern coast. The state's climate varies from year to year and decade to decade. These variations are associated with large-scale shifts in ocean temperature and salinity regimes, ice conditions, and marine biota in the surrounding seas. Temperatures in Alaska have increased during the past few decades, and precipitation has increased by as much as 30% in various regions. This warming has been accompanied by extensive melting of glaciers, warming and thawing of permanently frozen ground (permafrost), and retreat and thinning of sea ice. The arctic is the warmest it has been in 400 years. All climate models project that the earth's largest warming will occur in the arctic regions. Canadian Climate Model predictions of regional temperature increases range between 7 and 18°F by 2100, with a 25% increase in precipitation in some parts of Alaska. Increased

evaporation due to warming summer temperatures is likely to exceed the effect of projected increases in precipitation, so soil moisture is expected to decrease throughout the state.

Key Findings

The climate changes already underway have had major impacts on the ecosystems and people of Alaska. The Alaskan Regional Assessment has identified four key areas where continued climate change could have significant impacts: thawing and melting of the ice and frozen ground (permafrost); forests; marine ecosystems and fisheries; and subsistence livelihoods.

Thawing of the ice and permafrost

Thawing of permanently frozen ground (permafrost), retreat and thinning of sea ice, and reduction of the amount of time that rivers and lakes are frozen is already underway and projected to continue. Thawing that has already occurred is consistent with the modeled effects of greenhouse warming. Continued warming is likely to cause widespread alterations to the lifecycles, habitats and health of ecosystems and marine mammals, consequently harming subsistence livelihoods. Widespread damage to buildings and infrastructure and disruption of transport may also result from projected warming. Damage from warming that has already occurred is estimated to be about \$35 million per year. In the longer term, benefits to transport and offshore oil production are possible as additional sea routes become available for longer periods of the year, which will have significant implications for trade and national defense.

<u>Forests</u>

Both fire and insect disturbance have increased sharply in recent years, at least partly offsetting gains in forest productivity from recent warming. Future warming is likely to increase these stresses, eventually bringing large-scale landscape transformation as boreal forest advances into present tundra and mixed forest into present boreal forest. Other climate-induced effects projected include an increase in forest fire intensity and frequency and an increase in gale force winds resulting in more blowdown.

Marine ecosystems and fisheries

Alaskan and Bering Sea marine ecosystems are strongly influenced by changes in climate and climate variability, although their mechanisms are not fully understood. Changes in climate is likely to cause changes in these systems, in the form of altered streamflow, nutrient content, water temperature, and vertical stability of coastal waters. There is a good chance that further climate change will bring large-scale changes in both commercial and subsistence fisheries, but understanding of the potential magnitude or even direction of change is very limited.

Subsistence livelihoods

Fish, marine mammals and wildlife populations have been displaced, reduced and access to them has been decreased due to warming that has already occurred and the thawing, sea ice retreat and ecosystem shifts that resulted. As a consequence, subsistence hunting and fishing have been significantly affected. While some specific subsistence resources may grow more abundant (such as salmon near the northern limit of their range), many resources are likely to diminish further, even in the near term.

Other concerns

Other issues covered by the National and Regional Assessments include the effects of warming on bird migration, coastal wetlands, agriculture, and tourism. Changes in freshwater balance and storm surge levels due to some sea-level rise and altered river flow levels could lead to flooding of coastal wetlands and impairment of seabird and shorebird breeding. The impact to agriculture is mixed: warming could lead to a longer growing season, but increased soil erosion and loss of organic materials are also projected which could create problems for agriculture. Reindeer populations may decline due to decreased availability and quality of forage. Tourism may expand with continued warming.

Adapting to the impacts of global warming

Alaska is likely to bear a significant burden from the impacts of climate change. Climate scientists agree that further climate change may be inevitable and will therefore require adaptation, although most scientists also think that the pace of climate change can be slowed by substantially reducing greenhouse gas emissions. This would give governments, businesses, and ecosystems around the world more time to respond and adapt to climate change as well as reducing the overall severity of climate change-related impacts, thereby buying "insurance" for an uncertain future. Another way to buy insurance now is to

incorporate climate change into all long-term decisions about natural resources, thereby providing greater resilience.

Future adaptation strategies for addressing climate change could include careful selection of development sites and heat transfer measures to reduce local thermal disturbance, use of heave-resistant building materials, coastal protection, such as sea walls, and relocation of settlements. Fire protection measures and policy incentives to reduce private risk could help protect forests. Those dependent on Alaska's marine environment for survival will need to be increasingly flexible, adapting their activities and community locations to the changing locations and abundance of different species. Some subsistence communities may be able to adapt to climate change by shifting harvest practices and target species, but for many communities few adaptation strategies seem to be available.

Where do we go from here?

There remain uncertainties in predicting future impacts of climate change. Research is needed on permafrost changes and thawing dynamics, monitoring of changes in Arctic sea ice, and freshwater hydrology of the Arctic basin. Research should examine changes in boreal forest, carbon storage in high-latitude ecosystems, and the factors that influence ecosystem shifts in the Bering Sea and Gulf of Alaska. The patterns of multi-year climate variations in a greenhousewarmed world should be studied, as well as possibilities for interactions between climate-driven changes to natural systems and human impacts and responses. Alaska is also a region where changes set in motion by global warming, like melting of the permafrost, could add significantly to greenhouse gas accumulation in the atmosphere, and these 'positive feedbacks' should be examined further.

Additional Information

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