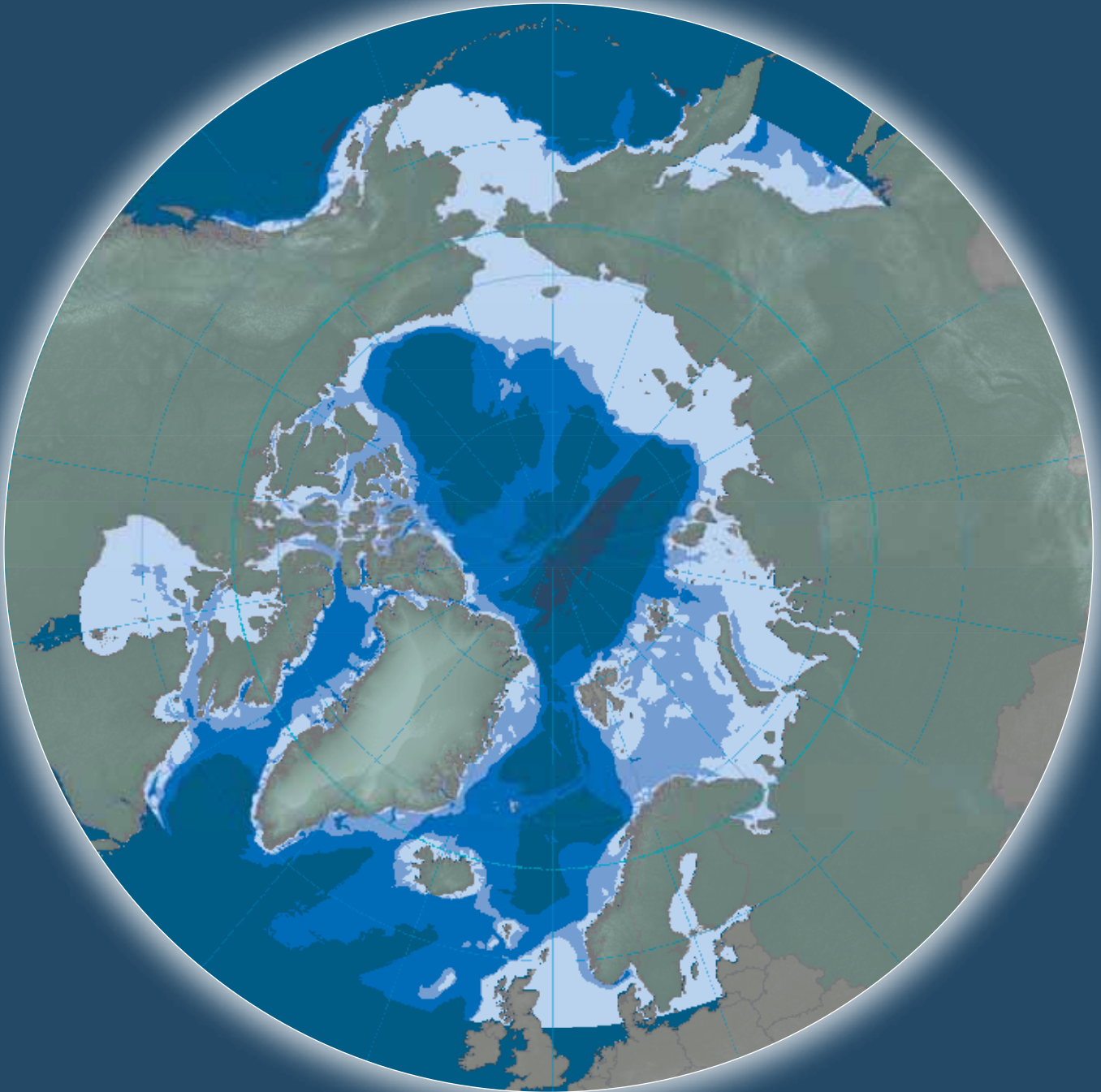


WHY THE ARCTIC MATTERS

AMERICA'S RESPONSIBILITIES AS AN ARCTIC NATION



A COMMONWEALTH NORTH STUDY REPORT

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ALASKA AND AMERICA NEED AN ARCTIC AGENDA

AMERICA MUST UNDERSTAND IT IS AN ARCTIC NATION... OUR ARCTIC HELPS DEFEND AMERICA. IT FUELS, FEEDS, SUPPLIES VITAL TRANSPORT SERVICES – AND INSPIRATION – TO THE WORLD. AND IT CAN DO MORE...

In 2009, the United States adopted a new Arctic Policy, focused on goals for international cooperation in the Arctic. As we witness sea ice retreat, warming temperatures, new estimates of Arctic energy resources, stress on indigenous peoples, and other rapid change, Commonwealth North – Alaska's premier public policy forum – recommends next steps to help America's Arctic better contribute to America's national, economic and environmental security:

- With the State of Alaska, the U.S. should adopt a concrete plan of action to meet the broad opportunities and responsibilities America faces as an Arctic nation. Recognize that the Arctic's diverse "natural capital," energy, fish, minerals, and location are strategic U.S. assets. Managed right, these assets will sustain us today and tomorrow.
- The Arctic's cold helps moderate the Earth's climate, and keeps large amounts of carbon locked into permafrost that would otherwise enter the atmosphere. We must respond to climate change with adaptation measures as well as effective mitigation. For example, coastal erosion threatens to wash some of our Arctic communities out to sea. We need to develop and fund a plan to secure their future.
- Define our needs for Arctic infrastructure – for access to resources, air, land and sea transport, environmental protection, research, communications and health – and develop a plan to enlist international, national, state, and private funding.
- Allocate the resources necessary to enable the Coast Guard do its job as the Arctic Ocean becomes increasingly accessible to all comers. Provide funding for two new Polar-class icebreakers, replacing those now in near-caretaker status.
- Ratify the United Nations Convention on the Law of the Sea, and aggressively prepare a U.S. claim for extended continental shelf. Engage our neighbors in developing common rules and investments for safe, secure and reliable shipping. Manage our common assets – air, water, fish and wildlife – in concert with other Arctic nations
- Improve the standard of living for all Arctic residents by addressing basic medical care, high infant mortality rates, youth suicide, poor access to clean water and reliable sanitation. Help indigenous languages and culture survive. Work to reduce high energy and food costs, and contamination of subsistence foods from trans-boundary pollution.
- Encourage greater indigenous participation in Arctic decision-making.
- Continue scientific exploration to unveil the Arctic's mysteries. Education and outreach help us respond to the Arctic's opportunities and responsibilities.





The United States, with Alaska's Arctic Shaded



The Arctic View

Executive Summary

The world's Arctic has significant promise and potential for humankind. As change comes to the region, and the Arctic becomes more accessible, global attention and commitment is required. Commonwealth North, Alaska's premiere public policy forum, commissioned this study to help Americans and Alaskans understand the challenges we face as an Arctic nation, as well as the opportunities. In 2008 and 2009, our civic leaders enlisted the advice of Arctic experts from around the world, Arctic residents and Alaskans whose livelihood depends on Arctic resources. We recommend the United States take six key actions in the Arctic region, through international cooperation and close work with the people of Alaska:

- Continue to support and expand basic research in the Arctic, including focused work to understand the role of the Arctic in global climate change, enhance the health of Alaskans, and to realize the economic potential of Arctic resources.
- Work to raise the standard of living of Arctic residents. Help the U.S. Arctic expand its contribution to the nation's economy and security through sustainable development of energy, minerals, fisheries, transportation and tourism.
- Help Arctic residents implement effective strategies to adapt to climate change and maintain biodiversity in the region.
- Consider the Arctic region's unique needs, as well as the contribution the Arctic and Alaska can make as a national/global regime is established to mitigate climate change.
- Immediately begin to make the necessary infrastructure investments that will allow increased human activity in the Arctic to occur safely and efficiently; the Coast Guard should expand its Arctic operations to perform search and rescue (SAR), law and fisheries enforcement, environmental protection, and other missions just as the agency does on other parts of the U.S. coast. To do this right, the U.S. must build new Polar-class icebreakers.
- Strongly support stable legal institutions in the Arctic, first and foremost by ratifying the United Nations Convention on the Law of the Sea. Implement the new U.S. Arctic policy to claim new territory in the region, seek global "partners" to ensure "safe, secure and reliable" Arctic shipping, and manage Arctic Ocean fisheries together with our neighbors.

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I. Introduction: Why the Arctic Matters

In the next few years, crucial decisions will be made on a global scale that will set new borders in the Arctic.

The United States of America purchased Alaska in 1867, and thereby became an Arctic nation. Only seven other states in the world are members of this club: Russia, Finland, Sweden, Norway, Iceland, Denmark (for Greenland) and Canada. Yet what happens in the North has dramatic impacts throughout the world: the Arctic matters. The Arctic is vast, rich, vulnerable and vital. Our Arctic assets help feed our nation, fuel our nation, and with transport routes, supply our nation and the

global economy. Our strategic location helps defend many nations. Even the Arctic's cold helps moderate the world's climate in significant ways, from storing massive amounts of carbon to reflecting – from snow cover and sea ice – the sun's heat back into space.

Historically, culturally, scenically, Arctic assets inspire mankind. While the Arctic is busy, and long settled, it is still seen as a frontier, a clean slate, a place to strike out for riches and adventure, a place to cherish for its beauty and biodiversity, a place to enjoy, even if only vicariously.

The premise of this report is simple: if America minds its Arctic interests, Arctic assets will help take care of us all.

In early 2009, the President of the United States issued a white paper restating America's objectives in the Arctic, revised for the first time since 1994. In Alaska, a blue ribbon panel of experts is helping the state set its course in response to dramatic climate change being felt throughout the state. Commonwealth North commissioned this study to help Americans and Alaskans understand the challenges we face as an Arctic nation, as well as the opportunities.

In the next few years, crucial decisions will be made – on a global scale – that will set new borders in the Arctic. Shipping in the Arctic Ocean, a long-sought goal of explorers, will benefit from reduced sea ice, and rulemaking and investment in aids to navigation by Arctic nations. New arrangements to deal with changing climate, Arctic fisheries, research and monitoring, defense and search and rescue will be formed among the eight Arctic nations, and other Arctic "partners." Giant Arctic energy and mineral prospects will supply global markets in greater magnitude.

With all this, residents of the Arctic – both longtime indigenous cultures – and others will experience great change. Attempts will be made to ensure that Arctic residents' needs are met, and that the traditional values that brought and kept residents here are not lost.

The majority of Americans have little idea that the United States is an Arctic nation. In Alaska, the country possesses valuable national assets that give the nation the benefits and responsibility of a direct stake in Arctic affairs. Most Americans also do not realize that the region is currently in a period of rapid change because of a convergence of environmental, economic and geopolitical factors.

This report addresses these deficiencies by providing a comprehensive overview of the issues related to the changing Arctic for state and national policy-makers as well as the public. It is set up as an overview that frames the issues and outlines their intersection with U.S. national and Alaska interests - a bird's eye view - rather than entirely encompassing Arctic change.

The report begins by briefly introducing the resources that make the region so valuable to the United States. It then proceeds to explore the causes and effects of the changes now so rapidly overtaking the Arctic. Also explored is the increasing accessibility of the region because of climate change and improving technology, and a number of global forces, including global demand for resources, international competition for those resources, and national security interests. The more accessible Arctic will become more fully integrated into the global economy as it begins to provide increasing shares of natural resources (oil and gas, coal, minerals, seafood, renewable energy) and as marine shipping and tourism increase. In addition, the fact that climate change affects the Arctic earlier and more severely than the rest of the globe is already having significant impacts in the region and making it a center for global climate research and intervening.

The final section of the report offers recommendations on how to ensure a stable and prosperous Arctic in the future in this turbulent time. It pursues the essential questions: How should the United States respond to the tremendous challenges and opportunities presented by the wealth, accessibility, and cultural and environmental fragility that the region presents? How do we ensure that Arctic residents, still struggling for self-determination, have a say in what happens?

Understanding and managing a changing Arctic will require Americans to become accustomed to thinking of their country as an Arctic nation. Given a general lack of knowledge about the Arctic, this report is designed first and foremost to help with that process. It aims to answer three main questions:

- 1) What Arctic assets does the United States' currently possess?**
- 2) What changes are occurring in the Arctic and why are they significant? What challenges and opportunities do they present to Alaska and the U.S.?**
- 3) What should be done about it? What state, national and international policy actions will best serve the interests of Alaska and the U.S., while ensuring a stable and prosperous international Arctic regime? Through which entities should these be implemented?**

By raising awareness in the public sphere about Arctic issues and stimulating discussion, Commonwealth North believes that it can prompt the state and the nation to take action to bring about a desirable future for the Arctic.

II. Arctic Assets

We must continue to support and expand basic research in the Arctic, including focused work to understand the role of the Arctic in global climate change, enhance the health of Alaskans, and to realize the economic potential of Arctic resources.

Given that the Arctic is of vital importance to the United States, it is useful to examine what exactly the nation currently possesses within this vast territory, before discussing the changes that will likely transform the region in many ways. In this land so foreign to the majority of Americans, what sorts of assets, both natural and human, are present that make it valuable? Alaska's Arctic assets are grouped here in four broad categories:

- A. People**
- B. Land and water**
- C. Natural resources**
- D. Infrastructure**

It may help first to give a broad overview of the region's economy. First, it should be remembered that Arctic Alaska is a vast territory with a relatively small population, characterized by long distances and almost no road system, where transportation occurs mainly by airplane and boat. By far, the largest contributors to Arctic Alaska's formal economy are federal and state government spending and the exploitation of natural resources. Public sector jobs in education, health care, and other government services provided about 28% of jobs in 2000. Oil and gas extraction provides many jobs on the North Slope, while fishing is a major industry in the southwest of the state, and various mines throughout the region also contribute significantly. It should be noted, though, that only a small portion of the value of these resources is captured and circulated in local Arctic communities, as much of this resource extraction is performed by non-residents and non-local corporations. Recreation and tourism activity also provides returns to local communities. Among the Native population in the Arctic, the informal economy of subsistence and barter remains an important part of the rural lifestyle. It is also worth noting that the cost of living is much higher in rural Arctic Alaska than in urban areas, while overall economic and infrastructure development lags behind urban areas.

The State of Alaska and the United States should help Arctic residents implement effective strategies to adapt to climate change and maintain biodiversity in the region.

Before enumerating Alaska's many Arctic assets, it is important to understand what the boundaries are of this massive territory. Although there are many definitions of what constitute "Arctic" lands and marine areas, based for example, on permafrost, biogeography or cultural distinctions, the

most widely recognized one is the geographic definition stated in the U.S. Arctic Research and Policy Act of 1984. This Act defines the Arctic as all territory north of the Arctic Circle, and it defines Arctic Alaska as all areas north and west of the line formed by the Porcupine, Yukon, and Kuskokwim Rivers, including the waters of the Beaufort, Chukchi and Bering Seas, and the Aleutian Chain. It also extends out 200 nautical miles into the Arctic Ocean within the United

States' Exclusive Economic Zone (EEZ), a limitation that will likely change when additions are made under Law of the Sea. That definition is adopted here.

A. People

The indigenous peoples of the Arctic are an important piece of the American cultural landscape.

The Arctic is home to a number of indigenous peoples who have proved highly resilient in the face of a difficult environment. Though most of the Native population in Alaska is now settled in permanent villages, in the past many followed a migratory lifestyle, moving with the wildlife and

plant species in order to survive. Each group developed a unique and vibrant culture that is still in evidence today in the rural Alaska Arctic, where approximately 82% of the population is Native.¹ The four main Native groups are²:

- **Inupiaq.** The Inupiaq (who are part of a larger cultural group called the Inuit, including many of the indigenous peoples of northern Canada and Greenland) live in northern and northwestern Alaska, and many still base their livelihood on subsistence hunting of seals, walruses, polar bears, caribou and fish.
- **Yup'ik.** On the western coast, the Yup'ik people followed a similar subsistence lifestyle – living off of the resources of the Yukon-Kuskokwim delta and the Bristol Bay region. Though the two groups are culturally and linguistically distinct, the Yup'ik and Inupiaq people both belong to the Inuit Circumpolar Council (ICC), an organization that advocates for Arctic Native rights and sovereignty internationally.
- **Athabascan.** Just south of the Brooks Range live the Athabascan peoples of the Interior, who inhabit the major riverways of the region, including the Yukon and the Kuskokwim, and traditionally lived by trapping and hunting and fishing.
- **Aleut.** Finally, the Aleut people inhabit the islands of the Aleutian Chain and the Pribilofs. Their livelihood is based almost entirely on their relationship to the sea and their intimate knowledge of it. Russians began sustained contact with the Aleuts in the eighteenth century, and so this group's culture shows more Western influence than the other three groups. Alaskan Aleuts belong to the Aleut International Association (AIA).

The indigenous peoples of the Arctic are an important piece of the American cultural landscape. They deserve the respect accorded any distinct human culture. They have been living in the region for millennia. They also represent an important asset: their traditional knowledge of the

¹ Based on the 2000 U.S. Census:

http://factfinder.census.gov/servlet/GCTTable?_bm=n&_lang=en&mt_name=DEC_2000_PL_U_GCTPL_ST2&for_mat=ST-2&_box_head_nbr=GCT-PL&ds_name=DEC_2000_PL_U&geo_id=04000US02.

² Based on information from the Alaska Native Heritage Center:

http://www.alaskanative.net/en/main_nav/education/culture_alaska/.

Arctic environment – the climate, wildlife, plant life, landscape, etc. – represents a vast pool of information that has yet to be fully tapped.

B. Land and Water

Approximately one out of every 15 acres of U.S. land is located in the Arctic.

The next Arctic asset is land, and there is a large amount of it, an area nearly the size of Texas.³ This vast tract includes:

- the northern coastal plain (otherwise known as the North Slope) which contains 30% of worldwide Arctic wetlands and is an important hub for migratory species from shorebirds to caribou⁴
- Point Barrow, the northernmost point in the U.S.
- the Brooks Range, the northernmost drainage divide in North America and one of the most remote and undisturbed wildernesses on the continent
- the river systems of the Yukon, the third longest river in the U.S., and the Kuskokwim, the longest free flowing river in the U.S.
- the windswept Aleutian Islands, which stretch over a thousand miles from the Alaska Peninsula toward Russia and include both the westernmost and easternmost points in the U.S.
- a diverse range of habitats, including wetlands, tundra, boreal forests, lakes, and shallow continental shelf waters
- unique populations of polar bears, walruses, seals, sea lions, otters, caribou, marine birds, and many other species
- nearly 22 million acres of National Park land⁵ and even more National Preserve land, which offer a wide variety of recreational opportunities to residents and visitors

C. Natural Resources

Alaska is rich with natural resources, particularly in the Arctic regions.

Though Alaska has always been known largely for its abundant natural resources, many of its Arctic resources are not as well known. Here are some of the highlights:

- **The oil and gas fields of Alaska's North Slope.** The existing North Slope oil fields currently supply 17% of US domestic production. With 15 billion barrels produced from 1977 to 2004, remaining economically recoverable volume stands at about 6 to 7 billion in currently developed fields. There is an estimated 35 trillion cubic feet of recoverable

³ This is based on the geographic boundary of the Arctic described above, and information from the U.S. Census Bureau: <http://quickfacts.census.gov/qfd/>.

⁴ Randy Hagenstein presentation to the Commonwealth North Arctic Issues Study Group, July 9, 2008.

⁵ From the National Park Service website: <http://www.nps.gov/akso/ParkWise/Students/ParkFacts/acreages.htm>.

natural gas in these fields that is currently stranded due to the absence of a gas pipeline.⁶ Significantly, production peaked 20 years ago and has been slowly declining since. In 2005, production fell below 900,000 barrels per day.

- **The Bering Sea fishery.** The Bering Sea fishery is the most productive fishery in the United States – in 2004, the catch in this fishery was valued at nearly \$600 million.⁷ It provides a diverse range of species, from pollock and cod to king crab. Dutch Harbor, the largest port in the US Arctic (probably actually North American Arctic), annually brings in more seafood catch by volume than any other port in the nation, and it ranks second in the total value of the annual catch that its fleet brings in.
- **Arctic mining.** Arctic Alaska hosts a variety of mining activity. Many mines in the Interior produce significant quantities of valuable minerals like gold. Red Dog Mine near Kotzebue is the largest zinc mine in the world, and is served by the largest bulk ore carriers in the world.
- **Renewable energy sources.** Though it may lack much potential for large-scale solar power, the Arctic has a great abundance of many other renewable energy sources. Many rural Arctic communities are already operating wind turbines; Kotzebue leads this trend with a wind farm that generates approximately 1,155 kW (as of the end of 2006). Chena Hot Springs in the Interior is currently demonstrating a wide range of uses for geothermal power. Three small hydroelectric projects already generate power in the Aleutians, including one at Dutch Harbor. The fish processor UniSea Inc. in Dutch Harbor is now blending a significant portion of the raw fish oil it produces with diesel fuel to make a unique biofuel that powers its generators.⁸ A recent Minerals Management Service study of OCS resources detailed major offshore wind, wave, and ocean current/tidal prospects off Alaska as well.⁹

D. Infrastructure

The Arctic is also home to a large amount of existing infrastructure, ranging from military bases to industrial facilities to transportation corridors. Listed here are some of the major examples of Arctic infrastructure:

- **The Trans-Alaska Pipeline.** Completed in 1977, this massive project allowed the development of Alaska's North Slope oil fields and remains a marvel of modern engineering. It stretches about 800 miles from the fields at Prudhoe Bay south through the Brooks Range and the Interior to the port of Valdez on Prince William Sound. At full capacity, it can handle in excess of 2 million barrels of oil per day. Its useful life is expected to extend several more decades, as long as the flow rate remains above the minimum of 300,000 barrels per day.

⁶ U.S. Department of Energy National Energy Technology Laboratory, "Alaska's North Slope Oil and Gas: A Promising Future or an Area in Decline?", August 2007, pp. vii-viii.

⁷ Scott Goldsmith, "The Remote Rural Economy of Alaska," April 2007. Institute for Social and Economic Research, University of Alaska Anchorage. p. 8.

⁸ Alaska Energy Authority, *Renewable Energy Atlas of Alaska*, 2006, pp. 6-17.

⁹ Minerals Management Service, *OCS Report MMS 2009-15*, Report to the Secretary, US Department of the Interior, Survey of Available Data on OCS Resources and Identification of Data Gaps.

- **The Dalton Highway.** This highway, built during the construction of the Trans-Alaska Pipeline, proceeds north from a point near Fairbanks 414 miles to Prudhoe Bay on the North Slope. It is partially unpaved in the northern portions, but maintained for heavy truck traffic year-round despite the harsh conditions. It is also open for recreational traffic in the summer.
- **North Slope oil production facilities.** The oil production facilities of the North Slope represent a huge capital investment in Alaska that has been steadily expanding for decades. With their productive life expected to last well into the future, they are a major asset in Alaska's Arctic.
- **Military Facilities.** The U.S. military maintains a number of facilities throughout the Arctic. The largest near the Arctic are the Army base Fort Wainwright and Eielson Air Force Base in Fairbanks. Smaller facilities include Fort Greely near Delta Junction and Eareckson Air Station in the Aleutian Chain.
- **Ports.** There are sizable ports located throughout Alaska's Arctic. There are a number of ports that serve the Bering Sea, including Adak, Dutch Harbor, the Pribilof Islands, Bristol Bay, and others. Nome maintains the northernmost true port in the state, while Bethel has a small river port and Kotzebue a small boat harbor.
- **Fish processors.** There are a number of major fish processing facilities that serve Alaska's Arctic fisheries, located in Kotzebue, St. Paul Island, Dutch Harbor and other ports along the Aleutian Chain. They add significant value to the seafood catch from the region, and thereby make an important contribution to the region's economy.
- **Airports.** In the Arctic, there are few facilities that would qualify as major "airports". In fact, Fairbanks supports the only international airport close to Alaska's Arctic. But there are a great number of smaller airports and airstrips throughout the region that serve Arctic communities. These range from the regional hub airports at Bethel, Nome, Kotzebue, Barrow and Prudhoe Bay to community airstrips that can accommodate only single-engine planes. Despite their small size airports represent vital community links.

III. A Changing Arctic

Having established why the Arctic matters and briefly surveyed the United States' current Arctic assets, it is now time to turn to the heart of this report. This section will explore the changes now occurring in the Arctic, both within U.S. territory and internationally, and seek to explain why they are significant for the U.S. That is, why they present both challenges and opportunities that Alaska and the United States need to respond to. This section is broken down into three sub-sections:

- A. A more accessible Arctic:** the forces that are contributing to increased access to the Arctic
- B. A contributing Arctic:** how the Arctic will become more integrated into the global economy
- C. A warming Arctic:** how the Arctic is becoming both an indicator of significant climate change and a center for climate research

A. A More Accessible Arctic

What is happening to increase access to the Arctic in the twenty-first century? The causes can be split into three different groups: climate change, technological progress, and global forces. Any one of these causes alone would likely not increase access to the Arctic very much, but the convergence of all three makes it nearly inevitable that human activity in the Arctic will proliferate.

1. Climate Change

Consider the Arctic region's unique needs, as well as the contribution the Arctic and Alaska can make as a national/global regime is established to mitigate climate change.

Regardless of whether or not human emissions are a significant factor in global climate change, it is undisputed that the Arctic climate is warming rapidly. During the past fifty years, winter temperatures over land in Alaska have risen by an estimated 3-4 degrees Celsius, and are expected to rise another 4-7 degrees Celsius over the next century.¹⁰

One of the most conspicuous effects of this warming pattern is the gradual shrinking of summertime sea ice in the Arctic Ocean. This became a much greater concern in September 2007, when a new minimum sea ice extent was reached that was 23% below the previous record minimum set in 2005, and 39% below the average minimum of the years 1979-2000.¹¹ Such an extreme drop in sea ice cover signifies that Arctic sea ice may be disappearing even faster than the most aggressive climate models have predicted. Whereas these models showed an ice-free

¹⁰ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge University Press, 2004. pp. 11-12.

¹¹ U.S. Interagency Arctic Research Policy Committee (IARPC), *Arctic Observing Network (AON): Toward a US Contribution to Pan-Arctic Observing*, 2007. p. 8.

summertime Arctic Ocean by the middle of the century, some experts now predict that this may happen as early as the summer of 2013.¹² 2008 continued this pattern of low-ice summers.

As with many aspects of climate change, this rapid disappearance of sea ice will produce both winners and losers. The largest losers will likely be the marine animals – polar bears, some seals, walrus – that depend on the ice for feeding and breeding, and the Native subsistence hunters that in turn depend on these species. One study predicts that polar bear populations may decline by 66% through 2050¹³, and other species may experience similar losses. Also, coastal Arctic communities will experience accelerated coastal erosion due to greater exposure to storms able to impact shorelines formerly protected by sea ice.

The winners in this situation will likely include marine shipping interests, tourism companies, and resource extraction industries that will be able to access Arctic resources (oil and gas, minerals, etc.) and Arctic sea routes (the Northern Sea Route north of Russia, and the Northwest Passage in northern Canada) more easily. This is one of the key findings of the Arctic Climate Impact Assessment (ACIA)¹⁴ – that reduced sea ice will likely lengthen the Arctic navigation season, permit increased marine shipping and transportation within the region, and allow greater offshore extraction of oil and gas. However, the ACIA also notes that increasing ice movement (receding ice packs mean more free-floating ice) could hinder navigation and resource extraction as much as permanent pack ice.

2. Technological Progress

The Coast Guard should expand its Arctic operations to perform search and rescue (SAR), law and fisheries enforcement, environmental protection, and other missions just as the agency does on other parts of the U.S. coast. To do this right, the U.S. must build new Polar-class icebreakers.

The continued withdrawal of sea ice from Arctic navigable waterways is not the sole prerequisite for greater maritime access to the Arctic. Technological advances have and will continue to play a central enabling role because conditions remain harsh and infrastructure is sparse. Furthermore, while declining, sea ice will not completely disappear for many years, if ever.

Icebreaker technology. The first major technology needed for increased Arctic access is icebreakers, ships with reinforced hulls of a special shape and large power supplies that can clear a path through thick Arctic sea ice. They are needed for a variety of reasons: to make way through sea ice for other ships, to support Arctic search and rescue missions, and in general to support conventional navigation in unconventional ice-infested waters. Icebreakers have gone through a significant number of improvements since the first steam-powered icebreakers of the

¹² Scott Borgerson presentation to Commonwealth North Arctic Issues Study Group, May 21, 2008.

¹³ US Geological Survey. 2007. "Future retreat of Arctic sea ice will lower polar bear populations and limit their distribution." Reston, VA: USGS. <http://www.usgs.gov/newsroom/article.asp?ID=1773>.

¹⁴ The Arctic Climate Impact Assessment was a comprehensive multi-year study of Arctic environmental change that was sponsored by the Arctic Council and published in 2004.

nineteenth century. Russia introduced the first nuclear-powered icebreaker in 1959, and in May 2007 launched the largest icebreaker in the world. Nuclear-powered icebreakers offer greater power than diesel-powered ships, but the U.S. maintains only diesel-powered Polar-class models. Of the three ice breakers, two are currently in desperate need of replacement.

Recent advances in icebreaker technology include: computer-controlled systems that quickly shift ballast water in order to increase the stability of the ship; reinforced and shielded propellers; rotating propellers called “azipods” that allow a ship to travel both backward and forward, giving it greater maneuverability while eliminating the need for a rudder; and the “double-acting” icebreaker design, which has a traditional ship bow and an icebreaker-like stern, allowing it to travel forward in normal waters and backward in ice and thereby reap the advantages of both hull types.

It should be noted that icebreakers are not only used for military operations and for ensuring the viability of shipping routes. They have also been, since the end of the Cold War, a vehicle for tourism. For almost twenty years, wealthy tourists have paid to ride icebreakers throughout the Arctic Ocean, often to the North Pole. Indeed, tourism itself is one of the main commercial enterprises that is likely to dramatically increase in a more accessible Arctic. Icebreakers also support important scientific research in polar regions.

Offshore drilling technology. Offshore oil and gas drilling technology, like icebreaker technology, is making access to Arctic resources more economical. A recent study by the U.S. Minerals Management Service found that while a number of challenges still face offshore drilling in the Arctic despite decreased sea ice, new materials and designs could soon allow the extraction of the large estimated reserves in Alaska’s Outer Continental Shelf (OCS).¹⁵ Assuming that exploration proves the resource, a number of innovations will likely help bring it to market: advanced steel structures more suited to cold conditions than concrete; new platform designs that either rest on the sea bottom or float on the surface; subsea facilities and pipelines; ice or gravel island platform bases; and extended reach drilling from onshore sites.

3. Global Forces

Although receding sea ice and better technology are the two factors *allowing* increased human activity in the Arctic, they are not the factors that *drive* this increase. These drivers of Arctic activity can be summed up under the term “global forces” because they extend far beyond the boundaries of the Arctic to embrace trends around the world, and also international trends within the Arctic itself. Rising global demand for resources, international competition within the Arctic for resources and economic opportunities, and national security needs are the forces truly driving the expansion of Arctic human activity.

Global demand for resources. At the broadest level, the growing world population by necessity requires a greater amount of resources. In particular, the steady economic growth of the developed world (the U.S., Europe, Japan, etc.) and the rapid economic growth of major developing nations like China and India are combining to increase worldwide demand for food,

¹⁵ Alan Bailey, “Platforms for the Arctic offshore?” *Petroleum News*, July 27, 2008.
<http://www.petroleumnews.com/pntruncate/209820163.shtml>.

energy, raw materials, consumer products, transportation, healthcare, and other amenities by huge amounts. (As an example, global energy demand is expected to grow by 55% from 2005 to 2030.¹⁶) Three of these – energy, raw materials, and transportation – are especially relevant to the Arctic because it is estimated that the Arctic holds vast quantities of oil and gas, coal, minerals, and also promises new shipping routes that may increase the efficiency of world trade.

International competition. Many parties are highly interested in the economic opportunities afforded by the Arctic, because of this fast-rising global demand, the increased access permitted by receding sea ice, and better technology, and are already making large investments in the region. The most publicized of these competitive efforts has been the symbolic planting of a Russian flag on the seabed under the North Pole in August 2007. While many point to this as the beginning of a “race” to claim the Arctic, it is merely the most visible in a series of events that mark the Arctic’s emergence as a region of global interest. For example, the underwater Lomonosov Ridge in the Arctic Ocean is currently the subject of intense scrutiny. Because it is estimated to contain significant deposits of petroleum and valuable minerals, Russia, Canada and Denmark are all competing to gather sufficient scientific evidence to prove that the ridge is part of their own Outer Continental Shelf (OCS), and thus within their sovereign territory. As another example, an ice-free Northwest Passage in Canada will allow much greater marine traffic through those waters. However, Canada asserts that the waters are part of its territorial waters, while the United States maintains that the Passage should be an international waterway like the Panama or Suez Canal.

Other instances could be cited, but what is clear is that competition to reap the benefits of a more accessible Arctic is real, and is a major driver of the actions of all the Arctic nations. Many experts agree that if this can be called a “race,” then the United States is lagging behind and Russia is almost certainly in the lead¹⁷ – with its much larger icebreaker fleet, aggressive pursuit of OCS claims in the Arctic Ocean, buildup of military power in the Arctic, and generally greater attention to Arctic issues. Indeed, the actions of Russia, and to a smaller extent the other nations bordering the Arctic Ocean (Norway, Denmark and Canada), are one of the most influential drivers of U.S. action in the region.

National Security Issues. During the Cold War, the Arctic first became a major venue for national defense because of the need to defend against Soviet attack through aircraft operations, missiles and missile defense, and monitoring networks. However, as activity of all sorts in the Arctic increases, there will be an increased need for a more conventional military presence. This does not mean that aircraft carriers will be patrolling the Arctic anytime soon, but it does probably mean that the Coast Guard’s intermittent visits will become more frequent, and that permanent operations in the region will begin. (Already, in the summer of 2008, preliminary Coast Guard operations along Alaska’s northern coast are testing the capabilities of current equipment and crews, and working to determine what future needs will be.¹⁸)

¹⁶ International Energy Agency, “World Energy Outlook 2007”. www.worldenergyoutlook.org.

¹⁷ “USA lagging behind in race for the Arctic.” Barents Observer, July 18, 2008.

<http://www.kodiakdailymirror.com/?pid=19&id=6336>.

¹⁸ Ralph Gibbs, “Coast Guard builds checklist for Arctic mission.” Kodiak Daily Mirror, June 17, 2008. <http://www.kodiakdailymirror.com/?pid=19&id=6336>.

The Coast Guard's presence will be required for a number of reasons. As marine traffic, offshore drilling and tourism all increase, Arctic waterways will become more like waterways in the rest of the world, which the Coast Guard provides a number of essential services for. The Coast Guard will need to ensure border protection and law enforcement, extend search and rescue capabilities into ice-infested waters, perform reconnaissance and surveillance, respond to possible oil spills or other environmental incidents, enforce environmental regulations, and take on any other missions required to enable Arctic waterways to function smoothly.

Russia and Canada are both ramping up their military presence in the Arctic. Canada plans to build a cold climate military training center and a deepwater port in its northern territory, in order to strengthen its claims in the region.¹⁹ Russia is already sending regular patrols far out into the Arctic Ocean and preparing some of its armed forces for potential Arctic conflicts. It claims that these are in response to U.S. military operations in the Arctic, but is also clearly a projection of renewed military strength and status both within the region and globally.²⁰ Though Canada remains a strong ally and its plans are not cause for worry, Russian military buildup in the Arctic will undoubtedly be an important variable in the U.S. military's calculations about future needs in the area, and a driver of U.S. Arctic policy in general.

B. A Contributing Arctic

A more accessible Arctic, in which economic opportunities are greatly expanding and the drivers listed above are accelerating the pursuit of those opportunities, will almost inevitably become a more economically developed Arctic. This means that the Arctic will become a much larger contributor to the global economy and a more integrated part of the global economic system. Arctic economic opportunities are diverse, and will be discussed in the following order:

1. **Oil and gas**
2. **Coal**
3. **Minerals**
4. **Fisheries**
5. **Renewable energy**
6. **Marine shipping**
7. **Tourism**

The world's Arctic has significant promise and potential for humankind.

1. Oil and Gas

Oil and gas reserves are probably the most well-known of the Arctic's many natural resources, and with global demand rising quickly and historically high prices, even difficult-to-reach offshore reserves are beginning to look economically viable. Oil and gas extraction, however, is by no means a new phenomenon in the Arctic. Most Americans are familiar with Alaska's North Slope oil fields, which have been producing for about three decades, but fewer know that oil

¹⁹ Alec Crawford, "Territorial Claims: The Security Dimensions of Environmental Policy." The Toronto Star, July 8, 2008. <http://www.thestar.com/comment/article/455931>.

²⁰ "Russia prepares for future combat in the Arctic." RIA Novosti, June 24, 2008. <http://en.rian.ru/russia/20080624/111915879.html>.

drilling in the Russian Arctic is several decades older than that. And it will almost undoubtedly prove to be an important Arctic industry for some time to come.

This is largely due to the fact that the U.S. Geological Survey has recently completed a comprehensive geological survey of all the likely petroleum provinces north of the Arctic Circle, the first time such information has been consistently gathered and made available publicly. Its mean estimate is that the Arctic's undiscovered reserves may total about 90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids (of course, actual reserves may be significantly higher or lower). This is equal to 22% of the undiscovered but technically recoverable oil and gas resources in the world – 13% for oil, 30% for natural gas, and 20% for natural gas liquids. More than 50% of the oil reserves are expected to reside in just three geological provinces, one of which is Arctic Alaska; and 70% of the natural gas reserves are expected to be found in three provinces, one of which again is Arctic Alaska. Also, about 84% of the resources are likely to be offshore.²¹

Of course, it should be noted that the USGS did not estimate how economical it would be to develop these resources, and, as noted earlier, the feasibility of such development is still largely uncertain, despite technological progress and receding sea ice. However, oil companies appear to believe that the Chukchi and Beaufort Seas are worth exploring, as they bid a combined \$2.66 billion (a record in Alaska oil and gas lease auctions) for federal leases in the Chukchi in February 2008. The Dutch company Shell has planned to drill in the Beaufort since 2005, but has been denied during the last two summer seasons because of a challenge in the U.S. Ninth Circuit Court that has yet to be resolved.²²

Given the size of the potential resources, the Arctic is almost certain to become a larger exporter of oil and gas, especially Arctic Alaska. The leader of the recent USGS study has said publicly that Alaska's OCS is one of the most promising oil and gas provinces in the entire Arctic.²³ However, it is unknown how the recent listing of polar bears as a threatened species under the Endangered Species Act will affect exploration and development in the Arctic Ocean. Former U.S. Secretary of the Interior Dirk Kempthorne has said that the listing will not prevent any activity not already prevented by the federal Marine Mammal Protection Act, but Alaska Governor Sarah Palin decided that the state would contest the listing in court, largely because it is believed that it could interfere with oil and gas development.²⁴ Though many factors are in play, most signs indicate that oil and gas will continue to be a major part of the Arctic's economic future.

2. Coal

Despite coal's greater CO₂ output compared to other fossil fuels and concerns about climate change, rising global energy demand will likely lead to increased demand for coal. This demand

²¹ USGS Newsroom, "90 Billion Barrels of Oil and 1,670 Trillion Cubic Feet of Natural Gas Assessed in the Arctic." USGS, July 23, 2008. <http://www.usgs.gov/newsroom/article.asp?ID=1980>.

²² Wesley Loy, "Record bids for oil, gas leases in Chukchi Sea." Anchorage Daily News, February 7, 2008. <http://www.adn.com/front/story/307588.html>.

²³ USGS Newsroom, 2008.

²⁴ Joling, Dan. "State will sue over polar bear listing." *Anchorage Daily News*, May 22, 2008. <http://www.adn.com/polarbears/story/413710.html>

may be partially met by high quality bituminous coal from Alaska's western North Slope, where billions of tons of the resource reside. This region's vast coal reserve represents about one third of the U.S.'s reserve, and one ninth of the world's reserve.²⁵ The particular physical properties of this coal make it more environmentally friendly when burned, but it still faces stiff competition with coal from other regions.

In July 2006 BHP Billiton Energy Coal signed an agreement with the Arctic Slope Regional Corporation to conduct a five-year coal exploration program on the corporation's lands south of Point Lay, and also to develop a concept for bringing this coal to market in a region with little existing infrastructure. The initial concept-level feasibility study will assess the viability of a rail corridor from the North Slope south to an ice-free port and a port terminal for shipping to Asian markets.²⁶ Though still in its early stages, the study promises to greatly enhance the chances that this resource will be developed. In addition, the Arctic Energy Action Team of the Arctic Energy Summit (a project sponsored by the Arctic Council) is currently working on a plan to accelerate the commercialization of Arctic coal. The team has suggested that because of the high likelihood of national or global restrictions on greenhouse gas emissions, demand for coal may decrease below what it would otherwise be in the future. Because of this, they propose that it may become economical and strategic to invest in facilities for pre-processing the coal into less carbon-intensive forms for export – these could include in situ gasification, gasification through integrated gasification combined cycle (IGCC) technology, or coal-to-liquids.²⁷

3. Minerals

Minerals are one of the most abundant resources that the Arctic contains.

Although they do not have the same high profile as oil and gas resources, minerals are one of the most abundant resources that the Arctic contains. Large mining operations already exist in many locations throughout the region, from the Teck Cominco Red Dog Mine on NANA land in northwest Alaska to the Norilsk Nickel mines in northwestern Siberia, and there is great potential for expansion of mining, especially as ice-free waterways open for longer periods of the year. Iron ore deposits in the northern Canadian archipelago, and other mineral deposits in northwest Alaska – of zinc, copper, lead, silver, and others – are generating great interest. To these can be added the deposits believed to exist under the Arctic Ocean, in ECS areas that may be claimed. No comprehensive assessment of all Arctic minerals (comparable to the USGS survey of oil and gas resources) has been performed yet.

Assessments have been made within Arctic Alaska that point to significant recoverable deposits. Despite the impressive size of Red Dog Mine, what is most impressive is that there could be many more mines in the area of equal size, if there were sufficient access to a coastal port.²⁸ Mining already contributes significantly to the economy of Alaska and the Arctic as a whole, and

²⁵ Arctic Slope Regional Corporation website: <http://www.asrc.com/lands/lands.asp?page=coal>.

²⁶ BHP Billiton Western Coal Project website: <http://bhpbilliton.com/bb/ourBusinesses/energyCoal/westernArcticCoalProject.jsp>.

²⁷ Ben Ellis presentation to Commonwealth North Arctic Issues Study Group, June 25, 2008.

²⁸ U.S. Coast Guard Rear Admiral Gene Brooks presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

this activity is likely to continue increasing as access to the region improves, not only because of receding ice and technology, but because of infrastructure development (e.g. the construction of deepwater ports).

4. Fisheries

The Bering Sea fishery, as mentioned previously, provides more seafood than any other single fishery in the U.S. Like other Arctic fisheries, it is extremely rich in biomass, but also very sensitive to environmental changes. With warming water temperatures and changes in salinity, it has been found that Bering Sea fish stocks are moving northward. Just in the years between 2003 and 2006, the majority of catch for certain species has shifted from the southern Bering near the Aleutian Chain to the central and northern Bering. Species previously found only in southern Alaska are now being caught on the northern coast.²⁹

As stocks move north of the Bering Strait, commercial fishing vessels are likely to follow. However, government regulators are completely unprepared to establish sustainable quotas for this new fishery because they lack the baseline information about the types and quantities of the species there. In consequence, a fishing moratorium is being imposed in the area by the North Pacific Fishery Management Council so that the appropriate data may be gathered and a scientifically-based set of quotas put in place. It should be noted, however, that enforcement of this moratorium is the responsibility of the Coast Guard, which is only just beginning its operations in the area. The results of the baseline study of this fishery, which will lead to a full fishery management plan in the near future, are likely to indicate that this could become a major commercial fishery in the future, especially as sea ice continues to recede.

5. Renewable Energy

While the nonrenewable energy resources of the Arctic have captured significant attention recently, largely because of rising energy prices and the USGS oil and gas survey, these have the distinct disadvantage of perpetuating a reliance on methods of energy generation that contribute to the climate change that is already having major impacts in the Arctic. Moreover, the rise in fossil fuel prices is felt more strongly in Arctic communities than almost anywhere else in the nation, and is making it ever more difficult to maintain a fuel-intensive rural lifestyle. 79% of rural Alaskans heat their homes with diesel, besides relying on diesel for power generation and gasoline or diesel for mobility. The poorest 20% of rural Alaska households now spend approximately *half* of their total income on energy needs.³⁰

As fossil fuel prices continue to rise, it will become increasingly economical to diversify the energy base of Arctic communities and to include more power generation from local renewable sources – wind, conventional hydro, in-river hydrokinetic, geothermal, biomass, tidal and wave energy all are available in large quantities in the Arctic. In very remote regions, for stand-alone cabins and other facilities, solar panels are a viable option despite the relatively lower year-round amount of sunlight that the Arctic receives.

²⁹ U.S. Coast Guard Rear Admiral Gene Brooks presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

³⁰ George Cannelos presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 14, 2008.

Government agencies like the Alaska Energy Authority and the Denali Commission are currently partnering with private companies and local governments all over Alaska to complete renewable energy projects that are appropriate to each location. A number of coastal villages have already, or are currently, installing wind turbines and integrating them into wind-diesel hybrid power systems – from St. Paul in the Bering Sea to Hooper Bay to Kotzebue. In the interior of the state, a pilot in-river hydrokinetic turbine (essentially a wind turbine underwater) will soon be installed in the Yukon River at Eagle, and funding has been secured for a biomass generation plant at Fort Yukon that burns fast-growing willow trees.³¹

There is also the possibility of several geothermal projects in southwestern Alaska, including one at Mount Spurr that could be connected to the Railbelt power grid. Such a plant, with the high-density and low-cost electricity it generates, could supply power to energy-intensive industrial facilities like aluminum smelting plants. Iceland has proven that such industries are very willing to relocate to the Arctic if they can have access to inexpensive electricity – and such a partnership is a way that Arctic regions can “export” their abundant renewable energy resources. Once the many remaining technical hurdles are cleared, hydrogen may serve as a viable way to store and export renewably-produced energy out of the Arctic.

The heavy reliance on liquid fuels for transportation in the Arctic means finding renewable and local substitutes for petroleum fuels is another great challenge in the region. Electric vehicles are an option, but cold temperatures tend to render many battery systems inefficient or non-functional and there is an engine to provide heat inside the vehicle. But with a great amount of research into electric and hybrid vehicles worldwide, such challenges may not stop them from working in the Arctic for long. (The issue will then become the maintenance and disposal of batteries, which usually contain acids, heavy metals and other contaminants.) Besides electric vehicles, local production of liquid fuels from biomass is a possibility in the area of the Alaska community of Galena.³² Of course, greater vehicle efficiency, along with greater electricity efficiency and conservation are also important to reducing reliance on imported fuel in the Arctic.

6. Marine Shipping

Increased ship traffic is almost certain to enter Arctic waterways, whether the U.S. is prepared to handle it or not.

Because of the freedom of the seas and the drivers described above, increasing ship traffic is almost certain to enter Arctic waterways, whether the U.S. is prepared to handle it or not. Of course, this has both positive and negative consequences. On the negative side, increased ship traffic brings pollution, the risk of accidents and fuel spills, and possible disturbance of wildlife and subsistence hunting. On the positive side, as Arctic traffic expands, Alaska’s strategic location may allow it to reap the economic benefits of trade, especially if it makes early investments in infrastructure, such as ports which may serve as trans-shipping points.

³¹ George Cannelos presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 14, 2008.

³² James Hemsath presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 14, 2008.

The Bering Strait, only about 53 miles across and 300 feet at its deepest, is the only passageway between the Pacific and the Arctic Oceans. This means that all trans-Arctic shipping (that is, shipping through the Arctic Ocean) that is destined for, or originates from, East Asia or the west coast of North America must pass through the Bering Strait and pass by the Aleutian Islands. The same is true for the growing ship traffic that will carry newly accessible resources out of the Arctic to those regions. The Bering Strait and Bering Sea could become a “choke point,” analogous in some ways to the Strait of Malacca, and the Strait may someday be known as the “Bering Gate” instead. Such trans-Arctic routes, using either the Northern Sea Route north of Russia or the Northwest Passage north of Canada, are advantageous because they cut shipping distances – for instance, using the Northern Sea Route would reduce the distance from northern Europe to East Asia by about one third.³³ A major shipping port at Adak or Dutch Harbor, to handle the traffic through this choke point, may have the potential to become a worldwide hub of trade. Indeed, approximately 6000 conventional ships passed by the Aleutians in 2004 on the great circle routes between the U.S. west coast and East Asia.³⁴

The Arctic Marine Shipping Assessment (AMSA), a major project sponsored by the Arctic Council, is a comprehensive study of marine shipping in the region that will be published in April 2009. Its preliminary findings show that there is already a significant ship presence in the Arctic: it estimates that over 5,400 vessels made at least one trip in the Arctic during 2004 (mostly during the summer), and traffic has increased substantially since then.³⁵ It is a virtual certainty that the Arctic will see major growth in marine shipping throughout the region in the next few decades, and the U.S. must be ready to match this with the appropriate infrastructure.

7. Tourism

Marine tourism, and a smaller amount of land-based tourism, is increasing along with marine shipping in the Arctic. In fact, it may be increasing even more quickly than shipping, especially in particular regions like Greenland. Just a decade ago, Greenland saw very little tourism, but now it is making headlines because of the rapid growth in summertime cruise ship traffic. In 2007, about 30 cruise ships carrying a total of 23,000 passengers visited Greenland; in 2008, this increased to 45 ships, carrying 55,000 passengers – more people than live in all of Greenland. This dramatic growth holds potential benefits for the local economy, because many of the ships are stopping in the capital of Nuuk, but it also poses huge challenges to the very small Danish naval resources that would need to respond in case of an emergency.³⁶

The speed with which tourism is reaching new places has surprised many. In the summer of 2007, three different cruise ships navigated through the Northwest Passage from Canada’s Atlantic coast to Alaska’s North Slope for the first time. In the summer of 2008 at least seven cruise ships carrying over 3,000 passengers scheduled visits to the northern Bering Sea and other

³³ Tom Kizzia, “U.S. needs to prepare for Arctic traffic surge.” Anchorage Daily News, February 12, 2008. <http://www.adn.com/news/environment/story/312402.html>.

³⁴ Dr. Lawson Brigham presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

³⁵ Dr. Lawson Brigham presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

³⁶ Greenland Command Rear Admiral Henrik Kudsk presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

Arctic waters off of Alaska.³⁷ This highlights a major issue, which is the problem of tracking vessel traffic in the Arctic, for which there is currently no comprehensive system. It also demonstrates that, even if greater Arctic tourism does not originate within Alaska, greater Arctic tourism in general will almost certainly affect the state, if only because it requires that the infrastructure be put into place so that the U.S. can provide search and rescue capabilities in its own northern waters.

C. A Warming Arctic

In the northern regions climate change is not a future result, but a present reality that is having large impacts.

As has been mentioned previously, the Arctic is warming rapidly. Whether it is significantly influenced by human greenhouse gas emissions is irrelevant, because in the northern regions climate change is not a future result that may be avoided through carbon mitigation, but a present reality that is having large

impacts. Yet this rapid rate of climatic change, though it produces many harmful effects (and possibly some benefits, depending on one's point of view), also makes the Arctic one of the centers of scientific attention in relation to climate, since the effects are felt there first. This section will discuss exactly what the current and anticipated effects of climate change are in the Arctic and particularly in Alaska, and also summarize current scientific research and future research possibilities.

1. Impacts

An excellent description of the current and expected impacts of climate change in the Arctic is provided by the Arctic Climate Impact Assessment, a comprehensive study of Arctic environmental change sponsored by the Arctic Council. The ACIA's key findings regarding past and future impacts are summarized in the following outline³⁸:

- 1) **Rapid Warming.** The Arctic is warming rapidly and larger changes are expected in the future.
 - a. higher temperatures
 - b. more melting of glaciers and sea ice
 - c. less snow
 - d. shorter winters
 - e. increased precipitation
- 2) **Global Effects.** Arctic warming has worldwide implications.
 - a. a decrease in the reflectivity of the Earth's surface
 - b. rising sea levels because of melting glaciers and increased river runoff
 - c. changes in ocean circulation, which could affect global climate

³⁷ "Arctic countries unprepared for cruise ship accidents: officials." *CBC News*, June 3, 2008. <http://www.cbc.ca/canada/north/story/2008/06/03/Arctic-cruise.html>.

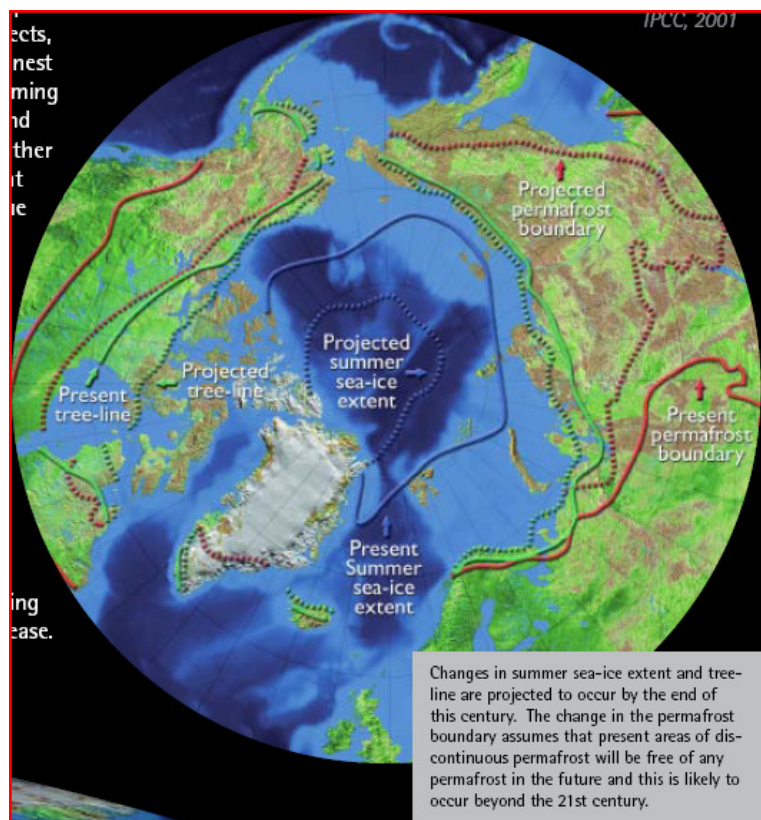
³⁸ ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge University Press, 2004. pp. 10-11

- d. alterations in the release and uptake of greenhouse gases by soils, vegetation and coastal oceans with releases of methane from frozen soil, the Arctic is a growing carbon “emitter”
 - e. effects, due to ocean warming and ocean acidification, on the breeding and feeding of species that migrate to the Arctic
- 3) Shifting Vegetation.** Arctic vegetation zones are likely to shift.
- a. the treeline will move northward, displacing part of the tundra, and tundra will displace polar deserts
 - b. more productive vegetation in the Arctic will take in more carbon, but a darker land surface will reduce reflectivity and probably outweigh the greater carbon uptake in terms of warming effect
 - c. insect outbreaks (e.g. the spruce bark beetle) and forest fires will become more frequent and severe, and this could facilitate invasive species penetration
 - d. in suitable soils, agriculture may be able to move farther north as the climate warms
- 4) Shifting Animals.** Animal species diversity, range and distribution are very likely to change.
- a. habitat for polar bears, walruses, some seals and some birds will shrink and make it difficult for them to survive
 - b. caribou and other land animals will suffer as access to food, breeding grounds and migration routes changes
 - c. species ranges will move north, limiting species like polar bears but also bringing in new species to the Arctic
 - d. new species may bring new diseases (e.g. West Nile) that may pose health risks to humans
 - e. some Arctic ocean fisheries will become more productive, while other freshwater fisheries will decline
 - f. The Alaska sub-region of the Arctic is currently home to the most threatened species, and thus is most vulnerable to loss of biodiversity
- 5) Coastal Erosion.** Many coastal communities and facilities will be increasingly threatened by storms.
- a. rising sea level in some locations and a lack of sea ice will make storms more likely to cause severe erosion
 - b. thawing permafrost along the coast will weaken Arctic coastlines and make them more vulnerable to erosion
 - c. the risk of flooding in coastal wetlands will increase
 - d. some coastal communities and facilities are already being forced to relocate, and others will have to deal with increasing costs and risks
- 6) Thawing Permafrost.** Thawing permafrost will threaten transportation, buildings and other infrastructure.
- a. ice roads and tundra will be frozen for shorter periods each year, limiting travel and operations like oil and gas extraction and forestry
 - b. existing buildings, roads, runways and other facilities will be destabilized, which will require substantial maintenance and investment
 - c. future infrastructure will have to be designed for the new conditions, adding to construction and maintenance costs

- d. collapse of the ground surface will cause some lakes to drain, create new wetlands, and bring down trees in unstable areas
- 7) **Indigenous Peoples.** Indigenous peoples will be seriously impacted, both culturally and economically.
 - a. indigenous peoples depend on many of the animal species (e.g. seals and caribou) that will be greatly affected for food, and also for cultural identity
 - b. changes in access to various animal species, a perceived decline in the predictability of weather, and reduced travel safety in a shifting landscape will threaten the health and security (and even the survival) of many indigenous cultures
 - c. indigenous knowledge and observations agree with scientific findings of a rapidly changing Arctic climate, and they constitute an important source of information about that climate
- 8) **UV Radiation.** Elevated levels of ultraviolet (UV) radiation will affect plants, animals and humans.
 - a. ozone depletion in the Arctic is likely to continue for several decades, which will allow more damaging UV radiation to reach the Arctic surface
 - b. Arctic people will receive higher doses of UV radiation than ever before, which could cause increased risk of skin cancer, cataracts and immune system disorders
 - c. greater UV radiation may disrupt photosynthesis in plants and the early life stages of amphibians and fish
 - d. UV exposure will be greatest in springtime, when plants and animals are most vulnerable, and decreased snow and ice cover may expose normally protected species
- 9) **Multiple Factors.** Multiple factors in combination will cause greater stress on humans and ecosystems than individual impacts alone.
 - a. climate change is proceeding at the same time as a host of other changes, including chemical pollution, overfishing, habitat fragmentation, human population growth, and other cultural and economic changes
 - b. effects on plants, animals and humans are amplified when impacts (e.g. pollution, excess UV radiation and warming) occur simultaneously
 - c. multiple factors will cause different effects in different Arctic sub-regions

In order to give a quantitative and visual sense of these climate impacts, here are a few illustrative images and statistics (some of which are cited above, but bear repeating):

Image of Current and Projected Tree Line, Permafrost Line, and Sea Ice Minimum Extent



(Source: Arctic Climate Impact Assessment)

- Temperatures in the Arctic have warmed almost twice as fast as the rest of the world; in Alaska, winter temperatures have warmed about **3-4 degrees Celsius** over the past fifty years, and may rise another **4-7 degrees Celsius** over the next century.³⁹
- In September 2007, sea ice in the Arctic Ocean reached a historic low which was **23% lower** than the previous record set only two years before and **39% lower** than the long-term average, surprising ice experts around the world.⁴⁰
- Some ice experts now predict that the whole Arctic Ocean could be essentially **ice-free as soon as the summer of 2013**.⁴¹
- One study predicts that **polar bear populations may decline by 66%** through 2050⁴², and other species may experience similar losses.

³⁹ ACIA, pp. 11-12.

⁴⁰ U.S. Interagency Arctic Research Policy Committee (IARPC), *Arctic Observing Network (AON): Toward a US Contribution to Pan-Arctic Observing*. 2007. p. 8.

⁴¹ Scott Borgerson presentation to Commonwealth North Arctic Issues Study Group, May 21, 2008.

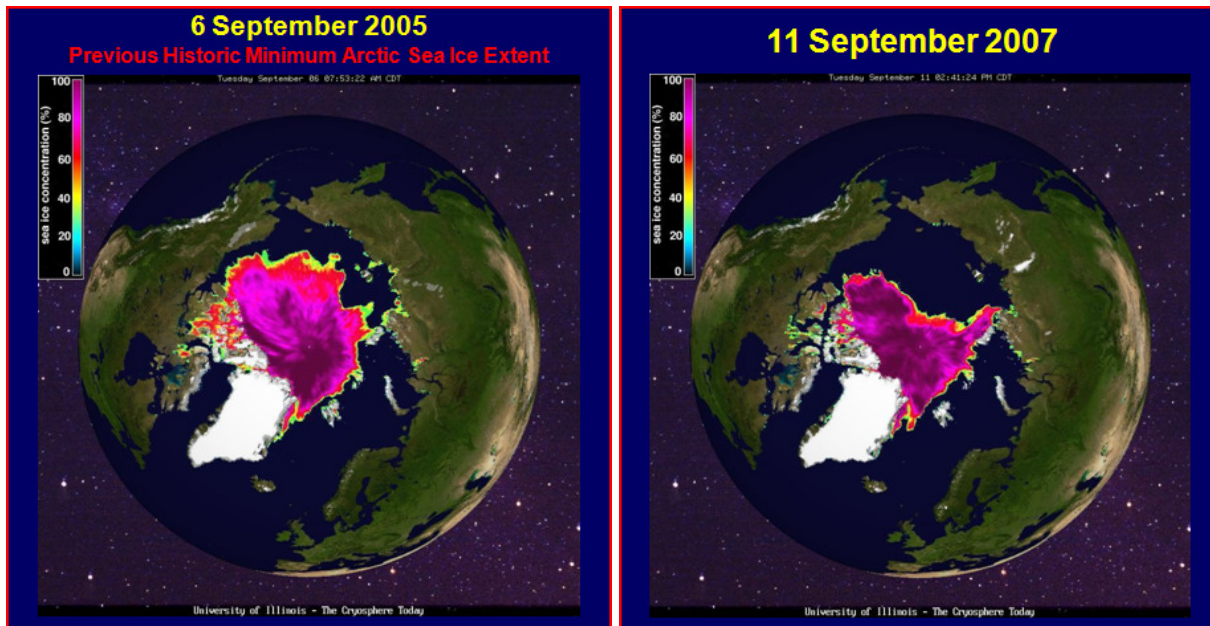
- All along the northern and western coasts of Alaska, a warmer climate is causing less ice formation in the fall every year and allowing storms to batter the shores of rural villages. This, in combination with thawing permafrost underneath the villages, is resulting in massive erosion and flooding in many locations. A 2006 U.S. Army Corps of Engineers study found that the towns of Shishmaref, Kivalina and Newtok will be critically impacted within ten years and will most likely have to be completely relocated over time. **The estimated cost is \$100-200 million for Shishmaref, \$80-120 million for Kivalina and \$80-130 million for Newtok.** Additionally, other towns will require significant erosion protection measures with significant costs: Bethel, \$5 million; Dillingham, \$10 million; Unalakleet, \$30 million; and Kaktovik, \$40 million.⁴³ Undoubtedly, there will be others as well.
- Another study estimates that the extra cost to maintain public infrastructure (schools, roads, airports, hospitals, sewage systems, etc.) in Alaska because of climate change will be **\$3.6 - 6.1 billion** through 2030, or **10-20%** of total infrastructure costs.⁴⁴

⁴² US Geological Survey. 2007. "Future retreat of Arctic sea ice will lower polar bear populations and limit their distribution." Reston, VA: USGS. <http://www.usgs.gov/newsroom/article.asp?ID=1773>.

⁴³ U.S. Army Corps of Engineers - Alaska District, "Corps of Engineers releases study of village erosion issues," June 12, 2006.

⁴⁴ Peter Larsen and Scott Goldsmith. "How Much Might Climate Change Add to Future Costs for Public Infrastructure in Alaska?" Institute of Social and Economic Research, University of Alaska Anchorage. June 2007.

Satellite Images of Arctic Sea Ice Minimums in 2005 and 2007



(Source: University of Illinois)

While it is very important that Alaskans and other Americans understand the potential negative impacts of climate change in the Arctic, they should also remember that climate change is not necessarily a negative influence in all cases. Some species will decline with warming, like polar bears, while others will likely thrive, such as some Arctic fish species. While infrastructure may suffer from thawing permafrost, it will also suffer less damage from cold weather; likewise, costs for heating will be diminished in a warmer climate. Less sea ice and longer navigation seasons in the Arctic may also entail lower transportation costs as well. Still, these positive side-effects do not lessen the urgency that is needed in responding to Arctic climate change.

2. Research

Though much of the technology and facilities needed for Arctic research already exists, there are still many gaps left to fill.

Federal Entities. U.S. research in the Arctic is guided by two entities within the federal government. The U.S. Arctic Research Commission (USARC) is a seven-member group that advises the President and Congress on priorities for Arctic research. Currently, its five main themes are understanding and adapting to climate change, human health, natural resource assessment, energy resource and infrastructure development, and the preservation of indigenous cultures and languages. The U.S. Government executes the Commission's plans through another entity, the Interagency Arctic Research and Policy Committee (IARPC), which includes representatives from fifteen different agencies and is chaired by the National Science Foundation

(NSF). This committee coordinates Arctic research activities between the different agencies and presents a unified voice for them.

International Polar Year. Current U.S. spending on Arctic research totals approximately \$400 million, including the ongoing research in the five key themes of the Arctic Research Commission as well as special projects underway as part of the International Polar Year (IPY).⁴⁵ IPY is a two-year event lasting from early 2007 to early 2009, designed to focus scientific attention on both the Arctic and AntArctic, under the auspices of which hundreds of research projects will probe various aspects of the changing polar environment and society.

Arctic Observing Network. Perhaps the most significant investment in Arctic research is the current effort to develop and implement a permanent Arctic Observing Network (AON), both within Alaska and across the Arctic. USARC and IARPC have both concluded that current research infrastructure and programs are inadequate for the enormous task of attaining a comprehensive understanding of both baseline Arctic environmental conditions and how they are changing. Thus, a complete AON would allow for the consistent observation and understanding of Arctic climate processes throughout the region (including atmosphere, ocean and sea ice, hydrology and cryosphere, terrestrial ecosystems, paleo-environment, and human dimensions), for integrated data management and the sharing of knowledge internationally, and for the development of appropriate responses to Arctic climate change.⁴⁶ AON is a crucial tool within the larger effort to effectively address climate change, because before setting policies the government and other stakeholders must have some idea about the nature, magnitude and rate of the change and its consequences. Additionally, such a network would greatly enhance scientists' ability to measure climate change "feedback" systems – such as release of methane from thawing northern tundra or loss of albedo from receding Arctic sea ice – and thus understand how the planet is reinforcing anthropogenic effects on climate.

Barrow Coastal Observatory. Though much of the technology and facilities needed for Arctic research already exists and is in place, there are still many gaps left to fill. One of these gaps is the monitoring of subsea conditions in the Arctic Ocean, where sea ice makes it difficult or impossible for much of the year to make observations below the surface. The Barrow Coastal Observatory, a proposed addition to the Barrow Global Climate Change Research Facility, would fill this need via a system of cabled seafloor observatories. These would offer a continuous year-round capability to observe conditions on the seafloor, in the water column and at the water surface in any ice conditions. They would be modular, and could incorporate a variety of different instruments and sensors, from seafloor seismometers to cameras to acoustic monitors for the tracking of marine mammals. A proposal has been submitted to the NSF which would fund site evaluation, and is currently under consideration.⁴⁷ A similar cabled observatory is proposed for the Bering Strait region.

Climate Change Mitigation. Besides its work on understanding environmental change, the USARC has urged the U.S. government to focus on research and demonstration projects for

⁴⁵ Mead Treadwell presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 13, 2008.

⁴⁶ U.S. Interagency Arctic Research Policy Committee (IARPC), *Arctic Observing Network (AON): Toward a US Contribution to Pan-Arctic Observing*. 2007. p. 12.

⁴⁷ Professor Bernard Coakley, Geophysical Institute, University of Alaska, 2007.

technologies and practices that will allow the Arctic to contribute to the mitigation of global climate change – such as local renewable energy generation and more efficient, climate-friendly buildings.⁴⁸ Though the Arctic makes a relatively small contribution to global greenhouse gas emissions because of its sparse population, the relatively higher cost of energy makes it the perfect location to test higher-cost but lower-emission energy production methods like wind-diesel hybrid systems, geothermal systems, small hydroelectric and in-river hydrokinetic systems, tidal and wave systems, biomass systems, and others. Moreover, these renewable energy resources are quite abundant in many parts of the Arctic. Because of the cold climate and long distances, it is also a perfect area to test more efficient but higher-cost design and building practices, such as better building design (site selection, passive solar heating, etc.), geothermal heat pumps, district heating, better building envelope (insulation, windows, etc.), smart grid technology and home energy meters, and many others. The USARC believes that the Arctic – and Alaska in particular – can be a world leader in the development and adoption of these mitigation strategies. In addition, Alaska can lead further research into how forest management and other environmental management practices might optimize the natural sequestration of greenhouse gases.

The Importance of Research. The United States maintains and is expanding a significant investment in Arctic research. This research has already contributed to the substantial pool of existing knowledge about the Arctic climate. With sufficient funding and proper coordination from the USARC and the IARPC it will continue to generate vital information about the environmental and also the social impacts of climate change in the Arctic. Moreover, this research is not only beneficial to the Arctic. Because the Arctic is an early indicator of worldwide climate change and because the Arctic's climate has a significant effect on worldwide climate, Arctic research provides great value to both the United States and the world.

⁴⁸ Mead Treadwell presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 13, 2008.

IV. Recommendations for a Prosperous Future Arctic

It will be important to develop a strategic vision for the future of the Arctic.

Having described the United States' current Arctic assets and the enormous changes that are already coming to the Arctic, this section will make recommendations about how Alaska and the U.S. should address the Arctic issues discussed here. Because the region is in a period of such rapid change and because the outcome of this change is uncertain, it is essential that policy-makers begin to think about the long-term future of the Arctic and how they can and should shape that future.

As a part of this process, it will be important to develop a strategic vision for the future of the Arctic. The U.S. Department of State and National Security Council finished a comprehensive internal review of federal Arctic policy, which was concluded this year. This is the first such major revision since 1994, when climate change was not even a politically significant issue and the Arctic Council did not yet exist. This strategic vision provides a solid foundation for U.S. action by establishing priorities, which include: national and homeland security, international governance, OCS and boundary issues, international scientific cooperation, marine shipping, economic issues including energy, and environmental protection and conservation of natural resources.⁴⁹

However, while this federal Arctic policy revision has directed attention to the region and will establish priorities, it does not represent a concrete plan of action for tackling the issues that this report discusses. Such a plan would lay out goals for the short-, medium- and long-term in all policy areas related to the Arctic, and establish reasonable deadlines for resolution of certain issues (such as OCS and boundary disputes). It would integrate various Arctic issues into one coherent whole and also include a budget forecast, which would bring together all of the Arctic funding needs from the relevant federal agencies. Putting a number of small appropriations requests into the context of broader Arctic needs may give them more weight and meaning to legislators than they would have individually.

The federal government has revised its Arctic policy. The State of Alaska should also consider developing a comparable strategic vision or plan of action. The state may wish to draw on the federal example, but it also has another model – a vision statement released in 2007 by Canada's northern regions of Yukon, the Northwest Territories and Nunavut. *A Northern Vision* declares that the premiers of these three territories are committed to shaping their future so that they are places where diverse cultures can thrive independently, where economic development is sustainable and responsible and local residents benefit from it, and where the people are full partners in a "dynamic and secure" Canadian federation. It acknowledges the fact that northern Canadian communities face many challenges (most of which are common to all Arctic communities), and it establishes goals for achieving a sustainable economy that does not overly impact fragile ecosystems and cultures, goals for responding to climate change, for maintaining sovereignty over northern lands and waters, for fostering international circumpolar cooperation,

⁴⁹ Margaret Hayes presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 13, 2008.

and for establishing the broad range of partnerships needed to attain these lofty objectives.⁵⁰ A similar policy document would be an excellent beginning as Alaska works to develop its own Arctic “plan of action.” One important part of such a process would be a public outreach and education campaign in order to make sure all Alaskans (particularly those in the Railbelt and Southeast Alaska) are sufficiently aware of Arctic issues.

Beyond these broad recommendations for developing visions and plans for the Arctic’s future, this section will offer more specific recommendations for specific Arctic needs, in the following order:

- A. Arctic research**
- B. Standard of living**
- C. Climate change adaptation**
- D. Climate change mitigation**
- E. Infrastructure investments**
- F. Stable institutions**

A. Arctic Research

As has been described above, the Arctic has become a global hub of climate research and a bellwether for climate change. The United States has always been a leader in climate research, the Arctic is one of the most globally significant places for such research, and the entire United States (not just Alaska) will benefit from greater knowledge about the mechanisms and effects of climate change. Therefore, it is important that the federal government continue, and also expand where necessary, its support for Arctic climate research.

In practice, this means providing sufficient funding for: ongoing research under NSF, NOAA, and other agencies; International Polar Year activities and future activities spawned by IPY; and also the completion of the Arctic Observing Network. Without these research programs, it will be difficult to measure and understand current and future climate change, and it would be risky to proceed into unknown climatic territory without the best available information. It would also be unwise to proceed without taking advantage of one of the best sources of climate information – indigenous peoples. Their accumulated knowledge of the Arctic environment, based on millennia of intimate daily contact with the land and water, has already led to important scientific insights and will undoubtedly lead to more if it is fully tapped. In fact, though climate change has only become a major concern in the last decade or two within non-indigenous society, the Natives of northern Alaska have been noticing important changes and trying to call attention to them for over thirty years.

Besides lack of funding, research may also falter because of a lack of international cooperation. The most striking example of this has been Russia’s multiple refusals in recent years to allow certain scientific expeditions to enter its Arctic waters. Because Russia’s coastline bounds nearly half of the Arctic Ocean, this constitutes a large area in which one country can essentially halt internationally significant research. The U.S. should work with other Arctic nations to

⁵⁰ *A Northern Vision: A Stronger North and a Better Canada*, May 2007. Available at www.anorthernvision.ca.

permanently open the Arctic Ocean for research, much as AntArctica was left open for research by the AntArctic Treaty that came into effect in 1961. The lack of such an agreement may prevent Arctic researchers from gaining key insights into the changing climate.

B. Standard of Living

As the spotlight of national and international attention is directed towards the changing Arctic, one sociological fact will emerge: the residents in the remote areas of the Arctic suffer from a lower overall standard of living than residents in the urbanized areas of the state. Living conditions in many rural communities resemble conditions in the developing world, with high infant mortality rates, youth suicide, poor access to clean water and reliable sanitation, inferior quality of educational services, extremely high energy and food costs, and lack of basic medical care. These conditions exist even before factoring in the disruptive effects of climate change, particularly the erosion of coastal communities and melting of the permafrost. As the Arctic is developed, the interests of Arctic residents improve Arctic living. Reaching this goal will take a concerted effort by the State of Alaska and the United States as they expand the Arctic's contribution to the nation's economy and security. Some of the areas that will potentially affect this issue are described below.

Work to raise the standard of living of Arctic residents and help the U.S. Arctic expand its contribution to the nation's economy and security through sustainable development of energy, minerals, fisheries, transportation and tourism.

Sustainable living in the Arctic requires both conservation and development. Arctic residents rely on abundant wildlife for food. Protection of habitat and appropriate management are keys to maintaining these subsistence resources. Likewise, industrial development in the North has brought jobs, communications, transport, health, and education infrastructure to the region. Arctic resources are the fountainhead of Alaska's government and economy.

A recent letter by 67 congressmen called for a moratorium on industry development in the Arctic, saying that a plan is needed first.⁵¹ The plan will include a comprehensive conservation and energy strategy that will include the strongest possible protection of the Arctic refuge and suspend the expansion of industrial activity. This report finds a significant amount of planning for OCS, shipping, wildlife protection ongoing. Throughout this report, we leave recommended improvements in research and readiness. We believe the U.S. is the world's leader in safe economics development in the North and that no moratorium – beyond that imposed now on fishing – is necessary.

⁵¹ Letter to President Obama to create a moratorium in the Arctic signed by 67 members of Congress. March 24, 2009.

1. Fisheries

The United States is finalizing a moratorium on almost all commercial fishing inside the 200 mile exclusive economic zone in the Arctic Ocean. It is doing so even as preliminary research tells us that valuable fishing stocks are moving north. The United States will host an international conference this October, in Anchorage, to discuss fishing with others interested in the fate of fish stocks and wildlife in the Arctic Ocean. A stronger commitment to joint marine science in the Arctic Ocean and Bering Sea region must be reached. We have much to do, even with our closest neighbors, Canada and Russia. A second outcome could be a concerted effort toward a regional fisheries regime, recognized under international law. Appropriate proposals for marine protection areas should also be discussed.

2. Minerals

Given the size of the potential resources, the Arctic is almost certain to become a larger exporter of oil, gas, coal, and other minerals, especially in Arctic Alaska. Mining already contributes significantly to the economy of Alaska and the Arctic as a whole, and this activity is likely to continue increasing as access to the region improves, not only because of receding ice and technology, but because of infrastructure development. It is important to ensure the development of Alaska's natural resources continues to help build the economy of rural communities, as well as adding to the sources of revenue at the State level. The Alaska National Interest Lands Conservation Act, ANILCA, promised a continuing mineral's assessment on government owned land. This assessment must be restored in the federal budget as work since the 1990's has been sporadic.

3. Transportation

The Arctic Marine Shipping Assessment being conducted by the Protection of the Arctic Marine Environment (PAME), shows that regular Arctic shipping is not just a "future" thing, but it's a "now" thing. Business and government entities from around the Arctic cooperate on improving oil spill prevention and response in the Arctic through a "Joint Industry Program" being conducted in Norway. The U.S., which increasingly relies on oil and gas shipped in Arctic waters, should expand its domestic spill research programs in cooperation with these other entities. Developing infrastructure to support the anticipated growth of Arctic shipping can provide a significant and long term economic benefit to the coastal Arctic communities. As well, Alaska and the United States must take investment, rulemaking, and marketing steps to ensure that ongoing Arctic shipping is, as the U.S. policy envisions, "safe, secure, and reliable."

4. Tourism

The growth of tourism and eco-tourism in the Arctic holds great potential benefits for the rural economies. But there are also great challenges to this development, particularly the lack of infrastructure in most of these remote areas. Most communities are inadequately prepared to deal with an emergency. More professionals need to be trained, both health care workers and search and rescue personnel. Coast Guard operations should also be moved north to ensure Alaska is prepared to deal with the increased sea traffic and activity in the Arctic.

5. Energy

Hydrocarbon production is a major source of revenue to several countries in the Arctic. Nations outside the Arctic depend on this energy, and all should work to ensure its safe development. More work should be done to expand renewable energy research and demonstration projects in the Arctic region. Hundreds, if not thousands, of Arctic settlements and villages are off national road systems and power grids, and energy is much more expensive. There is no better place to test new, more costly technologies than in communities where the current cost of energy is so high. An Arctic Energy Summit held in 2007 showed this is true across the Arctic region. Alaska is rich in tidal energy, hydrothermal, wind, and hydro potential, and should use these sources for power generation, transportation fuels and potentially for commercial development.

Commonwealth North has long supported safe exploration and development of Alaska's Arctic oil and gas, including that to be found potentially in ANWR. Newly proposed legislation to allow drilling from outside the refuge should be addressed by Congress. The Obama Administration has made development of the North Slope natural gas pipeline a priority. Gas supplies from new exploration will help all known North Slope gas move more quickly to market.

C. Climate Change Adaptation

Adaptation to climate change is one area of Arctic policy in which the State of Alaska is already highly engaged.

In September 2007, Governor Sarah Palin established the Climate Change Sub-cabinet, which was charged with developing a comprehensive climate change strategy for the state. One of the four advisory groups within the sub-cabinet is the Adaptation Advisory Group, which is currently preparing recommendations about necessary adaptation measures and will present its final report in May 2009.⁵²

1. Coastal Erosion

The most pressing issue within the broad heading of “adaptation” is how to protect coastal communities increasingly vulnerable to erosion. The three most urgent cases – Newtok, Kivalina and Shishmaref – will have to be completely relocated within five to ten years because of the rapid disappearance of the land that they are sitting on, whether from river erosion, storm surge erosion, permafrost thawing, or other factors. The U.S. Army Corps of Engineers (USACE) has also identified as many as 160 other rural Alaska communities that will be vulnerable to erosion to one degree or another.⁵³ And, as indicated by some of the costs cited above for erosion protection and relocation, dealing with this issue will be an expensive task. Such a large need is far beyond the means of the communities themselves, and will require as much aid from the state and federal government as possible.

⁵² State of Alaska Climate Change Sub-cabinet website: www.climatechange.alaska.gov/.

⁵³ State of Alaska Climate Change Sub-cabinet website: www.climatechange.alaska.gov/.

Besides the funding challenge, these communities face the additional hurdle of obtaining permission for these projects from a multitude of federal and state agencies, each with a complicated set of regulations. The Adaptation Advisory Group is expected to recommend that this tortuous process be simplified – whether by consolidating the regulatory functions into one agency or streamlining the permitting process for these projects – so that these communities can respond effectively to this potentially devastating threat. Such a simplification will empower communities to control their own fate, as will the fact that many are already becoming more adept at navigating the bureaucratic process.

2. Infrastructure Impacts

Just as the USACE has performed the studies that allow Alaska communities to make informed decisions about responding to coastal erosion, so it will be necessary to perform other similar studies – for instance, to determine the threat to infrastructure from thawing permafrost. A study cited above indicated that additional public infrastructure costs from climate change in Alaska (including thawing permafrost) could run as high as 10-20% of total public infrastructure costs through 2030.⁵⁴ This is necessarily a rough first estimate, and it should be followed by a more detailed inventory of likely impacts for all major public infrastructure in the state, which will allow for informed long-term planning and help to reduce future impacts. Further research into best practices for designing and constructing infrastructure in changing Arctic permafrost conditions will also help to reduce future impacts and costs.

3. Arctic Fisheries

Still another study will be needed to determine the baseline types and amounts of commercial fish species that are now entering the Arctic Ocean in large numbers. A temporary moratorium on commercial fishing north of the Bering Strait is necessary in order to establish reliable data that can be used to set science-based quotas for this new fishery. Fortunately, the North Pacific Fishery Management Council has decided to do just that, i.e. to impose a moratorium in order to allow time to establish a comprehensive fishery management plan similar to those in other Alaskan fisheries. Though it will decrease fishing revenue for a few years, this moratorium has the potential to assure an abundant and sustainable Arctic fishery that will generate revenue and local jobs for many years to come, and one that will not collapse as have so many others around the world. One concern, though, is that the U.S. Coast Guard currently does not possess sufficient resources to enforce this moratorium, which may render it ineffective as opportunistic fishing boats seek to exploit this new area. The Coast Guard will require more resources and funding for this new mission. A second concern relates to fishing in the Arctic Ocean outside the U.S. 200 mile limit. The U.S. has invited other Arctic nations to Alaska in October 2009 for a Regional Fisheries Conference for discussions to begin.

4. Endangered Species

While many commercial fish species may become more abundant, the Arctic Climate Impact Assessment and other studies predict that many other species will decline dramatically due to

⁵⁴ Peter Larsen and Scott Goldsmith. “How Much Might Climate Change Add to Future Costs for Public Infrastructure in Alaska?” Institute of Social and Economic Research, University of Alaska Anchorage. June 2007.

warmer temperatures and receding sea ice, on which so many Arctic animals depend. As mentioned above, projections for a significantly reduced polar bear population led the U.S. Department of the Interior in May 2008 to declare the bears a “threatened species” under the Endangered Species Act, which entitles them to special protections. It is not known exactly how this will affect various economic activities in Arctic Alaska, but it is known that conflicts have already arisen between Inupiaq subsistence hunters and oil companies over the impacts of offshore oil exploration on protected bowhead whales in the Arctic Ocean. The polar bear listing is especially significant because it is the first listing as a direct result of climate change, and it thus opens the way for the listing of the other species anticipated to decline with Arctic warming – such as walruses and several species of seals. This situation exemplifies the need for government regulators to carefully consider the consequences of their decisions for all relevant stakeholders, and the need to strike a delicate balance between economic development and environmental stewardship.

The non-confrontational, science-based approach of the Nature Conservancy may be an excellent example in this regard. The group, after carefully evaluating habitat and biodiversity in northern Alaska, has identified specific areas of global ecological importance and is working to protect them; it has already negotiated for moratoria on petroleum exploration in the area of Teshekpuk Lake. However, it recognizes that further oil and gas development is practically inevitable and would consider allowing for it by “swapping out” certain areas that are desired for exploration in exchange for other areas elsewhere, in order to ensure that a particular conservation goal is met. It is also interested in fostering better management of lands already leased for petroleum exploration and drilling, and in developing a dynamic conservation plan that is flexible enough to incorporate the uncertainties that accompany climate change.⁵⁵ All of these strategies could be a model for how to achieve the necessary balance between economy and environment throughout the Arctic.

D. Climate Change Mitigation

Within the Alaska Climate Change Sub-cabinet, there is also a Mitigation Advisory Group currently preparing recommendations that will be presented in May 2009. These recommendations will cover five broad areas: oil and gas; energy supply and demand; transportation and land use issues; forestry, agriculture and waste; and cross-cutting issues.

1. An Arctic Test-bed

As mentioned above, the Arctic is not a large relative contributor of greenhouse gas emissions because of its sparse population, but its higher cost of energy and other essential goods and services makes it an ideal region for the testing of slightly higher-cost technologies and practices that reduce emissions – such as local renewable energy production and more energy-efficient buildings. Communities throughout the Arctic, and especially in Alaska, are very interested in these possibilities, and the state and federal government should expand their support for the demonstration and implementation of these technologies and practices. Though they will have

⁵⁵ Randy Hagenstein presentation to Commonwealth North Arctic Issues Study Group, July 9, 2008.

comparatively little effect on actual global emissions, these early demonstrations will allow for more cost-effective emissions reductions in the future in non-Arctic regions. And, just as importantly, local energy production and greater efficiency in resource use will increase the self-sufficiency and ultimately the sustainability of Arctic communities.

2. Effects of Emissions Restriction Schemes

Both state and national policy-makers need to consider the effects that a national or global emissions restriction scheme would have on Arctic communities in Alaska.

It is important and timely for the State of Alaska to plan internally for how it can reduce emissions, but it is also necessary for both state and national policy-makers to consider the effects that a national or global emissions restriction scheme (whether it is a “cap-and-trade” scheme or a “carbon tax”) would have on Arctic communities in Alaska. While either scheme may in the long run provide great benefits by minimizing the risk of catastrophic climate change, the short-term end result for consumers is a higher price for energy derived

from fossil fuel sources, whether it is coal-fired electricity or liquid diesel fuel for space heating, trucks, or boats. Such a scheme would exacerbate already soaring energy prices in Arctic Alaska, making it more difficult to continue subsistence hunting and even to stay warm in the winter. And while there are many opportunities to reduce dependence on imported fossil fuel in the Arctic, other regions within the U.S. have much more flexibility with regard to their energy needs. Arctic communities have few options and scarce resources for pursuing alternatives, and expecting them to adjust to emissions restrictions as smoothly as large urban areas is unreasonable. Within such a scheme, rural Arctic communities deserve special consideration, which leaders at the state and national level will have to work hard to secure.

Besides Arctic energy consumers, Arctic energy producers will be affected. As fossil fuel prices increase, demand diminishes – indeed, this is exactly the aim of proposed emissions restrictions – and production could diminish with it. Given that fossil fuel production currently contributes such a large portion of Alaska’s state revenue, and that there is great potential for future development of oil and gas and coal resources in Arctic Alaska, the state should also examine how an emissions restriction scheme would affect its own economic base. Of course, it is also necessary to consider the fact that a restriction would increase demand for natural gas, which emits approximately half as much carbon dioxide as coal does. Assuming that a natural gas pipeline is built in the state, one scenario predicted that the now-defunct Lieberman-Warner Climate Security Act (a cap-and-trade scheme) would possibly increase the wellhead value of Alaska North Slope gas by \$4-9 billion per year, which would increase Alaska state revenue by \$1-2.2 billion per year.⁵⁶

While the effects of an emissions restriction scheme may be positive (especially in the long run) as well as negative, the State of Alaska’s revenue base as well as individual Arctic communities would face significant challenges if such a scheme were imposed without regard to the special circumstances of the region. Thus, it will be of utmost importance for the U.S. and other Arctic nations to communicate this point clearly and forcefully at the climate negotiations set to take

⁵⁶ Steve Colt presentation to Alaska Municipal League, Anchorage, Alaska, May 29, 2008.

place in Copenhagen in 2009. If a restriction scheme is inevitable (as many now believe), then Alaska and the rest of the Arctic will have to adjust accordingly. But one possible long-term benefit of a restriction scheme is that it may force the state to diversify both its energy sources and its economy, perhaps by taking advantage of some of the opportunities discussed in this report.

E. Infrastructure Investments

With greater human presence in the Arctic comes the need for a more comprehensive infrastructure that can enable shipping, resource extraction, tourism, and other activities in the region to operate as they do in other parts of the world. Of course, this entails a significant investment that will not be regained immediately, but an early investment will signal a much greater readiness to embrace the opportunities and manage the risks associated with the changing Arctic, and create a more attractive environment for economic activity. The Arctic should not be considered a “sinkhole” for investments, particularly in light of the changes occurring there. Many of these investments are considered normal governmental functions and create positive returns as they establish order, prevent human or environmental tragedies, or promote commerce.

At the same time, having the proper infrastructure (and legal institutions) in place when economic activity does increase will enhance the ability to regulate it and ensure environmentally responsible development. If further development is practically inevitable in the Arctic, as is the case, then appropriate infrastructure is not only necessary but highly desirable for shaping this development. Moreover, regions like the Arctic have historically been ruled by a “use it or lose it” principle; whether or not the U.S. has legal authority over certain areas, if it does not demonstrate its sovereignty through the physical presence of people and infrastructure, it will find its influence in the region weakening in the future. Canada and Russia understand this principle very well, and this is a large part of their justification for increased military action there. This section will describe some of the most important infrastructure investments needed in the near future.

1. Navigation Infrastructure

At the most basic level, greater Arctic activity requires that traffic be able to navigate safely and efficiently.

Given that navigation in the Arctic has been relatively sparse compared to other regions, it is not surprising that it is not as well-mapped as other regions. However, this could be a potential hindrance to increasing traffic. Thus, it is practical and important to provide more complete nautical charts and hydrographic surveys for the Arctic Ocean and adjacent waterways. All five of the Arctic coastal nations (the U.S., Canada, Russia, Denmark and

Norway) are currently pursuing intensive mapping activities in order to support claims to the various OCS areas still in dispute, and this may accelerate the completion of the mapping necessary for marine safety.

Another basic need besides mapping is aids to navigation, which are taken for granted in other places but still almost totally absent in Arctic waters. Along with this, greater Arctic navigation will require weather and sea ice forecasting as extensive and reliable as that in other parts of Alaska. Again, it cannot be over-emphasized that these basic prerequisites for safe and reliable navigation are not yet present in Arctic Alaska, and the sooner they are put in place, the less likely it is that a major accident will occur.

2. Vessel Traffic Monitoring Infrastructure

Perhaps just as important as the navigation infrastructure listed above will be vessel traffic monitoring in Arctic waters, because this also is essentially absent. Eventually, traffic monitoring will likely become just as sophisticated as it is in the rest of Alaska. The Alaska Marine Exchange, a satellite- and land-based vessel monitoring system based in Juneau, currently possesses state-of-the-art technology that provides real-time information on vessel traffic to the Coast Guard and commercial interests throughout the nation. Though satellites can track vessels anywhere, participation in this satellite network is voluntary, whereas the land-based receiving stations can monitor any vessel. There are currently 52 such land stations in Alaska, and a state capital appropriation has just been made to build 18 more, including several in Arctic waters.⁵⁷ Such extensions of monitoring and communication infrastructure into the Arctic will become more common as traffic in the region increases.

Still, this infrastructure will not provide significant benefits if, as is now the case, participation in vessel monitoring systems is largely voluntary. Several recent examples of ships sinking in Alaska waters and other ships being saved have demonstrated how useful these systems are and how helpless rescue efforts are without good monitoring information. It is important that participation be made mandatory.

It is also important that the U.S. and Russia cooperate in developing a vessel monitoring system in the area of the Bering Strait, where fishing fleets from both sides are already experiencing close encounters along the maritime boundary line. However, the future will bring more than just fishing fleets chasing fish species migrating to the Arctic Ocean; as noted above, the Bering Strait will be a global choke point for Arctic marine traffic, and as traffic increases so will the necessity of a close bi-national management plan for this narrow waterway. Such a plan might draw on the model of the St. Lawrence Seaway, a successful example of bi-national waterway management between Canada and the United States.

3. Emergency Preparedness Infrastructure

Because it is virtually certain that the future will bring greater marine traffic and resource extraction in Alaska's Arctic waters, it is only a matter of time before it will be necessary to respond to an emergency, whether it be the sinking of a cruise ship or a large oil spill. Those in charge of emergency response are acutely aware of and concerned about these possibilities, since the U.S. is not prepared to handle either of these disasters at the moment.

⁵⁷ Tim Bradner, "Juneau tech works to avert world's shipping disasters." *Alaska Journal of Commerce*, May 18, 2008. http://www.alaskajournal.com/stories/051808/hom_20080518019.shtml.

Search and Rescue. Search and rescue (SAR) capability is a concern throughout the Arctic and AntArctic, and large losses of life have only been prevented by fortunate circumstances in several recent cases.⁵⁸ Because marine shipping and tourism are becoming such important economic drivers in the Arctic, it is critical that SAR resources are able to match the level of traffic in the region. Communities throughout Alaska derive much of their revenue from cruise ship tourism, and an accident in the Arctic Ocean could discourage tourism throughout the state.

Since SAR capabilities are now insufficient in most Arctic waters worldwide, it is all the more important that ships be required to follow stringent marine safety regulations. The International Maritime Organization (IMO), a UN body, sets such regulations internationally. And although it has developed special guidelines for ships operating in the Arctic, these are still only voluntary. Public safety concerns dictate that Arctic IMO codes be made mandatory, and Denmark is now taking an international lead in developing such codes, including a rule that ships in Arctic waters should operate in pairs so that they can assist each other in emergencies.⁵⁹

Oil spill response. Oil spill response in ice-infested waters is another major concern. Current research indicates that nearly any method or combination of methods would in many cases be ineffective in Arctic waters, because of extreme conditions, remoteness, and lack of necessary infrastructure. The latter two factors may be mitigated by increased activity in the region in the future, but the harsh environment will always impose significant limitations on response time and capacity. This fact should make regional and national governments throughout the Arctic cautious about permitting the extraction and transportation of oil in the fragile Arctic environment. It should encourage them to enact strict safety and environmental regulations for oil and gas operations, and to require the deployment of the best available oil spill cleanup technology and practices. Meanwhile, further basic research and testing are needed to improve oil spill response.

Ports and harbors of refuge. One other piece of emergency preparedness is the availability of ports and harbors of refuge for ships. No systematic study of the need for ports and harbors in Arctic Alaska yet exists, but it is almost certain that such a need will arise as marine traffic increases along the northern coast. There are currently no ports or significant harbors in Alaska north of the Bering Strait, and this severely limits marine operations (e.g. Coast Guard operations) in the area.

4. An Expanding Coast Guard Presence

The U.S. Coast Guard is and will continue to be the primary U.S. military presence in the Arctic. Its high-ranking officers realize that with the changes occurring now in the Arctic, it will soon be required to perform all of the functions in Arctic waters (on a seasonal basis) that it does in the rest of Alaska. In fact, the Coast Guard will be the entity providing many of the services mentioned above – navigation infrastructure, vessel traffic monitoring, emergency response – in

⁵⁸ In November 2007, a crippled cruise ship sank off of AntArctica, and all passengers were rescued only because another large ship happened to be nearby at the time, and the weather was favorable. A similar incident took place off the coast of Greenland.

⁵⁹ Greenland Command Rear Admiral Henrik Kudsk presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

addition to many others, such as law enforcement, border protection, and support for scientific research. Of course, this presents a challenge to Coast Guard experience and resources that commanders are only beginning to appreciate. They have never had to operate regularly in such extreme conditions, and where the necessary infrastructure is missing, it will have to be built up from nothing.

In order to extend its “Arctic domain awareness” and assess its capabilities and needs in the Arctic region, the Coast Guard deployed a small contingent of personnel, along with some helicopters and small boats to Barrow in summer 2008. It has also begun reconnaissance flights over the Arctic Ocean and intensified its flights along the maritime boundary line with Russia in the Bering Strait area. Preliminary results indicate that the Coast Guard is still unprepared for the many new missions it will face in the Arctic, and that increased funding is needed to allow it to meet these challenges.⁶⁰

Perhaps the most significant of these funding needs is the large appropriations required to build new Polar-class icebreakers. The three U.S. icebreakers now in service are insufficient for the rapidly expanding needs of the Coast Guard in the Arctic, as two of them are nearing the end of their lifetime and the third is smaller and designed mostly to support scientific research. These icebreakers are a vital investment that the United States must make in the Arctic in order to remain competitive with Russia and also to ensure that it can respond to any situation in any ice conditions. Funding for icebreakers is currently awaiting Congressional approval, and will likely come incrementally in successive annual budgets (as will most Arctic infrastructure investments), but it is vital that the United States acknowledges its large interest in the Arctic and funds the Coast Guard, new icebreakers, and other infrastructure accordingly. In addition, other military branches are beginning to evaluate their own Arctic needs, and should start to request appropriations accordingly.

F. Building Stable Institutions

We strongly support stable legal institutions in the Arctic, first and foremost by ratifying the United Nations Convention on the Law of the Sea. Implement the new U.S. Arctic policy to claim new territory in the region, seek global “partners” to ensure “safe, secure and reliable” Arctic shipping, and manage Arctic Ocean fisheries together with our neighbors.

Just as the Arctic still lacks much of the basic infrastructure that developed regions take for granted, so it also lacks many of the basic legal institutions that developed regions take for granted – for instance, clearly defined boundaries and resource rights, maritime and environmental regulations, unambiguous legal status of internationally significant waterways, and in general a coherent and stable body of laws governing economic and other activities. Indeed, institutions are just as important as infrastructure in guiding the future of Arctic development and ensuring that it proceeds with sufficient sensitivity toward the fragile

⁶⁰ U.S. Coast Guard Rear Admiral Gene Brooks presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 12, 2008.

environment and indigenous cultures. The earlier these institutions are solidified, and the more stable they are, the more stable and beneficial economic development will be for local Arctic populations. Stable institutions will also allow for increased international trust and cooperation, and help to prevent an unbridled “race” for Arctic resources.

1. UN Convention on the Law of the Sea

The latest iteration of the UN Convention on the Law of the Sea (UNCLOS) was designed as a single agreement that would codify and clarify all international maritime rules, including maritime boundaries and economic rights, rights of passage, and protection of the marine environment. It first came into effect in 1994 and has since been ratified by a large majority of UN participating nations. Importantly, all of the eight Arctic nations have ratified except the United States. Critics claim that it could impinge on U.S. sovereignty over its own waters, but they represent a shrinking minority; the current administration, the Pentagon, the majority of Congress, and a wide variety of scientific, environmental and business groups all support ratification.

This report recommends ratification as well, since UNCLOS is particularly important in the Arctic. This is because it has become the accepted international legal framework in the region for defining boundaries and for establishing environmental, safety and other regulations. It is also the framework under which all of the Arctic coastal nations are submitting their OCS claims. Despite the arguments of critics, proponents of ratification argue that any drawbacks are greatly outweighed by the need for the United States to be an equal partner at the table during any negotiations on boundaries and OCS claims. If it does not engage with other Arctic nations as a signatory to UNCLOS, it may not be able to exert as much influence over the decision-making process as it would like. The U.S. could lessen its chance to benefit from new Arctic opportunities as a result of not ratifying the treaty. But the small minority in the Senate that opposes ratification is losing ground, and it is possible that the treaty may soon be approved.

2. Boundary Disputes and OCS Claims

Boundary disputes. The only major boundary dispute relevant to the U.S. concerns a wedge-shaped area of more than 7,000 square nautical miles in the Beaufort Sea that lies within the Exclusive Economic Zone claimed by both countries. Canada asserts that an 1825 treaty defines the boundary as the 141st meridian, while the U.S. firmly states that the boundary should follow the median line between the two coasts. This long-standing dispute, though it has existed for some time, has only become a more contentious issue recently because of the high level of attention focused on oil and gas and mineral resources under the Arctic Ocean. U.S. officials seem to be waiting for Canada to begin negotiations to resolve this disagreement, but there is currently little will on either side to do so and there is no guarantee that it will happen anytime soon. One option may be to set up a “grey zone” as Norway and Russia have done in the Barents Sea, in which both countries have jurisdiction over their own people and equipment.

OCS claims. OCS claims are a far more urgent topic in the Arctic, and current competition between the Arctic coastal nations to control the seabed under the Arctic Ocean is one of the main issues that the media have seized on to support the narrative that there is a “race for the

Arctic” going on. While a traditional “land grab” does not involve submitting scientific research to an international organization and waiting years for a ruling, the sense of a competition does exist. Russia and Norway have already submitted their documents to the Commission on the Limits of the Continental Shelf (CLCS) – which UNCLOS established as the arbiter of OCS claims – and Canada and Denmark will submit theirs in 2013 and 2014 respectively. So it will be at least several years before there is a full resolution of OCS issues, and even then some disputes are likely to persist. The United States is also currently at work on scientific work to support an OCS claim; in fact, the U.S. and Canada will conduct joint mapping operations in late summer 2008 to gather further data on the OCS.⁶¹ It will be beneficial for the U.S. to continue supporting OCS research and also to ratify UNCLOS so that it can have legal standing to make a submission to CLCS in the near future.

International Waterways. One other important dispute concerns the status of certain Arctic waterways, primarily the “Northwest Passage” route that winds through the northern islands of the Canadian archipelago. Canada has always maintained that this route falls within its own “internal waters,” while the United States has argued that it is a “strait [that could be] used for international navigation” and as such should allow free passage for foreign ships. This debate did not have much urgency until the last few years, when it has become clear that the Passage will be open for summertime navigation in the coming decades – indeed, it opened up completely in 2007 for the first time. Similar disputes may arise along the Northern Sea Route north of Russia, and perhaps even in the Bering Strait as marine traffic increases.

3. The Need for New Agreements

There has been some discussion among Arctic officials about how best to establish the stable institutions that the Arctic needs, and one debate centers around what sort of agreement should define these institutions. In other words, should boundaries and resource rights and safety regulations be defined in a series of sole subject agreements through existing channels, or is it necessary to start fresh and convene all stakeholders in a single convention to draft a comprehensive new Arctic Treaty (similar to, but more complex than, the current AntArctic Treaty)?

At a meeting of the five Arctic coastal nations in May 2008 in Greenland, it was agreed that parties would continue to work through existing channels – i.e. through the Arctic Council, through the legal framework of UNCLOS, through the IMO, etc. – to address the growing need for more extensive institutional structures in the Arctic.⁶² Similarly, discussion at the recent 8th Conference of Arctic Parliamentarians came to the same general conclusion that a comprehensive new treaty is not necessary, because the IMO provides a slow but satisfactory process for mandating Arctic marine safety regulations, the CLCS provides a slow but satisfactory apparatus for resolving OCS disputes, and the Arctic Council provides an effective high-level forum for political dialogue among Arctic nations.

Though the current consensus among Arctic leaders appears to be that existing institutions are sufficient for establishing stable governance within the region, this does not mean that a

⁶¹ Margaret Hayes presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 13, 2008.

⁶² Margaret Hayes presentation at 8th Conference of Arctic Parliamentarians, Fairbanks, Alaska, August 13, 2008.

comprehensive treaty may not be useful or necessary in the future. It simply means that at this time, the costs of such a large effort would most likely outweigh the benefits. And it also means that the authority of already-existing international entities like the Arctic Council, the IMO and UNCLOS will have to be strengthened, in order to support the emergence of an international Arctic regime that can ensure stability, prosperity, and respect for the environment and indigenous cultures.

The authority of these international institutions will also help to establish consistent regulations across the region. The AMSA has found that one hindrance to increased marine traffic in the Arctic is the fact that companies must deal with a hodgepodge mix of different rules and requirements from different nations. Harmonization of these regulations – for safety, pollution and noise control and other environmental impacts, etc. – will benefit all economic activity (not just shipping) in the region, and put pressure on areas with less stringent regulations to strengthen them to match international standards.

4. Greater Participation for Indigenous Peoples

The remaining challenge for Arctic institutions is to ensure that indigenous peoples are equal partners in the decision-making process.

One of the most important measures of the success of future Arctic institutions will be the active participation of indigenous peoples. They are the ones who have lived in the Arctic the longest, they feel the negative impacts of Arctic change first and most severely, and they should be the beneficiaries of the opportunities that the Arctic holds. Yet in many parts of the region, indigenous peoples have not historically been an integral part of the governmental decision-making process; in fact, they have been left out, marginalized, and their interests and desires have often been ignored or contradicted.

However, the overwhelming trend in recent decades has been toward much greater respect for indigenous cultures, and a much more significant place for indigenous participation. Although indigenous leaders do not often occupy official government positions (except in Canada, where First Nations leaders are more fully incorporated into the structure of government than in other countries), they are heard more often than ever before. And this is not simply a begrudging inclusion of a minority perspective; scientists and Arctic officials recognize the value of indigenous knowledge and are utilizing it in earnest, though there is still plenty yet untapped. Besides being heard more, Arctic indigenous leaders also receive more respect than in the past, and there is no better example than the fact that the former chairwoman of the Inuit Circumpolar Council, Sheila Watt-Cloutier, was nominated in 2007 for the Nobel Peace Prize.

The remaining challenge for Arctic institutions is to ensure that indigenous peoples are equal partners in the decision-making process, and the most fundamental step toward doing so is giving them a seat at the table. The Arctic Council includes six international indigenous organizations as permanent participants, and the fact that these groups are heard at such a high political level gives them much greater influence than they would otherwise have. Still, even today many meetings – such as the Greenland conference in May 2008 – largely exclude

indigenous groups. Because they have such a vital interest in the future of the Arctic, because they feel any changes first, and because they deserve greater respect than they have historically received, it is critical that indigenous peoples be allowed and encouraged and even required to participate in the institutions now being established in the region.

And in addition to ensuring greater participation by indigenous peoples in political and legal processes, Arctic institutions must provide (to the greatest extent possible) for the preservation of indigenous cultures and languages and a traditional subsistence lifestyle. These are the foundations of indigenous identity, without which individuals' lives lose meaning and they tend to fall into the traps of depression and substance abuse that are so prevalent in many Arctic communities. As has been mentioned, loss of indigenous cultures also means an irrevocable loss of thousands of years of accumulated knowledge that Western science has yet to fully assimilate.

Indigenous peoples voice a keen need for protection of traditional ways of life and of the environment on which they depend so intimately, but they also acknowledge the practical need for local economic opportunities so that their communities remain viable. Indeed, they are often deeply conflicted about this dilemma. Balancing the economy with culture and environment has always been a difficult task anywhere, but it will be an especially demanding task in the rapidly changing and developing Arctic. In any case, the participation of indigenous peoples in the decision-making process will aid non-indigenous leaders in striking the proper balance.

V. Conclusion and Summary of Policy Recommendations

This report does not purport to be an exhaustive exploration of Arctic issues. Rather, it attempts merely to frame these issues so that state and national policy-makers understand that a number of seemingly disparate trends all fit within the context of a rapidly changing Arctic. If it is successful, it will convince readers that the United States possesses vast assets in the Arctic, that the region is changing rapidly, and that this presents a number of challenges and opportunities. Given that the nation has a large stake in the future of the region, it will be both necessary and beneficial to pursue a variety of policy actions in order to minimize risks, profit from future development, and protect indigenous cultures and the environment.

The policy actions recommended in this report, Commonwealth North believes, would represent a sound beginning toward a better future Arctic. However, as discussed above, they should ideally be part of a broader strategic vision and plan at the state and national level for how to deal with the changing Arctic. Even with all of the many uncertainties that accompany this rapid and multi-faceted process of change, it is certain that with inclusive decision-making, honest research, international cooperation, and a commitment to realistic long-term solutions, the Arctic can become a global example of sustainability and prosperity.

Summary of Policy Recommendations

The following is a list of the policy actions recommended in this report in bullet format for quick reference. Urgent needs are listed in the “High Priority” section; other needs that are just as important but less urgent are listed in the “Other Recommendations” section.

High Priority

- The federal government should build on the 2009 revision of its Arctic policy and adopt a concrete “plan of action” with regard to Arctic issues.
- The State of Alaska should develop a comprehensive Arctic policy document; this might be modeled on the federal government’s 2009 Arctic policy revision, on the climate change strategy currently being prepared by the Alaska Climate Change Sub-cabinet, or on the Canadian northern regions’ document *A Northern Vision*.
- The State and the federal government should support communities struggling with coastal erosion by increasing funding and other assistance, and accelerating/streamlining the bureaucratic process for approving relocation and erosion prevention measures; give priority to communities facing the most imminent impacts.
- The State and the federal government should develop a strategic budget forecast for Arctic infrastructure needs, and begin as soon as possible to include immediate needs in upcoming agency budgets.
- The federal government should allocate the resources that will enable the Coast Guard to effectively expand its Arctic operations as soon as possible, especially for SAR.
- Congress should provide funding for two new Polar-class icebreakers.
- The U.S. Senate should ratify United Nations Convention of the Law of the Sea, UNCLOS. Aggressively preparing a U.S. claim for extended continental shelf under

Article 76, rules for environmental safety under Article 234, safer shipping, and cooperative Arctic management. The federal government should share OCS and ECS resource development revenues with Alaska as it does with states adjoining the Gulf of Mexico.

Other Recommendations

- Alaska should conduct a public outreach and education campaign to make all Alaskans aware of Arctic issues that the state faces.

Arctic Research

- Fully fund and otherwise support Arctic research activities, including: ongoing activities by NSF, NOAA, NASA, and other agencies. ARPC should continue the work of the international Polar Year. Fully establish the Arctic Observing Network.
- The U.S. should work with other Arctic nations through diplomatic channels to ensure that the Arctic Ocean is permanently open for scientific research.

Standard of Living

- State and federal officials should work to improve the standard of living for all Arctic residences by alleviating the hardships brought on by high infant mortality rates, youth suicide, poor access to clean water and reliable sanitation, inferior quality of educational services, extremely high energy and food costs, and lack of basic medical care.
- Joint marine protection regulations in the Arctic Ocean and Bering Sea region should at least be established with Russia and Canada.
- The U.S. should continue the development of Alaska's natural resources, onshore and offshore.
- The U.S. should expand its domestic spill research programs in the Arctic.
- Alaska and the federal government should expand renewable energy research and demonstration projects in the Arctic region.

Climate Change Adaptation

- State and federal officials should follow up on ISER public infrastructure study by conducting a comprehensive study of public infrastructure vulnerability throughout Alaska.
- State and federal government should fund further basic research into best practices for design and construction of infrastructure in changing permafrost conditions.
- State and federal government should support the North Pacific Fishery Management Council's precautionary moratorium on Arctic fishing by allocating resources for the Coast Guard to enforce the moratorium and to NSF, NOAA, and NMFS to study the Arctic Ocean ecosystems.
- State and federal government should include extensive input from all stakeholders and cost-benefit analyses in decisions on endangered species listings.
- State and federal government should consider flexible ways to meet critical conservation goals in the Arctic, such as the approach advocated by the Nature Conservancy.

Climate Change Mitigation

- State and federal government should provide funding and other assistance for more intensive demonstration and implementation of greenhouse gas emissions mitigation strategies in Alaska – local renewable energy, energy efficient buildings, etc.
- State and federal officials should build statewide awareness of the possible impacts – both positive and negative – of a national or global emissions restriction scheme on Alaska’s consumers and local industries.
- State and federal government should work with other Arctic regions and nations to make unique Arctic concerns about emissions restriction schemes heard at the Copenhagen climate talks in 2009.

Infrastructure Investments

- State and federal government should provide adequate funding for improved navigation infrastructure in Alaska’s Arctic waters – nautical charts and hydrographic surveys, weather and sea ice forecasting, and aids to navigation where necessary.
- State and federal government should begin to develop a comprehensive vessel traffic monitoring system in the Arctic, both within Alaska waters and in cooperation with other Arctic nations throughout the Arctic Ocean and adjacent seas; focus especially on a joint system with Russia for the Bering Strait area; also make participation in these systems mandatory for all vessels coming into U.S. ports.
- State and federal government should systematically evaluate and begin to request appropriations for emergency preparedness infrastructure – SAR, oil spill response, and additional ports and harbors of refuge.
- State and federal government should enact strict oil spill prevention standards in Arctic waters, and require the highest standards for technology and practices for responding to oil spills.
- Military branches besides the Coast Guard should systematically evaluate their own Arctic responsibilities, capabilities and future needs, and begin strategic planning and budget requests.

Stable Institutions

- The U.S. and other nations should initiate negotiations to resolve the Beaufort Sea boundary dispute with Canada, and also to resolve the legal status of the Northwest Passage.
- The U.S. and other nations should support the authority of UNCLOS as the legal framework for resolving Extended Continental Shelf claims in the Arctic, and finalize the U.S. submission as soon as possible (after ratification of UNCLOS).
- The U.S. and other nations should ask other nations of the world to support and respect “self determination” in the Arctic region by becoming “partners” with the Arctic Council’s effort for safe shipping, sustainable development, and environmental protection.
- The U.S. and other nations should support the Arctic Council and other existing institutions. Work toward harmonization of regulations in the Arctic to high international standards, including: IMO marine safety codes, oil spill prevention and response, pollution control, and other environmental codes.

- The U.S. and other nations should encourage greater indigenous participation in the public decision-making process in the Arctic.
- The U.S. and other nations should provide funding, perhaps in the form of research grants, for the preservation of indigenous cultures and languages, and for the preservation of the extensive environmental knowledge that indigenous peoples have accumulated.

VI. Acknowledgements

A. Speakers

Date	Name	Topic
4/30/08	Mead Treadwell	Global Climate Change Research, Accessible Arctic
	Professor Anatoly Zolotukin	Oil and Gas Development in the Russian Arctic
5/7/08	Lawson Brigham, Chair, Arctic Marine Shipping Assessment, U.S. Arctic Research Commission	Arctic Marine Shipping Assessment
5/14/08	Larry Hartig, Commissioner of Environmental Conservation	Climate Change in Alaska, including Climate Change Subcabinet
5/21/08	Scott Borgerson, Council on Foreign Relations	Preparing for changing Arctic conditions; U.S. Arctic policy
5/28/08	Karen Matthias, Canadian Consulate	Canadian Arctic and international policies
6/4/08	Capt. Tom Meadows, Alaskan Command/JTF Alaska	Military Implications of Changes in the Arctic
6/11/08	Mead Treadwell	Updating of study group plans for a report
6/18/08	Tim Wiepking	Who or what are the drivers of future Arctic development?
6/25/08	Ben Ellis, Managing Director of the Institute of the North	Arctic energy and transportation
7/9/08	Randy Hagenstein, The Nature Conservancy	Perspectives on Biodiversity: Conservation in Alaska's Arctic
7/23/08	Peter Larsen, Climate Change Director at AK Nature Conservancy and former ISER researcher	ICICLE Model- climate change and impacts on environment and infrastructure
7/30/08	Adrian Herrera, Arctic Power	Oil development in ANWR

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Joshua Wilson
Dan Wilson, Hartig Fellow

VII. Appendix

Following is the text of the U.S. Arctic Policy document signed by President George W. Bush January 9, 2009, after a broad review throughout the U.S. government. In response to questions posed by Senator Lisa Murkowski of Alaska during her confirmation hearing January 13, Secretary of State Hillary Rodham Clinton said, “the issues that are posed by the recent Bush administration report that did come out just a few days ago, the work of the Arctic Council that has been an attempt to try to summon the best thinking of the government and outside experts will find a very receptive ear in the State Department. I think President-elect Obama and I see that this is one of those areas that offers a chance for cooperation that might lead not only to positive actions with respect to the Arctic, but deepen our partnerships with Russia and others across the board.”

January 9, 2009

NATIONAL SECURITY PRESIDENTIAL DIRECTIVE/NSPD -- 66
HOMELAND SECURITY PRESIDENTIAL DIRECTIVE/HSPD -- 25

SUBJECT: Arctic Region Policy

I. PURPOSE

A. This directive establishes the policy of the United States with respect to the Arctic region and directs related implementation actions. This directive supersedes Presidential Decision Directive/NSC-26 (PDD-26; issued 1994) with respect to Arctic policy but not Antarctic policy; PDD-26 remains in effect for Antarctic policy only.

B. This directive shall be implemented in a manner consistent with the Constitution and laws of the United States, with the obligations of the United States under the treaties and other international agreements to which the United States is a party, and with customary international law as recognized by the United States, including with respect to the law of the sea.

II. BACKGROUND

A. The United States is an Arctic nation, with varied and compelling interests in that region. This directive takes into account several developments, including, among others:

1. Altered national policies on homeland security and defense;
2. The effects of climate change and increasing human activity in the Arctic region;
3. The establishment and ongoing work of the Arctic Council; and
4. A growing awareness that the Arctic region is both fragile and rich in resources.

III. POLICY

A. It is the policy of the United States to:

1. Meet national security and homeland security needs relevant to the Arctic region;
2. Protect the Arctic environment and conserve its biological resources;
3. Ensure that natural resource management and economic development in the region are environmentally sustainable;
4. Strengthen institutions for cooperation among the eight Arctic nations (the United States, Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, and Sweden);
5. Involve the Arctic's indigenous communities in decisions that affect them; and
6. Enhance scientific monitoring and research into local, regional, and global environmental issues.

B. National Security and Homeland Security Interests in the Arctic

1. The United States has broad and fundamental national security interests in the Arctic region and is prepared to operate either independently or in conjunction with other states to safeguard these interests. These interests include such matters as missile defense and early warning; deployment of sea and air systems for strategic sealift,

- strategic deterrence, maritime presence, and maritime security operations; and ensuring freedom of navigation and overflight.
2. The United States also has fundamental homeland security interests in preventing terrorist attacks and mitigating those criminal or hostile acts that could increase the United States vulnerability to terrorism in the Arctic region.
 3. The Arctic region is primarily a maritime domain; as such, existing policies and authorities relating to maritime areas continue to apply, including those relating to law enforcement.^[1] Human activity in the Arctic region is increasing and is projected to increase further in coming years. This requires the United States to assert a more active and influential national presence to protect its Arctic interests and to project sea power throughout the region.
 4. The United States exercises authority in accordance with lawful claims of United States sovereignty, sovereign rights, and jurisdiction in the Arctic region, including sovereignty within the territorial sea, sovereign rights and jurisdiction within the United States exclusive economic zone and on the continental shelf, and appropriate control in the United States contiguous zone.
 5. Freedom of the seas is a top national priority. The Northwest Passage is a strait used for international navigation, and the Northern Sea Route includes straits used for international navigation; the regime of transit passage applies to passage through those straits. Preserving the rights and duties relating to navigation and overflight in the Arctic region supports our ability to exercise these rights throughout the world, including through strategic straits.
 6. Implementation: In carrying out this policy as it relates to national security and homeland security interests in the Arctic, the Secretaries of State, Defense, and Homeland Security, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Develop greater capabilities and capacity, as necessary, to protect United States air, land, and sea borders in the Arctic region;
 - b. Increase Arctic maritime domain awareness in order to protect maritime commerce, critical infrastructure, and key resources;
 - c. Preserve the global mobility of United States military and civilian vessels and aircraft throughout the Arctic region;
 - d. Project a sovereign United States maritime presence in the Arctic in support of essential United States interests; and
 - e. Encourage the peaceful resolution of disputes in the Arctic region.

C. International Governance

1. The United States participates in a variety of fora, international organizations, and bilateral contacts that promote United States interests in the Arctic. These include the Arctic Council, the International Maritime Organization (IMO), wildlife conservation and management agreements, and many other mechanisms. As the Arctic changes and human activity in the region increases, the United States and other governments should consider, as appropriate, new international arrangements or enhancements to existing arrangements.
2. The Arctic Council has produced positive results for the United States by working within its limited mandate of environmental protection and sustainable development. Its subsidiary bodies, with help from many United States agencies, have developed and undertaken projects on a wide range of topics. The Council also provides a beneficial venue for interaction with indigenous groups. It is the position of the United States that the Arctic Council should remain a high-level forum devoted to issues within its current mandate and not be transformed into a formal international organization, particularly one with assessed contributions. The United States is nevertheless open to updating the structure of the Council, including consolidation of, or making operational changes to, its subsidiary bodies, to the extent such changes can clearly improve the Council's work and are consistent with the general mandate of the Council.

3. The geopolitical circumstances of the Arctic region differ sufficiently from those of the Antarctic region such that an "Arctic Treaty" of broad scope -- along the lines of the Antarctic Treaty -- is not appropriate or necessary.
4. The Senate should act favorably on U.S. accession to the U.N. Convention on the Law of the Sea promptly, to protect and advance U.S. interests, including with respect to the Arctic. Joining will serve the national security interests of the United States, including the maritime mobility of our Armed Forces worldwide. It will secure U.S. sovereign rights over extensive marine areas, including the valuable natural resources they contain. Accession will promote U.S. interests in the environmental health of the oceans. And it will give the United States a seat at the table when the rights that are vital to our interests are debated and interpreted.
5. Implementation: In carrying out this policy as it relates to international governance, the Secretary of State, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Continue to cooperate with other countries on Arctic issues through the United Nations (U.N.) and its specialized agencies, as well as through treaties such as the U.N. Framework Convention on Climate Change, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on Long Range Transboundary Air Pollution and its protocols, and the Montreal Protocol on Substances that Deplete the Ozone Layer;
 - b. Consider, as appropriate, new or enhanced international arrangements for the Arctic to address issues likely to arise from expected increases in human activity in that region, including shipping, local development and subsistence, exploitation of living marine resources, development of energy and other resources, and tourism;
 - c. Review Arctic Council policy recommendations developed within the ambit of the Council's scientific reviews and ensure the policy recommendations are subject to review by Arctic governments; and
 - d. Continue to seek advice and consent of the United States Senate to accede to the 1982 Law of the Sea Convention.

D. Extended Continental Shelf and Boundary Issues

1. Defining with certainty the area of the Arctic seabed and subsoil in which the United States may exercise its sovereign rights over natural resources such as oil, natural gas, methane hydrates, minerals, and living marine species is critical to our national interests in energy security, resource management, and environmental protection. The most effective way to achieve international recognition and legal certainty for our extended continental shelf is through the procedure available to States Parties to the U.N. Convention on the Law of the Sea.
2. The United States and Canada have an unresolved boundary in the Beaufort Sea. United States policy recognizes a boundary in this area based on equidistance. The United States recognizes that the boundary area may contain oil, natural gas, and other resources.
3. The United States and Russia are abiding by the terms of a maritime boundary treaty concluded in 1990, pending its entry into force. The United States is prepared to enter the agreement into force once ratified by the Russian Federation.
4. Implementation: In carrying out this policy as it relates to extended continental shelf and boundary issues, the Secretary of State, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Take all actions necessary to establish the outer limit of the continental shelf appertaining to the United States, in the Arctic and in other regions, to the fullest extent permitted under international law;
 - b. Consider the conservation and management of natural resources during the process of delimiting the extended continental shelf; and

- c. Continue to urge the Russian Federation to ratify the 1990 United States-Russia maritime boundary agreement.

E. Promoting International Scientific Cooperation

1. Scientific research is vital for the promotion of United States interests in the Arctic region. Successful conduct of U.S. research in the Arctic region requires access throughout the Arctic Ocean and to terrestrial sites, as well as viable international mechanisms for sharing access to research platforms and timely exchange of samples, data, and analyses. Better coordination with the Russian Federation, facilitating access to its domain, is particularly important.
2. The United States promotes the sharing of Arctic research platforms with other countries in support of collaborative research that advances fundamental understanding of the Arctic region in general and potential Arctic change in particular. This could include collaboration with bodies such as the Nordic Council and the European Polar Consortium, as well as with individual nations.
3. Accurate prediction of future environmental and climate change on a regional basis, and the delivery of near real-time information to end-users, requires obtaining, analyzing, and disseminating accurate data from the entire Arctic region, including both paleoclimatic data and observational data. The United States has made significant investments in the infrastructure needed to collect environmental data in the Arctic region, including the establishment of portions of an Arctic circumpolar observing network through a partnership among United States agencies, academic collaborators, and Arctic residents. The United States promotes active involvement of all Arctic nations in these efforts in order to advance scientific understanding that could provide the basis for assessing future impacts and proposed response strategies.
4. United States platforms capable of supporting forefront research in the Arctic Ocean, including portions expected to be ice-covered for the foreseeable future, as well as seasonally ice-free regions, should work with those of other nations through the establishment of an Arctic circumpolar observing network. All Arctic nations are members of the Group on Earth Observations partnership, which provides a framework for organizing an international approach to environmental observations in the region. In addition, the United States recognizes that academic and research institutions are vital partners in promoting and conducting Arctic research.
5. Implementation: In carrying out this policy as it relates to promoting scientific international cooperation, the Secretaries of State, the Interior, and Commerce and the Director of the National Science Foundation, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Continue to play a leadership role in research throughout the Arctic region;
 - b. Actively promote full and appropriate access by scientists to Arctic research sites through bilateral and multilateral measures and by other means;
 - c. Lead the effort to establish an effective Arctic circumpolar observing network with broad partnership from other relevant nations;
 - d. Promote regular meetings of Arctic science ministers or research council heads to share information concerning scientific research opportunities and to improve coordination of international Arctic research programs;
 - e. Work with the Interagency Arctic Research Policy Committee (IARPC) to promote research that is strategically linked to U.S. policies articulated in this directive, with input from the Arctic Research Commission; and
 - f. Strengthen partnerships with academic and research institutions and build upon the relationships these institutions have with their counterparts in other nations.

F. Maritime Transportation in the Arctic Region

1. The United States priorities for maritime transportation in the Arctic region are:

- a. To facilitate safe, secure, and reliable navigation;
 - b. To protect maritime commerce; and
 - c. To protect the environment.
2. Safe, secure, and environmentally sound maritime commerce in the Arctic region depends on infrastructure to support shipping activity, search and rescue capabilities, short- and long-range aids to navigation, high-risk area vessel-traffic management, iceberg warnings and other sea ice information, effective shipping standards, and measures to protect the marine environment. In addition, effective search and rescue in the Arctic will require local, State, Federal, tribal, commercial, volunteer, scientific, and multinational cooperation.
3. Working through the International Maritime Organization (IMO), the United States promotes strengthening existing measures and, as necessary, developing new measures to improve the safety and security of maritime transportation, as well as to protect the marine environment in the Arctic region. These measures may include ship routing and reporting systems, such as traffic separation and vessel traffic management schemes in Arctic chokepoints; updating and strengthening of the Guidelines for Ships Operating in Arctic Ice-Covered Waters; underwater noise standards for commercial shipping; a review of shipping insurance issues; oil and other hazardous material pollution response agreements; and environmental standards.
4. Implementation: In carrying out this policy as it relates to maritime transportation in the Arctic region, the Secretaries of State, Defense, Transportation, Commerce, and Homeland Security, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Develop additional measures, in cooperation with other nations, to address issues that are likely to arise from expected increases in shipping into, out of, and through the Arctic region;
 - b. Commensurate with the level of human activity in the region, establish a risk-based capability to address hazards in the Arctic environment. Such efforts shall advance work on pollution prevention and response standards; determine basing and logistics support requirements, including necessary airlift and icebreaking capabilities; and improve plans and cooperative agreements for search and rescue;
 - c. Develop Arctic waterways management regimes in accordance with accepted international standards, including vessel traffic-monitoring and routing; safe navigation standards; accurate and standardized charts; and accurate and timely environmental and navigational information; and
 - d. Evaluate the feasibility of using access through the Arctic for strategic sealift and humanitarian aid and disaster relief.

G. Economic Issues, Including Energy

1. Sustainable development in the Arctic region poses particular challenges. Stakeholder input will inform key decisions as the United States seeks to promote economic and energy security. Climate change and other factors are significantly affecting the lives of Arctic inhabitants, particularly indigenous communities. The United States affirms the importance to Arctic communities of adapting to climate change, given their particular vulnerabilities.
2. Energy development in the Arctic region will play an important role in meeting growing global energy demand as the area is thought to contain a substantial portion of the world's undiscovered energy resources. The United States seeks to ensure that energy development throughout the Arctic occurs in an environmentally sound manner, taking into account the interests of indigenous and local communities, as well as open and transparent market principles. The United States seeks to balance access to, and development of, energy and other natural resources with the protection of the Arctic

environment by ensuring that continental shelf resources are managed in a responsible manner and by continuing to work closely with other Arctic nations.

3. The United States recognizes the value and effectiveness of existing fora, such as the Arctic Council, the International Regulators Forum, and the International Standards Organization.
4. Implementation: In carrying out this policy as it relates to economic issues, including energy, the Secretaries of State, the Interior, Commerce, and Energy, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. Seek to increase efforts, including those in the Arctic Council, to study changing climate conditions, with a view to preserving and enhancing economic opportunity in the Arctic region. Such efforts shall include inventories and assessments of villages, indigenous communities, subsistence opportunities, public facilities, infrastructure, oil and gas development projects, alternative energy development opportunities, forestry, cultural and other sites, living marine resources, and other elements of the Arctic's socioeconomic composition;
 - b. Work with other Arctic nations to ensure that hydrocarbon and other development in the Arctic region is carried out in accordance with accepted best practices and internationally recognized standards and the 2006 Group of Eight (G-8) Global Energy Security Principles;
 - c. Consult with other Arctic nations to discuss issues related to exploration, production, environmental and socioeconomic impacts, including drilling conduct, facility sharing, the sharing of environmental data, impact assessments, compatible monitoring programs, and reservoir management in areas with potentially shared resources;
 - d. Protect United States interests with respect to hydrocarbon reservoirs that may overlap boundaries to mitigate adverse environmental and economic consequences related to their development;
 - e. Identify opportunities for international cooperation on methane hydrate issues, North Slope hydrology, and other matters;
 - f. Explore whether there is a need for additional fora for informing decisions on hydrocarbon leasing, exploration, development, production, and transportation, as well as shared support activities, including infrastructure projects; and
 - g. Continue to emphasize cooperative mechanisms with nations operating in the region to address shared concerns, recognizing that most known Arctic oil and gas resources are located outside of United States jurisdiction.

H. Environmental Protection and Conservation of Natural Resources

1. The Arctic environment is unique and changing. Increased human activity is expected to bring additional stressors to the Arctic environment, with potentially serious consequences for Arctic communities and ecosystems.
2. Despite a growing body of research, the Arctic environment remains poorly understood. Sea ice and glaciers are in retreat. Permafrost is thawing and coasts are eroding. Pollutants from within and outside the Arctic are contaminating the region. Basic data are lacking in many fields. High levels of uncertainty remain concerning the effects of climate change and increased human activity in the Arctic. Given the need for decisions to be based on sound scientific and socioeconomic information, Arctic environmental research, monitoring, and vulnerability assessments are top priorities. For example, an understanding of the probable consequences of global climate variability and change on Arctic ecosystems is essential to guide the effective long-term management of Arctic natural resources and to address socioeconomic impacts of changing patterns in the use of natural resources.
3. Taking into account the limitations in existing data, United States efforts to protect the Arctic environment and to conserve its natural resources must be risk-based and proceed on the basis of the best available information.

4. The United States supports the application in the Arctic region of the general principles of international fisheries management outlined in the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of December 10, 1982, relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks and similar instruments. The United States endorses the protection of vulnerable marine ecosystems in the Arctic from destructive fishing practices and seeks to ensure an adequate enforcement presence to safeguard Arctic living marine resources.
5. With temperature increases in the Arctic region, contaminants currently locked in the ice and soils will be released into the air, water, and land. This trend, along with increased human activity within and below the Arctic, will result in increased introduction of contaminants into the Arctic, including both persistent pollutants (e.g., persistent organic pollutants and mercury) and airborne pollutants (e.g., soot).
6. Implementation: In carrying out this policy as it relates to environmental protection and conservation of natural resources, the Secretaries of State, the Interior, Commerce, and Homeland Security and the Administrator of the Environmental Protection Agency, in coordination with heads of other relevant executive departments and agencies, shall:
 - a. In cooperation with other nations, respond effectively to increased pollutants and other environmental challenges;
 - b. Continue to identify ways to conserve, protect, and sustainably manage Arctic species and ensure adequate enforcement presence to safeguard living marine resources, taking account of the changing ranges or distribution of some species in the Arctic. For species whose range includes areas both within and beyond United States jurisdiction, the United States shall continue to collaborate with other governments to ensure effective conservation and management;
 - c. Seek to develop ways to address changing and expanding commercial fisheries in the Arctic, including through consideration of international agreements or organizations to govern future Arctic fisheries;
 - d. Pursue marine ecosystem-based management in the Arctic; and
 - e. Intensify efforts to develop scientific information on the adverse effects of pollutants on human health and the environment and work with other nations to reduce the introduction of key pollutants into the Arctic.

IV. Resources and Assets

A. Implementing a number of the policy elements directed above will require appropriate resources and assets. These elements shall be implemented consistent with applicable law and authorities of agencies, or heads of agencies, vested by law, and subject to the availability of appropriations. The heads of executive departments and agencies with responsibilities relating to the Arctic region shall work to identify future budget, administrative, personnel, or legislative proposal requirements to implement the elements of this directive.

GEORGE W. BUSH

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THE ARCTIC IS RICH

WHEN THE PURCHASE OF ALASKA MADE THE UNITED STATES AN ARCTIC NATION IN 1867, THERE WAS A NATIONAL DEBATE ON THE VALUE OF “SEWARD’S FOLLY.” EVEN TODAY, THE VALUE OF THE ARCTIC’S ASSETS TO THE NATION AND THE WORLD IS SIGNIFICANTLY MISUNDERSTOOD...

Location: At the same time the Arctic is remote from much of the world’s population, Arctic air routes are central to the world’s air transport system. With new technologies and thinning sea ice, the Arctic may soon become central to global shipping. Alaska’s key role in North America’s security – for early warning, training, global logistics and missile defense – stems from its location, as well.

Vast lands, forests, tundra, oceans: The Arctic’s “natural capital” assets – including its sea ice, vast permafrost, and boreal forests – play a fundamental role in moderating the world’s climate. Alaska’s lands and oceans – some of which are set aside under special protection – are all managed to support biodiversity and abundant fish and wildlife populations. The Arctic attracts tourists from the world over.

Oil and gas: Perhaps one-fifth of the world’s remaining oil and gas will be found in the Arctic region. Existing North Slope oil fields currently supply 17% of US domestic production. With 15 billion barrels produced from 1977 to 2004, remaining economically recoverable volume stands at about 6 to 7 billion barrels in currently developed fields. As much as 100 trillion cubic feet of North Slope natural gas reserves and potential reserves await transportation infrastructure (pipelines and/or ships) to market.

Coal: Alaska’s vast coal reserve represents about one third of the U.S.’s reserve, and one ninth of the world’s reserve. Billions of tons of high quality bituminous coal are found on Alaska’s western North Slope.

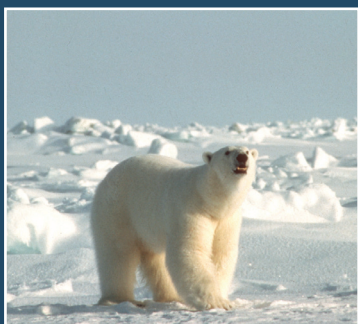
Minerals: Large mining operations already exist in many locations throughout the circumpolar region, with the world’s largest nickel, lead/zinc, gold, and iron ore deposits providing substantial or potential income and employment to Arctic residents.

Fisheries: The Bering Sea fishery is the most productive fishery in the United States. In 2004, the catch in this fishery was valued at nearly \$600 million. It provides a diverse range of species, from pollock and cod to king crab. Dutch Harbor, the largest port in the US Arctic, annually brings in more seafood catch by volume than any other port in the nation, and it ranks second in the total value of the annual catch that its fleet brings in.

Renewable energy: The Arctic has a great abundance of renewable energy sources, including wind, wave, tidal, hydro, geothermal assets. Development of these assets will help stabilize costs for Arctic residents and earn income as exported energy or value-added products as well.

Indigenous cultures: The Arctic is home to a number of highly resilient indigenous peoples. Approximately 82% of Alaska’s rural Arctic population is Native. Traditional knowledge of the Arctic environment; the climate, wildlife, plant life, and landscape, has made major contributions to understanding human history and the global environment.





WITH GREAT CHANGE IN THE ARCTIC COMES PRESSING ISSUES. WE MUST ACT RESPONSIBLY. AS THE ARCTIC BECOMES ACCESSIBLE, WE CAN AND WE MUST BOTH RESPOND TO THE ARCTIC'S OPPORTUNITIES AND SUSTAIN THOSE THINGS IN THE ARCTIC WE'VE ALWAYS HELD DEAR AS A PEOPLE...



COMMONWEALTH
NORTH

Commonwealth North was co-founded by former Alaska Governors Walter J. Hickel and the late William A. Egan.

Commonwealth North provides an educational forum where opinion leaders and activists in Alaska can gather to review public policy issues and topics affecting the state. Commonwealth North is a non-partisan organization where cultural and professional diversity is welcomed. Monthly forums are held to hear from renowned speakers on a wide variety of stimulating and controversial subjects. Working committees, called Study Groups, are formed by its membership to research critical issues and to produce reports or publications. Commonwealth North is funded by individual memberships and private sector funds.

The Commonwealth North Arctic Study Committee Members

Co-Chairs Mead Treadwell and Tim Wiepking, David Arzt, David Atkinson, Douglas Causey, Mike Felix, Randy Hagenstein, Sharman Haley, James Hemsath, Nancy Hemsath, Pat Kennedy, Nancy King, Mike Kenny, Karen Matthias, Chris Menefee, Pat Pitney, Macon Roberts, Jack Roderick, Buck Sharpton, Veronica Slajer, Terry Smith, Bill Sobers, Larry Wiget, Researched and drafted by Hartig Fellow Dan Wilson

The Full Arctic Study Committee Report, with links to additional information, may be found at www.commonwealthnorth.org.
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