S. HRG. 111–1049

THE CHANGING ARCTIC: IMPLICATIONS FOR FEDERAL RESOURCES AND LOCAL COMMUNITIES

FIELD HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

AUGUST 19, 2010

Printed for the use of the Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE

67–956 PDF WASHINGTON : 2011

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

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THE CHANGING ARCTIC: IMPLICATIONS FOR FEDERAL RESOURCES AND LOCAL COMMUNITIES

THURSDAY, AUGUST 19, 2010

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Barrow, AK.

The Committee met, pursuant to notice, at 10 a.m. in the Multipurpose Room, Inupiat Heritage Center, 542 Northstar Street, Barrow, Alaska, Hon. Mark Begich, presiding.

OPENING STATEMENT OF HON. MARK BEGICH, U.S. SENATOR FROM ALASKA

Senator BEGICH. We can call—is that on? Yes. We can call the field hearing to order.

Before we start and before I describe how a field hearing works and some opening comments, I'd like to ask George Little Man to come up and give us an opening prayer, if that would be OK.

George?

Mr. LITTLE MAN. Thank you for coming. Welcome you and with that, just a moment of silence. As you know, we lost our late Senator here, Ted Stevens. So a moment of silence and then I'll say the prayer.

[Moment of Silence.]

Mr. LITTLE MAN. Father, we thank you for this day that you have given us and the things that have happened and they are what they are, but we cannot change anything but you are our Creator and we thank you for the people that are gathered here to address the issues that concern all of us. Amen.

Senator BEGICH. Thank you, George. Let me—before we start, we do have a panel and I'm joined by Senator Stabenow from Michigan.

Before I do that, I want to explain to people what a field hearing is and what the purpose is. This is a chance for the U.S. Senate, in this case the Commerce Committee, to go out to communities and these happen around the country in different aspects, different committees, and this one's the Commerce Committee, to talk about in our case, the Arctic and the Changing Arctic and to understand what is happening and to hear from people who have information that they will present to the Commerce Committee in this format and in an official record which will then be shared with my colleagues back in Washington, D.C.

So the objective is to help inform the Washington, D.C., folks how it works in Alaska when it comes to the Arctic and we have a very good panel, and I am joined by Debbie Stabenow, Senator from Michigan. We're very pleased for her to be here.

I think this is now the farthest north you have ever been.

Senator STABENOW. I think so.

Senator BEGICH. I think so and so she will—as she said to me as she landed, she is learning every second already about the uniqueness of our state and our communities here. So we thank her for being here.

She sits on the Energy and Natural Resources Committee which, for Alaska, is an important committee that deals with many issues, especially here in the Arctic.

We also serve together on the Budget Committee. I'm a new member, she has been there a little longer, and we've had an opportunity to do some interaction with regard to the budget.

As mentioned by George, I do want to just take a minute to recognize and honor, as yesterday the state took some time to honor, the late Senator Ted Stevens. There's no question his understanding, his desire with the Arctic and understanding the uniqueness of Alaska and bringing Alaska truly into the modern world in a lot of aspects. Everything from statehood to the pipeline to Native Land Claims Act and many other things, as all of us know.

I have been traveling the last week here and wherever I've gone, there's no question wherever and whoever you talk to, Senator Ted Stevens touched us. It may have been as a group, an organization.

I don't know if that's a good thing or not, Mayor, that bell there.

But there's no question that he had incredible impact on all of us across this state and will be remembered for generations to come not only in the city I was born in in Anchorage, but all the way here in Barrow and throughout the state. So yesterday was a very, I think, moving ceremony and an opportunity for Alaskans to think and remember so much of what he did to help us move forward.

But one of the areas I know he was interested in was the Arctic and the future of the Arctic and where it should go and what it could be. I know, as now a U.S. Senator in Washington, DC., there's no question in my mind the importance of the Arctic.

As I talk to my colleagues and explain the value and what is here and its potential, I know from my perspective that, as we move down the road, we'll be talking about mineral resources, oil and gas resources, the environment, the transportation. You can kind of list the items that are on the agenda, from subsistence to what can happen and will happen with or without us participating.

As the Arctic continues to melt and the industrial activity occurs up in the Arctic, it is important for us now to take a lead in doing what we can to manage it the best we can.

I have introduced several bills around the issue of the Arctic, from research to addressing the environmental impacts to long-term need for the Coast Guard. We were up in Kotzebue, if I remember—you know, that's the one thing I've learned. I travel so much now, I've got to remember what day I was where, but we were up in Kotzebue visiting some of the forward operations of the Coast Guard and we were recognizing the need, the long-term need

and the presence of the Coast Guard here in the North as the Arctic continues to open up.

Also, whatever happens in the Arctic, if we decide to develop in the Arctic with oil and gas, the revenue stream that should be available from the Federal waters into our state, to the people of our state is critical, and we've introduced legislation around that.

Let me really just—I want to kind of end my general comments and before I introduce the panel, I'm going to ask Senator Stabenow to say a few words and then I'll introduce the panel and, Mayor, I'm going to start with you.

My D.C. folks tell me I'm breaking protocol, but I don't really care. The mayor of a borough is important and, Mayor Itta, you have been a great ally in your community in bringing your needs to Washington not once but many times, as I have been subjected to your, and I say that in a positive way, your explanation to me on the needs of the Arctic and you have done a great job in doing that.

[The prepared statement of Senator Begich follows:]

PREPARED STATEMENT OF HON. MARK BEGICH, U.S. SENATOR FROM ALASKA

Thank you and welcome to this important hearing by the Senate Commerce Committee on the Effects of Climate Change in the Arctic, its implications for local communities and Federal responsibilities in the area.

I'm pleased to welcome my colleague from the Senate, Debbie Stabenow of Michigan, who serves on the Senate Committee on Energy and Natural Resources and with whom I serve on the Budget Committee.

Before I introduce our witnesses today. I'd like to remember my predecessor in the U.S. Senate and his commitment to the Arctic.

Ted Stevens was honored yesterday following the tragic airplane accident which took a life that encompassed much of what we know as modern day Alaska—from the statehood movement to building the pipeline and Native land claims.

Senator Stevens cared deeply about all Alaskans and worked to ensure that rural residents shared the same benefits enjoyed by other Americans: basic services like health care, clean water, and telecommunications.

So we could afford these services, he was a strong proponent of responsible and sustainable resource development, guided by a strict conservation ethic.

Senator Stevens knew the Arctic has vast opportunities for energy development and unique needs to protect the subsistence resources that have sustained the Inupiaq residents of the Arctic for generations.

I share those goals and in looking at the challenges facing the Arctic—which has been called "ground zero for climate change"—I introduced a series of hills last year.

I called it the "Inuvikput" package, named after the Inupiaq word for "the place where we live."

That's intended to underscore that the Arctic is not a frozen wasteland, rather it is a unique ecosystem that is home to a strong people who endure the hardships of its long winters and have built a vibrant culture about subsisting in the north.

My Inuvikput bills deal with:

- Strengthening basic research into changing Arctic environmental conditions;
- Addressing the adaptation needs of communities some of which are literally being undercut by coastal erosion or heaving permafrost;
- The special health needs of northern peoples;
- The need for a stronger Coast Guard presence, including icebreakers and forward operating bases to assert our national interest in the opening Arctic waters deal with the search and rescue and other responsibilities of increased maritime trade and be prepared for oil spills in Arctic conditions; and,
- Revenue sharing so local communities share in the benefits of development off their shores.

Some of these concepts were recently included in Commerce Committee Chairman Rockefeller's SHORE Act, the "Securing Healthy Ocean Resources and Environment Act."

This bill mainly addresses shortcomings apparent after the *Deepwater Horizon* blowout in the Gulf of Mexico, but I'm pleased the Chairman recognized the importance of Arctic by including key provisions regarding scientific research and infrastructure development in his bill.

I'd like to thank all of our witnesses, many of whom have traveled from far away to be here today.

For those from Washington, D.C., I think you will find that Arctic winds are not just cooler, but they blow free of the partisan pressures that often stifle progress within the Beltway.

In the Arctic, speaking your mind is often a matter of survival. With that, I'd like to welcome our panelists:

I'm happy we have representatives of the Coast Guard and the National Oceanic and Atmospheric Administration since these two key agencies play a vital role in the Alaska Arctic now, and will do even more so in the future.

We're fortunate to have Rear Admiral Chris Colvin, Commander of the Coast Guard's 17the District which includes all of Alaska, and Laura Furgione, who heads NOAA's Arctic Strategy team to tell us more about how the government is going to help us operate safely and sustainably in the changing Arctic.

I especially look forward to second panel, which is where we get to hear from the people who live here and are on the front lines of how climate change is affecting their lives.

I'm pleased to welcome:

- North Slope Borough Mayor Edward Ina—a longtime leader and whaling captain recently featured in *Parade* magazine;
- Mary Pete of Bethel, an educator and subsistence advocate and the newest member of the U.S. Arctic Research Commission;
- Richard Glenn, Vice President of the Arctic Slope Regional Corporation, a for-profit ANCSA corporation committed to preserving the traditional values of protecting the land, the environment and the culture of the Inupiat;
- State Representative Reggie Joule of Kotzebue, a leader on Alaska health and education issues and World Eskimo Indian Olympian;
- And Marilyn Crockett, executive director of the Alaska Oil and Gas Association which represents the majority of oil and gas operators in Alaska.

Before we begin, I'll invite my colleague from Michigan to make some opening remarks before we begin our broader discussion of this important subject.

But let me first, if I can ask Senator Stabenow, and then I'll introduce the panel, and then I'll ask Mayor Itta to open.

STATEMENT OF HON. DEBBIE STABENOW, U.S. SENATOR FROM MICHIGAN

Senator STABENOW. Well, thank you, Senator Begich, and good morning. It really is a thrill and an honor for me to be here for a number of reasons.

First, having heard over and over again from Senator Begich both about the beauty of Alaska but also the needs of Alaska, I don't think there's anyone—I know there's not anyone I have met in my tenure that has been more of a champion in talking about Alaska and being the welcoming presence of urging all of us to come and see for ourselves both what your needs are, what your challenges are, and how we can be supportive of you.

I certainly join with Senator Begich in remembering the lion, the champion in Senator Ted Stevens, certainly, and we all send our prayers to his family this week.

But it has been a real pleasure for me to get to know Senator Begich and his family and to see Alaska through his eyes and to now have the opportunity to come and see for myself.

I am from Michigan. We consider what we call the Upper Peninsula, the UP of Michigan to be North. I now have found a place that is farther north in our country, but we share many things.

The Coast Guard resources are critical to Michigan as they are to you and we so much appreciate the leadership, Rear Admiral, of your being here today and we also share neighbors with Canada. So I find there are a number of different ways. We have very many small rural communities.

I actually grew up in a town, I was telling the Mayor, smaller than Barrow, 2,500 people in a little town in Northern Michigan where I grew up. So, Senator Begich, we have a lot of common interests in terms of the needs of our states and not only on the Energy Committee and Budget but serving on the Agriculture Committee where rural development is so important and focusing on Finance Committee where I'm very proud we were able to pass the Indian Health Bill after many, many, many years and to be able to focus, as well, on those needs which are so important.

So, Mayor, we're happy to be here. I'm happy to be here and I'm looking forward to the opportunity to hear from the panel.

[The prepared statement of Senator Stabenow follows:]

PREPARED STATEMENT OF HON. DEBBIE STABENOW, U.S. SENATOR FROM MICHIGAN

Thank you to Senator Begich and the Barrow Community for having me here today as a visitor to Alaska and the Commerce Committee.

I look forward to hearing testimony and learning more about how climate change is affecting communities in Alaska and also hearing about possible solutions that can link communities everywhere.

Global warming is a fact. The science is solid. We know that we are the cause, and that we will have to be the solution. And how that solution looks will likely define the global economy for the next 50, 60, 70 years. The challenge is that while we know this is a serious issue, it is not the issue most people in America are concerned about.

When I am talking to my constituents, their number one concern is jobs.

In my state, we have an unemployment rate hovering near 13 percent. Nationally, there are 15.1 million people who are unemployed. When we count the number of people who are no longer receiving benefits, or who are working part-time for economic reasons, that number jumps to over 26 million people.

Families in my state, and around the country, are deeply worried about their jobs and their own economic situation. They are worried about paying the mortgage, or paying the rent, putting food on the table, and paying their bills. Winter is coming on, and people are turning up the heater, and they're extremely concerned about energy prices and how that affects their checking accounts.

So as we address climate change, we need to keep our focus on jobs and American families who are already struggling with rising energy bills.

We know that the clean energy economy represents an incredible opportunity for growth. In my state of Michigan, we know how to build things and grow things. We are manufacturing experts, with some of the best engineers supported by some of the finest research universities in the world. By making the right choices, we can become a leader in clean energy research and manufacturing.

And these manufacturing solutions are also solutions for communities in Alaska having to fight the effects of climate change. New energy sources such as wind can help alleviate both the costs to communities to import in fossil fuels and the costs borne from these energy sources that result in the need to adapt to climate change.

But we have to do this right.

So when we're talking about clean energy, it's not enough that we *use* those technologies, we have to *make them here too.*

There are 8,000 parts in a wind turbine—and all of them can be made in Michigan. Solar panels require advanced manufacturing techniques, which we happen to be very good at in Michigan.

But we are in a race to be leaders to make these new technologies. The last thing we want is for communities in Alaska or Michigan to be forced into purchasing these new clean energy technologies from abroad. Our jobs and our national security depend on doing better.

Climate change is an important issue—probably the defining issue of our time. How we respond to the current climate challenges will have a lasting impact on the

direction of our economy and on the future of our country. We must get this right. We must do this in a way that not only reduces greenhouse gas emissions, but that creates jobs and opportunities in engineering, agriculture, information technology, and most importantly, in manufacturing.

Senator BEGICH. Thank you very much. Thanks, Debbie. It is true every time, whatever committee, I don't even care if it's the Budget Committee, I usually say, when I start talking about something, I kind of weave in the Alaska component and then whoever is on the panel, whoever they might be, the odds are we're going to invite them to Alaska.

We've been very fortunate over the last year and a half to have seven Cabinet Secretaries here traveling throughout the state, most recently the Commandant of the Coast Guard Admiral Papp who visited and actually spent kind of a whirlwind tour visiting the state which was very impressive to have him here. I think it was his first major visit, if I remember, Admiral. So it was very impressive and so we will continue to bring more Federal officials up here, as well as my colleagues, just to get a better sense of what goes on here and the travel that it takes.

Some of my colleagues now understand that when I say I've got to go home for the weekend, it's not as simple as hopping in a cab or taking a bus. It's a little longer.

Let me introduce the panel and then, Mayor, I'm going to ask you to start off, if that's OK. We are again fortunate to have many people representing different organizations.

First, Rear Admiral Chris Colvin, Commander of the Coast Guard 17 District, which includes all of Alaska.

Laura, and I'm going to—I know I'm going to mess up your name. So I'm going to try here. Furgione, Laura Furgione, who heads NOAA's Arctic Strategy Team and who is going to tell us more about how the government is going to help us operate safely in sustaining the Arctic, and we had a great—on the Coast Guard plane on the way up here, we had some incredible technology to see the impacts within the atmosphere as we traveled on the Coast Guard plane. It's a partnership between the two which is very impressive and I have to tell you I couldn't understand all the numbers and what they meant but I know it was good because they were low. So that was a good thing and there was not many red lines and that was a positive.

Also, as I mentioned, Mayor, thank you for hosting us here. Mayor Itta, who is a long-time leader in his community and through the state and a whaling captain, and recently I understand you were featured in *Parade* magazine which you are now a star. I know.

Mary Pete, an educator and subsistence advocate and the newest member of the U.S. Arctic Research Commission which we thank you.

Also, Richard Glenn, the Vice President of the Arctic Slope Regional Corporation for Nonprofit Corporation committed to preserving the traditional values and protecting the land, environment and culture of the people of the North.

And Marilyn Crockett, always good to see you, Executive Director of the Alaska Oil and Gas Association, which represents the majority of the oil and gas operators in Alaska, as well as servicing

companies. So, we thank you for coming all the way up to be able to be here on this panel.

Mayor Itta, we will start with you on opening comments, if that's OK, and then, Admiral, we'll go to you, Laura, then we'll go to you, and then we'll continue down the panel.

I wanted to let you know we combined the panels because of time and we were late arriving, but let's go ahead, Mayor, and we have about—if you can keep your comments to about 5 minutes each, I will do my best not to invoke my old assembly days.

Mayor Itta understands what that means, where I say time is up, but, no, Mayor.

STATEMENT OF EDWARD S. ITTA, MAYOR, NORTH SLOPE BOROUGH

Mr. ITTA. OK. Thank you, Mr. Chairman, Senator Stabenow. Welcome, and also to our fellow speakers up here, and also everybody else that came up. We want to welcome you.

Again, I just really am thankful that you took the time, considering all the changes we've had to make because of the funeral and still be able to make it up here and I think that shows the level of commitment and interest that you have in hearing from the people and we're particularly thankful.

You are always welcome here and we appreciate your efforts on behalf of our people and all Alaskans. I also want to give you both our big Arctic warm welcome. We didn't provide snow for you today just for that. OK?

You know, while we may be small towns, by any standard Barrow is really off the beaten path, if you will, and so we appreciate you taking the extra effort to make the journey all the way up here and see what the people of America's Arctic have to say and during your brief stay we hope you'll find that our welcome is really warm and even if our weather isn't.

So I'm grateful for the chance to share with you a few thoughts today about issues that concern us and fall under your committee's jurisdiction. Climate change has attracted a lot of interest in recent years and since the Arctic is the planet's heat sink, this region here is kind of like ground zero when it comes to the visible effects of a warming climate.

The Arctic Ocean's permanent ice pack, we know, is melting away at an unprecedented rate. While this has become a widespread concern only in recent years, it is something that our people have observed for many decades.

When you live in a place like this for as long as we have, lived along this coast, and when your survival depends upon successfully hunting migratory animals across the tundra and out among the ice flows, it is not surprising that Inupiat possess vast environmental knowledge, a base, if you will.

We call it traditional knowledge. Scientists, who like to reduce things to initials, call it TK. It is the accumulated understanding about environmental conditions here that have been passed on from generation to generation for thousands of years. That's what enabled us to survive in one of the harshest climates on Earth.

Some of our elders were aware of the current environmental shift decades ago, as I stated, long before it became a national concern.

They didn't call it climate change but they observed how the ice was further from the shore in the fall, thinner in the spring than it had been in the past, the snow cover didn't last as long on the tundra in the spring, and ice cellars where we store our food were increasingly subject to the melting of the permafrost. We lived this. We see this.

Erosion, eating away at the edges of our coastal villages, the signs were there, but nobody imagined that this process would accelerate to the extent that it has in recent years.

So there is a wealth of historical perspective among our elders and our hunters and the science community is paying more attention to traditional knowledge these days and we're thankful for that.

Researchers acknowledge that TK can inform their work with the longer view and a continuity that comes from the daily encounter that our hunters and that our elders have had with this environment.

I hope that the Federal Government will increase its commitment to Arctic research, that researchers will take advantage of the facilities offered by the Barrow Arctic Science Consortium Facility, and that scientists and local experts will develop closer ties as we try to understand how climate change is affecting the animals' habitat and humans over time.

The visible effects of climate change amount to a profound set of impacts on our region. We anticipate another set of impacts from offshore oil and gas exploration and development. We would be a lot happier if this activity were happening onshore in ANWR and we stand ready to speak up if the politics ever began to look more promising, but offshore seems to have the support of both government and industry and given that reality, my goal is to make sure that any offshore activity is conducted under the safest conditions with the best mitigations and regulatory framework that recognizes the unique risks that we face and that we must live with.

Our culture is anchored in the traditional hunt of the bowhead whale along this coast and when something goes wrong with an oil rig out there, we are the only people whose lives may be drastically affected by the long-term impacts.

In closing, that is why I've been promoting a set of offshore policy positions for more than 2 years now and I salute our delegation for having sponsored legislation that addresses a number of these positions.

Unfortunately, the tragedy in the Gulf has created conditions that should make these policies all the more marketable in Congress. But I'll be real interested to hear about your feelings on that.

So with that, thank you for giving me the opportunity.

[The prepared statement of Mr. Itta follows:]

PREPARED STATEMENT OF HON. EDWARD S. ITTA, MAYOR, NORTH SLOPE BOROUGH

Thank you, Mr. Chairman. I want to welcome you back to Alaska and the North Slope. You are always welcome here, and we appreciate your efforts on behalf of our people and all Alaskans. I also want to give a warm Arctic welcome to Senator Stabenow. Even by Alaska standards, Barrow is off the beaten path, so we appreciate your interest in making the journey to hear what the residents of America's Arctic have to say. And during your brief stay, we hope you'll find that our welcome really *is* warm, even if our weather isn't.

I'm grateful for the chance to share a few brief thoughts with you today about issues that concern us and fall under your committee's jurisdiction. Climate change has attracted a lot of interest in recent years, and since the Arctic is the planet's heat sink, this region is kind of like Ground Zero when it comes to the visible effects of a warming climate.

The Arctic Ocean's permanent ice pack is melting away at an unprecedented rate. While this has become a widespread concern only in recent years, it is something that our people have observed for many decades. When you live in a place for as long as we have lived along this coast, and when your survival depends on successfully hunting migratory animals across the tundra and out among the ice floes, it is not surprising that the Inupiat possess a vast environmental knowledge base. We call it "traditional knowledge." Scientists who like to reduce things to initials call it "TK." It is the accumulated understanding about environmental conditions here that has been passed on through the generations for thousands of years.

Some of our elders were aware of the current environmental shift decades ago, long before it became a national concern. They didn't call it climate change, but they observed how the ice was farther from shore in the fall and thinner in the spring than it had been in the past. The snow cover didn't last as long on the tundra in spring, and ice cellars were increasingly subject to melting of the permafrost. Erosion was eating away at the edges or our coastal villages. The signs were there, but nobody imagined that this process would accelerate to the extent it has in recent years.

So there is a wealth of historical perspective among our elders and hunters, and the science community is paying more attention to traditional knowledge these days. Researchers acknowledge that TK can inform their work with a longer view and a continuity that comes from the daily encounter that our hunters and elders have had with this environment.

I hope that the Federal Government will increase its commitment to Arctic research, that researchers will take advantage of the facilities offered by the Barrow Arctic Science Consortium, and that scientists and local experts will develop closer ties as we all try to understand how climate change is affecting the animals, habitat and humans over time.

The visible effects of climate change amount to a profound set of impacts on our region. We anticipate *another* set of impacts from offshore oil and gas exploration and development. We would be a lot happier if this activity were happening onshore in ANWR, and we stand ready to speak up if the politics ever begin to look more promising. But offshore seems to have the support of both government and industry. Given that reality, my goal is to make sure that any offshore activity is conducted under the *safest* conditions, with the *best* mitigations and a regulatory framework that recognizes the *unique risks* we must live with. Our culture is anchored in the traditional hunt of bowhead whales along this coast, and when something goes wrong with an oil rig out there, we are the only people whose lives may be drastically affected by the long-term impacts.

This is why I have been promoting a set of offshore policy positions for more than 2 years now. And I salute our delegation for having sponsored legislation that addresses a number of these positions. The tragedy in the Gulf has created conditions that should make all of these policies more marketable in the Congress. But I'll be interested to hear your feelings on that.

Quyanaqpak.

Senator BEGICH. Thank you, Mayor Itta. Admiral Colvin, I'll turn to you and your testimony.

STATEMENT OF REAR ADMIRAL CHRISTOPHER COLVIN, COMMANDER, COAST GUARD DISTRICT SEVENTEEN, U.S. COAST GUARD

Admiral COLVIN. Good morning, Senators. The Arctic is perhaps the most exciting and significant geopolitical issue of our generation. There are various potential geopolitical futures for an evolving Arctic, but as of today we don't know what the Arctic will look like by mid century. So today is our opportunity to shape the future.

Today the United Sates does not have persistent presence in the Arctic. That might preserve those options for future generations. If the national intent is to only do science in the Arctic, we're doing

a reasonably good job of it, although the Nation does need to conduct increased oil spill response research in the Arctic, but if the national intent is to preserve and enhance U.S. sovereignty in the Arctic, *i.e.,* maintain awareness and oversight of activities in the U.S. Arctic, there is vast room for improvement.

For example, the Nation needs operational icebreakers. Currently, our two Polar Icebreakers are inoperative. Maintenance and operating funds for the Polar Icebreakers need to be returned to the Coast Guard.

Why do we care more about the Arctic today than a decade ago? Simply stated, because there is water where there used to be ice, lots of water, and more water means increased human activity and increased human activity is what the Coast Guard has been observing in the Arctic.

Last year, for the first time ever, large merchant ships transited the northern route above Russia while at the same time cruise ships transited the Northwest Passage above Canada.

Currently, a 70,000 metric ton cargo of gas condensate is heading above Russia to Asia via the Bering Strait. It is important to remember that there is only one way in and out of the Arctic for over half the world and that's the Bering Strait. The Bering Strait may become the Gibraltar of the future.

Why does the Arctic matter to the United States? Because the highest potential concentrations of oil and gas in the Arctic coincidentally lie directly above Alaska, according to the USGS's KERA Study. Other minerals, like the world's highest concentrations of zinc, currently being mined at the Red Dog Mine above the Arctic Circle, may be found in the Arctic.

The U.S. Coast Guard has been operating in the Arctic since the whalers first were here in the 1800s. One of the greatest Coast Guard rescues ever involved saving 265 sailors trapped in the ice north of Point Barrow in 1898. I'm not sure if you were there then.

[Laughter.]

Admiral COLVIN. Still, the Coast Guard has much to learn about operating in the Arctic and we learn it by working with local experts, like the Northwest Borough's whaling captains, and by conducting short operations, like Arctic Crossroads, to prototype equipment and to learn about the local area.

We also take the opportunity to bring doctors and dentists and veterinarians in to help the local people, much like the famous Revenue Cutter Captain Mike Healey did in bringing reindeer across from Siberia to help feed Native populations back in the late 1800s.

Our lessons learned from operation of Arctic Crossroads are varied and predictable. There is a lack of infrastructure to support operations. HF Communications do not work well. Satellite antennas often point too low on the horizon to be effective. It is difficult to launch and operate small boats from shore.

Every summer we are challenged to put together Arctic Crossroads due to sparse resources and minimum funding and old ships. This summer the *Polar Sea* broke down and was unable to participate in our operations up here and much needed ships. The buoy tender that was to have participated was also canceled due to deep water horizon.

As Commandant said when he visited the Arctic last week, the Coast Guard needs additional resources to operate in the Arctic without negatively impacting other missions.

I fear in the not-too-distant future a large ship might sink along the Northern Coast of Alaska. The Coast Guard will be hard-pressed to rescue survivors and will be hard-pressed to oversee the cleanup of any associated oil spill. The nearest Coast Guard Search and Rescue resources are about a thousand miles away and across two mountain ranges in Kodiak, Alaska.

In conclusion, Congress has the same responsibilities and authorities in the Arctic Ocean as in any other ocean or the Great Lakes. The challenge is finding the resources to properly execute those responsibilities.

Thank you for your time and I look forward to your questions.

[The prepared statement of Admiral Colvin follows:]

PREPARED STATEMENT OF REAR ADMIRAL CHRISTOPHER COLVIN, COMMANDER, COAST GUARD DISTRICT SEVENTEEN, U.S. COAST GUARD

Good morning, Chairman. I am pleased to be here today to discuss the Coast Guard's operational presence in a changing Arctic and the need for Federal infrastructure in the region.

Icebreaking Capacity in the Arctic

Just over a year ago, Admiral Allen testified before Congress on Coast Guard icebreaking. He stressed the importance of maintaining our Nation's ability to project maritime presence and strength throughout the world, and specifically in the Arctic region. Arctic policy has been further defined by National Security Presidential Directive (NSPD) 66/Homeland Security Presidential Directive (HSPD) 25 on Arctic Region Policy. This Directive provides specific policy objectives while acknowledging the effects of climate change and increased human activity in the Arctic region. In addition, President Obama recently signed Executive Order 13547, which approved and directed Federal departments and agencies to implement the Final Recommendations of the Interagency Ocean Policy Task Force. One of the national priority objectives the Task Force highlighted was to address the changing conditions in the Arctic through better stewardship. In executing these directives, we must be prepared to address the impacts of more open water, an increasing population of maritime users operating in a fragile and challenging environment, and assertion of claims to the vast natural resources of the region. The Coast Guard, through the Department of Homeland Security and working closely with the Departments of State and Defense, must work to improve maritime domain awareness, preserve the global mobility of United States military and civilian vessels and aircraft, and project a sovereign United States maritime presence in the Arctic region.

To that end, the Coast Guard has continued expansion of its operations in Arctic waters during open water periods, while also ensuring its multi-mission capacity is available to support execution of Coast Guard responsibilities year round. As you know, the Coast Guard has three polar icebreakers, of which only the *Healy,* a medium icebreaker, is currently operational and is capable of fulfilling most of the current icebreaking needs in the Arctic and is specifically adapted for scientific research. The *Healy* is currently operating in the Arctic conducting hydrographic mapping of the U.S. continental shelf. *Polar Sea*, which is one of our two heavy icebreakers, is currently laid up due to a major engineering casualty. Our other heavy icebreaker, *Polar Star*, will be fully ready for operations in 2013 after completing a major reactivation project, funded by the 2009 and 2010 appropriations. These three ships represent our Nation's current polar icebreaking capacity.

Arctic Trends

The Arctic environment is fragile and often harsh , and the distances involved in Arctic operations can be immense. Observations and trends have been reported that could increase the intensity of our operations and impact our access requirements:

- *Dynamic changes in ice conditions*: The steady recession of the ice edge continues to open new water in the summer months. As such, dangers to shipping may increase because of the dynamic and unpredictable movement of ice.

- *Expanding Resource Development*: Based on assessments by the U.S. Geological Survey, there have been projections that an estimated 22 percent of the world's oil and natural gas could be located beneath the Arctic with some portion of undiscovered, technically recoverable resources located within the U.S. Exclusive Economic Zone (EEZ). Reflective of this value, oil companies bid nearly $2.7 billion to lease a part of the Chukchi Sea mineral rights.
- *Eco-tourism*: This industry continues to expand as cruise ships, carrying hundreds of passengers, test the limits of safe navigation in Arctic waters. To date, we have already observed an increase by one in the number of adventure cruises from last year's for Northwest Passage Transits. Two cruise ships recently transited the Northwest Passage, one from the east and one from the west with 164 and 184 passengers respectively.
- *Fish Stock Migration*: As the ice edge recedes and water temperatures change, the North Pacific Fishery Management Council reports an increase in fish stocks being observed in the Arctic waters north of the Bering Strait. As a result, fishing vessels have been observed moving further north, which could lead to increased foreign incursions into the U.S. EEZ.
- *EEZ Sovereignty Claims*: With the increased level of open water comes more ability to research and map the oceans floors. This research, including hydrographic surveys and bottom sampling may serve as precursors to international sovereignty claims to extended continental shelves pursuant to the Law of the Sea Convention. The *Healy* has been working over the past few summers with a Canadian icebreaker, the *Louis St. Laurent,* to collect scientific data necessary to assert claims to an extended continental shelf in the Arctic.

National Arctic Policy

The United States is an Arctic nation. As the ice edge continues to recede in the summer, the extent of navigable waters increase. As we adjust to this dynamic, it is critical to recognize the Arctic Region as environmentally fragile, rich in natural resources, and of significant national importance and international interest. We must be prepared to meet current and future demands. The objectives established in the Arctic Region Policy, and reflected in the new national ocean policy, include:

- Meeting national security and homeland security needs relevant to the Arctic Region.
- Protect the Arctic environment and conserve its biological resources.
- Ensuring natural resource management/economic development are sustainable.
- Strengthening institutions for cooperation among the eight Arctic nations.
- Enhancing scientific monitoring and research into environmental issues.
- Involve the Arctic's indigenous communities in decisions that affect them.

Several of the Coast Guard's statutory missions have a significant role in supporting the objectives established in NSPD–66/HSPD–25 and the National Ocean Policy.

Additionally, the multi-nation Arctic Marine Shipping Assessment (AMSA) published in April 2009 provided a comprehensive assessment of the current uses and future impacts of increased accessibility and maritime activity in the Arctic. The report concluded that safe, secure, and environmental sound maritime commerce in the Arctic region will depend on adequate infrastructure to support shipping activity, search and rescue capabilities, short and long range aids to navigation, high-risk area vessel-traffic management, iceberg warnings, shipping standards, and comprehensive measures to protect the marine environment.

Supporting Execution of the National Arctic Policy Objectives

Today, one thing is certain regarding the Arctic: there is more navigable ocean during summer months where there used to be ice, and the Coast Guard has statutory and regulatory responsibilities in that ocean. The Coast Guard is the Nation's primary maritime safety, security, environmental protection and -law enforcement agency. As such, we hold a significant responsibility in executing the Arctic Region Policy and the National Ocean Policy. In order to better perform our anticipated role, we have developed an Arctic Strategic Plan to ensure the Coast Guard is both prepared and able to engage and conduct statutory operations in the Arctic. From my perspective as the Commander of the Seventeenth Coast Guard District, in addition to our existing mission demands, the Coast Guard must actively participate in the multi-agency effort to address current and future challenges associated with the Arctic.

Meeting Homeland Security Needs in the Arctic

As part of a multi-agency effort to implement the Arctic Region Policy, we continue to push forward and assess our Arctic limits. In the summers of 2008 and 2009, we established Forward Operating Locations (FOL) on the North Slope. We employed Coast Guard small boats, helicopters, and Maritime Safety and Security Teams (MSSTs) in Prudhoe Bay, Nome, and Barrow to increase maritime domain awareness and test capabilities in the Arctic environment. We will continue those efforts this summer, when there is the most open water, by redeploying Forward Operating Location bases in most of the same places. Currently, these FOLs operate on a limited basis due to weather conditions, distances, and a lack of shore based infrastructure. We will institute changes based on lessons learned last year, as we continue to develop and refine our knowledge base on operations in the Arctic.

To evaluate activity trends in the Arctic, the Coast Guard commenced extensive Arctic Domain Awareness flights. Coast Guard C–130 flights originated out of a temporary Forward Operating Location in Kotzebue last summer and will continue later this summer. These flights help develop a complete awareness of all private, commercial, and governmental activities in the Arctic.

Protecting the Maritime Environment

To help protect the environment of the Arctic Region, we must continue to partner with companies operating in the region to support pollution response. Recognizing that oil spill clean-up is significantly more difficult in colder temperatures and ice-covered waters, enhancing prevention measures is even more critical as a means to reduce risk and mitigate against potential environmental damage. Moreover, the combination of a harsh environment and limited response resources and capabilities necessitates that awareness, contingency planning, and communications amongst stakeholders are effective and efficient.

While prevention is critical, so is response capability. We continue to exercise the Vessel of Opportunity Skimming System (VOSS) and the Spilled Oil Recovery System (SORS) in the Arctic. Both of these systems enable vessels to collect oil in the unfortunate event of a discharge. The VOSS is deployable and capable of being used on a variety of ships and the SORS is permanently stored and deployed from the Coast Guard's 225-foot ocean-going buoy tenders.

To better understand the impact the northward movement of fish stocks into the Arctic will have on sustainability, a regional management plan is needed. The North Pacific Fisheries Management Council imposed a moratorium on fishing within the U.S. EEZ in the Arctic until assessment of the practicality of sustained commercial fishing in the region is completed. Regardless of the outcome of the assessment and follow-on management plan, it is certain the Coast Guard will play a critical role in its enforcement.

Facilitating Safe, Secure, and Reliable Navigation

With the deployment of the Coast Guard buoy tender SPAR to the Arctic last year the Service began an in-depth Waterways Analysis Management Survey (WAMS). This ongoing survey applies criteria described in the AMSA to assess safe shipping routes, aids to navigation, and vessel routing and traffic system requirements in the Arctic.

Supporting Multi-Agency Arctic Region Policy Implementation

- Strengthen Cooperation Among the Eight Arctic Nations

  The Coast Guard continues to support international and multilateral organizations, studies, projects, and initiatives. Some key groups, projects, and legal frameworks include the Arctic Council, AMSA, Ilulissat Declaration (2009), and the U.N. Convention on the Law of the Sea (UNCLOS), to which the U.S. has not yet become a party. In April 2009, Coast Guard District Seventeen and the Canadian Coast Guard held a Joint Maritime Pollution Contingency Plan Table Top Exercise for oil spill responses in the Beaufort Sea. In addition, District Seventeen has excellent communications and working relationships with Russian agencies responsible for law enforcement, search and rescue, maritime pollution response, and other missions in the Arctic. Consistent with such efforts, the Coast Guard will continue to engage Arctic nations and international organizations to identify and meet current and future challenges associated with the Arctic.

- Involve the Arctic's Indigenous Communities in Decisions that Affect Them

  Some of the biggest successes and lessons for the way forward that the Coast Guard has gained in recent years have come from our continued engagement with Alaska Native Tribes. Their extensive knowledge, assistance, and col-

laboration have been invaluable to our safe operations and successful mission execution. The Coast Guard has also provided valuable assistance, including boating safety exchanges and medical, dental, and veterinary outreach programs while operating in remote villages on the North Slope. We will continue to focus on working with these groups, while ensuring their equities are recognized and protected to the greatest extent possible, as we adapt to the challenges associated with changing operations in the region.

- Enhance Scientific Monitoring and Research into Environmental Issues

  The Coast Guard continues to support the Arctic research efforts of the scientific community through ongoing operations onboard the CGC HEALY this summer and early fall. These missions will support the Naval Research Lab, National Science Foundation, Office of Naval Research, and the Department of State to continue mapping of the continental shelf. Additionally, Air Station Kodiak has and will continue to provide scientific research support from its C–130s through deployment of data buoys in the Arctic.

National Arctic Capacity

While our summer operations continue to provide valuable lessons and help us gain better insight regarding the Arctic, we must acknowledge the seasonal limitation of these efforts. When summer season commercial activity expands, mariners will test the boundaries of safe navigation, and as the eight Arctic nations continue to collect data to make jurisdictional claims, it is important to maintain an appropriate presence in the Arctic for law enforcement and response purposes with vessels capable of accessing the region. The expansive distances, severe weather conditions, and lack of land-based infrastructure continue to challenge our capabilities.

As established by NSPD–66/HSPD–25 and noted previously, the Coast Guard has jurisdiction and statutory mission requirements over Arctic waters and the demands associated with those obligations will increase as waterways continue to open. In addition, the Coast Guard will work with its interagency partners to address stewardship requirements in the Arctic consistent with the new National Ocean Policy. Future mission requirements for this vast, remote, and exceptionally harsh environment have been studied and are currently being reviewed. The full multi-agency missions and asset gaps for the future have yet to be determined.

In order to better understand our future roles and requirements in both the Arctic and Antarctic, the Coast Guard contracted a consultant to review current mission requirements and assess how changing Arctic conditions might affect those requirements. The contractor has completed their report and the Coast Guard is reviewing the study. Information from this study, combined with lessons learned over the past two summers, will help the Coast Guard's ongoing efforts to determine the right mix of assets for the Arctic. The Coast Guard will leverage the ongoing work of other agencies that are also confronting mission impacts due to changing Arctic conditions, such as the Navy and NOAA. Working together under the auspices NSPD–66/HSPD–25 we will define and install the necessary infrastructure in the region. The Coast Guard is also partnering with DHS in an upcoming Workshop at University of Alaska Fairbanks to identify and prioritize research opportunities to support Coast Guard operations in the Arctic. The Workshop will emphasize infrastructure, communications, and sensors.

We will continue to update our Waterways Analysis & Management System (WAMS) to determine the changing needs and uses of the Arctic Federal navigational system. We are also moving forward with a Bering Strait Port Access Routing Study which is a preliminary document to establish Traffic Management Systems required by the International Maritime Organization for recognition of the international community.

It is currently premature to plan shore-based facilities without a clear understanding of what infrastructure will be required (*e.g.,* deepwater support harbors, small boat stations, permanent air stations, etc). The Coast Guard will continue to monitor the direction industry takes, be it tourism, outer continental shelf (OCS) development, fishing or Alaska Native needs.

Coast Guard Icebreaker Assets

The HEALY, commissioned in 2000, has an expected service life of 30 years. The *Polar Sea* and *Polar Star* were both commissioned in the 1970s, and are fast approaching their extended service lives of just over 30 years. The *Polar Sea* had a significant two-year refit in 2006, extending its projected service life to 2014.

Currently, we are engaged in a multi-year, $62 million project to reactivate *Polar Star*. The cutter is planned to be completed and ready to return to operations in 2013. This project will extend *Polar Star*'s planned operational service life by 7 to 10 years.

Conclusion

The Arctic is a vast and challenging environment going through significant changes. The unique nature of the region, magnitude of open water, harsh weather and great distances involved, and new users are leading to increased challenges to national sovereignty. As a Nation, we now have an Arctic Region Policy and a National Ocean Policy and the Coast Guard has a significant role in implementing those policy directives. We are pushing forward to meet our responsibilities using the resources available now.

To meet our national responsibilities in the Arctic, we must ensure we are prepared for the challenges associated with this unique and harsh environment. While we work to refine future mission requirements and identify the precise mix of assets needed to perform them, Coast Guard icebreakers stand ready to meet our current icebreaking needs in the Arctic. Other Coast Guard resources are also expanding their knowledge, experience, and competence to carry out mission responsibilities in this vast and vitally important region.

Thank you for the opportunity to testify today. I look forward to your questions.

Senator BEGICH. Thank you, Admiral. Let me go to next Laura Furgione. I'll get it down. Let me go and have you do your testimony next, please.

STATEMENT OF LAURA K. FURGIONE, DEPUTY ASSISTANT ADMINISTRATOR FOR WEATHER SERVICES, NOAA, U.S. DEPARTMENT OF COMMERCE

Ms. FURGIONE. Thank you. Good morning, Senator Begich, Senator Stabenow, Mayor Itta, and distinguished guests.

My name is Laura Furgione, and I'm the Deputy Assistant Administrator for Weather Services at the National Oceanic and Atmospheric Administration, NOAA.

I've called the State of Alaska home for 15 years. During this time I worked for NOAA's National Weather Service in Kodiak, Juneau, Fairbanks, and from 2004 to 2008, in Anchorage at the National Weather Service, as Alaska Regional Director.

Thank you for inviting me to testify before you this morning. Before I begin my official testimony, I do want to devote a portion of my time to Senator Stevens, a tribute to his lifelong dedication. He was such a strong advocate for NOAA, the National Weather Service, the State of Alaska, and the Arctic.

On May 2007, I was able to present him with the Director's Award, celebrating his contributions to the expansion of the Alaska Data Buoy Network from 5 buoys to 19 buoys.

When I started with the Weather Service, we actually only had two buoys, one in the Central Bering and one in the Gulf of Alaska. More buoys are weather sentinels of the sea. In addition to providing data for operational marine forecast warnings and atmospheric models, buoy data are used for a wide variety of scientific research programs. This is merely one example of how Senator Stevens assisted in expanding our understanding of the Arctic and its surrounding waters.

My deepest sympathy to his family. May he rest in peace.

Is it on now? Is that better?

Senator BEGICH. Try it one more time.

Ms. FURGIONE. Now? Oh, wow. OK. See, I didn't really need a microphone.

Senator BEGICH. You were doing pretty good without it.

Ms. FURGIONE. Now back to my formal testimony. This hearing puts a well-deserved spotlight on emerging Arctic issues.

On behalf of NOAA, I'd like to thank the Committee on Commerce, Science, and Transportation for its continued attention to the issues associated with the changing Arctic and the myriad of impacts to our Native culture, subsistence in the Arctic, and the ecosystems on which we depend.

I also recognize Senator Begich and Senator Stabenow for their leadership and support on Arctic issues, including the numerous important pieces of Arctic-related legislation that you mentioned.

The Obama Administration is looking closely at Arctic policy and management. This is evidenced by the identification of the Arctic as one of the "special emphasis" in the final recommendations of the Interagency Ocean Policy Task Force that was adopted by the President July 19, 2010.

The Ocean Policy Task Force final recommendations calls for better ways to conserve, protect, sustainably manage Arctic coastal ocean resources, new collaborations and partnerships to better monitor and assess environmental conditions, and improvement of the scientific understanding of the Arctic system and how it's changing in response to climate-induced and other changes.

As you know, there's now widespread evidence of climate change in the Arctic region, most dramatically observed in loss of sea ice. For in the last 5 years, we have witnessed the lowest sea ice extents on record as well as a 35 percent decrease in thicker multiyear ice. Recent Arctic temperature increases are more than doubled in those found at more southerly latitudes, suggesting the Arctic may be disproportionately affected by changes in the Earth's climate.

The Arctic's 2008 Annual Mean Air Temperature over land was the fourth warmest on record, which continues a long-term upward trend. In addition, we're detecting shifts in ecosystems from the Aleutian Islands to here in Barrow. I even understand they saw an Opelio crab here in the Beaufort Sea.

These changes are already being felt in communities around the Arctic and especially here in the State of Alaska. As my boss, Dr. Jane Lubchenco, the NOAA Administrator and Under Secretary of Commerce for Oceans and Atmosphere, has said, "Most of what we've seen in the Arctic Ocean has led us to believe that warming is happening even faster than many of our models are predicting. The melting of the ice in the Arctic Ocean is happening at a faster pace than we had predicted and that's creating new opportunities, opportunities that need to be pursued in ways that are precautionary and take into account the need to ensure those systems remain healthy and resilient through the coming changes."

As the United States confronts these Arctic challenges and opportunities, it is evident that despite the wealth of traditional scientific knowledge, exploration, and research to date, basic data is still lacking in the Arctic.

In order to effectively manage the various Arctic interests, accurate information about environmental conditions in the Arctic is needed. Doug DeMaster, the Director of NOAA's Alaska Fisheries Science Center, and I led a team of NOAA experts to develop NOAA's Arctic Vision and Strategy.

As the uses of the Arctic evolve, we believe it is important that decisions related to conservation, management, and use are based

on sound science and support healthy, productive, and resilient communities and ecosystems.

In addition, because of the global impacts of changes in the Arctic environment, we seek to better understand and predict those changes. Our Arctic Strategy integrates and aligns our numerous and diverse capabilities and supports the efforts of our international, Federal, state, local, tribal partners and stakeholders.

NOAA's Arctic Vision and Strategy has six priority goals. The first, which is our organizing principle, is forecast changes in sea ice. The second: strengthen our foundational science to understand and detect Arctic climate and ecosystem changes. The third: improve our weather and forecast warnings, weather and water forecast and warnings. My hydrologist would be mad at me to mess that up. Enhance international and national partnerships, improve stewardship and management of ocean and coastal resources in the Arctic, and advance resilient healthy Arctic communities and economies.

These goals were selected because they represent areas where NOAA has the expertise to address emerging Arctic issues and it also meets two criteria: one, providing the information, knowledge, and policies to meet our mandates and stewardship responsibilities, and, also, providing the information, knowledge, and services to enable others to live and operate safely in the Arctic.

The choices we make today can have pivotal impacts on the future state of the Arctic. There is a great deal of work to be done and NOAA, in collaboration with our partners, is committed to strengthening Arctic science and stewardship and providing the information, products and services needed by our Arctic stakeholders.

We're in the process of finalizing our Arctic Vision and Strategy and our next step is to engage our partners and stakeholders again and transform that strategy into actions that will support healthy, productive, and resilient Arctic communities and ecosystems.

Thank you again, Senators Begich and Stabenow, for the opportunity to talk about NOAA's role in the Arctic. We appreciate your leadership and the time and attention the Committee is devoting to this important issue and look forward to working with you further.

Thank you.

[The prepared statement of Ms. Furgione follows:]

PREPARED STATEMENT OF LAURA K. FURGIONE, DEPUTY ASSISTANT ADMINISTRATOR FOR WEATHER SERVICES, NOAA, U.S. DEPARTMENT OF COMMERCE

Good morning, Senator Begich, Senator Stabenow, and distinguished guests. My name is Laura K. Furgione, and I am the Deputy Assistant Administrator for Weather Services at the National Oceanic and Atmospheric Administration (NOAA). I called the State of Alaska, America's Arctic, home for 15 years. During this time, I worked for NOAA's National Weather Service (NWS), in Kodiak, Fairbanks, Juneau, and most recently, from 2004 to 2008, as the Alaska Regional Director in Anchorage. Thank you for inviting me to testify before you today on NOAA's activities in the Arctic.

This hearing puts a well-deserved spotlight on emerging Arctic issues. On behalf of NOAA, I would like to thank the Committee on Commerce, Science, and Transportation for its continued attention to the issues associated with a changing Arctic and the myriad impacts to its people and the ecosystems on which they depend. I would also like recognize Senator Begich and Senator Stabenow for their leadership and support on Arctic issues, including the numerous important pieces of Arctic-related legislation that Senator Begich has worked to advance this Congress. The Ad-

ministration is looking closely at Arctic policy and management, as evidenced by the work underway to implement the January 2009 National Security Presidential Directive 66/Homeland Security Presidential Directive 25 (NSPD 66/HSPD 25) on an Arctic Region Policy, and the identification of the Arctic as an area of special emphasis in the Final Recommendations of the Interagency Ocean Policy Task Force, adopted by the President by Executive Order on July 19, 2010. The Ocean Policy Task Force's Final Recommendations call for "better ways to conserve, protect, and sustainably manage Arctic coastal and ocean resources . . . new collaborations and partnerships to better monitor and assess environmental conditions . . . [and] improvement of the scientific understanding of the Arctic system and how it is changing in response to climate-induced and other changes."

As you know, there is now widespread evidence of climate change in the Arctic region, most dramatically observed in loss of sea ice. In 4 of the last 5 years, we have witnessed the lowest sea ice extents on record, as well as a 35 percent decrease in thicker multi-year sea ice during the same time period. Recent Arctic temperature increases are more than double those found at more southerly latitudes, suggesting that the Arctic may be disproportionately affected by changes in the Earth's climate. The Arctic's 2008 annual mean air temperature over land was the fourth warmest on record, which continues a long-term upward trend. And while the annual mean temperature over land for 2009 was cooler than in recent years, the average temperature for the last decade remained the warmest in the record beginning in 1900. In addition, we are detecting shifts in ocean ecosystems from the Aleutian Islands to Barrow, Alaska, due to a combination of Arctic warming, large natural variability, and sensitivity to changing sea ice conditions.

These changes are already being felt in communities around the Arctic and especially here in the State of Alaska where, for example, coastal communities like Newtok are experiencing rapidly eroding shorelines forcing costly and life-changing retreat inland. In the same way, increasing coastal storms in the autumn in recent years are impacting barge operations that supply coastal communities with necessary supplies. In other parts of the State, thawing permafrost and unprecedented outbreaks of insects like the spruce beetle are profoundly changing the landscape and presenting new risks to infrastructure. The availability of species that Alaskans depend on for subsistence and economic livelihoods is also changing, whether in the northward movement of marine fish species, the range of migratory herds, or displacement of walrus and seal populations. These impacts and a myriad of others present Alaskans and, by extension the Nation, with a broad range of overwhelming challenges.

As Dr. Jane Lubchenco, the NOAA Administrator and Under Secretary of Commerce for Oceans and Atmosphere, has said:

> "Most of what we have seen in the Arctic Ocean has led us to believe that warming is happening even faster than many of the models are predicting. The melting of the ice in the Arctic Ocean is happening at a faster pace than we had predicted. And that is creating new opportunities in the Arctic Ocean . . . [opportunities that] need to be pursued in ways that are precautionary and take into the account the need to ensure that those systems remain healthy and resilient through the coming changes."

As access to the region opens up because of sea ice retreat, we are seeing a corresponding growth in international and domestic attention to the Arctic—manifested in public interest in countries' extended continental shelf claims under customary international law as reflected in the United Nations Convention on the Law of the Sea—as well as maritime domain awareness concerns and opportunities for economic development and access to Arctic resources. Oil companies are investing more in energy exploration and recovery, and commercial shipping interests are anticipating one or more seasonally open trans-Arctic trade routes. The potential for increased cruise ship tourism, commercial fishing and establishment or expansion of other economic activities may exert pressure on the existing marine transportation system infrastructure and our security assets. These pressures are likely to make it more challenging to respond promptly to changing conditions in the region. These economic drivers can also threaten marine and coastal ecosystems as well as Arctic inhabitants already affected by the rapidly changing climate. Furthermore, the Arctic has profound significance for climate and functioning of ecosystems around the globe, so changes in the region affect us all. Climate changes already apparent in the Arctic may portend future global climatic conditions.

As the United States begins to confront these Arctic challenges, it is evident that despite the wealth of traditional scientific knowledge, exploration, and research to date in some areas, basic data is lacking in the Arctic. In order to effectively man-

age the various Arctic interests, accurate information about environmental conditions in the Arctic is needed.

A strategic approach is essential to best leverage the strengths of NOAA and the many agencies that have missions that relate to or impact Arctic resources. As the uses of the Arctic environment evolve, NOAA believes it is important that decisions and actions related to conservation, management, and use are based on sound science and support healthy, productive, and resilient communities and ecosystems. In addition, because of the global impacts of changes in the Arctic environment, we seek to better understand and predict changes there. NOAA has developed a comprehensive Arctic strategy that integrates and aligns our numerous and diverse capabilities and supports the efforts of our international, Federal, state and local partners and stakeholders. NOAA's Arctic Vision and Strategy (available at *http://www.arctic.noaa.gov/docs/arctic_strat_2010.pdf*) has six priority goals, derived directly from stakeholder requirements, upon which NOAA will focus its efforts:

1. Forecast Changes in Sea Ice;
2. Strengthen Foundational Science to Understand and Detect Arctic Climate and Ecosystem Changes;
3. Improve Weather and Water Forecasts and Warnings;
4. Enhance International and National Partnerships;
5. Improve Stewardship and Management of Ocean and Coastal Resources in the Arctic; and,
6. Advance Resilient and Healthy Arctic Communities and Economies.

These goals were selected because they represent areas where NOAA has the expertise to address emergent Arctic issues that meet two key criteria: providing the information, knowledge, and policies to meet NOAA mandates and stewardship responsibilities; and providing the information, knowledge, and services to enable others to live and operate safely in the Arctic.

Forecasting Changes in Sea Ice

Continued rapid loss of sea ice will be a major driver of large changes across the Arctic, and is the organizing principle for NOAA's Arctic Vision and Strategy. The loss of sea ice affects marine access, regional weather, ecosystem changes, and coastal communities. As ice cover diminishes, marine food webs are expected to dramatically shift from seafloor-dominant systems that favor commercial species such as crabs to water column-dominant systems that favor commercial fish species such as Pollock. The understanding of ice as a habitat also has implications for oil spill response and damage assessment. As the Arctic Ocean becomes seasonally passable and tourism, oil and gas exploration, and shipping increase, floating sea ice will present a major threat to maritime safety and increase the potential for oil spills from vessel traffic in the region.

NOAA is currently conducting operational sea ice analysis and forecasts, evaluating sea ice projections through Intergovernmental Panel on Climate Change climate models, conducting and analyzing satellite and airborne observations of sea ice freeboard or thickness, improving satellite image analyses, and contributing to the Arctic buoy program. NOAA's NWS has a sea ice desk at the Anchorage Weather Forecast Office which provides operational sea ice forecasting in Alaska. In cooperation with the National Ice Center in Suitland, Maryland, it provides operational analyses and forecasts of sea ice conditions and hazards in the Arctic 5 days a week. NOAA also supports the National Snow and Ice Data Center, within the Cooperative Institute for Research in Environmental Sciences at the University of Colorado, where a vast array of Arctic data are stewarded and made available to both academic and public users.

However, improvements in the sea ice services that NOAA provides, particularly model resolution and forecast frequency, and the integration of different types of observations (including sea ice characteristics and local knowledge) into the forecasts would enhance our understanding of the Arctic environment. For operational planning purposes, it is important that sea ice atlases for Alaskan waters are up-to-date. To support infrastructure planning and development, industry, state and local governments, and Federal agencies would benefit from seasonal to multi-decadal sea ice projections to make informed decisions. Research and modeling of Arctic processes and anthropogenic effects are required to achieve these projections, understand the impacts of sea ice loss, and improve weather and climate forecasts for the Arctic and northern mid-latitude regions. NOAA's goal is to provide accurate, quantitative, daily-to-decadal sea ice projections in support of safe operations and ecosystem stewardship during this time of rapid environmental change.

Strengthening Foundational Science to Understand and Detect Arctic Climate and Ecosystem Changes

There is also great uncertainty in tracking the types and magnitudes of social and ecological impacts caused by Arctic climate changes and economic development. For example, the response of marine primary production from additional loss of sea ice and the impacts on higher levels within the food chain are largely unknown. Other examples of changes in the Arctic are the thawing of permafrost, increased coastal erosion, sea level changes, shifts in land and marine transportation patterns, and changes in land-based human subsistence resources. To adequately track these changes, sustained observations are essential. Monitoring and understanding climate change in the Arctic is important for other socioeconomic applications as well, including infrastructure protection related to sea level changes, transportation, and community resilience.

NOAA has a variety of ongoing and/or recent Arctic-focused climate and ecosystem projects. NOAA operates a manned Atmospheric Baseline Observatory six miles east of Barrow, Alaska, to measure changes in atmospheric climate forcing agents. These include carbon dioxide (CO_2) and methane (CH_4), compounds that deplete stratospheric ozone, and related gases. They also include air pollution from Eurasia known as Arctic Haze, black carbon measurements, and surface radiation, to name only a few of the more than 200 measurements conducted at this facility. The observatory was established in 1973 and it has operated continuously to date. It is the world's longest continuously operating atmospheric climate observatory in the Arctic. It is expected to be in operation for the next century, monitoring and documenting the causes of climate change in the Arctic.

Two NOAA polar orbiting satellite downlink antennae that relay images of Arctic sea ice and clouds are supported at this site in Barrow, as well as the northern most NOAA Climate Reference Network station that accurately documents temperature and moisture changes in the region. The NOAA Barrow Observatory also hosts the Department of Energy's North Slope of Alaska Atmospheric Radiation Measurement facility, and supports the adjacent United States Geological Survey Barrow Geomagnetic Observatory. Together, these facilities are the largest collection of environmental scientific instrumentation in the entire Arctic and represent an investment in excess of $100 million.

To reduce uncertainties in NOAA information and services, NOAA is establishing the basis for an ecosystem-level Arctic Change Detection System within current resources. The goal is to monitor at minimum four key areas: ecosystem responses to sea ice loss, necessary additional climate observations over the Arctic, basic water level information, and accelerated methane release. Such a system includes a marine Distributed Biological Observatory for consistent monitoring of biophysical responses and ecosystem change in the U.S. Arctic as sea ice retreats. The Distributed Biological Observatory was the central recommendation from a NOAA-sponsored stakeholder workshop in May 2009 on the biological impacts of loss of sea ice. Efforts such as the Russian-American Long-term Census of the Arctic can also improve the exchange of information about near and far field changes in the Arctic. In addition—as evidenced by the science community's surprise at the rate and magnitude of loss of summer Arctic sea ice from 2007 through 2009—new *in situ*, drifting, airborne, and satellite observing technologies are needed to fill gaps in meteorological and oceanographic fields for temperature, heat, methane feedbacks and other biophysical parameters. Accurate geodetic elevations and water-level information to update obsolete historical datasets will help coastal communities adapt and increase resilience to hazards as ice-diminished coastlines allow a completely new wave and storm surge regime to develop as the seasons change.

Improve Weather and Water Forecasts and Warnings

Major stakeholders and partners, including the U.S. Coast Guard and the State of Alaska Division of Homeland Security and Emergency Management, require more useful weather and water information for planning and decisionmaking to protect lives, property, and manage the region's many resources. Arctic populations rely heavily on aviation and marine weather for safe transportation and access to goods and services.

A 2006 study by the National Institute of Occupational Safety and Health reported that the accident rate for commercial pilots in Alaska was five times higher than the national average. Additionally, Alaska's $4 billion fishing industry is one of the most dangerous occupations in the Nation, primarily due to the harsh weather conditions in the region.

Improvements in weather and water information will lead to increased safety and efficiency in these important sectors. Environmental observations and studies supporting weather and ice forecasts are highly limited in both geographic scope and

frequency. For example, there is inadequate real-time meteorological data in U.S. Arctic waters to support accurate forecasting of ocean storms which have serious potential to threaten marine transportation, offshore oil and gas operations, and the Arctic coastal communities. The 2009 failure of NASA's QuikSCAT satellite scatterometer and the 2008 expiration of an agreement between NOAA, NASA and the Canadian Space Agency for valuable, cost-free synthetic aperture radar (SAR) data from the RADARSAT1 mission continue to hinder Arctic weather and sea ice services capability. NOAA is attempting to mitigate these impacts by procuring data from foreign satellite operators through a partnership with the University of Alaska's Alaska Satellite Center. This information is critical in real-time forecasting and warning of events such as rapid sea ice formation, river ice jams, and storms carrying hurricane force winds that are major hazards for life, property and economic activities in the Arctic.

NOAA has also operated the Fairbanks Command and Data Acquisition station in Fairbanks, Alaska since 1965 which manages the aforementioned Barrow satellite downlink antennae. From that station, NOAA accesses data from its Polar-orbiting Operational Environmental Satellites (POES), various NASA research satellites, and a number foreign environmental satellites which provide space-based data that are used by NOAA to develop its forecasts, warnings, and information for surface, marine, and aviation weather interests, with emphasis, when possible, on high-impact events such as extra tropical storms and polar lows, storm surge and other coastal hazards such as tsunamis, heavy precipitation, floods, droughts, volcanic ash, and space weather. Services are delivered through a number of media outlets from Internet to high frequency radio broadcasts. NOAA is working to improve Arctic marine weather, sea ice, and storm surge forecast services by addressing greater needs for observations, modeling, and forecasts while incorporating new techniques for ensuring this information leads to the best possible decisions and associated response. Improved forecast services will better ensure the safety and security of marine transportation, oil and gas exploration, and tourism activities, and protect northern and western Alaska coastal communities from storm surge, inundation, and erosion hazards. Arctic weather also plays an important role in global weather; understanding this role is essential to improving global forecasts. NOAA understands that regular forecasts and support for the Arctic region will contribute to the protection of life and property and the enhancement of the economy, and will help to fulfill NOAA's obligations in cooperative agreements with international partners, and treaties such as the International Convention for the Safety of Life at Sea. For example, from the Fairbanks station, NOAA receives alerts from locator beacons that have been activated by persons in distress in the Alaska wilderness, or from mariners or aviators in distress. The signals from these beacons are transmitted via NOAA satellites which provide support under the auspices of the international Search and Rescue Satellite-Aided Tracking (SARSAT) program.

Enhance International and National Partnerships

No single region better exemplifies the complex interdependence of communities and changing ecosystem conditions than the Arctic. The breadth and complexity of the cultural, societal, economic, and environmental impacts requires a concerted, systematic and rapid effort with partners from international to local levels.

NOAA currently cooperates with other Arctic nations directly, as well as through international institutions and organizations, to support work in areas such as weather, climate, aviation, and marine observations, forecasts, and services; ecosystem management; marine transportation (*e.g.,* hydrography and nautical charting); fisheries; and ice monitoring. These relationships allow us to cooperate on sea ice forecasts, as well as efforts to understand and predict changes in the Earth's environment by observing the Arctic atmosphere and cryosphere from manned observatories in places such as Summit, Greenland and Tiksi, Russia. NOAA is also an active participant in numerous international organizations such as the World Meteorological Organization, the International Maritime Organization, the International Hydrographic Organization, and the Arctic Council. NOAA serves in leadership roles in two Arctic Council working groups (Protection of the Arctic Marine Environment and Arctic Monitoring and Assessment Program), while providing expertise to others. Current Arctic Council work includes assessing the effects of pollutants in the Arctic, reviewing the comprehensiveness and efficacy of existing governance mechanisms for the Arctic marine environment, and understanding the status of biodiversity in Arctic ecosystems.

Modeling climate change at the regional and global levels is an enormous task, best accomplished by sharing data at multiple levels—with universities and researchers, with Federal and State agencies, with other Arctic countries, and with non-Arctic countries possessing satellite and observation capabilities in the Arctic.

NOAA is working to continue and expand these relationships through partnerships and formal bilateral arrangements, recently highlighted by the signing of the comprehensive climate change agreement between the Department of Commerce and Department of the Interior (DOI). Understanding and predicting how ice cover and consistency will change in the Arctic will necessitate cooperation. NOAA seeks to increase both its interagency and international partnerships to improve the accuracy, timeliness, and coverage of its sea ice forecasts—ensuring seamless transitions across jurisdictional boundaries and enhancing safe navigation.

These changes in climate and sea ice are also driving changes in marine ecosystems (including species abundance and composition) in ways not yet fully understood. Due to the interconnected nature of Arctic ecosystems, the U.S. will need to continue to improve collaboration and engagement with other Arctic nations through international mechanisms, such as the Arctic Council and our bilateral relationships, to better understand, observe, research, and manage Arctic resources. NOAA will provide leadership and resources to support Arctic governance and science organizations. Specifically, NOAA will continue to support the Arctic Council and its working groups, which monitor and assess biodiversity, climate, and the health of humans and ecosystems, and contribute to international approaches to ecosystem and protected area management, as well as management of shipping.

Continued coordination across Federal entities, such as that provided by the Interagency Arctic Research Policy Committee, will be essential to implement overarching U.S. Arctic Policy goals, particularly those identified by the U.S. Arctic Policy (NSPD 66/HSPD 25) and the Interagency Ocean Policy Task Force's Final Recommendations. NOAA continues to develop and advance partnerships with our colleagues from the National Science Foundation (NSF), DOI, and the U.S. Arctic Research Commission, along with a multitude of other Federal agencies that are focused on Arctic issues. A good example is NOAA's regular collaboration with the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE, formerly the Minerals Management Service) on a variety of biological assessments. BOEMRE is currently funding roughly $29M in NOAA fisheries and marine mammal studies, along with other cooperative environmental impact, meteorological and oceanographic Arctic study projects in the Chukchi and Beaufort Seas.

In the State of Alaska, NOAA partners with public and private sectors at the Federal, state, and local scales. The agency is a member of the Alaska Climate Change Sub-Cabinet's Advisory and Technical Working Groups, and also plays an active role in the Alaska Climate Change Executive Roundtable to facilitate cooperation among agencies seeking solutions to Alaska's climate change challenges. Through the roundtable, NOAA has acquired sites for observing stations; benefited from sister agency capabilities to implement Administration events such as the public meetings in Anchorage associated with the Ocean Policy Task Force; and worked on defining clear synergistic roles for new tools and services such as the proposed NOAA Climate Service and DOI's Climate Science Center and their Landscape Conservation Cooperatives NOAA and BOEMRE also partner closely to engage Alaska Natives regarding oil and gas impacts to subsistence activities through the annual "Open Waters" meeting. NOAA has had long standing co-management agreements with several Alaska Native Organizations regarding research and management of marine mammals in Alaska (excluding walrus, polar bears and sea otters which are managed by DOI). NOAA believes co-management should serve as the foundation for the management of subsistence takes of marine mammals in Alaska. In addition, NOAA participates in a Cooperative Agreement with the Alaska Eskimo Whaling Commission (AEWC) for the management of its subsistence hunt and fully cooperates with the AEWC on related domestic issues and through U.S. engagement at the International Whaling Commission. NOAA is also on the oversight committee of the North Slope Science Initiative and is contributing to the development (and eventual implementation) of the Arctic and the DOI Western Alaska Landscape Conservation Cooperatives. Finally, NOAA has a close working relationship with faculty and staff at the University of Alaska, through partnerships such as the Alaska Regional Integrated Science and Assessments group and Alaska Sea Grant which conduct research on the impacts of climate change and ocean acidification on commercial and subsistence fisheries in the Bering and Chukchi Seas. Continuing to build and sustain strong partnerships with the State of Alaska and other local, regional and international stakeholders will be critical to achieving success in the Arctic.

Improve Stewardship and Management of Ocean and Coastal Resources in the Arctic

As the Arctic Ocean becomes more accessible with the retreat of sea ice in summer months, cascading consequences must be anticipated. Biophysical and chemical changes in the ocean, combined with increasing human uses will impact the Bering,

Chukchi, and Beaufort Seas. Currently, commercial harvest of groundfish, shellfish, salmon and other resources, primarily in the Bering Sea, constitute almost 50 percent of marine fish landings in the United States. Further, these same resources, plus various species of marine mammals, seabirds, and other marine life are critical to the maintenance of the subsistence lifestyle of over 40,000 indigenous people who inhabit small towns and villages on Alaska's Arctic coastline.

NOAA currently conducts population assessments and ecological process studies to meet its living marine resource management mandates. An important research gap is that existing ecosystem models are unable to provide reliable information on how loss of sea ice, increased ocean acidity, and increasing ocean temperatures will specifically impact key fish and mammal species. NOAA is leveraging existing resources to expand limited aspects of its current Arctic ecosystem research program and the regional Alaska Ocean Observing System, as well as implement better data collection, analyses, and models to provide reliable predictions of the changes coming to marine ecosystems in the U.S. Arctic. It is critical to both the U.S. economy and the coastal inhabitants of the U.S. Arctic that NOAA, in cooperation with Federal, state, and local partners and stakeholders, improve its capabilities to understand and predict the full spectrum of changes associated with climate change in the Arctic, with the intended outcome of improving the stewardship and management of Arctic marine resources.

Additional surveys are needed to assess the impact of climate change, loss of sea ice, and ocean acidification on living marine resources in the northern Bering, Chukchi, and Beaufort Seas. One key management question is how productivity and species composition will change with the loss of sea ice, increased acidity, and sea surface temperature warming. Very few surveys have been conducted to date to assess the status of living marine resources in the northern Bering, Chukchi, and Beaufort Seas because of limited access to survey vessels and aircraft during the ice free summer months. NOAA is exploring ways to increase its Arctic survey capability. For example, it is considering supplementing the NOAA fleet that performs survey work with contracting vessels.

NOAA is working to expand two existing programs, while continuing on-going assessment programs on marine mammals, fish, and shellfish: (1) the Bering Aleutian Salmon International Survey and the Russian-American Long-term Census of the Arctic, which are cooperative international research programs in the northern Bering and Chukchi Seas; and (2) NOAA's ocean acidification program. The former will provide critical information on the biodiversity of this region and a baseline for assessing how biodiversity will respond to climate change and loss of sea ice. The latter activity will result in greater attention given to the impact of more corrosive waters on the ecology and life history of key Arctic species such as king crab. It is NOAA's intent to continue annual trawl surveys for groundfish and crab in the Bering Sea and biennial acoustic surveys. These surveys form the base for sound management of groundfish and crab resources in the Bering Sea.

Advancing Resilient and Healthy Arctic Communities and Economies

The Arctic's condition can be gauged by the health of the people living and working in this unique environment, and by the impact of increased economic activity on the region. Indigenous people have long depended upon the unique characteristics of the Arctic for food, livelihoods, cultural heritage, and protection. However, climate change in the Arctic is altering the foundations of their communities and challenging indigenous ways of life. As the ice barriers that protect Arctic coastal communities diminish, the State of Alaska and its people must make critical decisions based on threats from stronger storms, increasing erosion, thawing permafrost, changing animal migration patterns, and sea level changes. At the same time, the loss of sea ice creates opportunities for commercial enterprises, creating tension between traditional uses and new opportunities. Oil companies are investing in exploration, private interests are anticipating an open Arctic trade route, and pressure is increasing on our defense and security assets to maintain a presence in the region in a "response-ready state" because of the increased risks.

In light of these growing commercial, security and coastal community pressures, sustainable management of the region, which until now has been relatively inaccessible, will require Federal, state, and local governments to work together to advance improvements in:

- geospatial infrastructure for accurate positioning and elevations;
- tide, current and water level observations and prediction coverage;
- shoreline and hydrographic data;
- nautical charts;
- research on how oil behaves in ice;

- spill response capability and understanding of current environmental conditions for damage assessment and restoration;
- weather and ice forecast coverage; and,
- science-based recommendations for coastal community climate change adaptation strategies.

NOAA has a variety of mandates relating to resilient communities and economies, from hydrographic surveys and nautical charting to coastal zone management and oil spill response. It recognizes that it can make the highest positive impact to Arctic communities and sustainable economic growth by providing an accurate geospatial framework and products and services for safe navigation and security, oil spill response readiness, and climate change. Putting good information into the hands of mariners is essential for safe navigation and environmental protection, and coastal communities and scientists must have the same foundational support for good operational and research decisions.

NOAA is working with partners like the U.S. Coast Guard and local vessel pilots to prioritize surveys of likely shipping lanes in the North Bering and Chukchi Seas to help address the Bering Strait chokepoint, in particular, and more broadly to reduce the risk of accident and environmental impact in Arctic waters. In FY 2010, NOAA is conducting hydrographic surveys in the Bering Strait, a key area of interest to the U.S. Navy, with some additional surveys planned for FY 2011. Through its Gravity for the Redefinition of the American Vertical Datum (GRAV–D) initiative, NOAA is leveraging resources in FY 2010 and FY 2011 to dramatically improve elevation data in the U.S. With current elevation measurements off by as much as two meters, Alaska is the foremost priority for GRAV–D, and gravity data collection flights over Alaska in the summers of 2010 and 2011 will improve that accuracy to two centimeters. This effort will help coastal communities with infrastructure-hardening challenges and decisions on erosion controls and flood protections. In addition, NOAA has recently completed a tide gauge demonstration project in Barrow in order to develop the technology and approaches necessary for long-term water level measurements under harsh Arctic conditions. NOAA's hydrographic services provide valuable information to ensure conservation, management, and use are based on sound science to support U.S. economic growth, and resilient and viable ecosystems and communities.

To improve environmental preparedness, response, and recovery efforts, NOAA is working to expand the NOAA Environmental Response Management Application (ERMA) program to benefit Arctic stakeholders, including coastal communities, Alaska Native villages, the State of Alaska, industry, as well as NOAA and other Federal agencies. NOAA will develop an ERMA website for two to three areas of high priority to prepare for Arctic oil spill risks, and will likely include an area of concern in the Chukchi and Beaufort Seas. ERMA is a web-based Geographic Information System tool designed to assist both emergency responders and environmental resource managers who deal with incidents that may adversely impact the environment. The application can assist in response planning and is accessible to both the command post and to assets in the field during an actual response incident, such as an oil spill or hurricane. The data within ERMA also assist in resource management decisions regarding hazardous waste site evaluations and restoration planning. ERMA also includes human use and human dimension data components and, for the Arctic, would include sea-ice conditions. Federal, State and Tribal governments will be able to use this information and the ERMA interface not only to address oil spill planning and response, but also to assess sea-ice and shoreline erosion information.

NOAA is also responsible for administering the Coastal Zone Management Act (CZMA), and the State of Alaska has a NOAA-approved CZMA program. The State's CZMA program includes local districts and Alaska Native tribal governments. NOAA works with the State, districts and Alaska Natives and provides annual grants, management, and technical assistance to help the State build its capacity to address pressures on the State's coastal resources and communities, including planning for climate-related changes and impacts.

In conclusion, NOAA is bringing its diverse capabilities to bear on the cultural, environmental, economic, and national security issues emerging as a result of changes in the Arctic. The breadth and complexity of these impacts require a concerted, systematic and rapid effort with partners from international to local levels. NOAA's scientific capabilities are being deployed to increase understanding of climate and other key environmental trends, to predict the ecosystem response to those trends, and to offer the technical expertise needed to develop policy options and management strategies for mitigation and adaptation to the environmental challenges in the Arctic region. NOAA's service capabilities are supporting safety

and security needs for fishing, marine mammal protection, marine and other modes of transportation, energy, infrastructure, and mineral exploration in the unique Arctic environment. The choices we make today can have pivotal impacts on the future state of the Arctic. There is a great deal of work to be done, and NOAA, in collaboration with our partners, is committed to strengthening Arctic science and stewardship, and providing the information, products, and services needed by our Arctic stakeholders. Key to enhancing these efforts will be the coordinated implementation of the Ocean Policy Task Force's Final Recommendations. In addition to the Arctic as an area of special emphasis, there are other key priorities that provide for focused and coordinated actions that will improve our stewardship of the Arctic Region.

NOAA is currently in the process of validating a comprehensive NOAA Arctic Vision and Strategy with our stakeholders that aligns our capabilities in support of the efforts of our international, Federal, state and local partners, and within the broader context of our Nation's Arctic policies and research goals. Our next step is to engage our partners and stakeholders, and transform that strategy into actions that will support healthy, productive, and resilient Arctic communities and ecosystems.

Thank you again, Senators Begich and Stabenow, for the opportunity to talk about NOAA's role in the Arctic. We appreciate your leadership and the time and attention the Committee is devoting to this important issue, and look forward to working with you further.

Senator BEGICH. Thank you very much. Richard Glenn, and then I'm going to go this way.

STATEMENT OF RICHARD GLENN, VICE PRESIDENT, ARCTIC SLOPE REGIONAL CORPORATION

Mr. GLENN. OK. Thank you.

Senator BEGICH. I should have said that warning ahead of time so everyone knew where they were, so you weren't wondering who's next.

Mr. GLENN. Thank you for coming, Committee Members and Senators.

It's an honor to be here presenting to you on this panel and I'm struck by the comments of the other panel members already. I think that you are hearing the right words from the right people and so I will not retrace the steps or the words of Edward or the Admiral or Laura. Instead, I'll kind of edit my comments on the fly, but you have a written version for you.

Senator BEGICH. Yes, we'll include all the written testimony in the record.

Mr. GLENN. Thank you. So as Edward mentioned, this is ground zero for climate change and if it's ground zero, the residents of our coastal communities in the Arctic are at the tip of the spear, to use another analogy. The traditional knowledge that he referenced is a storehouse of information that goes back over thousands of years and if you look at the change observed today against the backdrop of traditional knowledge, you bring a greater depth and understanding and so while others might like to point to our people as victims of climate change, I think we're adept as observers of this change and adjusting to it because in many ways our culture is built on change and there are many examples, from whaling camps perched on the ice to coastlines suffering from erosion in our villages where, if you're too complacent and you think the status quo will remain that way, it's just the wrong decision. So we adjust to change.

As you know, I'm the President or Vice President of Lands and Natural Resources for Arctic Slope Regional Corporation. I'm also

the President of the Board of Directors of a local nonprofit organization called the Barrow Arctic Science consortium and this consortium's mission is to put visiting researchers together with experts in our community and for the last 15 or 20 years the theme of most of the research has been global climate change.

As has been spoken already, the Arctic Ocean is changing and the changes have been described accurately but it begs some questions. There is less ice cover, less multiyear sea ice cover especially, but is the corresponding increase in seasonal sea ice good or bad for marine mammals and ice-dependent species? Is there a measurable change in the current systems in the Arctic Ocean, and what about this introduction of new species? What is coming in here, and how do we understand it better?

In the fall time season when the ice cover is at its most drastic retreat, there's more fetch. That means we're more prone to waves and wave-induced erosion, but in this new era of reduced ice cover, is it really stormier? I mean, are we suffering from increased wave erosion because it's stormier or not?

Fundamental questions like these remain unanswered and there's a place mat, I believe at your table, like there is at mine, that talks about a coastal observatory based in the Arctic, based at Barrow. I believe the Arctic Ocean is screaming for greater understanding and without understanding it, how can we understand the changes?

If, instead, you observe something for the first time, what might appear to be a change could instead be something that was yet undiscovered. So this cable marine observatory will give us greater understanding of the Arctic Ocean system.

This is not a brand-new idea. This kind of observatory exists in the Monterrey Bay Canyon and off the Oregon coastline near Astoria, but the Arctic Ocean system itself lacks such a tool.

We have cable ocean-observing systems installed by the United States, by Canada, by Russia, and others, but they're just mere data points and something like this cable coastal observatory would give you an integrated approach with many, many useful purposes. Our community, the industry, community members, our hunters, our whalers are all in support of this kind of observatory.

It can document the migration of marine species. It can answer fundamental questions related to ocean, chemistry, and currents. It can also observe and measure the effects of this increase in vessel traffic that has been referenced and the effects of seismic exploration, for example, on the ocean environment and on marine species.

Barrow has what has been called the best-characterized air column in the world, thanks to the NOAA facilities that are here, the Climate Modeling and Diagnostics Lab, which is the old name for these three or four buildings around the world that measures the trace gases in the atmosphere, and we're the first atmospheric evidence for increases in carbon dioxide and other greenhouse gases.

There's also a Department of Energy facility whose mission is to look at clouds and wind profiles and incoming solar radiation and discuss how that either warms or cools the environment.

We have a National Weather Service station here and if you turn your back to the ocean and look inland, you'll see hundreds of re-

search plots and data sites that are already wired. The Arctic is wired for research, everywhere but in the ocean, and so it's especially appropriate now in this time of change that we put increased monitoring on our ocean system.

My background is in natural sciences. I'm a geologist. My mother was born and raised here and so this pride that our people put in the knowledge of the natural environment and its changes is a great ad mixture for Western science style education and it's this crossroads of traditional knowledge and Western science that's so important here.

And if you look at the land for a moment, you look at a permafrost environment, you would see that our existence on the surface is only part of the equation. Right beneath our feet, there's a thousand feet of permafrost. If you go to Prudhoe Bay, there's 2,000 feet of permafrost, not because it's any colder there, it's because the ground over there is more like Styrofoam and the ground over here is more like aluminum foil. It's a thermal conductivity question.

But with such a thickness of permafrost, that's a time investment of cold temperature. You know that it's not going anywhere fast, but what is changing is that surface portion of the permafrost that melts and freezes every year and the permafrost itself is not an ironclad safe. It's a porous system. Inside the peat that lies in the active layer, the shallow permafrost and beneath the permafrost are hydrocarbons and all kinds of sources of carbon. Peat lands in bogs everywhere like this but it's especially more enriched here because the permafrost for a time traps whatever it's freezing and if you look just under the permafrost, you'll see these things called methane hydrates which, for the purposes of too long of a lecture, I'd love to talk about with you off record, but the pressure and temperature conditions under the permafrost and in the floor of our ocean are ripe for this ice crystal that traps methane. It is the premier hydrocarbon source but it also is a huge environmental issue.

It was the methane seeps and the oil seeps percolating up through this natural system that caused President Warren Harding in 1923 to draw basically a 150-mile circle around here and call it the Naval Petroleum Reserve Number 4 and it's now called the NPRA and was host to a lot of things, including oil and gas exploration and knowledge and research about the permafrost environment.

If you look just south of this town you'll see the Barrow Gas Fields and that is a place discovered by the Navy, shallow natural gas accumulations that may be the only gas fields in the world that are producing gas from potentially a methane hydrate source. So even though it was developed in the 1940s and producing through today, it may be part of this cutting edge of research related to methane hydrates.

There's change in the ocean, there's change on the land, but our communities are changing, too, and this is an unusual topic, I think, and it's not one that's talked about often, but we live in villages. Our culture is rooted in the rural communities, but villages are changing and villages in the Arctic are really gritty and hardscrabble places and that means that things that the rest of the world takes for granted come to us at immense cost, even things

like reliable power, sanitation, running water, clean and safe places to live. Those things come here only at great cost.

In our region we're dependent upon a clean and healthy environment for our culture and for our food. In addition, we're dependent upon a resource industry to provide these amenities that the rest of the world takes for granted at such great cost. It might seem that we are conflicted but I believe we, and like the rest of the world, should be, where appropriately, conflicted, and so we live in this balance, this balance of resource development and respect and use of our natural environment.

The Arctic is changing but some things stay the same and one of the things that stays the same is this image of the Arctic as an idyllic frontier that's far away, this pristine place where, if we could just put a jar over it, everything would be fine. We know it's not that way, especially those of us who live here, and if it's not that way, try to look at it from our side. The Arctic is a close place. The Arctic is our home and think of the lower latitudes as the distant and remote places because it's only a thousand miles from here to the North Pole and if you just go dot to dot along the communities, along the coast, through the Canadian Archipelago, we speak the same language, we have the same culture. The same issues affect us as affect our neighbors in the Canadian and Russian Arctic, as far away as Greenland.

In fact, we have friends, relatives, and family that continue in an unbroken stream all along there and have for thousands of years. So the image of this idyllic Arctic is a mixed blessing. Some scientists want to come here and research the frontier but the frontier is our home. We're thankful for the science that it brings but we are not comfortable with the stereotypes that exist related to the Arctic.

Finally, as committee members know, the Arctic policy is changing and here I would like to leave my final comment and a request. This is a field hearing in Barrow and we are one community and you're hearing great testimony from the right people and I applaud them and support their words, but there are many other villages in the Arctic.

As you know, Senator Begich, we have more than 200 Alaskan villages. I would say we probably have about a hundred, maybe 75 that you would classify as Arctic villages.

I would ask this committee and you Senators individually that when you consider changes in Arctic policy that you seek out input from all Arctic communities because, taken one at a time, we are just villages, local expertise and local knowledge, but taken together, we are the Arctic.

Thank you. Thank you for your time and thank you for your attention.

[The prepared statement of Mr. Glenn follows:]

PREPARED STATEMENT OF RICHARD GLENN, VICE PRESIDENT, ARCTIC SLOPE REGIONAL CORPORATION

Thank you to members of the Senate Committee on Commerce, Science, and Transportation for coming to Barrow, Alaska—the heart of Alaska's Arctic—to address this important theme. As you are aware, you are in the land of the Inupiat. Our villages in this region are home to Alaskan Native culture are storehouses of traditional knowledge; and they are on the "tip of the spear" when it comes to wit-

nessing our changing Arctic. Traditional Knowledge takes today's witnessed change and sets it against a backdrop of centuries of experience. The knowledge does not reside in books, but is passed generation to generation and resides in our people.

Our understanding of the Arctic is changing. Startling is it may seem to others, I feel that the Inupiat people are adept in this era of change because in many ways our culture is built up change and adaptation. There are many examples, from whaling camps perched on the sea ice, to villages on an eroding shoreline, where it never pays to predict that things will stay the same.

First, it is plain for us to see that the Arctic Ocean is changing. Freeze-up begins later and breakup begins earlier—measurably so. Hence, the ocean ice cover is relatively thinner than it was in years past. The reduced ocean ice cover means many things, and begs many questions. Here are just two:

- There is less multi-year sea ice, but is the corresponding increase in seasonal sea ice good or bad for ice-dependent species and other marine mammals? Is there a measurable change in the current systems of the Arctic Ocean or in the introduction of new species?
- There is more fetch for late fall season storm waves, but has it gotten stormier than in the times of greater ice cover?

I believe overall, that the Arctic Ocean system screams for greater understanding. Without understanding it how can we understand its changes? What may appear to be a "change" might instead be something that we are seeing for the first time.

A cabled marine observatory will give us greater understanding of the Arctic Ocean system. There are materials here which describe the cabled marine observatory concept. They exist elsewhere already (there is one near the Monterey Canyon and another near Astoria on the Oregon coast). The Arctic Ocean lacks such a tool and it can be immensely important in measuring fundamental parameters like sea chemistry and ocean currents and answering questions like those above. In addition, the observatory can document the migration of marine species, observe and measure the effects of increased vessel traffic, seismic exploration and other influences that mankind has on the Arctic Ocean environment.

Barrow has what is called the best characterized air column in the world. The NOAA GMCC lab is one of three in the world that are responsible for measuring the trace gases in our atmosphere. We have a newly renovated National Weather Service station. The U.S. Dept of Energy has established the Atmospheric Radiation Monitoring site here; it studies the effects of clouds, albedo, wind profiles on incoming solar radiation. Barrow is also host to hundred of research plots on the tundra extending inland in every direction up to a hundred miles studying everything from plant succession to carbon exchange. This part of the Arctic is wired for research. What is lacking is a similar infrastructure for studying the ocean.

My background is in the natural sciences, and I have made a personal focus of studying permafrost-related geology and sea ice processes. Combining traditional knowledge with academic study and what is called Western Science is an incredibly rewarding experience. Here where the permafrost is up to a thousand feet thick and where the ocean has a frozen cover for most of the year, we are in the heart of the U.S. Arctic. With permafrost a thousand feet thick (and up to two thousand feet thick at Prudhoe Bay), we understand that the bulk of it is not going anywhere fast. But the warming of the climate is changing that top few feet that freezes and thaws every year, and it may be affecting things at greater depth. Relationships between permafrost, carbon and carbon dioxide, methane, and the ocean seabed and tundra subsurface are important to us, and important to the world.

Like peatlands and bogs everywhere, the tundra landscape is rich with carbon. The tundra environment is especially enriched because the permafrost allows its contents to be trapped by being frozen. And within and underneath our permafrost (and on the bottom of the Arctic Ocean and oceans around the world) are trapped the ice-methane compounds called methane hydrates-which are the premier hydrocarbon sources, as well as other conventional hydrocarbons. Naturally-occurring methane and oil seeps were the reason President Warren Harding created the 23-million acre Naval Petroleum Reserve No. 4 here in 1923. The shallow natural gas fields of Barrow, discovered by the Navy in the 1940s are excellent windows into the study of permafrost and methane hydrates. Indeed we may be the only community in the world that relies upon natural gas that is recharged by a methane-hydrate source.

Change in the Arctic is not limited to the physical environment, of course. Our communities are changing. Alaska is home to more than two hundred villages. The term "village" keeps us at a loss when we push for quality of life improvements. When the outside world thinks of "villages" they do not think of real-world quality of life improvements. Villages in the Arctic have always been and will always be

gritty, hard scrabble places. As our villages grow, so does our need for real world improvements. Basic items taken for granted elsewhere such as running water, sanitation, reliable power, and access to the outside world are achieved here at great cost.

In our region, where our villages are dependent upon the land and ocean for food and the roots of our culture, we are also dependent upon the natural resource development industry that has given us our only economy. It has allowed us to build schools, health clinics, airports, and to install running water and safe sanitation systems. So it may seem that we are conflicted when it comes to issues like oil and gas development. But we feel we are appropriately conflicted.

The Arctic is changing. But some things stay the same. The idea of the Arctic as a frontier is indelible in Western culture. This is a mixed blessing. What needs to stay the same is the fascination and need for understanding of the Arctic system. The downside of the frontier mystique is that we are perceived as a far-away place. I find more value in keeping an "Arctic-centric" mindset and considering the low latitudes as the far-away places. The interest in our region mixed with our traditional knowledge has produced sustained, world-class research and a mutually beneficial relationship between visiting researchers and those who have been observing the Arctic and all of its changes for thousands of years. In many ways all of that began here. It continues here and it should be recognized and identified as a national priority.

Arctic Policy is changing—as it should. Here I would like to leave my final comment and request. Today's field hearing is in Barrow. We are one village. There are many other villages in the Arctic. I respectfully request that when this Committee, and you individually, consider changes to Arctic Policy, that you seek out input from all Arctic communities. Singularly, we are a village; together, we are the Arctic.

Senator BEGICH. Thank you, Richard. Let me go to Mary Pete now.

STATEMENT OF MARY C. PETE, COMMISSIONER, U.S. ARCTIC RESEARCH COMMISSION

Ms. PETE. My name is Mary Pete, and I thank us for being here.

Senator Begich, Senator Stabenow, and Members of the Senate Commerce Committee, and the City and Tribe of Barrow, thank you for the opportunity to testify on behalf of the U.S. Arctic Research Commission.

I was appointed by President Obama to the Commission in June of this year to represent indigenous perspectives and focus on anthropology, subsistence, and education. Additionally, I serve as the Director of the University of Alaska Fairbanks Kuskokwim Campus in Bethel, Alaska, and previously served as the Director of the Subsistence Division for the Alaska Department of Fish and Game overseeing research and advocating for the protection of subsistence hunting and fishing rights.

Again, thank you for this opportunity to share how climate change is affecting subsistence in the Arctic. Inner temperatures have warmed the Arctic at twice the rate of the rest of the world, causing exaggerated changes in thawing the permafrost and reducing sea ice, increasing weather variability, such as precipitation, storm surges, flooding, erosion, and increasing growing seasons.

The effects on subsistence are many. The northward range of flora and fauna, you've heard of, and introduction of non-native species, decreases in changes in traditional food sources, disappearance of permafrost food shelters as well as the disappearance of ice platforms during marine mammal hunting seasons and erosion threatening village land mass.

The cultural significance of subsistence to Alaska Native peoples cannot be overstated. It defines us. Any impacts to our subsistence

way of life is far-reaching and deep. Cultural impacts of separating Alaska Native peoples from our traditions, for example, by increased rural residents emigration to regional hubs and urban centers due to increasing energy costs and increased costs and effort to conduct subsistence activities affects transference of subsistence knowledge across generations, changes our diets, impacting our health.

I want to remind all of us of the Federal Government's fiduciary responsibility to provide for the health, safety, and cultural preservation of Alaska Natives and American Indians.

Research as a means of establishing a baseline to protect this trust responsibility and honoring self-determination of our tribes is something I want to emphasize.

It is important that Federal agencies incorporate traditional ecological knowledge in order to better understand baselines and how the Arctic is changing as well as to validate traditional ways of knowing. Methods for accomplishing this are to institute policies to encourage the adoption of traditional knowledge in managing decisions and to support co-management organizations.

Climate change is perhaps the most obvious and widely-acknowledged influence on the future of certain polar societies. Other factors play a more immediate role in the lives of Arctic residents in many areas. Globalization, economic and political transformations, change in cultural landscapes, often driven from afar but experienced from the North, all are requiring adaptations. This is a summary of my more extensive comments that you have on record.

Thank you for the opportunity to testify.

[The prepared statement of Ms. Pete follows:]

PREPARED STATEMENT OF MARY C. PETE, COMMISSIONER,
U.S. ARCTIC RESEARCH COMMISSION

Climate Change is Having Serious, Real-Time Impacts on Subsistence Resources and Subsistence Users

Senator Begich, Senator Stabenow, and distinguished guests, thank you for the opportunity to testify on behalf of the U.S. Arctic Research Commission.[1] At the recommendation of Senator Begich, I was appointed by President Obama to the Commission in June of this year to represent indigenous perspectives and to focus on anthropology, subsistence, and education. Additionally, I serve as the Director of the University of Alaska Fairbanks Kuskokwim Campus in Bethel, Alaska. I previously served as the Director of the Subsistence Division for the Alaska Department of Fish and Game, overseeing research and advocating for the protection of subsistence rights.

As a Commissioner and an Alaska Native subsistence user, I would like to share with you how we are experiencing climate change and how it is affecting our subsistence traditions. Climate change is happening now and collaborative research is needed to understand it and to investigate adaptation and mitigation strategies for Arctic subsistence communities.

In the past two decades, Arctic ambient temperatures have warmed at twice the rate of the rest of the globe.[2] Higher temperatures are becoming more common in autumn and winter, and daily temperature fluctuations have become more ex-

[1] Under the Arctic Research and Policy Act of 1984, the seven Commissioners of the USARC are appointed by the President and report to the President and the Congress on goals and priorities for the U.S. Arctic Research Program. That program is coordinated by the Interagency Arctic Research Policy Committee, (IARPC) chaired by National Science Foundation Acting Director Dr. Cora Marrett, who is also an ex-officio member of the Commission. See *www.arctic.gov* for Commission publications, including the 2009–2010 Goals and Objectives Report.

[2] *See* Parkinson, A.J. *et al.,* (2005), *Potential Impact of Climate Change on Infectious Disease in the Arctic*, 64 INT'L J. CIRCUMPOLAR HEALTH 478, 479.

treme.[3] Alaska is also experiencing exaggerated changes in ocean pH (acidity) levels, thawing permafrost, reductions in sea ice, changes in precipitation, storm surges, flooding, erosion, and increased weather variability.[4] As a result of these changes, indigenous peoples of the Arctic are seeing northward range expansion of flora and fauna, the introduction of non-native species, decreases and changes in traditional food sources, the disappearance of permafrost food storage shelters and ice platforms during marine mammal hunting seasons, and coastal erosion is occurring so quickly in many villages that homes and community infrastructure are quite literally falling into the sea.

Arctic people have a long history of adaptation. These changes in climate, however, are occurring much more quickly than ever experienced in the Arctic. The effects of climate change on subsistence resources are especially of consequence to Arctic indigenous people. To us, subsistence is much more than using traditional and natural materials for sustenance, tools, transportation, and clothing. Through subsistence, indigenous people are able to connect with the land and our place in it; we derive our identities from our homeland. To indigenous people of the Arctic, subsistence-based knowledge is the foundation of important cultural traditions.

Subsistence resources are affected by changes in the climate of the Arctic. Our subsistence resources, which form the backbone of our traditional cultural practices, are changing—the places and times where we have hunted and gathered for thousands of years are no longer the same. Additionally:

- Higher than usual temperatures are becoming more common, as are extreme weather events. Weather conditions that might be seen as negative in urban communities are often seen as favorable in subsistence communities. These include rains that make berries and vegetation grow, and blizzards and freezing temperatures that result in conditions that improve winter travel;
- Winter storm surges are eroding coastlines, washing out roads, and making travel difficult. A recent General Accountant Office report found that 90 percent of Alaska's 213 predominantly Native villages are regularly affected by floods or erosion. Communities are increasingly vulnerable as winter freeze up occurs later and later in the season. This lack of early autumn sea ice places many villages in great danger of storm impact in the absence of ice to control wave action. Storm impacts endanger human life, damage infrastructure and result in erosion;
- Hunting is dangerous or impossible on ice when early breakup and late freeze-up create poor ice conditions. Many traditional hunters have difficulty gaining access to land mammals (*e.g.,* caribou) because in sufficient snow prevented effective use of snow machines. Access is restricted to subsistence resources and there is increased risk and reduced efficiency to our hunting;
- Quality of animals is changing—for example, because ice seals have thinner blubber, it takes more of them to produce the amount of oil we need to get through the winter—or we just do without;
- Lack of haul out ice platforms for seals and walruses is causing problems for the species and is reducing hunter access;
- The composition, distribution, and density of subsistence species are changing. These changes directly affect the subsistence species available for harvest;
- Thawing of permafrost results in habitat changes, sinking buildings and melting ice cellars, making long-term storage of traditional foods more difficult. It also preconditions the land for greater impacts from secondary storm surges, as described above;
- Fisheries are changing with changes in ocean circulation, currents, water temperatures, ice coverage and nutrient availability. Decreases and changes in anadromous fish stocks directly affect the economic and dietary well being of subsistence users; and
- Changes and interruptions are occurring in the passing of traditional ecological knowledge (TEK).

Health and cultural activities of Alaskan Native peoples will be harmed by a decline in subsistence practices. Subsistence diets are rich in fish and marine and land

[3] Huntington and Fox (2005), Arctic Climate Impact Assessment,—Scientific Report. Cambridge University Press, New York.

[4] Warren, J. *et al.,* (2005). *Climate Change and Human Health: Infrastructure Impacts to Small Remote Communities in the North,* 64 INT'L J. CIRCUMPOLAR HEALTH 487.); Parkinson, A.J., (2008). The International Polar Year, 2007–2008, An Opportunity to Focus on Infectious Diseases in Arctic Regions, 14 EMERG. INFECT. DISEASES 1, 2.

mammals and offer numerous health, social, cultural, and economic benefits. Proven health benefits include protection from cardiovascular disease and diabetes and improved maternal nutrition and neonatal and infant brain development. With the cost of a pound of ground beef upwards of $10, and little or no available fresh produce in many villages, there are also serious economic and health implications related to a decline in subsistence practices that may result from climate change.

Emigration is a serious problem in many villages. This is a phenomenon that needs further study, but is likely to be exacerbated by a decline in subsistence success caused by climate change. As subsistence opportunities decline, it may become cost prohibitive to stay in the village, encouraging residents to relocate to hub villages and Anchorage. Angayuqaq Oscar Kawagley has written that many social ills of rural Alaska can be attributed to the disenfranchisement of Alaska Natives with our cultural traditions. Subsistence is a key component of our cultural traditions. Separation of Alaska Natives from our cultural traditions may lead to feelings of decreased self-worth and foster substance abuse, violence, and suicide. It is important to protect subsistence cultural traditions.

To understand the dynamics of climate change and subsistence harvest and use, there needs to be greater emphasis and coordination of research among the agencies. The need for research is two-fold. First, to understand traditional ways of knowing and action, agencies must collaborate with indigenous Arctic populations—to establish a baseline of understanding of topics such as where berries grow, when and where ice develops, and the thickness of seal blubber and caribou skins. I note that there is a wealth of this type of information at the Division of Subsistence, Alaska Department of Fish and Game. The division is charged with providing information to ensure that the state implements the subsistence priority law. To understand how subsistence resources are changing while providing for validation of indigenous knowledge, agencies should conduct research in collaboration with tribal groups. Only after we understand how subsistence resources are changing can the most effective policies be developed for protecting subsistence traditions.

Policy measures need to be developed to help build resilience. Co-management groups need to be supported and strengthened so they can play a strong role in relaying local concerns and potential solutions. In the past, these groups have played an important role, but as climate continues to change and litigation continues in regard to subsistence resources and climate change, co-management groups should play an elevated role, they should conduct additional research, and funding should be reprioritized in order to fulfill these tasks. Currently, the Senate version of the Commerce, Justice, Science and Related Agencies Appropriations Bill includes funding for seal and Steller sea lion research, Alaska Native marine mammal co-management, Bering Sea crab management and research, and ocean acidification research. These requests are included as part of the C-J-S bill at the request of Senators Begich and Murkowski.

In conclusion, the Federal Government has acknowledged that it has trust responsibilities to American Indian and Alaska Native people that include providing for health, safety and cultural preservation. Climate change endangers this trust responsibility because it may harm subsistence resources, and result in health declines in subsistence users, foster social ills, and inhibit cultural preservation efforts. Congress should look for ways to encourage greater collaboration among the agencies, scientists and tribes to evaluate climate change and its effect on subsistence and to develop consensuses on mitigation strategies. Additionally, policies should ensure that traditional ecological knowledge is used in developing resource management decisions.

Senator BEGICH. Thank you very much. Marilyn, thank you very much, Marilyn Crockett, for being here.

STATEMENT OF MARILYN CROCKETT, EXECUTIVE DIRECTOR, ALASKA OIL AND GAS ASSOCIATION

Ms. CROCKETT. Thank you. Thank you. First, I will start by mirroring the other welcomes that you've heard today. It's so important that we have Senators from Congress come and see this firsthand.

Senator Begich, thanks very much for sponsoring this field hearing. We very much appreciate it.

Senator BEGICH. Thank you.

Ms. CROCKETT. The energy development in Alaska, as I'm sure you know, has played a major role not only for North Slope residents but the State of Alaska and the Nation, as well.

At peak, production from the State of Alaska accounted for 20 percent of the Nation's energy supply. Today, it's down to about 12 percent but still that's a very significant factor obviously when we look at import rates at 60 percent. So energy development in Alaska plays a very key role.

As has been stated by others, and the Senator recognizes this very well, Alaska has produced over 16 billion barrels of oil to date, but that, while it feels like a major achievement and it is a major achievement, in fact that number is somewhat dwarfed when you look at the potential that still remains.

As Admiral Colvin pointed out, one-third of the Nation's energy resources offshore are offshore the State of Alaska. So the state can play a very, very critical role in the Nation's energy supply.

You've heard a recurring theme today and it almost sounds like we coordinated our messaging but in fact that did not happen with regard to research. Can't emphasize enough and you've heard it several times, the importance of evaluating the research that has been conducted already, identifying the data gaps that are out there and prioritizing the limited resources that all of us have and focusing on those.

Since the 1970s, the industry has privately funded hundreds of millions of dollars in research studies back in the 1970s focused on engineering studies, wave, wind and oceanography matters in sea ice.

Fast forward to today and more than a $150 million has been invested just in recent times on new environmental and wildlife-related studies over the past several years and that doesn't include the money that's spent on a day-to-day basis on ongoing monitoring and research in conjunction with existing fields, and we all know that the former MMS, now BOEMRE, has spent over $350 million on this research.

These are very, very important, but there still remains some work to do and one of the things that I wanted to specifically mention is the work that the USGS is doing. Last spring, late last spring, USGS was tasked with undertaking a comprehensive independent evaluation of science needs to understand the resilience of Arctic coastal and marine ecosystems to OCS resource extraction activities.

This evaluation is limited to the Beaufort Sea, so we'll have a good snapshot of what's happening for us up here. USGS will summarize key existing information, develop a process and identify where knowledge gaps exist, and provide guidance as to what research is needed, and we think that this report is scheduled to come out in the Spring of 2011.

We believe it will be an important tool and that it will demonstrate the depth and breadth of the research conducted to date.

Additionally, we also understand that it will address opportunities for and obstacles facing collaboration on current and future research, as well as the importance of maintaining what I call a centralized home for the science.

Research continues around the world and in the Arctic and is commissioned and carried out by a very large number of entities, but our ability to assimilate that work has been constrained. Doing so will enable all of us to build upon previous results, avoid duplication, and prioritize future work.

Finally, it's important to realize that or to observe that the research that I've been talking about is really related to oil and gas but much of it will carry over and will be extremely useful in evaluating the impacts from climate change, evaluating how the ocean is looking these days, and it also will set the stage for making decisions on what may be happening in terms of future activity, as the Admiral mentioned, with regard to shipping and tourism, fisheries, and so on.

I'd like to shift just briefly to giving the agencies the tools. That's what I sort of label this next topic. One of the greatest challenges facing agencies charged with managing the Arctic and its species is that of limited resources. Laws are enacted by Congress and are assigned to agencies to carry out, but, unfortunately, the resources to do so are frequently inadequate.

By way of example, we've watched this unfold here in Alaska related to the Cook Inlet Beluga Whale, an issue that the Senator is very, very familiar with. National Marine Fisheries Service is charged with managing this whale but it did not have the resources it needed to conduct thorough monitoring or population counts early in the beginning of the population decline to react. Only when the population was listed as depleted and, unfortunately, subsequently endangered under the ESA did additional funding get appropriated to NMFS.

This limitation on resources also affects the agency's ability to timely issue permits. For example, NMFS is responsible for issuing incidental harassment authorizations or IHAs required for any activity, including any scientific activity, that has the potential to interact with species that they manage.

These IHAs are important to the protection of the species because they contain the stipulations and mitigation necessary to conduct that activity, in other words, to protect the species. It's therefore somewhat ironic that they don't have the resources necessary to timely issue these permits, even taking into account the long lead times for applications.

And then, finally, another factor affecting the agencies are the number of petitions for listing those species under the Endangered Species Act and the subsequent filing of lawsuits that follows.

These already limited resources of agency personnel are continually drawn away from their rightful management of the species to deal with these legal challenges and I know that's not directly the subject of today's hearing but it's increasingly clear that the ESA is being wrongfully utilized as a tool to stop any kind of development or activity and today nowhere is this more true than in Alaska.

Finally, I can't conclude my comments without giving a nod to Senator Begich and recognizing that the Alaska Oil and Gas Association has advocated for OCS revenue-sharing for Alaska's coastal communities and we will continue to do so until enacted.

While it's true that the coastal communities will benefit from OCS development in terms of jobs and property taxes, these coastal areas are unique when compared to coastal areas of the Lower 48 and that they do not have the same level of infrastructure to accommodate increased demands on local services.

So again, we commend Senator Begich for his efforts and those of his colleagues and we're looking forward to having this matter moved along.

And with that I'll conclude my comments. Thank you.

[The prepared statement of Ms. Crockett follows:]

PREPARED STATEMENT OF MARILYN CROCKETT, EXECUTIVE DIRECTOR, ALASKA OIL AND GAS ASSOCIATION

Good morning. My name is Marilyn Crockett and I am the Executive Director of the Alaska Oil and Gas Association (AOGA). AOGA is a private, nonprofit trade association whose member companies account for the majority of oil and gas exploration, production, transportation, refining and marketing activities in the State of Alaska.

We want to first thank Senator Begich for holding this field hearing in Alaska and to Senator Stabenow for taking the time to travel to Alaska's north slope and to Barrow. Your efforts not only provide you an opportunity to see the Arctic firsthand but also provide an important and infrequent opportunity for north slope residents and public officials to share with you their experiences and vision and offer recommendations for initiatives which your committee may undertake.

For more than 30 years, energy development across Alaska's north slope has played an important role not only to north slope residents, but to everyone in the State of Alaska, as well as the entire Nation. At peak production, north slope oil accounted for more than 20 percent of the Nation's domestic energy supply. Today, even at the reduced rate of just over 12 percent, there can be no question that production from Alaska is a critical component of the Nation's energy supply, especially in the face of foreign imports which exceed 60 percent.

And the prospects for expanding the role Alaska can play in the future are tremendous. While Alaska has produced over 16 billion barrels of oil over the last 30 years, that achievement feels somewhat dwarfed by estimates of what remains: 30 billion barrels of oil and 220 trillion cubic feet of natural gas. To put this into another perspective, for the OCS alone, Alaska is estimated to contain one third of the Nation's offshore energy resources.

Development of these resources is not without its challenges, however. It is our sense that this is one of the fundamental reasons for this field hearing: identifying those challenges, establishing initiatives to address those challenges, and removing obstacles which stand in the way while protecting the environment and preserving the cultural way of life for local residents and communities. It's our belief that that objective can be achieved.

The Importance of Research

There is no disputing the fact that sound science is the key to addressing factors related to climate change, resource development, and protection of the environment, wildlife and habitat. Research funded by the industry in Alaska's arctic offshore has been underway since the 1970s, with a focus at that time on wind, wave, oceanographic and sea ice dynamics, along with engineering studies aimed at technology development to operate in the arctic. Fast forward to today: more than $150 million has been invested by industry in new environmental and wildlife-related studies over the past several years (not including ongoing research conducted onshore in conjunction with new developments and operations at existing fields), and the former MMS (now BOEMRE) has spent over $350 million.

This research and scientific studies are ongoing today and will continue into the future. But to be most effective, it's important that agencies, industry and scientists evaluate what's been done, identify what still needs to be done, and prioritize and fund that work. Progress in this regard is being made.

Pursuant to a directive from the Secretary of the U.S. Department of Interior, the U.S. Geological Survey (USGS) is undertaking a comprehensive, independent evaluation of science needs to understand the resilience of arctic coastal and marine ecosystems to OCS resource extraction activities. This evaluation is limited to the Chukchi and Beaufort Seas. USGS will summarize key existing information; develop

a process and identify where knowledge gaps exist; and provide guidance as to what research is needed. Their report will be issued in the Spring of 2011. We believe this report will be an important tool and that it will demonstrate the depth and breadth of the research conducted to date.

Additionally, we understand it also will address opportunities for (and obstacles facing) collaboration on current and future research, as well as the importance of maintaining a centralized "home" for this science. Research continues around the world and in the arctic and is commissioned and carried out by a large number of differing entities, but our ability to assimilate that work has been constrained. Doing so would enable all of us to build upon previous results, avoid duplication and prioritize future work.

Finally, it's important to observe that, while the genesis of this research is related to oil and gas, much of it will contribute greatly to evaluation of the other potential activities or changes we may see in the future in the arctic oceans (such as increased shipping and tourism, fisheries, etc.), as well as increasing our knowledge-base on wildlife critical to subsistence activities. As such, the Federal Government has a responsibility to financially invest in these research initiatives.

Give Agencies the Tools

One of the greatest challenges facing agencies charged with managing the arctic and its species is that of limited resources. Laws enacted by Congress are assigned to agencies to carry out, but unfortunately, the resources to do so are frequently inadequate. By way of example, we watched this unfold here in Alaska related to the Cook Inlet beluga whale. The National Marine Fisheries Service, charged with managing this whale, did not have the resources it needed to conduct thorough monitoring or population counts early enough in the beginning of the population decline to react. Only when the population was first listed as depleted, and subsequently endangered under the Endangered Species Act, did additional funding get appropriated to NMFS.

The limitation on resources also affects the agency's ability to timely issue permits. For example, NMFS is responsible for issuance of Incidental Harassment Authorizations (IHAs) required for any activity (not just oil and gas development) which has the potential to interact with the species that they manage. These IHAs are important to the protection of the species in that they contain the stipulations and mitigation measures necessary to conduct the activity (*i.e.,* protect the species). It is therefore somewhat ironic that they don't have the resources needed to issue these in a timely manner . . . even taking into account the long lead-times for applications.

Finally, another factor affecting these agencies is the plethora of petitions requesting listing of species under the ESA, and the subsequent filing of lawsuits that follow. The already-limited resources of agency personnel are continually drawn away from their rightful management of the species to deal with these legal challenges. Although not directly the subject of today's hearing, it is increasingly clear that the ESA is being wrongfully utilized as a tool to stop any kind of development or activity . . . and today nowhere is this more true than in Alaska.

Enact OCS Revenue Sharing for Alaska

The Alaska Oil and Gas Association has consistently advocated for OCS revenue sharing for Alaska's coastal communities, and we will continue to do so until enacted. While it is true that coastal communities will benefit from OCS development in terms of jobs and property taxes, these coastal areas are unique when compared to coastal areas of the lower 48 states in that they do not have the same level of infrastructure to accommodate increased demands on local services. We commend Senator Begich for his efforts, and those of his colleagues, on this important matter.

This concludes my comments. Thank you for inviting me to participate in this field hearing.

Senator BEGICH. Thank you, Marilyn. Let me—I have a few questions. Then I know Senator Stabenow will probably have some questions. So I'll start with a couple.

First, again, thank you all for testifying. Those that have written testimony they would like to submit to the record, I know some have already done that, we will accept that and have that as part of the official record. So please do that so that your words are part of the record we take back to Washington, D.C.

Let me first, maybe directly to you, Mayor, if I could, and give me a sense of how the community in the North Slope feels about offshore oil and gas development and their role or their connection to it. In other words, do they feel they're being heard? Do they think Federal agencies are part of the equation enough with them? Give me kind of the sense of—I know we've had some brief conversations, but I am curious as to how you see the community interacting with the Federal agencies and are they being heard enough, and is there a good process?

Mr. ITTA. Thank you, Senator. As you know, most of the——

Senator BEGICH. Is your microphone on there? Sorry about that.

Mr. ITTA. I'm sorry. Is that better?

Senator BEGICH. Better.

Mr. ITTA. As you know, most of our people historically have been opposed to OCS development for a number of reasons, not the least of which is that it negatively affects on our traditional whaling and I must note at this time that we feel that there's a lot of onshore development to be done yet and that that should be pursued before we start drilling in the water since we know that the risks are not nearly as great.

To answer your question, the people, in terms of people's experience with Federal agencies, I'd have to say it has been mixed. I'm a hunter and a whaler and have been a member of the Barrow Whaling Captains Association that have participated actively for 40 years in the MMS hearings. That's how long we've been dealing with them here and I understand now they're the Bureau of Ocean, Energy, Management something something.

Senator BEGICH. The guys that watch the water.

Mr. ITTA. But it has been mixed. The long and short of it is that the North Slope Borough and the whalers have been frustrated, very frustrated in terms of responses and I'm going to refer to the agency as MMS, that MMS has been less than responsive to local suggestions and comments, and they've always encouraged us to show up at one hearing after another, but they very rarely ever incorporate any of our comments or concerns into their regulatory framework.

So it's no wonder that lately there is less and less participation because the citizens say what's the use? It doesn't matter. They're just meeting their required you got to have a meeting here with the public type thing. That's the attitude that's prevailed. Now that's unfortunate, but this is a new day and we're hopeful.

I'd like to get a little specific on that and that one example we had suggested to MMS, which seemed perfectly reasonable to us, is that they limit the number of exploratory or operations offshore. Nobody has ever determined that five projects are OK or is it 10 or is it 50 or is it 100 and what we know as users of the ocean up here is what we call cumulative impacts. The permitting system takes each one by itself but never looks at the thing as a whole and that's something that would give real assurance, I think, to our people that there's a meaningful cap, if you will, that lessens the intensity of the activity and we've had assurances by industry that only a certain number of ships and assets can be up here because there are a limited number of Arctic-capable assets, if you will.

If that's the case, it makes perfect sense to put a number and make it into a part of the law and I know that certainly I would think that that would give our people a level of comfort and it's just a common sense measure to us that we've been bucking the wind on this issue like it's something.

So thank you, Senator.

Senator BEGICH. Let me ask you with Marilyn here and both of you, I know, tell me kind of the relationship that the North Slope, the Arctic Slope, the communities have with the oil ventures that have been here now for many decades and, you know, from obviously someone born and raised in the state, I see it as a unique—I think Richard kind of carefully described it as a balance between recognizing the change that's occurring, the needs of the community and how to balance that for both the resource development and the unique lifestyle here.

How would you describe the relationship with the industry from, you know, your personal or your view from the community?

Mr. ITTA. If I may say so,——

Senator BEGICH. And then I'm going to jump to Marilyn to give a——

Mr. ITTA.—I'll just say I think that we've had a great relationship with the oil and gas and also with the regional corporation in regards to resource development and management of those things. So, of course, we have differences but that's OK.

But since Prudhoe Bay almost 40 years ago, we've had a great working relationship with industry and the Oil and Gas Association and we hope to continue to do so.

Senator BEGICH. Marilyn, do you have some——

Ms. CROCKETT. Thank you. I would have to agree. There's a natural tension, as there should be, because we each have our respective interests but there's a natural tension between the industry and any form of government but particularly the form of government that is responsible for the lands on which we're operating or nearby.

But having said that, I know from personal experience that the companies go to great lengths to visit with the villages, sometimes at a fault, because I think they feel like there's a revolving door of newcomers showing up for yet another town hall meeting and we're sensitive to that, so we've been trying to weigh that.

But I would say that the relationship between the trade association and the borough, in particular, while we've had our differences of agreement, as the Mayor just pointed out, we still have had a very open door in terms of being able to air those differences and trying to reach some common ground.

Senator BEGICH. Very good. I have two other quick questions I'm going to do and then I'm going to hold. I know we're a little over time but I'm going to ask—Debbie has questions and then I'm going to probably pop back for one more round.

But let me ask, if I can, Marilyn, in regards to the *Deepwater Horizon*. You know, when I'm back in Washington, I spend a lot of time trying to explain the difference to Arctic exploration, oil and gas activity in the Arctic versus what goes on down in the Gulf of Mexico, and I've had to explain—you know, I became, you know, in a lot of ways like Richard was, like Mr. Science here.

I was really—I could tell you were about to give us a good long explanation which was good. So I've become like mini Mr. Science in the Senate trying to explain the differences.

Could you, in a very short way, kind of just—you know, when people hear the *Deepwater Horizon,* they think, you know, we're drilling 5,000 feet before we even—you know, we're going down 5,000 feet before we touch the ocean floor which is not the case.

Ms. CROCKETT. Yes.

Senator BEGICH. Can you——

Ms. CROCKETT. Absolutely. The Arctic offshore environment is very, very different, as the Senator just pointed out, than Gulf of Mexico.

Water depths in the Chukchi Sea, for example—well, first of all, the leases that are being looked at today to be drilled are about 80 to 100 miles offshore. The closest lease is 60 miles from shore, the farthest lease is about a 150 miles offshore. So, Number 1, it's not quite as far from shore.

Number 2, water depths are substantially different. We're looking at an area that's about a 150 feet deep as opposed to 5,000 feet deep. So from that perspective alone, it's a much—it's probably inaccurate from a scientist point of view. It's a much less dynamic environment because the water depths are shallower.

Third, the reservoir pressures are much, much different. Reservoir pressures in the Chukchi Sea and the Beaufort Sea, for the most part, excluding some onshore areas, are much, much less. So the ability to, Number 1, contain a blowout, should it occur, is, to use a layman's sort of point of view, it's probably the difference between, let's say, a firecracker and an M–80 that's going off, just to sort of put it in perspective.

So those are really, in a nutshell, to be very brief in answering your question, those are the——

Senator BEGICH. Sure.

Ms. CROCKETT.—biggest differences in terms of the operating environment.

The other difference that I'll point out is that in Alaska, we have a very limited number of players, companies that are operating here. The Chukchi Sea, for example, even though it was a $2.7 billion lease sale, has roughly six leaseholders. A $2.7 billion lease sale in the Gulf of Mexico would generate 2 or 300 lease holders. So smaller, a fewer number of players, much, much, much less activity occurring, and an operating environment that's much different.

Senator BEGICH. Very good. Thank you. Into that, I want to go, Admiral. During the Commerce Committee, I had an idea, an amendment, and we weren't able to move it forward in the Shore Act which is a piece of legislation that Senator Rockefeller, the Chair, has put together as well as we've been able to put a lot of our Arctic and Alaska kind of components into.

But one of the pieces I wanted to add in there but we were unable to, because I think when you say it and I'm about to say it, it gets people nervous and that is, and you've kind of said it in your testimony, and that is, in order for us to understand oil spill technology and how to maximize it and improve it, we actually have to have controlled spills in order to do that which means we have

to do that on the water which means we violate the Clean Water Act in order to understand what we're preparing ourselves for because the only time we do this research and that degree of research is when something bad happens, like in the case of *Exxon Valdez*. So that's when we're suddenly trying to move along and understand this new technology.

Can you give me—I mean, I'm a believer in this, that, you know, this is—understanding this technology, if you don't have a controlled environment and that is one of the big issues that comes up, was how do you deal with the Arctic environment. Well, the best way to do that is you've got to sample it a little bit and understand it and that means you have to not just model it on a computer but you actually have to touch the water at some point.

Can you give me some thoughts from the Coast Guard on that? Every time I mention that,——

Admiral COLVIN. Senator,——

Senator BEGICH.—I will tell you that just as soon as I mention it, people like go crazy because they think it's—you know, we're going to go out there and pollute the water. Well, we've got to figure this out.

Admiral COLVIN.—you know, Senator, I think small amounts of water in a controlled type of, very controlled type of environment that's actually in the Arctic would be very beneficial for us from a response perspective, oil response perspective.

The challenge we have right now is a lack of data. The Coast Guard will be responsible to oversee an oil spill that may happen. The responsible party, of course, is the party tasked to actually clean it up, along with the Federal cooperation and state cooperation.

Sir, the data that we have to rely on right now is essentially from Norway and——

Senator BEGICH. Because they've done this kind of research?

Admiral COLVIN.—they've done it, yes, sir, and getting the data from Norway is completely subjective to them allowing us to see it and they've been a great partner and they have allowed us to have access to their information.

But I think it's important to realize that the climate in Norway is significantly different. When you're up at Latitude 80 up there, you can still fish and they have a thriving commercial fishing industry. Latitude 80 here is frozen. It's a different world over here.

So, you know, you look at the results and you say, OK, you know, it's instructive, but I sure wish we could do a little bit in an isolated area, particularly in broken ice, maybe in the spring, that type of thing, to find out what works and what doesn't work, and I just don't know any other good way to do it, sir.

Senator BEGICH. Thank you. My last question. Laura, as you do the Arctic Visioning Strategy, I want to kind of go back to Mayor Itta's original—my original question to Mayor Itta.

How are you engaging and actually, Richard, you brought it up, too, the connectivity to the multiple villages, not just being here in Barrow but how is your agency engaging not in what has been described by Mayor Itta, the MMS, I call it check the box and move on routine, but really hearing their thoughts on how you develop that Arctic Visioning Strategy rather than, no disrespect to all pro-

fessors and all Ph.D.s and all the people back in D.C. just drawing up stuff, but how do you engage with folks like, as Richard said or Mayor Itta or Mary Pete, how do you—what is the strategy there?

Ms. FURGIONE. Thank you, Senator, for your question. When I moved back to D.C., the first thing they told me was to make sure not to drink the kool-aid and to stay connected with the local communities. So you understand that concept, as well.

We have a number of ways to maintain our connectiveness to the local communities. As Mr. Glenn had said that we do have a weather service office right here in Barrow and other NOAA entities.

We also have partnerships with the University of Alaska, Fairbanks. Hio Iken is participating in a research project to make sure that they are looking at this traditional ecological knowledge, to incorporate that into our forecasts, and we even have products now for the first time that try to incorporate that information into our services and products so they can better understand how the sea ice may impact the whalers and the whaler centers.

Two other points is that we do have Amy Holman here with me today. She's our NOAA Alaska Region Coordinator, so she makes sure to facilitate across all of the NOAA line offices and also to our stakeholders and partners.

We also just have a new Regional Climate Service Director James Partain was just selected this week, as well. So we can have a focus on the climate change right here in the state with connections then to NOAA's intent to create the NOAA Climate Service.

Senator BEGICH. Very good. Let me end there. Senator Stabenow. Could you introduce and have Amy stand up, so people—only because I want her to be seen by all those that have input. OK. Thanks, Amy. Thank you.

OK. Senator Stabenow.

Senator STABENOW. Well, thank you, Senator Begich. Thank you to each of you. I'm learning a lot and have many questions. I won't ask all of them.

But, Mayor, let me just go back to you, and I know it's very clear to me that, on the one hand, the oil and gas industry has been a huge blessing in terms of the economy and jobs and the resources certainly for our country, the resources that we know are there that haven't been explored yet.

On the same token, the challenges, the concerns, the risks, obviously certainly in a broad sense, both the benefits from this great natural resource, but the carbon pollution that comes from that is, on the other hand, creating the warming. So they are great challenges, I think, and tensions that you can see trying to work through all of that and I'm really learning more about that.

But I know you have concerns. You've mentioned concerns about offshore drilling which we certainly all appreciate. I mean, I appreciate that coming from the debate even in our own Great Lakes about that, what has happened in the Gulf and so on.

Talk about onshore oil exploration for a moment because this has been a very big part of your economy and jobs, and if the onshore resources are no longer there, if it's moved offshore, what does this

mean to the borough in terms of your economy and private sector jobs?

Mr. ITTA. Thank you, Senator, and I'm glad you asked that question.

As Mayor of the North Slope Borough, that is one of the lessons that I've learned on my job, that one of the unique responsibilities of being Mayor of a borough is to maintain not only the present economic well-being of the region, but the future economic well-being of the region.

I want to refer to three items that are ongoing. One is in ANWR and that is in the 10.02 area on the efforts to redesignate and virtually shut down any opportunity for oil exploration within the coastal plain.

The second one was denial of the permit for what we call CD–5 that you would look over as we go toward Prudhoe Bay Alpine today, was the denial of that permit to get a pipeline crossing across the Colville River which we look at as the gateway to further oil and gas development within the National Petroleum Reserve Alaska, NPRA, that you flew over.

Third was the current shutdown of any opportunities on offshore, albeit temporary and with very good reason because of the Gulf of Mexico incident, but what has happened is that, in essence, in two generations up here since the discovery of oil in Prudhoe Bay, we have gone from a subsistence-based economy to a cash economy where we are now dependent on oil and gas and mainly now oil and gas for the bulk of our revenues to provide for the life safety and essential infrastructure of our vast region up here. And we cannot go back and that is why I continue to advocate for at least the eight policy positions to be addressed in the hopes that the concerns will be mitigated up here, and if offshore has to happen, which is what the Federal Government, the past President and the current President, and industry seem to be doing, rather than just say no for no's sake, I've been advocating a position that strikes a balance, if you will, to use Secretary Salazar's statement, that I think that's enough said.

But we recognize the importance of oil and gas for the economic well-being of our region because, as my colleague Richard stated, things are different up here. It's very unique. Things are so expensive. There's no roads. We maintain largely our airports, roads, schools, health clinics. Virtually every service is provided for by the North Slope Borough with revenue largely from Prudhoe Bay.

Thank you.

Senator STABENOW. Just a little bit more on jobs because at first glance, the very high-tech world of oil and gas exploration seems very different from the ancient traditions of bowhead whaling and skin boats, and I'm wondering, and this would be for Mr. Glenn, as well, if you wanted to respond, how the oil and gas companies have worked with your community, with the Native American communities, the village corporations, to make sure that there were local jobs and local hires.

Is this an area where there needs to be more done? Is this an area that has worked well?

Mr. ITTA. Senator, if you would, I would defer to my colleague——

Senator STABENOW. Mr. Glenn?

Mr. ITTA.—Richard Glenn on that, but, all in all, I think they have done everything that was possible and with that, I'll give it to Richard.

Mr. GLENN. So we've developed local training for local jobs in our region in the hopes that our children, grandchildren will be able to find a sense of worth, well-being, economic opportunity and benefits and insurance packages and retirements and everything that goes with a career, not just a job, and that has been the vision of this Mayor, previous mayors that I have worked with, and of our regional corporation, the leadership that still exists in our regional corporation today and those who founded it.

But we haven't done that well and I think that there's room for improvement on both sides. If you take the time to look back a little bit when oil exploration was the only activity in our area, with the exception of isolated villages with almost no infrastructure, people left home to go to work because they had to feed their family and that would keep them away from home for half years at a time.

Edward's part of this effort. I'm talking about the exploration and discovery of Prudhoe Bay and the big fields that came right after it, late 1960s to late 1970s, and at the same time our borough was born and the borough was born to improve the quality of life for our people.

So there was a bloom of construction opportunities here at home, as well, and then so one generation of folks had to leave home to feed their families. The next generation of folks maybe were able to chase opportunities in their local village.

So now where are we? The borough revenues had hit a peak in the, I would say, mid-1980s and have been on a slow decline ever since then. There's less and less of a local economic engine. If you're relying only on government service jobs, I think that this has been a mixed blessing for our people. There has been a generation of young folks that have grown up maybe not having the necessity to leave their home to work in this image we have of people who are getting healthy jobs in industry, but it's happening. It's happening and industry deserves credit for training programs. We deserve credit for training programs and it's growing.

What people need is someone to make trail in front of them. A young person will see a role model that has done something and he'll follow and it kind of introduces a wave or a pyramid of people behind them and where we're traveling today with you, I hope Inupiat should be the postcard example of jobs in industry because this is walk-to-work distance almost. It's 8 miles or 10 miles.

Senator BEGICH. In D.C., we would say that would be impossible to have done. But eight miles is like eight blocks in comparison.

Mr. GLENN. Right.

Senator BEGICH. If you want to give a comparison.

Mr. GLENN. If you look out your living room window from Inupiat, where we were just visiting with representatives from the Department of Interior, you can see the drill rigs. You can see the flares, the safety flares from the production operations at night and so it must really rub people the wrong way if that's there and they are somehow either unable or not participating in full-time satis-

factory employment, and I don't think that the answer is because there's this cultural difference between pure subsistence lifestyle and the modern tools of industry because we've had this question before.

If you go to even our smallest village, there's a power plant running. There's a water-sewer plant running. There are the physical plants of a village and if you open the door in there 24 hours a day, three shifts around the clock, 7 days a week, chances are there's an Inupiat person there working the shift. His duty is to the shift, his duty is to keep the lights on. It happens here at the local gas fields, too, because I was there, and so when the power goes out, they wake up worried. What did I do wrong? Is my partner not monitoring his station?

And so these people have not sacrificed their culture for their duty to their community, in the same way I know our people did not sacrifice their culture for gainful satisfactory rewarding jobs in the oil patch.

The problem is making it happen and making it. In some examples, some of our role models were champions fighting industry and it's hard for the next generation to look back to the same thing that my uncle or my grandfather was fighting and now say I want to be a part of you. So we got our own issues to take care of, but it's happening and any help there would be encouraged.

Your earlier question was also important. If oil production, exploration production comes to the ocean, I think the borough still stands to benefit because, from everything I've heard, the oil has to come ashore. When it comes ashore, it has a landfall. There will be facilities there. There will be pipelines transmitting it to, hopefully to a tap system. That would be something that rivals the Great Wall of China in this part of the world because it would be a huge new piece of infrastructure, tax opportunities, and might open the door to new safe onshore exploration opportunities that are currently being held fallow because there's no infrastructure nearby.

So even offshore development holds benefits to our borough, to our village residents for employment and tax base.

Senator STABENOW. Thank you. Just a couple questions related to the offshore drilling because with what happened with deep water horizons is just very—you know, it's very present for all of us who have gone through months now of briefings and looking at what's happening and working with our colleagues in the Gulf and so on.

And, Ms. Crockett, you spoke about it being different here because it's not as deep and so on, but how would the companies access the offshore resources and how would they respond, I mean, if something were to happen here? Do you feel confident in the ability to respond with existing technologies and resources and so on?

Ms. CROCKETT. Yes, Senator. Thank you. Thank you for that question.

Yes, I do. If we look at—the company that has the—that is the most active, if you will, if they could be active, they would be active, is Shell and if you look at the plans that they had in place

for their drilling program in the Chukchi Sea, it was extraordinary and it was unprecedented.

They had 24/7 response vessel capability nearby. They had built-for-purpose ships that were at the location, that would be at the location the entire time that they were drilling during the exploration phase. So really an unprecedented, especially here in Alaska, kind of drilling program that we don't see anywhere else in the United States, frankly.

A lot of that has to do with the fact that it is a remote operating area. There's not another platform that's 10 miles away that you can, you know, call for assistance from and so they really ramped up to do that. So that's just one example of sort of the differences in the capability of the industry as it operates in the offshore.

In the Beaufort Sea, drilling activity that may be taking place there, very, very shallow water depths, very, very close to existing infrastructure obviously with Prudhoe Bay and the existing infrastructure there and the cleanup organizational, Alaska Clean Seas, that's in existence at that location.

Senator STABENOW. Thank you. Just a couple of quick questions for Admiral Colvin and then I'll turn it back over to Senator Begich.

But to change the subject just a little bit, you highlighted the problems with the *Polar Sea* Icebreaker, taking that out of operation and the *Polar Sea* was going to be used this summer to conduct the oil spill response drills.

Without the *Polar Sea* or other icebreakers like the *Polar Star,* how is the Coast Guard going to be able to conduct these drills in the coming years?

Admiral COLVIN. Thank you, Senator Stabenow, for the question.

We're not going to be. Unless the—well, we can certainly operate in open water during the summer and we can bring up our ships that normally operate in the Bering Sea, as long as it has summer open water conditions, and we can go ahead and do oil spill drills.

The challenge becomes earlier in the season on the shoulders. As you get early or late in the season when the ice is rapidly forming in November or earlier in the season, you really need the icebreakers to operate in those conditions and certainly throughout the winter.

One of the challenges, Senator, that I see with the icebreakers, we've taken the money away from the icebreakers, the maintenance and operations money, and we've given it to the National Science Foundation and Congress is working hard to give that money back.

The National Science Foundation has done exactly what I would do if I was running the National Science Foundation. That's put as many scientists aboard as many ships as possible to get as much science done.

What that has resulted in is having Russian, Swedish, and Canadian, a wide variety of foreign icebreakers operating in U.S. waters. My contention would be that does very little to enhance the sovereignty of the United States. We need to put those same U.S. scientists aboard U.S. ships operating in U.S. waters and that I think the National Science Foundation and everybody would be delighted if we had operational icebreakers and enough of them to put the

U.S. scientists aboard U.S. ships. (a) we'd get the science and (b) we'd make sure we ensure our sovereignty.

Senator STABENOW. Thank you. In the interest of time, Senator, I will conclude at this point.

Thank you.

Senator BEGICH. Thank you very much. Let me, if I can, say I just have one—if I can just do a quick follow up on that.

I'm trying to remember the class of icebreaker capable, we were talking on the plane last week, and remind me of that class because there was a lower cost but still could do an enormous amount of work. What was that class?

Admiral COLVIN. Yes, sir. The *Healy* is what we call a medium icebreaker. Even though it's as big as the Polars as far as length, it can only break ice up to about three meters thick. So that's a medium icebreaker and we currently have Healy operating with the Canadian Icebreaker *Louis St. Laurente* right now in the disputed area between Canada and the United States mapping that out. It's a great cooperation between the United States and Canada.

But that's fairly limited as to what they can do. The Polar icebreakers, the two Polar icebreakers, the *Polar Sea* and *Polar Star,* the two most powerful conventional icebreakers in the world, the only more powerful ones are the Russian nuclear icebreakers, those are the ones that can break ice up to 20 feet and they can go up to the North Pole. They can operate throughout U.S. Arctic.

Senator BEGICH. And what are the costs of those? Remind me.

Admiral COLVIN. Sir,——

Senator BEGICH. I know I'm sitting now, so it's OK.

Admiral COLVIN. Well, Senator, if you're asking to replace one, my understanding is it's probably in the $500 million range.

Now if you're asking how——

Senator BEGICH. Refurbished. Go ahead.

Admiral COLVIN.—expensive it is to fix the *Polar Star,* because the *Polar Star* had been taken out of operation, losing the maintenance and operations money, it had been taken out of operation and was just sitting at the pier in Seattle, when Congress said, hey, let's go ahead and fix the *Polar Star* and put it back into operation, about $68 million to get it returned to operation, but that was last year when the money and the work was started or actually this year, 2010. It'll be 2013 before it's ready to go.

So by letting that ship just sit there for about 5 years, we ended up having to wait another 3 years after we gave it the money before it will become operational.

Senator BEGICH. Very good. Let me say again, thank you to the panelists. Thank you all for being here. Thank you for your written testimony.

What's going to happen in seconds, I'm told, once I hit that gavel and suddenly people get up, seats will move around and this will turn into an opportunity for a town hall meeting that's occurring next, and I want to thank you all for the good testimony.

It's interesting. I have to agree with you, Marilyn, that no one coordinated but the one common thread that I heard was the issue of research, technology, and how do we ensure that the funding stream is there maybe for equipment to data collection to under-

standing, so when the data is there, then the decisions are made, the oil and gas development or fishing or transportation, you can make them with some knowledge and that seemed to be a very common thread. So I really appreciate the information and the testimony.

Thank you all very much. Thank you, Senator Stabenow, for being here today for this. We're going to later go fly over and see some of the areas and so that's going to be very exciting.

So thank you all very much. This meeting is adjourned.

[Whereupon, at 12:04 p.m., the hearing was adjourned.]

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