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Interviewer: So, thank you for participating in this interview. To help with the analysis of our interview, we use standardized and open-ended questions. And as you respond to these questions, keep in mind that there's no right or wrong answers, or desirable or undesirable answers. I'd like you to feel comfortable with saying what you really think. And if anything's confusing, please ask for clarification. But I'll also keep broader questions for the end. Participation is voluntary and you are free to end the interview or skip questions at any time.

So, I guess first set of questions, I already know quite a bit about you, so it's about the work that you've done with Alaska Native communities. So in general, can you just talk about the work that you or your institution has done with Alaska Native communities?

Respondent: Sure. So, we've had a number of projects where we've worked with Alaska Native communities. So the biggest project was a project to assess the hydrokinetic energy resource of Alaska. And in that project we visited 31 communities along the major rivers in Alaska, in addition to a couple of coastal locations. So we engaged with the communities, we usually stayed overnight in the school and we collected data, depth data, river velocity. And usually we had guides who helped us supply this with boats. But it was a way that we definitely engaged with the community and members of the community to do this research. And more recently we're doing more coastal processes, coastal hazards research and we've been talking with, I would say, three communities in particular, and those are Barrow, Utqiagvik, and Hooper Bay, and then to some extent Unalakleet.

Interviewer: Thanks. The first main set of questions I have are environmental risks and responses that you've seen. So I'm just going to ask you a few questions about your experiences with environmental risks. Also you could take climate change risks, so like flooding and erosion and [inaudible 0:02:38] and responses concerning infrastructure specifically. So, responses include actions taken and plans developed in response to existing or expected environmental risks. And actions are specific to infrastructure, including land transportation like roads and airports, buildings like public and private buildings and housing, marine docks, and sea walls and then water infrastructure like reservoirs or dams and then wastewater treatment systems as well. So, lots of different aspects of infrastructure.

Respondent: Okay. So, is it the question about infrastructure, my experience with infrastructure in hazards?

Interviewer: Yeah, that's sort of your preface. So, I haven't gone to the question yet.

Respondent: Okay, okay.

Interviewer: So, for this section, when I say infrastructure actions or infrastructure responses, that's what I mean by that, is that it could include any of those things. Just in general, so can you please tell me about your experiences concerning environmental risks, specifically in Alaska Native communities? It's a very general question.

Respondent: Yes. So, I do know that there are a number of Alaska Native communities that are experiencing significant environmental risks. Those are, in particular, erosion, flooding, permafrost thaw and saltwater intrusion. There's also the environmental risk of changing environment and the impacts to subsistence lifestyle, hunting and fishing, whaling. So, that's a huge open ended, for example, what's commonly referred to as, very often when people in western and northwestern Alaska hunt seals, they rely on the shore fast ice as a sort of a platform from which to hunt. But that ice is unreliable. Similarly, the rivers used to be, well, freezing solid and were great medium for transportation, but they're not reliable anymore. So, a lot of environmental change that has created hazards and challenges for the communities. I know, for example, Hooper Bay has issues with salinity intrusion and the drinking water. They have issues with erosion. Their airport has been threatened by erosion. There have been big projects that armor the airport. The road leading to the airport has flooded frequently and so they've had to raise the elevation of the airport.

In Utqiagvik, they've had, in the last several years, significant erosion and flooding events. I came close, and I think it was, I don't remember if it was 2015, but there was one August in recent years where they experienced really significant flooding and some of their water supply reservoirs were threatened with inundation. So, really, if the water was a little bit higher, they would have had some serious problems. And so, in response to those things, those hazards, there have been actions, nowadays Barrow has an army of front-end loaders. And because they don't have a real seawall, they actually build a seawall of sand and gravel, just scraping up sand and gravel from the beach. And maybe there's other sources. So, they actually respond in real-time to events. And they're actually rebuilding the berm prevent flooding right in the middle of a storm. I have pictures to document this, pretty wild.

Was that the type of answer that you were looking for?

Interviewer: Yes. I mean it went into some of my other questions. It was a very general question.

Respondent: Okay.

Interviewer: So yeah, you're great. You're ahead of the game. Because the next question is, can you tell me about the regions of Alaska that are experiencing these specific risks?

Respondent: Yeah. Oh yeah, the other community I've worked with is Kaktovik on Barter Island. I'm a water person, so I'm always dealing with communities on the water. They're all experiencing erosion even in the far north of Alaska in Kaktovik, and an environmental change. And so, the North Slope, north coast of Alaska, the northwest coast and then the west coast and then even all the way down into southern Bering Sea and Port Heiden, you have really extreme erosion happening. And of course, communities along the rivers are experiencing very rapid

erosion, like Napakiak and Kwig. There's also been a lot of, and I'm not sure, I don't understand this stuff as well, but there's been lots of flooding along the Yukon River, for example, and there's been lots of ice jams and flooding. And I'm not sure if that's something that used to happen or if it's that changes or environmental changes are responsible for that, but it's definitely the case that a lot of these communities on the sort of what I consider the upper Yukon, like Eagle, I think, have had some serious flooding and impacts the houses and associated, I think, with ice jams.

Interviewer: Okay. So then in the communities that you've worked with, can you tell me about some of the responses to these risks that you've seen? I guess Barrow is a good example of that.

Respondent: Right. So Barrow, I understand they've done lots of different things. As I mentioned before, they have these front-end loaders that they use to build the beach berm and that's their frontline response. So they are doing various things. They seems like they have lots of different things they're trying to do. One of the things is that they've also worked with the Corps of Engineers, federal agencies and so they actually have a plan to build this seawall. It's a $350 million seawall, but the challenge is I think that probably there's going to have to be a local match. They don't know where they're going to get the money. And we're working with them to improve hazards forecasting in real time like erosion and flooding. So, supplementing some of these tools that are available from the federal government, from the National Weather Service.

There's a big community based monitoring effort. A lot of these communities that are experiencing these impacts have taken on the task of trying to monitor some of the changes that are going on, monitoring shoreline change, monitoring changing the beach profile, monitoring flooding, storm surge and flooding just to get a better handle on what's going on. And to some extent, that's helpful for them when they're saying, "Well, we have a problem," and then they can actually show the data that sort of documents the problems that they're having rather than saying, "Oh, yeah, we have all these problems." So it keeps them more solid basis for basic seeking assistance.

Interviewer: Do you think that having the scientific data, I guess the important component of that and in terms of communicating their issues? Because I'm diverging from here, I shouldn't do that, but, like, the fact that they are by collecting this data it helps engineers and scientists understand what's happening more and make decisions, but at the same time it's also a communication tool to work with policymakers or with, like, grant agencies to sort of say, "Look, here's our proof that we're experiencing these things," do you think that that sort of data is helpful in that or that…?

Respondent: Yes, in both ways I think. So, for example, we use the data to calibrate, validate, develop hazard forecasting models. But at the same time the data is helpful for, from your point of view of, advocacy, look at how much the shoreline has changed in the last five years, for example. So, both.

Interviewer: Yeah, makes sense. Let's see. Have you done any specific work related to response actions concerning infrastructure? I don't want to lead the questions, so.

Respondent: Yes. But our work is more kind of like, if you will, academic. So, research work. So, for example, one of the things that we recognize is that a key component of the coastal erosion that's happening is the there's the actual thawing of the coastal permafrost which sort of weakens the soils and allows them to readily eroded. So, we have come up with this plan and also some simulations of a new technology that would supercool the coastal permafrost, keep it frozen so that it maintains its integrity.

Interviewer: Yeah, cool.

Respondent: And we could use solar panels to power that or they got lots of natural gas up there. So, we're trying to put together a demonstration project to show how this could be effective. And we actually have talked to different industry partners like Arctic Foundations, it's a company that develops technologies, thermal technologies like thermal siphons, and so we're sort of in communication with them and how you could use these technologies to stabilize the coastline and Arctic setting.

Interviewer: Yeah, that's so cool. We're almost out of time, so I'm going to just skip ahead to a couple questions about the aspects that support or limit your ability to work with communities. So, can you tell me about the factors that support you or your institution's ability to support communities and their infrastructure response actions?

Respondent: The factors that support it?

Interviewer: The factors that support it, yes.

Respondent: Well, because we are an educational institution and we are an engaged institution, so what that means is that we're really all about solving problems in our community. So, when we become aware of the challenges that some of our coastal communities are having, then we actually work to try to address those challenges in various ways.

Interviewer: Right. So, then what are the factors that support you being able to do that kind of work?

Respondent: Well, because I have a research component in my workload with the university so I can spend between a third or half of my time doing research. The fact that we can have graduate students who would assist us on this research, and at the same time we're actually training the new workforce in these critical areas. So, all that is real important in our being able to sort of help address these challenges.

Interviewer: And then in terms of what creates some barriers and limitations and you've been able to do that kind of work, is there any key factors that prevent you being able to do the work that you really want to do in that context?

Respondent: I think that the challenge is that it takes time to develop relationships with communities because to some extent Arctic communities are bombarded with researchers from around the country who want to come up and do Arctic research. So they're a little bit gun shy.

So basically that, if you will, is a barrier. But it's a barrier by developing relationships with communities over several years or by partnering with researchers or practitioners that already have developed relationships like you're doing, then you've surmounted or overcome that barrier. But it is an important barrier.

Interviewer: Yeah, makes sense. Okay, well, I won't steal anyone else's time.

Respondent: Well, what you could do is we can talk about whatever questions we mixed on the phone or something like that.

Interviewer: Yeah, yeah, definitely. And I think also things will get a little reworked and so it might even be better. But this was a good little start.

Respondent: Great.

Interviewer: So, thank you.

Respondent: Sure.

Interviewer: Yeah.