

CLIMATE ADAPTATION PLANNING IN COASTAL ALASKA COMMUNITIES



Challenges, Opportunities, and Equity Considerations




Sea Grant
ALASKA

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INTRODUCTION

“[Adaptation refers to the] changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change.”

— United Nations Framework Convention on Climate Change (UNFCCC, n.d.)

“Adaptation has long been part and parcel of indigenous communities; indeed their very survival and continuity as peoples depended on successful response to change.”

— Gary S. Morishima, *Climate Change and Indigenous Peoples: A Primer*

CLIMATE CHANGE IN ALASKA

The impacts of climate change have become much more visible in recent years, particularly to the most vulnerable communities. According to the latest Intergovernmental Panel on Climate Change (IPCC) report (Sixth Assessment Report (AR6), 2023), in 2010–2020, global average surface temperature reached 1.1 degrees Celsius above average temperatures from 1850–1900 (IPCC, 2024). As global average surface temperatures continue to rise, adverse climate change impacts include threats to food and water security, critical infrastructure, cultural continuance, mental health, and other impacts.³

Due to Arctic Amplification, the Arctic region is impacted by rates of warming that are significantly higher than regions outside of the poles⁴, contributing to instances of elevated vulnerability for Arctic communities. A recent

study demonstrates that the rate of warming in the Arctic from 1979–2021 is up to four times higher than global averages (Rantanen et al., 2022). Alaska, in particular, is on the frontlines of climate change. And the sub-regional variation in climate trends across Alaska is significant, with the Arctic North Slope experiencing certain changes much differently than Southeast Alaska (Ballinger et al., 2023). Figure 1 illustrates the temperature trend across Alaska from 1973–2022, with temperature increases generally steepening further north.

3 These effects are unevenly distributed, with the largest impacts being observed in the Global South, disproportionately affecting Indigenous Peoples (IPCC, 2024). From 2010–2020, flood, drought, and storms were responsible for 15x greater human mortality in high vulnerability regions than those with low vulnerability (IPCC, 2024).

4 Due in large part to feedbacks that are specific to the Arctic, such as surface-albedo, any change in Earth’s net radiation balance results in greater temperature changes in the Arctic than observed outside of the poles (Holland and Landrum, 2021).

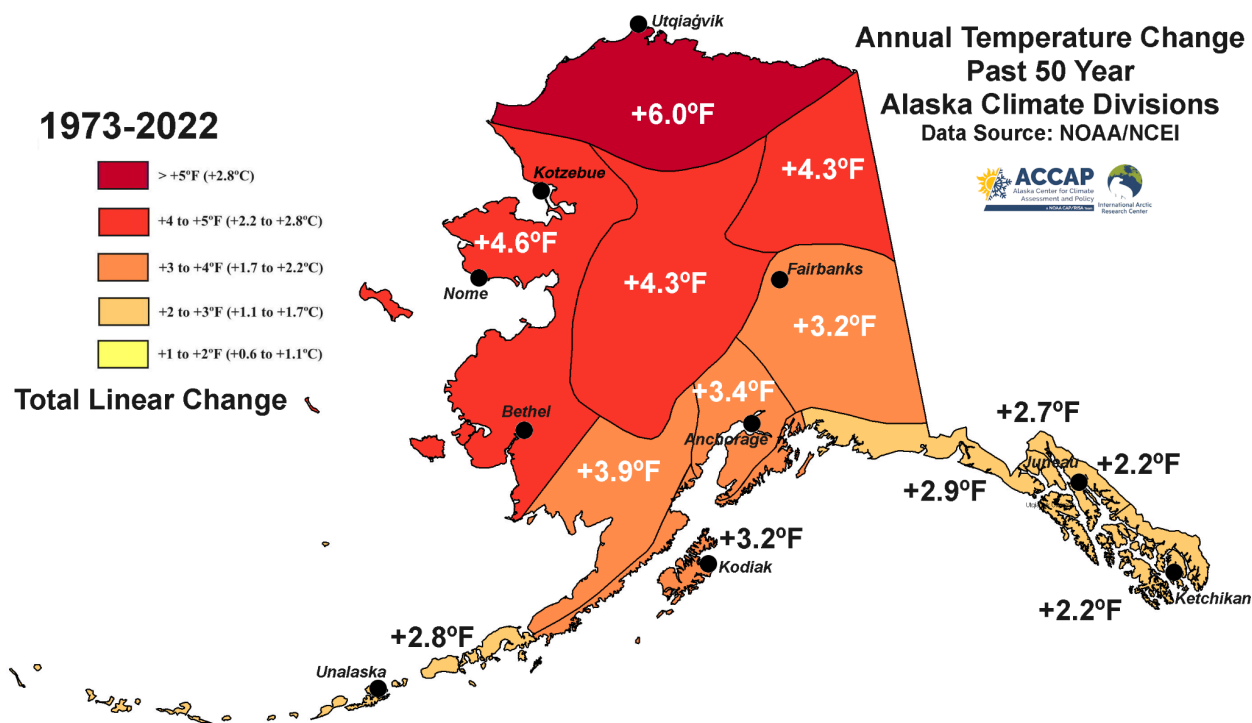


Figure 1: Temperature trends in Alaska over the past 50 years (source: ACCAP)

Climate change impacts vary significantly across Alaska's diverse geography. The damages wrought by Typhoon Merbok in September of 2022 on Western Alaska illustrate the impact of increasing ocean temperatures on coastal communities, including the formation of more damaging typhoons in the region (NOAA, 2022). From Western Alaska to the North Slope, permafrost degradation is compromising the structural integrity of homes and other critical infrastructure. Increases in the frequency of large wildfires have resulted in more smoky days for communities in the Interior, and there are now instances of wildfires burning on the tundra in Western Alaska as permafrost degrades (Moon et al., 2019, Smith et al., 2021). For coastal communities in Prince William Sound, ocean acidification

is threatening commercial and subsistence fisheries (Szymkowiak, 2023). In Southeast Alaska, a combination of warmer temperatures, drought, and other extreme weather events are impacting communities in several ways, from threatening salmon spawning and rearing habitat due to warmer stream temperatures and lower oxygen levels, to potential loss of life and infrastructure due to landslides (Holen, 2023). These factors impact food security, small-scale infrastructure at the local level, and access and abundance of culturally important resources (Wilson et al., 2022).

Still, some climate change impacts in Alaska and the Arctic are more nuanced. Warming is expected to result in a longer and perhaps

more productive growing season for agriculturalists. Fresco et al. (2021) used down-scaled regional climate data to illustrate projected changes to several agricultural variables at the community level, including summer season length, growing degree days, temperature of the coldest winter day, and plant hardiness zone. The results of this study indicated pronounced increases in summer season length and number of growing degree days over the course of the 21st century. Indeed, prior to this study, communities in several regions had already begun taking advantage of the increased agricultural productivity.

With recent scholarship arriving at a broad consensus that mitigation and adaptation efforts are necessary in response to climate change (Sharifi, 2021), greater investment is being directed to these efforts than ever before. Significant new funding has been made available for resilience and adaptation planning in Arctic communities through legislation such as the Inflation Reduction Act, providing an opportunity to turn planning into effective implementation. However, communities in need face challenges in taking advantage of these investments.

CLIMATE JUSTICE

“There is a tendency to invoke justice to call attention to formal wrongs against Tribes, like human rights violations, or retrospective considerations, like the fact that Tribes bear the hardships of anthropogenic climate change despite their relatively minimal contributions to factors like industrial burning of fossil fuels. Yet justice also represents a crucial framework for guiding leaders, scientists and professionals in their understanding of what actions are morally essential for supporting the institutions that Tribes must rely on to adapt.”³

— Kyle Powys Whyte

While Indigenous Peoples have contributed little to global warming, they are often the most vulnerable to climate change. This is largely due to their traditional livelihoods being embedded in polar, coastal, and island ecosystems that are particularly sensitive to the impacts of climate change (Ramos-Castillo et al., 2017). In Alaska, where American Indian and Alaska Natives constitute 15.7% of the total population (US Census Bureau), a traditional subsistence way of life is being

threatened by ongoing environmental change (Moerlein and Carothers, 2012). This is particularly evident in rural locations, where subsistence harvests are of much greater significance than in urban areas (see Figure 2). The close relationship between Alaska Native communities, the environment, and wild resources has paradoxically fostered their adaptive capacity while simultaneously straining traditional adaptation strategies in the face of accelerated anthropogenic cli-

3 Whyte, 2013.

mate change. Additionally, certain historical injustices, such as forced settlement in areas not conducive to modern infrastructure, have

further hindered the adaptive capacity of Alaska Native Peoples (Oswalt, 1990).

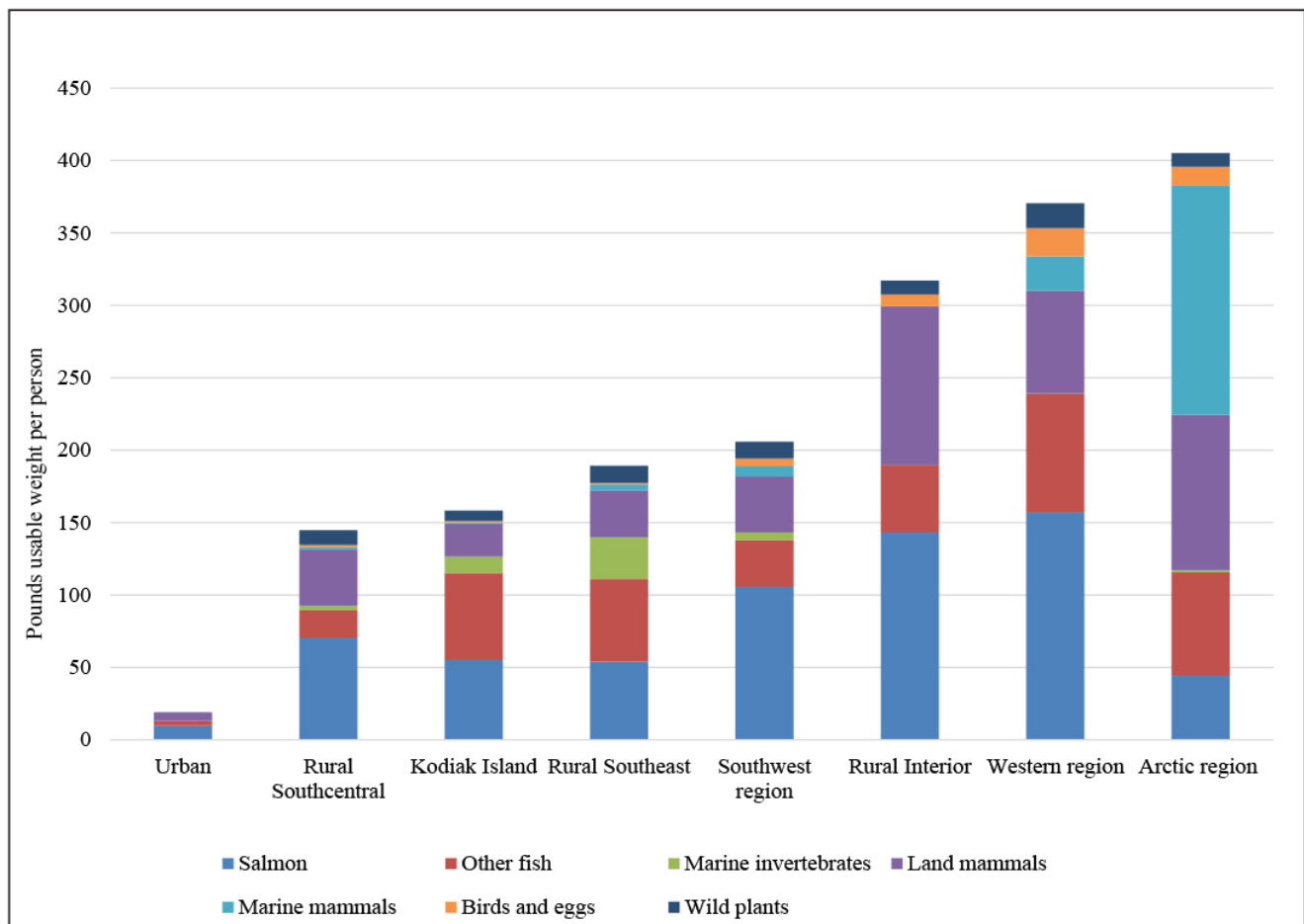


Figure 2: Harvests of wild resources by category and area, pounds per capita, 2017. (source: (source: Fall, James A. (2018). *Subsistence in Alaska: A 2017 Update*. Division of Subsistence, Alaska Department of Fish and Game.)

Communicating climate change and understanding community perspectives on change and adaptation strategies, inclusive of local and traditional knowledge (LTK), should be done in a way that factors in community-level social processes as well as the physical environment. “Adhering to a constitutive view of communication necessitates embracing the ontological perspective that climate change is not only a physical phenomenon,

but indeed also an ideological, cultural, and symbolic issue that takes on different meanings depending on different people and places” (Ballantyne, 2016:10). The widespread discourse of vulnerability and extension of the discourse of resilience has created a “fertile context for research that focuses on the social, cultural, and economic impacts of climate change in the Arctic” (Moerlein & Carothers, 2012:1). More attention to the

effective use of developing a narrative with communities and identifying local ways of understanding potential impacts will lead to more constructive efforts for monitoring, mitigation, and adaptation planning.

In addition to understanding community perspectives on climate change, it is essential that any collaborative efforts to address climate change are centered around relationship-building, cultural humility, and trust. Oftentimes, funded research projects claim to collaborate with communities. However, too often these projects do not fulfill such claims (Kawerak letter, 2020). Furthermore,

projects often include terms like “co-production” in their titles in order to check a box rather than engage in a meaningful and mutually respectful process. “The growing application of the term co-production in research proposal titles and academic papers is often used as a badge of sorts, whereby often incomplete or troublesome approaches are re-branded” (Yua et al., 2022). Moving forward, it’s important to recognize such shortcomings of past efforts at community collaboration in research and other projects, work to ameliorate them, and move towards actual community inclusivity.

CLIMATE CHANGE POLICY AND ADAPTATION PLANNING IN ALASKA

In Alaska, there has been a conspicuous absence of consistent and concerted state and federal climate change policy and leadership. According to Steffen et al. (2021), there have been no comprehensive and sustained climate action plans or policies for Alaska at the state or federal level. Rather, support for climate change policies and planning has been subject to the whims of shifting administrations. This is particularly evident at the state level.

Climate change policy and planning have been intermittent amid shifting state priorities. In 2006, House Concurrent Resolution (HCR) 30 established the temporary Alaska Climate Impact Assessment Commission. On

the heels of the resolution’s passage, the permanent Alaska Climate Change Sub-Cabinet was established by Governor Sarah Palin. The Sub-Cabinet tasked seven state agencies to assess the ways in which climate change might impact their ability to meet their missions (Steffen et al., 2021). The Alaska Department of Environmental Conservation (ADEC) produced greenhouse gas emissions inventories, the Alaska Department of Commerce and Community Economic Development (DCCED) administered the Community Coastal Impact Assistance Program, and the Alaska Department of Fish and Game (ADF&G) released a climate change strategy. By 2011, however, the Sub-Cabinet was disbanded by Governor Sean Parnell. In 2017,

Governor Bill Walker signed a bill to establish the Climate Action Leadership Team (CALT). However, in February 2019, before ADEC had finished preparing an emissions inventory and climate adaptation plan for Pedro Bay, Alaska, CALT was dissolved.

Federal efforts to address climate change in Alaska have been fragmented and federal funding for climate change adaptation has not been accessible to all communities in need. In 2003, the U.S. Government Accountability Office (GAO) released a report that drew attention to the immediate climate impacts Alaska Native villages were facing and the challenges associated with qualifying for funding to mitigate those impacts (Steffen et al., 2021). While there are many federal programs that provide support for hazard mitigation and climate change adaptation, these efforts are largely siloed. Federal programs and the resources they are responsible for delivering could be more effective if coordinated. However, there is no inter-agency or intergovernmental entity responsible for coordination, nor is there incentive for agencies to coordinate (GAO, 2022). In addition to acknowledging a continuing lack of interagency coordination, the most recent GAO report identified programmatic obstacles Alaska Native villages are facing in accessing funding (GAO, 2022). Many programs have cost-share requirements, which can be a significant barrier for smaller com-

munities where access to non-federal funding might be low.

Some federal agencies have provided consistent, if relatively siloed, funding and support for Tribal climate adaptation efforts in Alaska. In 1992, the Indian Environmental General Assistance Program Act was passed by Congress (EPA, n.d.). The EPA was authorized to “provide General Assistance Program (GAP) grants to federally recognized tribes and tribal consortia for planning, developing, and establishing environmental protection programs in Indian country” (EPA, n.d.). Tribes and Tribal consortia are eligible to receive GAP grants for climate adaptation planning, community education and outreach, and vulnerability assessments (EPA, n.d.). Another consistent funding source for climate adaptation planning in Alaska is the Bureau of Indian Affairs (BIA) Tribal Climate Resilience Program (TCRP). In 2011, the TCRP was established at BIA “to support climate preparedness and resilience for all Federally-recognized Tribal Nations and Alaska Native villages through technical and financial assistance, access to scientific resources and educational opportunities” (BIA, n.d.). However, these programs don’t necessarily coordinate to negotiate overlapping efforts and initiatives (ANTHC, 2022).⁴ Establishing a lead coordinating agency for addressing climate change policy issues across Alaska remains elusive (Steffan et al., 2021).

4 The lack of sustained federal efforts is further complicated by ambiguities in the relationship between the federal government and Alaska Native Villages and limitations of laws meant to address disasters (Korkut et al., 2022).

Some efforts have been undertaken to increase coordination among funding and technical assistance programs in rural Alaska. In 2015, the Denali Commission was designated as the lead agency for village relocation in Alaska (Steffen et al., 2021). The Denali Commission, an independent federal agency, was established by Congress in 1998 to provide “critical utilities, infrastructure, and economic support to Alaska communities through inter-agency cooperation and a focus specifically on remote communities” (Steffen et al., 2021). While the Denali Commission is largely controlled at the state level, it functions as an intergovernmental entity linking federal, state, and local governments (Steffen et al., 2021). The Denali Commission was responsible for a statewide threat assessment examining public infrastructure in 134 rural Alaska communities that included erosion, flooding, and permafrost degradation (Steffen et al., 2021). The statewide threat assessment could support a needs-based prioritization of resources as recommended by the Alaska Native Tribal Health Consortium (ANTHC, 2022). Still, a climate hazards threat assessment is only one, albeit significant, dimension of a more holistic needs-based prioritization.

In lieu of sustained federal or state climate policies, Tribes, Tribal organizations, municipalities, and others have taken on addressing climate adaptation at the community,

city, borough, and regional levels. In 2007, the City of Homer in Southcentral Alaska released a climate action plan, the first of its kind in Alaska.⁵ In the opening address by Homer Mayor Hornaday, a call was made to “reduce greenhouse gas emissions” and “avoid a looming crisis” (Homer, 2007). The importance of following the Homer plan’s recommendations in order to help create a “healthier, safer, more livable and more self-reliant community” was also recognized in the opening address (Homer, 2007). The drafting of this plan was initiated because of the “growing recognition that global climate change is real, it is due primarily to human activities, and it will have catastrophic consequences if immediate action is not taken to curb greenhouse gas emissions” (Homer, 2007). There was an additional recognition through the International Council for Local Environmental Initiatives’ (ICLEI) Climate Resilient Communities program, in which the City of Homer was invited to participate, that adaptation to climate change was becoming increasingly urgent, particularly in the Arctic (Homer, 2007). Thus, the Homer plan included sections on both climate change mitigation and adaptation. Adaptation recommendations included “creating a resilient local economy, protecting existing infrastructure, being prepared for extreme weather events and wildfires, and adopting wise policies for the future” (Homer, 2007). Climate action plans for the cities of Sitka and Juneau were

5 See Appendix A for a list of plans and assessments reviewed for this report.

completed in 2010 and 2011, respectively. In 2019, a climate action plan for the municipality of Anchorage was completed.

While several urban climate action plans have been produced, there have been some challenges around the adoption of such plans. The Fairbanks North Star Borough (FNSB) has been working on a Climate Action and Adaptation Plan (CAAP), following the ICLEI process for local governments, since 2007 (Fairbanks, 2023). In 2021, the Assembly Climate Action Committee (ACAC) was established and granted a temporary multi-year budget of \$79,700 to complete the CAAP (Fairbanks, 2023). The CAAP included goals and recommendations in several sectors for both mitigating and adapting to climate change. It also highlighted incidental benefits such as the job creation in the renewable energy sector associated with both climate change mitigation and adaptation. However, in June 2023, the CAAP was defeated by the assembly after disagreement over action steps being significantly revised or curtailed (Fairbanks, 2023). The drafting of this plan was nearly a two decade effort, highlighting the challenges associated with climate change planning and implementation for a relatively large borough in Alaska.

Rural community and regional climate adaptation efforts have faced a host of logistical

barriers and technical challenges. In a 2017 synthesis of Tribal climate adaptation planning needs, funding was the most frequently cited barrier to effective planning and project implementation (Meeker and Kettle, 2017). In 2022, a draft report prepared by ANTHC, *The Unmet Needs of Environmentally Threatened Alaska Native Villages: Assessment and Recommendations*, identified an \$80 million annual funding gap over the next 10 years to address environmental impacts to infrastructure alone (ANTHC, 2022). Such inadequate funding will likely result in significant inequities in the distribution of available funds.⁶ Additionally, without greater efficiencies and coordination between funding agencies, funding gaps are unlikely to be closed.

In recent years, significantly more funding has been made available for climate adaptation planning and implementation, which is particularly evident in the BIA TCRP (Figure 3). For the 2011 fiscal year, 15 grants were awarded nationally in two funding categories⁷ to Tribes and Tribal organizations for a total of \$328K (BIA TCR Annual Awards Dashboard, n.d.). In 2022, 118 grants were awarded in 13 funding categories for a total of \$45 million (BIA TCR Annual Awards Dashboard, n.d.). In Alaska there are 229 federally recognized Tribes out of a total of 574 nationwide (BIA, n.d.). Tribes and Tribal organizations in Alas-

6 The natural consequence of funding gaps is greater competition and some communities will naturally be in a better position, in terms of resource access, to compete for funding. However, the communities with more grant writing capacity and/or expertise are not necessarily those with the greatest need.

7 Climate adaptation planning and travel support for climate adaptation planning.

ka received about 40% of that funding, just under \$19 million. In July 2023, the BIA Tribal Climate Resilience Program announced available funding of \$120 million nationwide for the 2023 fiscal year (DOI, 2023).⁸ This is an increase of about 270% from the prior year.⁹

While the significant increase in funding is laudable, questions remain whether it will be enough to address resilience needs for Tribal communities in Alaska and whether the funding is targeted effectively.

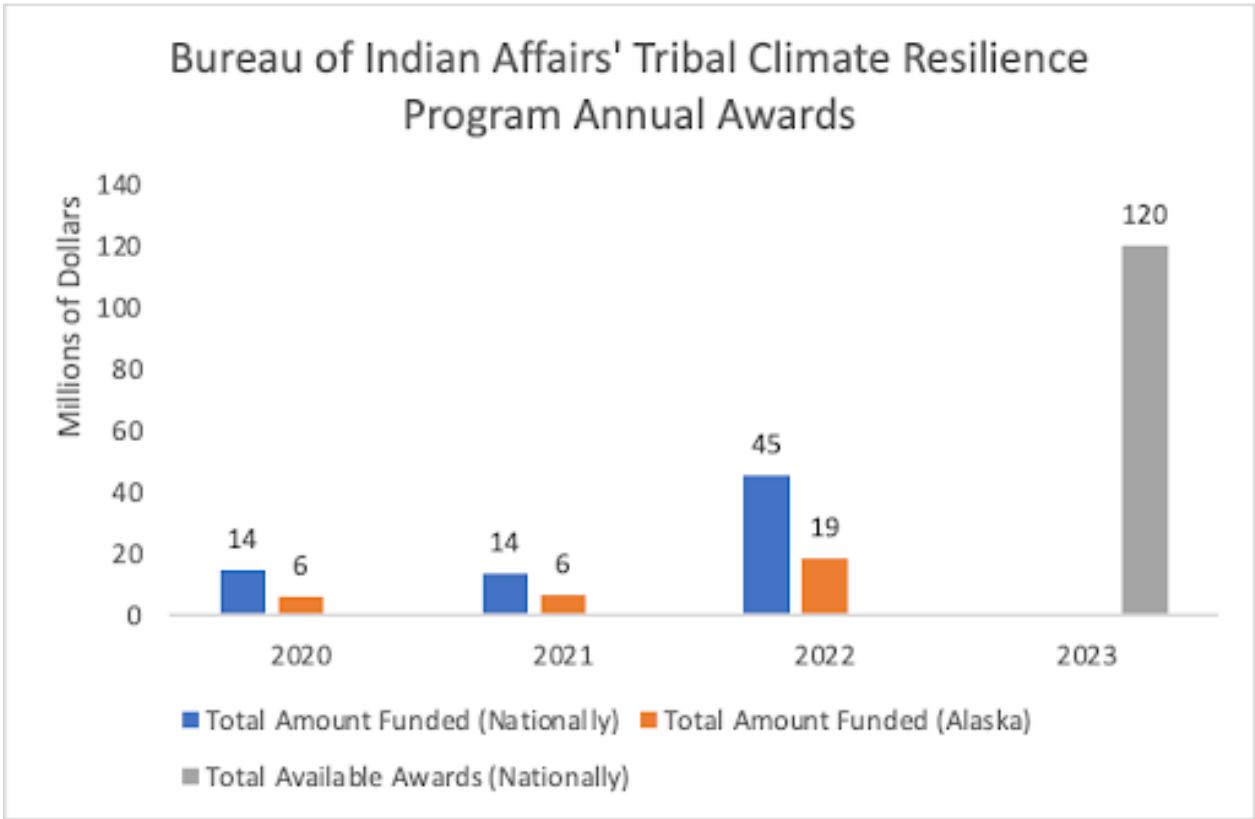


Figure 3: Trajectory of BIA TRCP awards over the past four years (data source: BIA)

KNOWLEDGE GAPS

In recent years, Tribes and Tribal consortia have been the beneficiaries of a relative surge in climate adaptation funding. However, there is little research on how effective

climate adaptation planning has been in Alaska. LTK is being increasingly incorporated in climate adaptation planning. Yet, there is insufficient information available on the

⁸ This total includes \$23 million from Bipartisan Infrastructure Law and \$72 million from the Inflation Reduction Act (DOI, 2023).

⁹ The increase from 2021 to 2022 was more than 300 percent.

extent to which LTK is meaningfully guiding planning. Similarly, while the desire to draw on co-produced knowledge in an equitable planning process has become more explicit (Figus et al., 2022), questions remain about what successes and challenges communities have faced in conducting this work. There is also a knowledge gap on the extent to which climate change mitigation and adaptation

synergies and co-benefits have been considered in climate adaptation planning. Finally, there is insufficient research on whether climate adaptation resources are being equitably accessed and effectively deployed in Alaska. This report provides insight on some of these knowledge gaps while addressing ongoing research needs.

SCOPE OF REPORT

A sample of climate adaptation assessments, plans, workshops, interviews, and case studies inform this report. It is largely a follow up to a 2017 report by Meeker and Kettle designed to inform interested agencies, research institutions, and Tribal organizations on climate adaptation planning efforts in Alaska Native communities (Meeker and Kettle, 2022). Meeker and Kettle identified

several barriers to climate adaptation planning, including limited funding, inadequate human capacity and technical expertise, institutional barriers, and lack of Tribal representation in agency decisions (Meeker and Kettle, 2017). This report is intended to provide insight into the degree to which some of these barriers have been addressed.

LIMITATIONS OF THIS REPORT

This report provides a synthesis of some climate adaptation planning efforts in Alaska and offers several broad recommendations for enhancing their efficacy and equity. However, it does not include a significant number of recently funded climate adaptation planning and implementation efforts across the state. While the insights of those interviewed for this report are of considerable value, they represent a limited sample of climate adaptation researchers and practitioners working in Alaska. Therefore, this report is intended

to provide some insight into climate adaptation efforts in Alaska and the context that surrounds those efforts, but it is not comprehensive. Additional research and data is needed to sufficiently address the barriers that communities face in accessing climate adaptation resources, engaging in meaningful and effective planning, and implementing climate adaptation initiatives.

RESEARCH QUESTIONS

In addition to providing an update on climate adaptation planning across the state, this report is intended to answer the following research questions.

Questions 1–4 are addressed directly in Findings.

1. What is a climate adaptation plan and what does it accomplish?
2. What areas of concern are being addressed in climate adaptation plans and assessments (e.g. infrastructure, subsistence, culture, economics, etc.)?
3. In what ways is local and traditional knowledge (LTK) being incorporated in plans and assessments and how has this evolved over time?
4. To what extent are climate change mitigation and adaptation synergies and co-benefits being explored in plans and assessments across Alaska?

Questions 5–6 are addressed in Case Studies and the Discussion.

5. What are the continuing barriers to climate adaptation planning and associated implementation?
6. Is access to climate adaptation planning resources distributed equitably? How might access to climate adaptation planning resources be more equitable?

METHODS

LITERATURE REVIEW

To build context around climate adaptation planning in Alaska, a combination of white papers, gray literature, and peer reviewed articles were reviewed for this report. As noted above, this report builds off an earlier assessment by Meeker and Kettle (Meeker and Kettle, 2017). The goal of the literature review was to build understanding around the climate landscape in Alaska, including climate projections, policy, social, cultural, economic, and environmental impacts, and

adaptation strategies. A Google Scholar search was performed to identify relevant literature on climate adaptation, using key phrases such as ‘climate adaptation in the Arctic/Alaska,’ ‘climate change in the Arctic/Alaska,’ and ‘Traditional Ecological Knowledge in climate adaptation planning.’ [Adapta-laska.org](https://adapta-laska.org), a climate resilience tool and clearinghouse for adaptation resources in Alaska, was also used to identify climate adaptation plans, assessments, workshops, and other

relevant documents, reports, and events. Discussions with representatives from agencies, Tribal consortia, and academia were

instructive in deciding what to include in the literature review.

ANALYSIS OF PRIMARY DOCUMENTATION

CLIMATE CHANGE ADAPTATION PLANS AND ASSESSMENTS			
Type	Number Completed	Number in Process	Total
Regional	7	4	11
Urban	4	1	5
Rural	18	1	19
Total	29	6	35

Table 1: Number of plans and assessments reviewed for this report

TITLE	TYPE	DATE/ COMPLETED	REFERENCED AS...
City of Homer Climate Action Plan	Climate Action Plan	2007	Homer plan
Climate Change in Point Hope, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2010	Point Hope assessment
City and Borough of Sitka Action Plan	Climate Action Plan	2010	Sitka plan
Climate Change in Kiana, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	Kiana assessment
Climate Change in Noatak, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	Noatak assessment
Climate Change in Kivalina, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	Kivalina assessment

Table 2: First six rows of plans and assessments table

This report reviewed 35 plans and assessments, including completed climate adaptation plans at the community (4) and regional level (4), completed climate action plans at the urban-municipal level (4), adaptation assessments at the community (14) and regional level (3), and plans that are nearing completion at the community (1), regional (4), and urban-municipal level (1). While this is a review of climate adaptation planning across the state, climate action plans and climate change assessments were included to capture the adaptation recommendations and strategies that are present in those documents. Completed plans and assessments were hand coded to address research questions 2, 3, and 4. The plans and assessments reviewed for this report also informed research questions 1, 5, and 6, albeit more broadly.

For research question 2, plans and assessments were scanned to identify priority areas (e.g. infrastructure), and when possible delineate a leading priority. In many documents, several priorities were highlighted with clear instances of crossover between priority areas (e.g. an ice cellar for food preservation is both an infrastructure and a subsistence priority). Leading priorities were only delineated where it was abundantly clear (e.g. the majority of adaptation strategies targeted a particular community priority).

For research question 3, plans and assessments were hand coded for the following keywords: 'Indigenous,' 'Tribal,' 'Traditional,'

and 'Local,' followed by '...Knowledge' and '...ways of knowing.' The documents were also scanned for 'TEK' (i.e., Traditional Ecological Knowledge). Documents that were inclusive of any of these terms were designated as acknowledging LTK. Additionally, documents were scanned for the keywords 'interviews,' 'workshops,' 'surveys,' and 'community/council meetings.' Documents that were inclusive of any of these methods were designated as having engaged in the process of collaboratively incorporating LTK in plans or assessments.

For research question 4, plans and assessments were hand coded for the following keywords: 'mitigation,' 'energy,' 'fuel,' 'efficiency,' and 'emissions.' Where these terms occurred, they were analyzed in context for being either connected or not connected to climate change mitigation. Further, adaptation strategies were analyzed in each of the documents to identify the presence of synergies with climate change mitigation (i.e., adaptation strategies that will very likely result in reduced local or regional carbon emissions).

INTERVIEWS AND WORKSHOPS

Twelve semi-structured interviews with resilience professionals and practitioners across Alaska were conducted for this report to gather diverse agency, regional, and community-level perspectives on research ques-

tions 1, 5, and 6. The author also facilitated and/or participated in several climate resilience workshops in both 2022 and 2023 to inform research questions 1, 5, and 6.

FINDINGS

RESEARCH QUESTION 1:

WHAT IS A CLIMATE ADAPTATION PLAN AND WHAT DOES IT ACCOMPLISH?

In rural Alaska, much of climate adaptation planning has taken place in response to the imminent threat of erosion, flooding, and permafrost degradation to infrastructure. Climate change adaptation plans and assessments have largely adopted a Western worldview and economic lens that seeks to understand the potential of quantifiable climate change damages in order to implement cost saving mitigation measures. This worldview drove the first several Tribal climate adaptation assessments and plans in Western Alas-

ka where exposure to erosion, flooding, and permafrost degradation is greatest.¹⁰ However, as climate change adaptation planning in Alaska has evolved over the past decade and broadened regionally, priorities have changed based on region-specific climate change vulnerabilities and risks, and significantly, an Indigenous worldview.

¹⁰ The impacts of sea level rise in Alaska vary from region to region. In Southeast Alaska, for instance, the Alexander Archipelago is experiencing isostatic rebound, which is the uplift of land masses that had been depressed under large ice sheets from the last ice age. The rate of uplift is currently outpacing sea level rise in Southeast Alaska (Overbeck, 2018).

CLIMATE ADAPTATION PLANNING PROCESS

As noted on the website Adapt Alaska (adaptalaska.org), climate adaptation planning is a process. This includes holding a community meeting or workshop that elicits and collects community input on the impacts of climate on the community, and community priorities. This then leads to a vulnerability assessment, monitoring of conditions and impacts, hazard mitigation planning to address specific impacts, and finally an adaptation plan. However, there is no one right way to proceed in this process and communities and Tribes may choose to complete discrete steps in a particular sequence or combine steps.

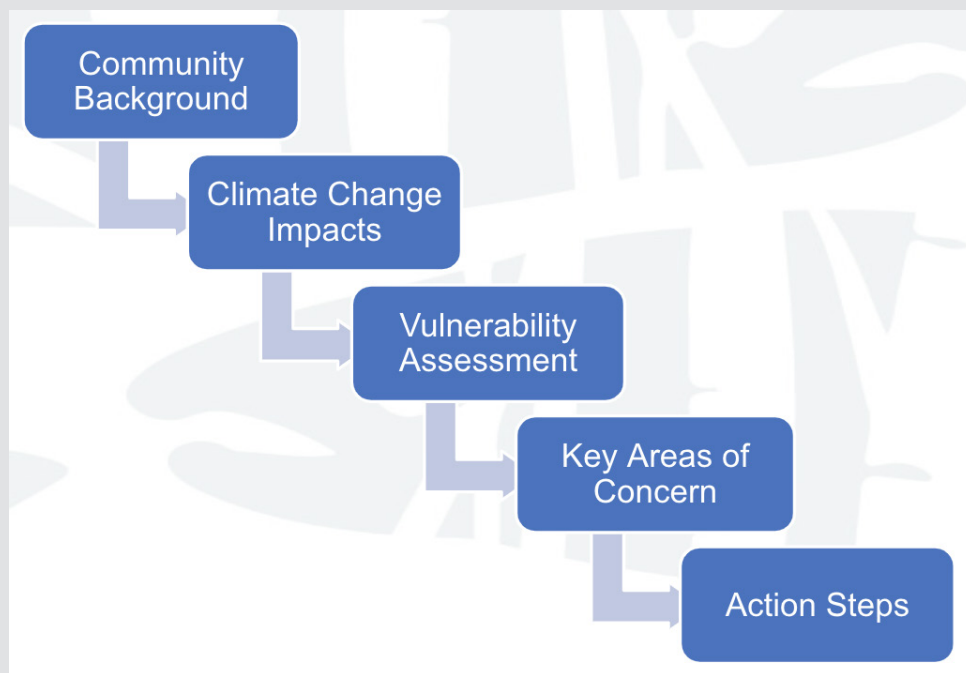


Figure 4: 'Typical' anatomy of a climate adaptation plan

VULNERABILITY ASSESSMENTS

Climate adaptation planning benefits from vulnerability assessments. A vulnerability assessment provides a baseline for risks and risk exposure from which to prioritize actions. The key levers in assessing vulnerability are climate exposure, sensitivity, and adaptive capacity (see Figure 5).

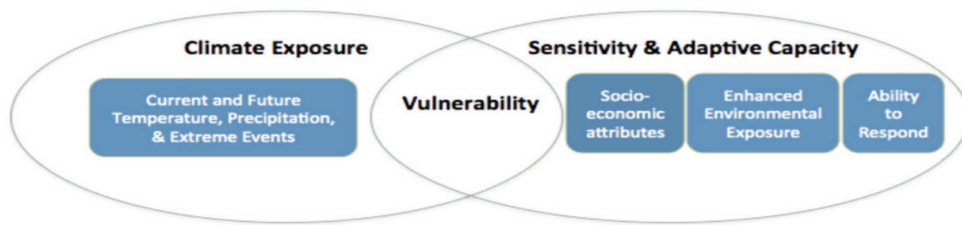


Figure 5: Climate vulnerability is a factor of sensitivity and adaptive capacity to a particular climate exposure (Source: CCTHITA Climate Change Adaptation Plan, pg 23).

NAVIGATING A SEA OF PLANS

When a climate adaptation plan for Shaktoolik was undertaken—one of the earliest climate adaptation plans written specifically for a Tribal community in Alaska—it was on the heels of several other planning efforts, including a local multi-hazard mitigation plan, Emergency Operations Plan, Evacuation Plan, Continuity of Operations Plan, Economic Development Plan, and the regional Norton Bay Climate Adaptation and Action Plan (Shaktoolik, 2014). It is not uncommon for Tribal communities to manage such an extensive portfolio of planning documents. Thus, it is important for communities to clearly delineate the unique role of a climate adaptation plan and ensure that appropriate human capacity is available to manage implement plans.

VARIATION IN CLIMATE ADAPTATION PLANNING STRATEGIES

Climate adaptation plans and priorities often cross over with other community plans and priorities. The Kodiak Area Native Association (KANA) is currently working on a plan for the 10 Tribes they serve in the Kodiak region. KANA is merging or ‘mainstreaming’¹¹ parts of this plan with its Comprehensive Economic

Development Strategy (CEDS), which is a set of economic priorities for the region heavily vetted by community members. Sections on energy, food security, and agriculture are expected to be included in the CEDS plan. Access to subsistence resources and food security have a pronounced impact on

¹¹ Mainstreaming refers to writing climate adaptation actions into other community planning documents (Cottrell, 2023).

the economic vulnerability of community members, becoming at once an economic development priority and an adaptation priority. Furthermore, adaptation needs are not always clearly linked to climate signals. For instance, erosion has been taking place at the mouth of a river near the Village of Karluk on the southwest coast of the Kodiak archipelago for years. Does a response fall under the purview of climate adaptation? These instances of crossover and ambiguity demonstrate that the boundaries between climate adaptation planning and other community priorities are often indiscrete.

Generally, vulnerability assessments have acted as a precursor for developing climate adaptation plans. In many cases, communities have leveraged vulnerability assessments to access additional funding for climate adaptation plans. However, some communities have bypassed producing standalone vulnerability assessments or completed them while writing climate adaptation plans. The Chilkat Indian Village (CIV) Environmental Department, for instance, incorporated an assessment of vulnerabilities in the climate adaptation planning process. The Alaska Sea Grant Coastal Community Resilience Specialist assisted CIV with a community workshop which used downscaled climate data for the upper Lynn Canal provided by the Alaska Climate Adaptation Science Center to assess and discuss

vulnerabilities as a first step in their climate adaptation planning process. CIV then included the data into their climate adaptation plan instead of creating a separate vulnerability assessment. CIV then established infrastructure and culturally significant plant and animal species as their primary areas of concern. For small communities, a single process that is inclusive of each of the critical steps in climate adaptation planning might be more desirable than a series of discrete and potentially more costly or time-consuming processes.

Other adaptation strategies have involved implementation before physical climate adaptation plans have been completed. The environmental department of the Hoonah Indian Association (HIA), for instance, has been monitoring snowpack in response to severe drought in Southeast Alaska in 2017–2018. The HIA environmental program is currently engaged in several other monitoring partnerships and programs, including stream temperature, shellfish, and ocean acidification monitoring (HIA, n.d.). HIA's environmental program has been so adept at taking initiative on adaptation efforts that they have completed several implementation steps in advance of formally publishing a climate adaptation plan.¹²

12 However, much of what will constitute HIA's plan lives on the pages of their environmental program's website which is arguably easier to access than a formal plan (personal communication, HIA).

REGIONAL AND LOCAL CLIMATE ADAPTATION PLANS

As noted in the GAO report (2022), there are many communities at risk in Alaska (Denali Commission, 2019) and resources are finite. Where to start? Starting with regional climate adaptation plans offers the advantage of pooling resources and avoiding duplication of efforts. However, the contents of regional adaptation plans are not always transferable to smaller communities. In the Bering Strait region, for instance, changes are accelerating so quickly and having such a wide range of impacts on communities that climate

models are not keeping pace (personal communication, Kawerak, Inc). There is nuance and granularity that only a local adaptation plan can capture. For this reason, several regional Tribal organizations are developing region-specific climate adaptation plan templates that communities may tailor to their localized contexts. The following are excerpts from interviews with both regional and local climate adaptation planners regarding the efficacy of plans at different scales.

WHAT DOES A REGIONAL CLIMATE ADAPTATION PLAN ACHIEVE?

“Provides a template for more localized versions of adaptation plans and an opportunity to assist Tribes that are interested in writing plans but don't necessarily have the [human] capacity to write a local climate adaptation plan.”

—personal communication, Tribal Environmental Planner

“Tribes have been using our [climate adaptation plan] template, which has been a great success.”

—personal communication, Tribal Environmental Planner

“Provides a forum for communities to share and confront resilience issues, supports the development of local adaptation plans, and creates a climate network in the region.”

—personal communication, Tribal Environmental Planner

“There is not a lot of technical expertise [in the Bering Strait region] for putting climate adaptation plans together and there isn't anyone keeping track of plans. With greater investment in human capacity, Kawerak could take on the role of building an effective regional plan and tracking and/or advising local plans.”

—personal communication, Tribal Environmental Planner

WHAT DOES A COMMUNITY-SPECIFIC CLIMATE ADAPTATION PLAN ACHIEVE?

“Our [Climate Adaptation] Plan is a living document that helps us track our accomplishments, incorporate feedback from community members, and ultimately remain accountable to the community we serve.”

—personal communication, Tribal Environmental Planner

“[The CIV local plan] is from the Tribe and accessible to Tribal staff. It is their voice and their plan.”

—personal communication, Tribal Environmental Planner

“The [climate adaptation] planning process provides an opportunity to incorporate language, culture, and mental health concerns.”

—personal communication, Tribal Environmental Planner

“[Local climate adaptation planning] provides a catalyst for Tribes to start thinking about the future and take ownership of the planning process.”

—personal communication, Tribal Environmental Planner

In both plans and expert interviews, there is an expectation that plans function beyond collecting dust on a shelf. While the expectation is clear that writing plans will comply with grant requirements and secure additional funding, it is also clear that plans are expected to continue to be living documents beyond grant cycles—revisited and revised by community members in response to inevitable social, cultural, political, and environmental changes. The Metlakatla Indian

Community Climate Change Adaptation Plan (2018), for instance, includes target dates for re-evaluating vulnerabilities and assessments, updating the plan with new available data, and performing a complete overhaul of the plan after 10 years. Climate adaptation plans are not intended to be discrete and compartmentalized, they are meant to provide an ongoing forum for addressing the needs of today while envisioning the communities of tomorrow.

RESEARCH QUESTION 2: WHAT AREAS OF CONCERN ARE BEING ADDRESSED IN CLIMATE ADAPTATION PLANS AND ASSESSMENTS (E.G. INFRASTRUCTURE, SUBSISTENCE, CULTURE, ECONOMICS, ETC.)?

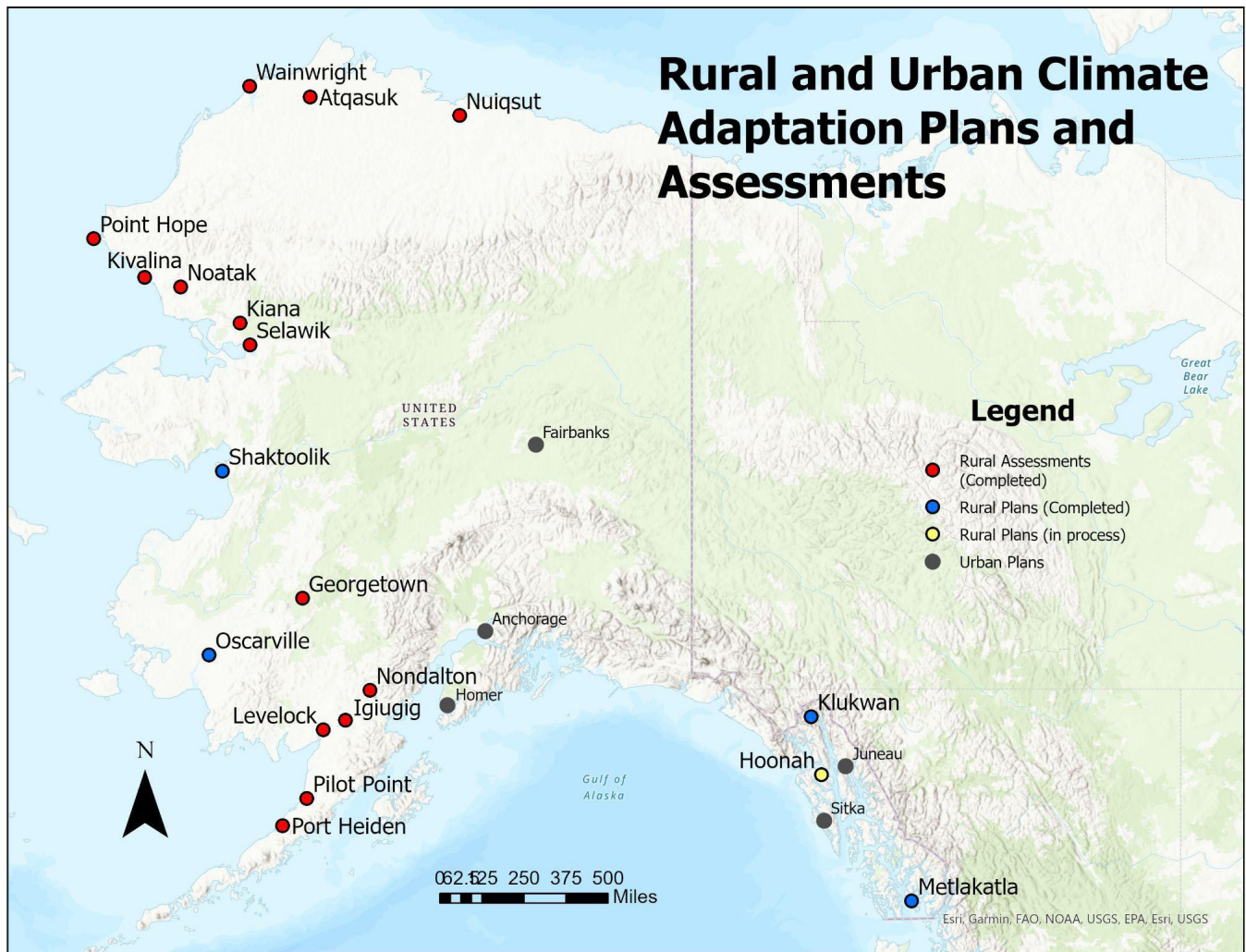


Figure 6: Local climate adaptation plans and assessments reviewed in this report

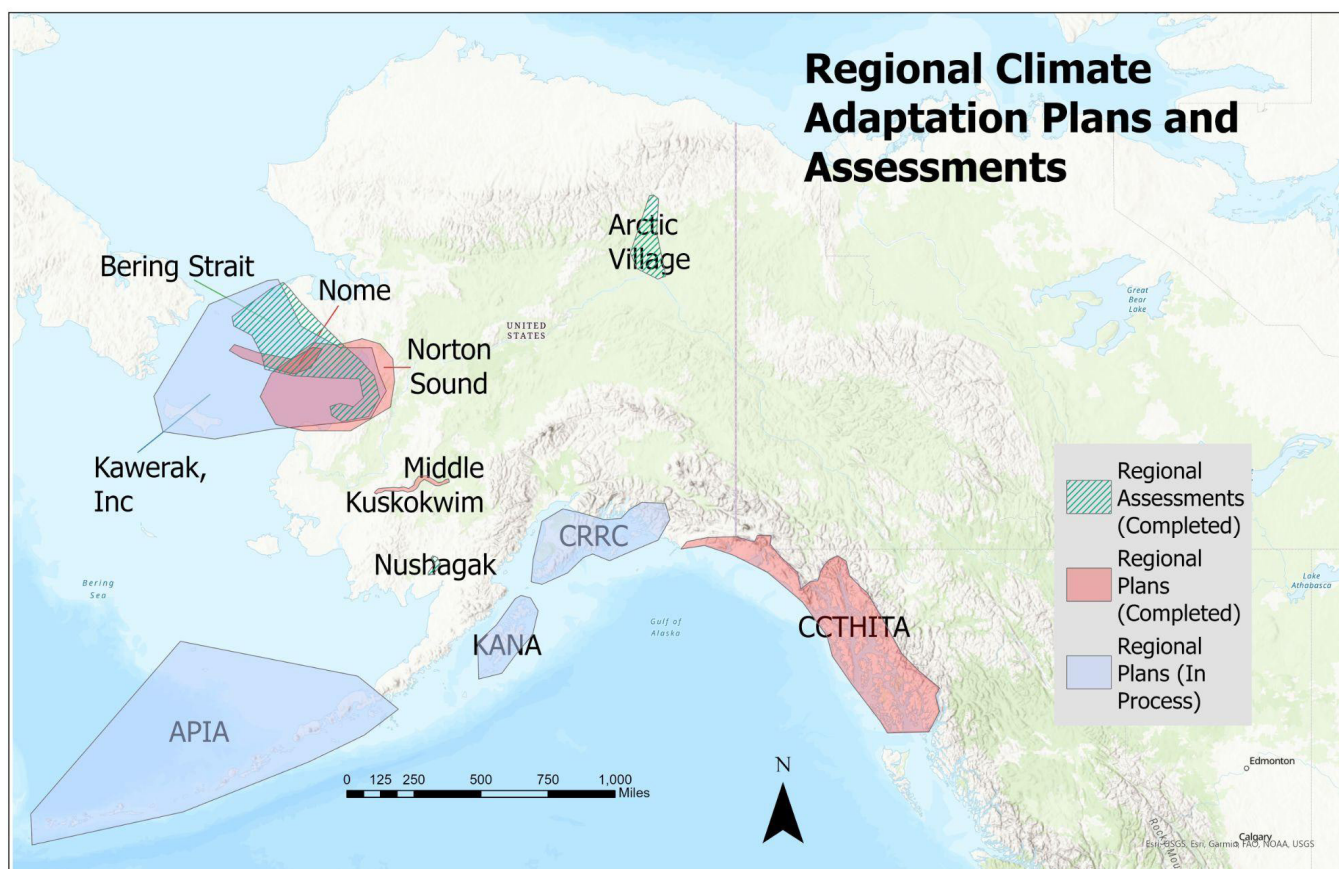


Figure 7: Regional climate adaptation plans and assessments reviewed in this report

In four of the regional climate adaptation plans reviewed for this report, subsistence was the leading priority. For instance, in the Middle Kuskokwim plan, emphasis was placed directly on “ensur[ing] sustainable populations of fish, game, and vegetation to increase the availability of Traditional foods” (Middle Kuskokwim, 2020). In this plan, the impact of high fuel costs was also addressed, particularly in regards to accessing subsistence resources. In the Metlakatla plan, a preliminary vulnerability assessment was completed to elucidate a value of ‘total priority’—factoring in exposure, sensitivity, risk, and adaptive capacity—for several impacts on the Annette Island Reserve. Salmon, sub-

sistence practices, and human health ranked among the top four priorities. Shoreline erosion and shifting precipitation patterns were also ranked highly among the leading concerns. In the Central Council plan, salmon stood out as a leading cultural and subsistence priority. Subsistence was also identified as a leading priority for the Nome plan, with the first 5 of 8 climate adaptation initiatives including concerns around traditional food preservation, subsistence resources, and Tribal representation in subsistence management. Other initiatives included building capacity for addressing concerns about increased shipping and protecting Tribal cemeteries from erosion.

In two of the rural climate adaptation plans reviewed, infrastructure was the leading priority. In the 2014 Shaktoolik plan, for instance, the first two initiatives are geared towards building natural infrastructure to mitigate storm surge, while the third is to construct a multipurpose building to serve as a refuge during large storms. In the 2019 Oscarville plan, 6 out of the 7 adaptation priorities are infrastructure projects. These plans are written for communities in Western Alaska where the climate change risks of erosion, flooding, and permafrost degradation are often associated with infrastructure.

In the two remaining rural climate adaptation plans, the presence of a leading priority was less discernible. For instance, the 2013 Norton Bay Watershed plan focuses on both laws and natural resources, with implications for subsistence users. The Klukwan plan addresses both infrastructure and plants and animals, addressing food security, energy efficiency, and cultural preservation. It's important to note that while there exists a significant spatial and temporal gap between each of these plans, they share addressing subsistence resources or the systems that impact a subsistence way of life.

Among the seventeen climate change assessments reviewed, there were a range of concerns addressed, without a discernible leading concern. The majority (15) of these assessments were led by ANTHC in the following regions: Bristol Bay, Y-K Delta, Bering Strait, and the North Slope. While

these assessments are largely characterized as infrastructure-focused (personal communication, ANTHC), there are a number of other areas of concern that are addressed, depending on the region or community. Concerns ranged from food and water security to mental health. For instance, the 2014 Nuiqsut assessment addresses food security by illustrating the impacts of warming temperatures on traditional ice cellars (Nuiqsut, 2014).

Traditional ice cellars are critical pieces of infrastructure and inextricably bound to cultural continuance and a subsistence way of life. Such overlapping of areas of concern is conspicuous in many of these assessments.

In certain ANTHC-led plans, other concerns emerge. In the Port Heiden assessment, economic development is a major priority. For instance, economic initiatives include the construction of a safe harbor to bolster the local fishing industry and an airport building to support airline partnerships. In the climate adaptation assessment for Arctic Village, Fort Yukon, and Venetie, subsistence resources have outsized importance. Associated recommendations included adapting harvesting strategies, exploring the harvest of new species, and relocating subsistence camps out of areas vulnerable to erosion.

The two assessments included in this report that were not ANTHC-led were written for the communities of Georgetown (2017) and Igiugig (2020). Several areas of concern are addressed in the Georgetown assessment, including ecosystems, subsistence, infra-

structure, water, and health. The Igiugig assessment addresses subsistence lifestyle and food security, water quality, and infrastructure. While the Igiugig assessment addresses critical infrastructure issues, it prioritizes Igiugig's subsistence way of life. The Igiugig assessment addresses issues related to hunting and fishing regulations, for instance. As climate change impacts the movement and abundance of subsistence resources, the assessment emphasizes the importance of regulations being adaptable and inclusive of LTK and input from local decision makers.

In each of the urban climate action plans, initiatives were generally geared towards decarbonization of various sectors, such as transportation. While these were largely climate change mitigation initiatives, explicit climate adaptation initiatives were also included in the plans reviewed for this report. As noted above, the Homer plan included both mitigation and adaptation measures. These included some metrics for improving energy efficiency, such as reducing energy use by 25% through conservation and energy efficiency. Adaptation measures included "tak[ing] steps to protect existing infrastructure from the impacts of climate change" (Homer, 2007, p. 8). The Sitka plan also includes climate adaptation measures in response to increased storm intensity and frequency. These included "tak[ing] into consideration the proximity of residential and commercial properties, as well as crit-

ical infrastructure to effects from violent sea action" (Sitka, 2010, p. 8). The Sitka plan provides explicit CO2 emissions reduction targets and the economic costs and savings associated with reductions. While the Juneau plan does not outline climate adaptation initiatives, it is explicit about its mitigation targets and timelines. It provides a clear rationale for its specific emissions targets in several sectors and supports those targets with quantitative data.

Other urban plans, such as the Fairbanks plan, have interwoven both climate mitigation and adaptation initiatives in sections organized by sector. For instance, goals and recommendations for the food and agriculture sector include "explor[ing] food and agriculture opportunities that arise from climate change" (Fairbanks, 2023, p. 25)—adaptation—and "identify[ing] and encourag[ing] agricultural use of FNSB lands with high potential to combine agriculture with soil carbon storage" (Fairbanks, 2023, p. 26)—mitigation. Although the Fairbanks plan provides some information on the relative costs associated with its goals and recommendations, they are less explicit in terms of quantifiable outcomes than other urban plans. The Anchorage plan is also organized by sector in establishing its objectives. Climate change mitigation and adaptation action steps are interwoven throughout these sectors. Though not always quantifiable, action steps are reasonably detailed, including co-benefits, primary municipal liaisons, potential

partners, and timelines. Though several urban plans mention the importance of subsistence resources for Alaskans, only the Anchorage plan provides a specific action step for improving education around subsistence resources (Anchorage, 2019, p. 72).

A relatively stark difference between urban plans and rural/regional climate adaptation plans or assessments is whether action steps are quantitative or qualitative. In many (though not all) of the plans and assessments reviewed for this report, action steps are

often qualitative and may not include specific metrics or timelines for evaluating whether an adaptation strategy has been successful. In contrast, urban plans generally offer more measurable action steps. Still, climate adaptation targets in urban plans are often less measurable than climate mitigation efforts, which suggests perhaps an inherent challenge associated with designing measurable climate adaptation initiatives as they are tied to uncertain future scenarios.

RESEARCH QUESTION 3: IN WHAT WAYS IS LTK BEING INCORPORATED IN PLANS AND HOW HAS THIS EVOLVED OVER TIME?

Each of the ANTHC-led assessments adopted a baseline of local observations from which to draw conclusions about changes and potential adaptation strategies. In some cases, this was referred to as ‘anecdotal data’ from local experts in various sectors (e.g. public health). While not entirely absent, references to ‘Traditional’ or ‘Indigenous’ Knowledge in these assessments are infrequent. However, in seven assessments, the importance of incorporating LTK for monitoring and other purposes is referenced. The Igiugig assessment was explicit about incorporating LTK in describing its process as “[being] guided by the cultural values of Igiugig and a Yup’ik worldview, including an understanding of social and environmental systems as highly connected and an emphasis on respectful relations and reciprocity, including between

the human, the non-human and the more-than-human” (Igiugig, 2020, p. 12). In the Georgetown assessment, it is stated that “Traditional knowledge and scientific information are equally weighted and complementary throughout [the] report” (Georgetown, 2017, p. 10). Moreover, the Georgetown assessment is explicit about methodological approaches to incorporating LTK. These included key respondent interviews, semi-directed group interviews, participant observation, and workshops.

Of the five urban climate action plans, only the Anchorage and Fairbanks plans reference LTK. In the opening sections of the Anchorage plan, it is stated that the plan is “built on the recognition that Indigenous values and knowledge are foundational to our efforts to build community resilience” (Anchorage,

2019, p. 3). It goes on to place particular emphasis on Indigenous Knowledge with regards to food systems: “Indigenous ways of knowing and practices of inclusivity and community involvement should be integrated into management, research, and policy decisions throughout the food system” (Anchorage, 2019, p. 69). The Fairbanks plan references LTK in its ecosystem health section, stating that “local Indigenous peoples have a long history of interacting closely with the environment and developing strategies for resilience and adaptation... . [This plan] encourages Indigenous partnerships to facilitate the incorporation of this knowledge, which can support healthy ecosystems and a resilient community, into FNSB actions” (Fairbanks, 2023, p. 7). While the Anchorage and Fairbanks plans do not explicitly provide methods for the inclusion of LTK in the planning process or action steps to include LTK moving forward, these plans go a step further than earlier urban plans in acknowledging the importance of LTK.

The climate adaptation plans reviewed for this report are much more explicit about both acknowledging and engaging with LTK. In all but one of the plans reviewed for this report, existing LTK is acknowledged and/or incorporated. For instance, the Metlakatla plan (2018) references LTK throughout the document, stating that “the Tribe acknowledges the changing climate and advocates addressing the potential effects through the integration of Traditional Ecological Knowledge

(TEK) and scientific evidence” (Metlakatla, 2018, p. 6). Further, the Metlakatla plan recommends “holding local discussions [and] encouraging Elders and harvesters to share their experiences with others” (Metlakatla, 2018, p. 64) to inform and strengthen community resiliency with regards to subsistence practices.

In five plans, methods for actively incorporating LTK (e.g. interviews, surveys, workshops) are thoroughly detailed and drawn upon to inform climate adaptation planning processes, such as vulnerability assessments and the development of adaptation strategies. As part of the Middle Kuskokwim plan process, residents from Middle Kuskokwim River communities (e.g. Aniak) gathered on three separate occasions to 1) share observations about environmental changes and their impacts on communities in the region; 2) identify priority adaptation areas and develop project ideas and goals; and 3) meet with potential agency partners to collaborate on future projects. These efforts resemble some of the recommendations suggested by David-Chavez and Gavin for increasing the overall quality of community engagement (David-Chavez and Gavin, 2018). While there isn’t specific language in the Middle Kuskokwim plan that points to the importance of co-produced knowledge (CPK), this type of engagement with communities approaches what more authentic co-planning might look like.

The use of LTK in climate adaptation planning and assessments has a discernible

temporal arc. While LTK is infrequently referenced, if at all, in earlier plans and assessments, it is frequently referenced in recent plans and assessments. The ways in which LTK is incorporated into plans is also evolving.

Evidently, merely acknowledging LTK represents an outdated practice, and the importance of co-planning is much more explicit in recent plans.

RESEARCH QUESTION 4: TO WHAT EXTENT ARE CLIMATE CHANGE MITIGATION AND ADAPTATION SYNERGIES AND/OR CO-BENEFITS BEING EXPLORED IN PLANS AND ASSESSMENTS ACROSS ALASKA?

Overlapping Climate Change Mitigation and Adaptation Initiatives in Alaska

According to the UN Environment Programme, climate change mitigation is defined by any effort to reduce or prevent greenhouse gas emissions (UNEP, n.d.).

“Many Indigenous declarations on climate change, in the United States and internationally, strongly suggest that adaptation strategies must come hand in hand with mitigation to generate benefits from multiple pathways.” (Norton-Smith et al., 2016).

“We further call for a just transition to decentralized renewable energy economies, sources and systems owned and controlled by our local communities to achieve energy security and sovereignty.”

—The Indigenous Peoples’ Global Summit on Climate Change Anchorage Declaration (2009)¹³

As a predominantly rural state with a cold climate, Alaska relies heavily on fossil fuels for its energy demands. Alaskans consume a lot of energy for residential purposes (e.g. home heating), industrial processes, and air or watercraft travel to and from remote locations. Further, many of Alaska’s remote, isolated communities depend on stand-alone micro-grids¹⁴ that consume diesel fuel for energy production. Alaska emitted about 35 million metric tons of CO₂e¹⁵ in 2019 (ADEC, 2023). While this is much less than the total emissions from other U.S. states (ranked 41 among U.S. states), on a per capita basis, it is carbon

¹³ Norton-Smith et al., 2016.

¹⁴ Disconnected from centralized energy production and distribution infrastructure or ‘The Grid.’

¹⁵ Carbon dioxide equivalent or the number of metric tons of CO₂ emissions that is equivalent to the global warming potential of one metric ton of another greenhouse gas (e.g. methane or CH₄).

intensive. Alaska per capita emissions in 2016 was about 45 metric tons, which was the 4th highest among U.S. states (EIA, n.d.). To put this further into perspective, the global average emissions per capita in 2021 was 4.7 metric tons (IEA, 2023).

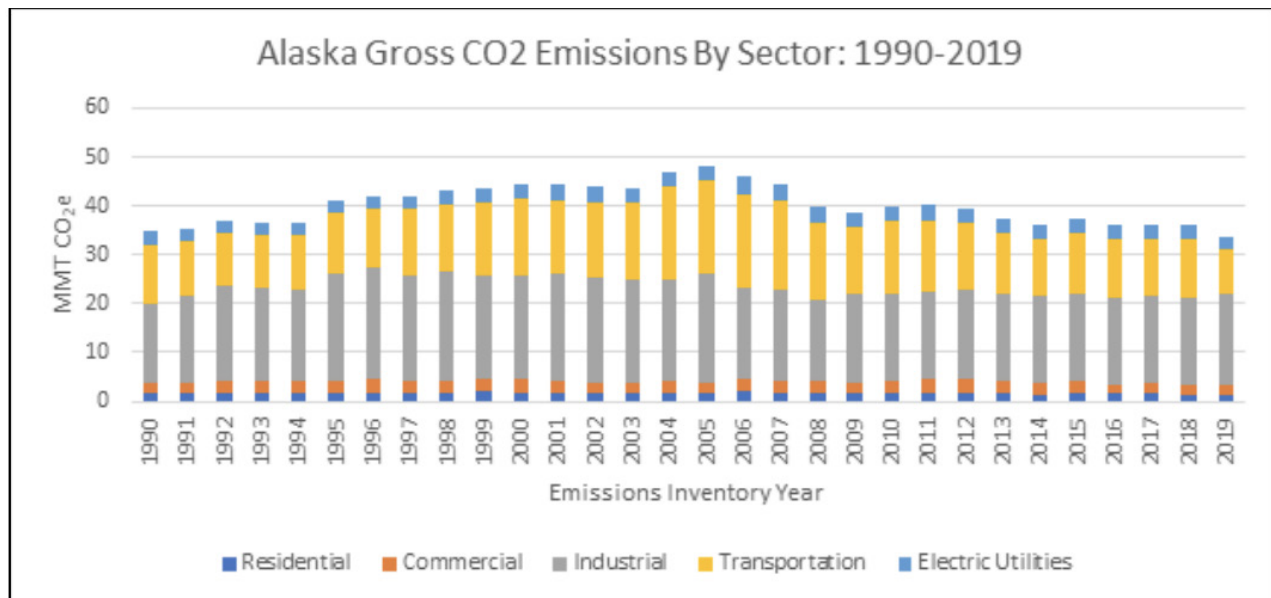


Figure 8: Alaska CO₂ emissions over time by sector (source: Alaska Department of Environmental Conservation Air Quality Division).

A lot of nuance gets lost in these aggregated data. For instance, hydropower facilities provide a great deal of clean energy to communities in both Southeast and South-central Alaska, but these clean energy sources and infrastructure are not available to remote communities in Western Alaska. Further, while electric vehicles (EVs) might seem more realistic in the context of the road system, they often appear less suitable to remote communities where energy infrastructure is less robust, cold climatic conditions compromise EV range, and a great deal of travel is undertaken in vehicles other than cars. Still, a number of the strategies that accomplish adaptation goals might also achieve reductions in emissions, such as the weatherization of homes to be more energy efficient (an energy cost saving adaptation strategy) or the use of baseload coupled with intermittent renewable energy sources to power microgrids (an energy security adaptation strategy). While it is in the best interest of every community to explore opportunities for reducing emissions, it is important to ensure that such opportunities

are culturally sensitive, self-determined, and equitably accessed.

Seven climate adaptation plans either address mitigation efforts directly or reference adaptation strategies that have implications for climate change mitigation. Of those, only three plans directly address climate change mitigation. For instance, the Klukwan plan recommends assessing renewable energy options and seeking funding for energy efficiency, which are adaptation strategies that are synergistic with climate change mitigation. However, the Klukwan plan doesn't directly address climate change mitigation. Whereas, the Norton Bay Watershed plan acknowledges the importance of communities engaging in both adaptation and mitigation efforts, but does not include adaptation strategies that would reduce regional emissions substantively.

Significantly, the Central Council plan offers the perspective that Indigenous Peoples have not only experienced some of the worst impacts of climate change but also international climate change mitigation measures (Central Council, 2019). For instance, the United Nations' REDD¹⁶ program has, in some cases, hindered the ability of forest-reliant communities to respond to unexpected shocks in environmental or economic systems (Hajjar et al., 2021). This goes to highlight the fraught relationship that Indigenous Peoples have

with technocratically driven climate change mitigation efforts and may explain a certain reticence when it comes to discussing climate change mitigation. Further, this may help explain why climate change mitigation opportunities are less explicit in some Tribal climate adaptation plans.

Climate change assessments rarely addressed climate change mitigation efforts directly. Eleven climate change assessments made no reference to climate change mitigation. However, in a number of assessments, synergies between adaptation strategies and climate change mitigation were implied. For instance, in the Kivalina assessment, a recommendation was made to explore the collection of methane gas from methane seeps for in-home heating (Kivalina, 2011). In the Selawik assessment, strategies for reducing energy costs included increasing energy efficiency and the use of 65 kW wind generators (Selawik, 2012). While these are intended for adaptation purposes, synergies with mitigation are clearly embedded. Several assessments directly referenced climate change mitigation.

Each of the five urban climate action plans reviewed for this report address climate change mitigation directly via greenhouse gas emissions inventories and emissions reduction strategies. In contrast to the climate adaptation plans and assessments

16 Reducing emissions from deforestation and forest degradation.

reviewed in this report, these plans lead with climate change mitigation initiatives. Climate action plans for Homer, Sitka, Fairbanks, and Anchorage also address climate adaptation and suggest adaptation strategies. The Homer plan, for instance, explicitly addresses both climate change mitigation and adaptation. Promoting and creating opportunities for local agriculture is listed as an adaptation measure in the Homer plan, which is synergistic with climate change mitigation in that it creates opportunities for reducing emissions associated with food miles¹⁷ (Homer, 2007). The Anchorage plan is unique among urban climate action plans in highlighting the co-benefits associated with climate change mitigation, such as the job opportunities that are expected to accompany a burgeoning clean energy industry (Anchorage, 2019).

Where references or allusions to climate change mitigation do occur in climate adaptation plans and assessments, they are often coupled with other community values, such as self-sufficiency. The Pilot Point assess-

ment (2013) references the potential of energy self-sufficiency using wind resources and capturing methane emitted from swamps and natural seeps. The Arctic Village et al. assessment also discusses the importance of self-sufficiency in terms of providing affordable and reliable (but not explicitly clean) energy. This could also be evolving over time as communities such as Igiugig take on more conspicuously clean energy projects. However, a more holistic approach to social, cultural, and environmental concerns is still more evident in rural plans and assessments than in urban plans where the language remains decarbonization-centered. The Village Council President of Igiugig, AlexAnna Salmon, clearly delineated her position on Igiugig's climate change efforts stating, "we now stand in a position to inform our leaders on what works and what doesn't and what is culturally and environmentally appropriate for the region that we're in" (McDermott-Murphy, 2023).

CASE STUDIES

Zooming in on community-level climate adaptation plans reveals distinct spatial contexts across Alaska while drawing attention to many of the unifying characteristics that Alaska communities share, particularly in terms of Indigenous culture and a subsis-

tence way of life. It also serves to establish a temporal arc showing how earlier efforts at Tribal climate adaptation planning (Oscarville) inform more recent efforts (Klukwan).

17 The distance that food is transported from where it is produced to where it is consumed and the associated CO₂ emissions.

CASE STUDY 1

Oscarville Tribal Climate Adaptation Plan (2019)

“This report was led by rural Alaskans, written by rural Alaskans, and is an attempt to bridge the gap between indigenous knowledge and Western science”

— Oscarville Tribal Climate Adaptation Plan, 2019

Community context



Oscarville is a Yupiit community in the Yukon-Kuskokwim Delta (Y-K Delta). Oscarville was established as a trading post in 1908 on the north bank of the Kuskokwim River opposite Napaskiak. It is located about six miles southwest of Bethel, the Y-K Delta regional hub, and 400 miles west of Anchor-

age. According to the most recent census, there are 70 residents in Oscarville (US Census Bureau, 2020). Oscarville residents continue to engage in a traditional subsistence way of life, characterized by hunting, fishing, and gathering wild plants and berries. In Oscarville, a number of factors that affect

health and well being are contingent upon the ability to continue practicing a traditional subsistence lifestyle.

Demographically, the Y-K Delta is considered the poorest region of Alaska with a poverty rate of 48% and an average household income of \$61,167. Access to energy is provided by the Alaska Village Electric Cooperative (AVEC) via an intertie with a single line from Bethel. At the time the Oscarville plan was drafted, the Oscarville Native Corporation owned and operated a 10,000 gallon bulk fuel container that was in poor condition. Each home used a 'honey bucket' system without running water or sanitation. Oscarville is generally accessed from Bethel by boat during the summer months, snowmobile during winter months (pending snow and ice conditions), or helicopter.¹⁸

As a region, the Y-K Delta is particularly vulnerable to climate change. According to Jorgenson et al. (2018), the Y-K Delta is the region most vulnerable to climate warming in the Arctic due to a combination of critical factors, including relative sea-level rise, sea-ice reduction, accelerating permafrost degradation, and flat terrain. According to the Denali Commission's Statewide Threat Assessment, Oscarville faces moderate risk due to both permafrost degradation and erosion (Denali Commission, 2019). Observed changes include warmer summers and more thawing in winter months, low water levels

in the Oscarville Slough (a landing for watercraft), and riverbank erosion accompanied by ground settling due to permafrost thaw.

Planning process

The Oscarville Traditional Council, Cold Climate Housing Research Center, and ANTHC collaborated on the Oscarville Tribal Climate Adaptation Plan. Funding for the project was awarded by the BIA Tribal Climate Resilience Program in 2016 (BIA TCR Annual Awards Dashboard, n.d.).

The Oscarville Tribal Climate Adaptation Plan utilized a planning strategy conceived of at the Cold Climate Housing Research Center Training Facility called the Holistic Approach to Sustainable Northern Communities. So often, rural projects in Alaska have struggled to achieve sustainable, cost-effective, and community-centered results. The Holistic Approach comes from the recognition that in order to create healthy, thriving, and sustainable communities in rural Alaska, it is critical to bring together communities and inter-agency partners at roundtable discussions to collaboratively address interconnected community goals and challenges. Using the Holistic Approach, community residents have the opportunity to define the characteristics that contribute to healthy communities.

18 Oscarville does not have a runway because of its close proximity to Bethel, the regional hub.

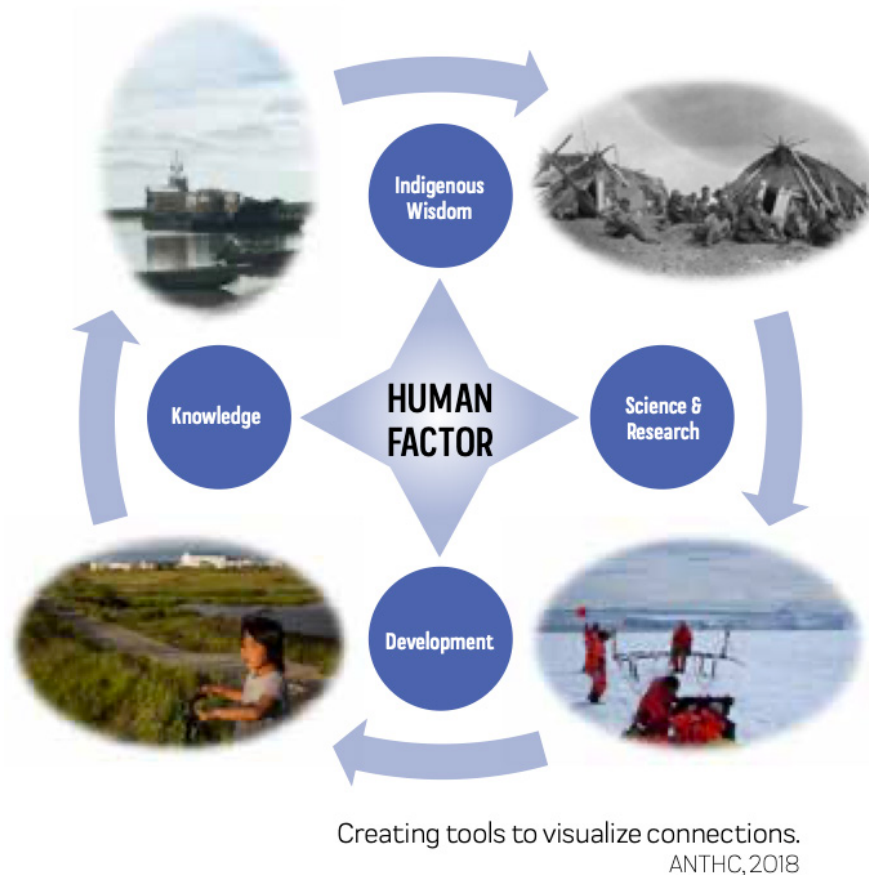


Figure 9: Oscarville plan figure illustrating the Holistic Approach (Oscarville Tribal Climate Adaptation Plan, 2019).

Details and observations that inform the Oscarville plan were largely drawn from community meetings, inter-agency meetings, and interviews that took place in the community. In order to ensure that roundtable discussions were meaningful for all participants, Oscarville residents were encouraged to define specific terms, such as ‘sustainability,’ in their own language. This provided a translation of sorts between a more Western-oriented worldview to one that was grounded in Yup’ik cultural values and understanding.

Several resources were drawn upon to identify localized climate projections and develop adaptation strategies, including the US Climate Resilience Toolkit, Climate Change

Adaptation Planning Manual, peer reviewed literature and climate change projections from the Scenarios Network for Alaska + Arctic Planning (SNAP).

The plan identifies threats and vulnerabilities to several sectors, from food security and subsistence to energy and infrastructure. Each of these are given a relative vulnerability score that is based on the following: 1) observations; 2) severity of impact; and 3) scale of adaptation efforts. These relative vulnerability scores were then used to derive priority projects and action steps moving forward.

Priorities and outcomes

Using the relative vulnerability score of each sector, Tribal leaders were able to prioritize potential adaptation projects. The following

table lists adaptation projects in order of priority.

Priority	Project name	Next steps	Partners	Funders	Estimated Costs
1	Improved Sanitation and Water	Sanitation Plan	ANTHC, YKHC	IHS, USDA-RD	\$1.6 million
2	Boardwalk to Bethel New dock and new location of dock	AVCP follow-up for planning	AVCP	BIA	
3	Electrical Upgrades	Meet with AVEC, AEA, DOE	AVEC, AEA, DOE	ONC, AVEC, AEA, DOE	\$150-200,000
4	Wind and Solar integration	Research possibilities	AVEC, AEA, DOE, REAP, ACEP, Calista, CCHRC	TBD	TBD
5	Incinerator for Solid Waste	Finalize Sustainable Solid Waste Plan	ANTHC-CEH	EPA	\$6,000
6	Multi-use building	Research and plan	AVCP, ONC, CCHRC	HUD, EDA,	
7	Local Data Monitoring (temp, precipitation, water, ice, snow)	LEO Network training, research	ANTHC, UAF, UAA	TBD	TBD

Table 3: Project priorities set by the community leaders of Oscarville (Oscarville Tribal Climate Adaptation Plan, 2019).

As of June 2023, five out of seven of the report’s priority projects have either been completed or are on their way to completion (personal communication, ANTHC, 2023). For instance, the electrical upgrades project (priority #3) was approved and supported by AVEC. This project may have been particularly appealing to AVEC because it would result in less energy loss from transmission of electrical energy across the Bethel-Oscarville intertie, a cost that AVEC had been absorbing. Though modified from its initial conception, the multi-use building project (priority #6) was also recently completed. Oscarville residents had been interested in building a new church. A church was constructed that

now also serves as a multi-use building. The Boardwalk to Bethel project (priority #2) has been stalled because of a land use issue. The Wind and Solar (priority #4) and Local Data Monitoring (priority #7) projects have not been completed to date.

The priorities section of the Oscarville plan provides a user-friendly ‘one-pager’ upon which the community may continue to reflect. The plan is designed to be revisited annually as adaptation goals and strategies evolve, so that Oscarville residents can make modifications and additions as needed. According to the lead author of the plan, “this became [Oscarville’s] plan” (personal communication, ANTHC).

Limitations and barriers to planning and implementation

The implementation of priority projects highlighted in the Oscarville plan faces a number of physical and social challenges. In rural Alaska, particularly in the Y-K Delta where permafrost is prevalent, delivering water and sanitation is often a considerable engineering challenge. In addressing water and sanitation improvements, ANTHC collaborated with the Cold Climate Housing Research Center, Lifewater Engineering, and Camp Water Industries to design a Portable Alternative Sanitation System (PASS). This system was designed for in-home use. While the unit has been installed in at least one home,¹⁹ PASS systems were intended to be only a transitional step between a ‘honey bucket’ system and something more sophisticated and sustainable. However, construction costs in rural Alaska communities are often prohibitive and funding scarce for completing and maintaining infrastructure projects. Further, certain physical characteristics of the landscape can be limiting. Drilling new wells was attempted, but the poor water quality and costs of sufficient treatment (e.g. reverse osmosis filtration) was prohibitive.

There are socio-technical barriers to project implementation. When the Oscarville plan was drafted, AVEC may have been less inclined to pursue renewable energy sources for electrical generation. Recently, as more diesel generation has been supplanted

by renewable energy sources in rural Alaska—primarily wind—not only is the proof of concept sufficiently demonstrated, funding opportunities for renewable energy systems are more widespread. As of 2023, AVEC has installed wind-diesel hybrid systems in 12 of the 58 communities they serve (REAP, n.d.). In 2022, the Inflation Reduction Act committed \$1 billion for rural renewable energy loans to rural electric co-ops, of particular relevance for AVEC (USDA, n.d.). A surge in funding and finance opportunities, tied to a recent transition in administrations, has made this more achievable and attractive to AVEC. Priorities also shift over time for the residents of Oscarville. While renewable energy power generation is desirable for Oscarville residents because of the potential for clean, secure, and affordable energy, its immediacy might be overshadowed by more pressing issues, such as the risk of the local school shutting down due to low enrollment.

Some implementation barriers are due to Oscarville’s size. Oscarville has much less capacity compared to larger communities. Without dedicated staff to write and manage grants, it can be challenging to access relatively scarce funding that is competitively awarded to Tribal communities.

19 Personal communication, ANTHC.

Unique contribution to climate adaptation planning at large

The Oscarville plan represents an early attempt at community-level climate adaptation co-planning. The Bureau of Indian Affairs

has cited it as an exemplar of a co-produced document (personal communication, ANTHC, 2023).

CASE STUDY 2

Resilience Planning for Tlákw Aan (Klukwan; 2023)

“The Chilkat Indian Village developed this plan to support actions that build resilience for the Village of Tlákw Aan (Klukwan), and the communities and people that live within the Upper Lynn Canal, with the hopes that current and future generations will continue to flourish here on the banks of the Jilkáat (Chilkat) River as they have since time immemorial”

—Resilience Planning for Tlákw Aan, 2023

Community context

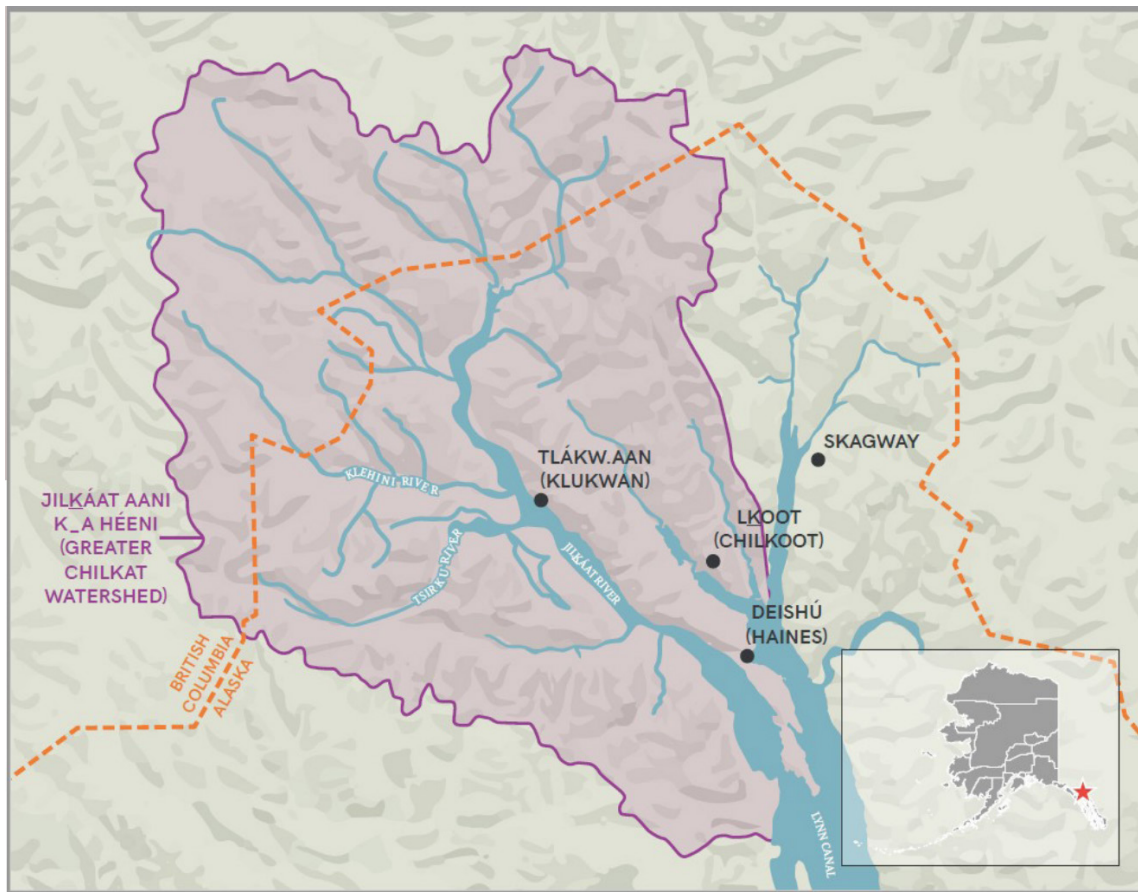


Figure 10: Chilkat River Watershed (Source: CIV Climate Resilience Plan, pg 6)

Tlákw Aan (Klukwan) is a Tlingit village along the banks of the Chilkat River, about 21 miles northwest of Haines in Southeast Alaska (Figure 9). The Chilkat Indian Village (CIV) is a federally recognized sovereign nation and the local jurisdictional and governing authority for the Village of Klukwan. Klukwan is an enclave within the Haines Borough, existing as an unincorporated borough responsible for its own services and administration. The Tribal Council, an elected governing body, upholds the Tribal government's constitution and provides services to Tribal members. The environmental department provides services such as water and sanitation, environmental monitoring, and government to government consultation, and coordinates programs such as the Tribe's brownfields program.

The non-anglicized version of Klukwan, the Lingít name Tla'kwaan, means 'eternal village.' Klukwan has been inhabited for millennia and is the only inland Tlingit village in Southeast Alaska. According to the Alaska Division of Community and Regional Affairs (DCRA), there are 86 residents in Klukwan, with a median household income of about \$38,000, which is about half of the median household income for all Alaskans (DCRA, 2022).

Klukwan is situated amidst a dynamic ecosystem gradient, where a mild, wet maritime climate and a western hemlock- and Sitka spruce-dominated forest ecosystem lies 20 miles to the southeast and a dry subarctic interior region lies 20 miles to the north. This dynamic environment provides an abundance

of plants and animals to Klukwan residents as well as access to clean air and fresh water. The breadth of the Chilkat River Watershed is significant, extending beyond international borders. Melting glaciers and tributaries that strengthen the flow of the Chilkat River also result in changes to the landscape through flooding, landslides, and erosion. Additionally, Klukwan sits atop an alluvial fan that is prone to mudslides, avalanches, flooding, and earthquakes.

Shoring up adaptive capacity in response to ongoing changes is critical because of the relationship that Klukwan has with its environment. Haa Atxaayí Haa Kusteeyíx Sitee ("Our food is our life") is a Traditional expression for Klukwan Tribal members. Chilkat River Sockeye, hooligan, and moose were some of the culturally significant species identified by CIV staff and Tribal members as being potentially vulnerable to ongoing changes. Because dissolved oxygen depletion can result from high water temperatures (Sergeant et al., 2023), increases in stream temperature could make salmon rearing areas less hospitable. Further, in 2019, parts of Southeast Alaska experienced record drought. Drought-impacted fisheries resulted in harmful algal blooms and species mortality. The following year, record daily precipitation was recorded (Lader et al., 2022), resulting in flooding rains that triggered landslides (Holen, 2023). Such extremes require sustained evaluation of climate adaptation priorities. Locally observed changes

in Klukwan include streambank erosion along the Chilkat River threatening the Jilkaat Kwaan Heritage Center, diminishing availability of berries and subsistence plants, and a reduced snowpack in the mountains.

Planning process

The resilience plan for Klukwan was conducted by the Chilkat Indian Village and will be referenced as the Klukwan plan. Funding was provided by the Bureau of Indian Affairs, Tribal Climate Resilience Program, the U.S. Department of Energy, Office of Indian Energy, Technical Assistance Program, and CIV. The CIV Tribal Council initiated the plan after observations of climate impacts had become so significant that planning became a top priority. CIV tasked the Tribe's natural resource planner with leading the planning process. Thus, a multi-year planning process was initiated. Associates from Alaska Sea Grant and the Alaska Climate Adaptation Science Center offered technical expertise and assistance. CIV also used support tools provided by the Central Council of Tlingit and Haida Indian Tribes of Alaska. The Cold Climate Housing Research Center was also instrumental in assessing the energy efficiency of homes in Klukwan.

In drafting action steps, CIV drew on the observations and concerns of its Tribal Members, CIV staff, and the CIV Council. The CIV Resilience Coordinator conducted a door-to-door survey of Klukwan residents, addressing

a number of climate issues. Several community gatherings were also hosted.

In response to feedback detailed in surveys and discussed at community gatherings, CIV decided to focus on climate change impacts to critical infrastructure and culturally significant plants and animals. The plan is divided into two parts. The first part provides a technical overview of ongoing climate change for those with a Western science oriented lens, elucidating climate exposures and projections for the Chilkat River Watershed. It also includes a vulnerability assessment. The second part provides an action plan that is designed to be more legible and useful for Tribal members.

Priorities and outcomes

Leaning on existing relationships with the Tribal government and accessing key individuals running the power plant and maintaining the roads led to productive outcomes. Community engagement elicited valuable information, particularly the door-to-door survey. The project leaders found that focusing on infrastructure and subsistence resources generated the most interest among community members. Community participants were especially interested in infrastructure and services because of an associated sense of agency around addressing the most actionable issues and outcomes.

CIV identified the following broader action items (each with its own subsidiary list of

action steps) in responding to the changing climate:

1. Support food security and sovereignty projects, programs and partnerships
2. Monitor watershed characteristics and the health of the plants and animals and their habitats
3. Address climate impacts to the most vulnerable infrastructure
4. Improve understanding of geohazards and the risk they pose
5. Seek funding for energy efficiencies and continue to assess renewable energy options

6. Update emergency preparedness and response to address climate vulnerabilities

Several leading concerns were identified, including housing, riverbank erosion, and landslides. Emergency response was also a significant issue because of the importance of keeping critical medical systems online in the event of a power outage. Before closing, the authors addressed several dimensions of climate impacts that were not included in the plan, and pointed to the importance of evaluating all forms of community capital moving forward.

Limitations and barriers to planning and implementation

The project leaders identified several limitations that surfaced throughout the planning process. For instance, the COVID-19 pandemic placed significant constraints on the ability to host community meetings and gather LTK. Project leaders found that community members were less willing to engage over Zoom or other virtual meeting platforms. Key subsistence informants throughout the region were hard to connect with because of the time commitment associated with a subsistence way of life. Overall, the project leaders found that it took more time than initially anticipated to start getting meaningful information from community members. This resulted in a need to extend funding from the BIA TCRP. In order to secure a second round

of funding from BIA, another grant needed to be completed. This created additional work for personnel already stretched thin. CIV concluded that it might be better to partition climate adaptation planning into phases or segments, so that each part of the process could be given sufficient attention and care.

It was found that among community members there is an interest in food sovereignty, but also a perceived lack of tractability in arriving at solutions to food security threats. While there is a lot of interest in subsistence resources, communities might feel a lack of agency in addressing an issue that is connected to actions beyond the community context.²⁰

20 i.e., increasing temperatures that have impacted local subsistence resources is the result of global emissions.

There is also concern over how rapidly climate projections are changing. Over the course of the planning process, climate projections might have changed significantly or new information about climate impacts might have come online. This provides an extra challenge around planning for projections of change, when the projections are also changing rapidly.

While the Klukwan plan was only recently completed, several potential barriers to implementation were identified by project leaders. Human capacity, particularly limited technical support and expertise, was identified as a significant potential barrier to implementation. While researchers are avail-

able to provide technical assistance, there remains a concern around such efforts being diluted across numerous communities and regions. CIV is concerned about receiving the appropriate region- and community-specific expertise that is required to carry out robust implementation. CIV planners also expect that gathering LTK will be challenging without a more robust intended use plan. Community members need to know that their observations, time, and efforts are achieving desirable outcomes for their community. This can only be accomplished with broader guidance on what will happen with local monitoring and information gathering.

Unique contribution to climate adaptation planning in Alaska

According to project planners, the Klukwan plan is from the Tribe, is in their voice, and is their plan (personal communication, CIV). CIV was intentional about ensuring the plan was

accessible to Tribal staff and members by including a section that was explicitly community-facing, rather than agency-facing.

DISCUSSION

LIMITED FUNDING AND HUMAN CAPACITY

“There are 56 Tribal governments that are part of AVCP and staff has always been pretty limited. Most Tribes do not have a lot of specialists.” —personal communication, Tribal Environmental Planner

“Kawerak updates economic development plans but is too busy to take on [extensive climate adaptation planning for the region].” —personal communication, Tribal Environmental Planner

“We’re skeptical that Tribes have the capacity to write a local climate adaptation plan. At least one staff person is needed to work on a climate adaptation plan.” —personal communication, Tribal Environmental Planner

While there are significant climate adaptation efforts taking place throughout the state, this report identified only eight completed climate adaptation plans, including both local- and regional-scale plans. This is against a backdrop in which 144 Alaska Native communities (43% of all Alaskan communities) are considered vulnerable to climate change impacts (Denali Commission, 2019). Thirty-eight Alaska Native communities are deemed severely threatened by erosion alone (Denali Commission, 2019). Though addressing each climate adaptation plan in the process of being drafted was beyond the scope of this report, it was clear that a significant number of planning projects were underway or recently funded. However, for many communities, the personnel to carry out such projects from front to back are either sparing or altogether absent. In the Chugach region, environmental coordinators are stretched thin with EPA IGAP workloads (personal communication, CRRC). They don't have the bandwidth to take on climate adaptation planning. Furthermore, two of the seven Tribes in the Chugach region are not federally recognized, so there is no IGAP program or coordinator in those communities. The circumstances are similar for the Kodiak region.

The BIA TCRP released an awards solicitation announcement on July 19, 2023, for its annual funding opportunity (DOI, 2023).

The announcement was historic in setting aside \$120 million dollars to support Tribes dealing with climate change impacts (DOI, 2023). This is roughly three times greater than what was funded nationally in 2022 and reveals an understanding of the need for Tribes to access greater funding in response to the challenges of climate change. But is it enough? Is more funding a solution in and of itself? Do Tribes have the capacity to apply for and administer this funding in a short amount of time?

The TCRP's 2023 awards solicitation does include measures to increase equity. For ease of use, the number of funding categories was reduced from previous years, including only two categories for 1) planning and 2) implementation (DOI RFP, 2023). Additionally, there are 'set asides'²¹ for significant implementation efforts involving community relocation or managed retreat. There is also a set aside for first-time applicants, reserved for communities that have no climate programs or climate coordinator (DOI RFP, 2023). These steps are intended to make TCRP's funding opportunity more legible and accessible to communities on the margins of climate adaptation planning in Alaska.

Still, Tribes and Tribal consortia are subject to eligibility requirements. Tribes that are not federally recognized are ineligible for TCRP awards. Further, Tribal organizations are not eligible for certain set asides, such

21 TCRP's awards solicitation includes 3 set asides that each function similarly to funding categories.

as funding for a relocation coordinator. Recognizing that the latter stipulation reflects an effort to ensure funding is going directly to Tribes, questions remain about whether communities have the capacity to apply for that funding or put it to use after it is awarded. Hiring climate coordinators in certain contexts could be challenging without direction from regional Tribal organizations. Tribal organization leaders have often found that the required skills, expertise, and sustained commitment are hard to come by in their regions (personal communication, Kawerak, Inc, AVCP). Additional coordinators will need training and support if they are to effectively plan and implement climate adaptation initiatives.

Before the TCRP funding announcement was released in the summer of 2023, the HIA environmental department anxiously anticipated its release because of the greater flexibility around the use of TCRP funds versus other funding opportunities (personal communication, HIA). Still, the limitations of funding, inclusive of the BIA TCRP, were consistently cited in interviews, workshops, and informal discussions. Climate adaptation planning and implementation is an ongoing iterative process that does not fit neatly into traditional funding cycles. As such, funding opportunities should be reframed to reflect the need for longer project timelines and greater accessibility.

CLIMATE CHANGE LEADERSHIP

“Without the voice of state and federal leadership, it is unlikely that any new attempt to formally coordinate government support will be successful in Alaska or throughout the United States.” —ANTHC, 2023

Historically, there have been significant gaps in climate change leadership in Alaska and a pattern of informally filling this leadership void. In 2007, the City of Homer took an informal leadership role in climate action planning in Alaska by publishing a Climate Action Plan (Homer, 2007). This project was conceptualized and undertaken before the Alaska Climate Impact Assessment Commission, established by HCR 30, had produced its Final Commission Report (Steffen et al., 2021). Later, the Central Council of Tlingit and Haida Indian Tribes of Alaska took on another informal leadership role for the rest of the state by

basing its climate adaptation plan template on its regional climate adaptation plan for Tribes in the Southeast of Alaska. This is a model that is currently being replicated at the Kodiak Area Native Association (KANA workshop), Aleutian Pribilof Islands Association (Alaska Tribal Conference on Environmental Management workshop), Kawerak, Inc. (personal communication, Kawerak, Inc.) and Chugach Regional Resources Commission (personal communication, CRRC).

In lieu of concerted leadership, climate change planning has taken place on a rela-

tively ad-hoc basis. That is, climate change planning is fragmented, rather than comprehensive and systematic across the state. In some ways, the lack of a more standardized planning procedure has allowed communities to exercise ingenuity and tailor planning to specific community needs. However, greater federal and state support doesn't need to come at the expense of context-specific place-based planning. Due to the nature of piecemeal fragmented efforts, plans are not always undergoing the scrutiny that might

lead to more actionable and effective results. In a nationwide review of Tribal climate adaptation plans, Cottrell points to the relative lack of included evaluation criteria that are associated with successful planning, such as timelines and measurable targets (Cottrell, 2023). This gap is not surprising. The onus of producing meaningful and effective plans cannot and should not rest solely on individual communities that oftentimes lack capacity and technical expertise.

LTK, INDIGENOUS WORLDVIEW, AND CO-PRODUCTION/MANAGEMENT

“Plans are not written with Tribes in mind”

—personal communication, Tribal Environmental Planner

About 40 percent of all federally recognized Tribes are located in Alaska, and Alaska Natives represent about 20 percent of Alaska's population—a higher proportion than any other state. Therefore, Indigenous Knowledge should thoroughly inform climate adaptation plans and efforts at co-planning should be prioritized. Communities that are predominately Alaska Native are located in remote isolated locations where practicing a subsistence way of life is vitally important for cultural continuity. From a Western worldview, critical infrastructure refers to technical management and delivery of water and sanitation, energy, and education. From an Alaska Native worldview, critical infrastructure might also refer to fishing camps, cultural centers, or burial grounds, to name

a few. In a world of finite resources, there will always be a need to establish priorities among competing interests. Depending on social norms and cultural perspectives, the ways in which climate vulnerabilities are assessed and action steps prioritized may look vastly different from location to location. In the context of Alaska, planning that is not informed by an Indigenous worldview will be predominantly symbolic.

In rural communities in Alaska, where subsistence is practiced to a much larger extent than in urban areas (Fall, 2017), there exists a different perspective on jobs and careers. Subsistence is considered a full-time job for many Alaska Native communities (personal communication, ACCAP) and is a crit-

ical dimension of rural Alaskan livelihoods. Depending on perspective and worldview (e.g. urban vs rural or city vs Tribal council), there will be different approaches to climate adaptation planning and response to extreme events. The impacts of Typhoon Merbok in September 2022 demonstrate the dichotomy of response to an extreme event. Whereas the City of Chevak worked with the Federal Emergency Management Agency (FEMA) to assess impacts to critical infrastructure such as fuel storage, housing, etc., the Chevak Traditional Council worked with FEMA to assess impacts to critical infrastructure for the subsistence way of life such as the loss of boats, motors, fish nets, and fish camps.

There has been recent emphasis on designing climate adaptation plans with Tribes in mind. While data, graphs, and climate models are valued by funding agencies, they are not necessarily meaningful for communities. In order to be valuable to individual communities, information and planning processes

need to be framed in a way that is accessible and specific to the community. In Kodiak, for instance, KANA is striving to elevate LTK as the most salient dimension of climate adaptation planning across the region (personal communication, KANA).

When adaptation efforts prioritize community involvement and decision making, chances are much better that such efforts won't result in maladaptation.²² Maladaptation often occurs when local perspectives are either not considered or insufficiently considered (Norton-Smith et al., 2016). The next step in the temporal arc of climate adaptation planning in Alaska may involve more authentic collaborative planning. While the Oscarville plan was described as co-informed, it was only verging on co-produced, according to the lead author (personal communication, ANTHC). Establishing more explicit guidelines around collaborative planning, based on lessons learned from past efforts, would be invaluable.

BROADER ASSESSMENT AND INCLUSION OF CLIMATE IMPACTS IN PLANNING

“Young people talk about how there is no future for their kids and their traditions”

—personal communication, Tribal Environmental Planner

High profile areas of concern in climate adaptation plans tend to be related to infrastructure and the environment, including subsistence resources. However, plans have

only begun to scratch the surface of several broader social, cultural, and economic impacts of climate change. For instance, public health concerns such as asthma,

22 An action taken ostensibly to reduce vulnerability to climate change, but actually increases vulnerability of other, related systems, sectors, or social groups (Norton-Smith et al., 2016).

resulting from increased exposure to mold, are not generally represented in climate adaptation plans (personal communication, CIV). Issues surrounding mental health and loss associated with climate change

impacts²³ are conspicuously absent in climate adaptation planning. At present, there is no readily available guidance on how to approach these impacts in climate adaptation planning.

CLIMATE MITIGATION AND ADAPTATION

“Diesel is going to be the easiest and cheapest option. But the Tribe doesn’t want to stick with diesel. [The Tribe] believes in doing their part.”

—personal communication, Tribal Environmental Planner

It is a challenge for small communities to feel a sense of agency when they are a large receiver of the impacts of climate change but only a small contributor. However, it may still be of significant value to prioritize renewing a sense of community-scale agency in addressing climate change mitigation as well as adaptation. Communities care about their carbon emissions, not necessarily because it makes a big impact on global mitigation efforts, but because it is aligned with their

values. For the Klukwan plan, the community was committed to exploring renewable energy options even after it became clear that diesel might remain the most affordable energy option.²⁴ For millennia, Alaska Native communities have lived in reciprocity with the environment. Exploring and elucidating viable mitigation pathways in planning only serves to reinforce this foundational reciprocity.

23 Often referred to as ‘Solastalgia’ or distress caused by environmental change (Albrecht et al., 2007).

24 Even though some renewable energy sources and technologies are price competitive with diesel fuel, the Power Cost Equalization program provides a subsidy for communities where fuel might otherwise be prohibitively expensive.

“While meeting virtually is a tool that can be utilized, fatigue sets in. Being in person makes all the difference”
—personal communication, Tribal Environmental Planner

While certain remedial steps have been taken,²⁵ access to climate adaptation resources and participation in climate adaptation decision making remains inequitable. From a purely economic viewpoint—one which generally underwrites funding opportunities for climate adaptation—providing expensive infrastructure to larger communities is easier to justify. However, it is inequitable when smaller communities (Oscarville, for instance) fall behind in their efforts to access limited funding. Cost-sharing requirements of some grants can be prohibitive and the submission portals can be difficult to navigate.²⁶ Moreover, some communities aren’t aware of funding opportunities. If members of smaller, less resourced communities are not afforded the same access as larger communities to water and sanitation or affordable/clean energy, it is fundamentally inequitable.

Inclusion in climate adaptation planning processes also remains inequitable. Tribal

organizations such as KANA and CRRC are making efforts to be inclusive with their regional climate adaptation planning by inviting representatives from the communities they serve. However, weather and the time commitments associated with a subsistence way of life lead to meeting delays or cancellations (personal communication, CRRC and KANA). In order to negotiate some of these challenges, virtual meetings have been adopted. However, in many rural contexts, internet connectivity is insufficient. Where virtual meetings are achievable, questions remain around how these meetings compare to in person meetings.

In terms of equity, there is a lot to consider. Each of the topics discussed above have equity implications. Moving forward, a more metric-oriented and inclusive study is needed to identify instances of inequity in order to support the best initiatives to improve equity.

25 For instance, the Anchorage Climate Action Plan includes a section on equity and inclusion (Anchorage Plan, 2019, page 30) and the BIA TCRP has included set asides that favor communities without established environmental programs.

26 Personal communication, KANA.

CONCLUSION

FUNDING

In previous efforts to understand challenges around climate adaptation planning in Alaska, funding was noted as the primary barrier. This report highlights the limitations of increased funding alone in overcoming climate adaptation planning challenges. At the heart of

these challenges lies institutional and structural nuance. Funding ought to be targeted to improve equitable access to adaptation resources and metrics put in place to ensure its usefulness to communities.

BROADER VIEW OF CLIMATE ADAPTATION

Climate adaptation and resilience planning encompasses a range of issues. In early plans, only some of these issues (e.g. infrastructure) were addressed. Over time, more issues have been added to the purview of climate adaptation planning. However, there are issues that exist outside the realm of what is easily quantifiable and by extension fundable. In

what ways do funding opportunities address threats to cultural continuance associated with a subsistence way of life? Is there a category in funding opportunities to support mental health in the face of existential loss? These sorts of issues need to be addressed if a more holistic suite of climate adaptation actions are going to be taken.

ONE SIZE FITS ALL?

Climate adaptation at the community level is a deeply contextual experience; community-level history, values, and desires cannot be sensed from afar. As such, planning requires a level of attention and community engagement that will only marginally benefit

from standardized templates, timelines, and protocols. Still, creating adaptable resources, guidance tools, and training opportunities is necessary to ensure well-equipped local and regional climate adaptation practitioners.

ONGOING RESEARCH NEEDS

In recent years, many Tribes and Tribal consortia have been the beneficiaries of a surge in climate adaptation funding. However, there is insufficient research on the extent to which

climate adaptation plans are being effectively implemented in Alaska. Increasingly, LTK is being incorporated in climate adaptation planning. Yet, there is a need to better under-

stand the extent to which LTK is meaningfully guiding planning. Similarly, while the need to draw on co-produced knowledge in a co-equal planning process has become more

explicit (Figus et al., 2022), best practices for engaging in collaborative community and regional planning have yet to be sufficiently demonstrated.

RECOMMENDATIONS

The following recommendations are broadly scaled. They are informed by the gaps and limitations represented in case studies, interviews, plans and assessments, and other literature reviewed for this report. Recommendations are designed to either directly target specific adaptation planning challenges that were identified and confirmed by multiple sources or build capacity and improve planning strategies to target multiple planning challenges.

Because recommendations are intended to inform a range of interested parties, from rural community planners to federal funding agencies, they have been separated into two categories: (1) administrative recommendations for agencies, NGOs, and other climate professionals; and (2) recommendations for Tribes and urban and rural communities facing climate change. While these categories are not mutually exclusive, they provide a baseline for parties with different roles in climate adaptation planning.

1. Administrative recommendations for agencies, NGOs, and other climate professionals

ISSUE	RECOMMENDATION
How to enhance human capacity?	Build human capacity through 1) the non-competitive placement of regional resilience coordinators; and 2) the establishment of an adaptive training program for regional coordinators and environmental programs <i>Description: While the funding to place resilience coordinators in each Alaskan community might not be available, placing regional coordinators provides a starting point. Regional resilience coordinators could act as a liaison and mentor to local environmental planners and community-specific coordinators as they emerge. A climate change adaptation primer would be useful for both resilience coordinators and environmental programs in Alaska. The primer would be a starting point for an adaptive training program in context-specific resilience planning.</i>

ISSUE	RECOMMENDATION
How to ensure that climate adaptation initiatives are actionable?	Foster actionable climate adaptation objectives through evaluation criteria²⁷ <i>Description: Effective planning and implementation requires actionable objectives. While it should not be a requirement to fulfill each criterion in climate adaptation planning, communities should be encouraged to adopt evaluation criteria that are most appropriate and useful to their community.</i>
How to harmonize funding cycles with realistic climate adaptation planning outcomes?	Award more flexible funding over longer time horizons, as needed <i>Description: Depending on the community context and availability of personnel and expertise, the time needed to complete a climate adaptation plan will vary significantly. Additionally, objectives may evolve over longer time frames. To ameliorate this funding mismatch, grants cycles should range from 4–5 years rather than 2 years and amendments to original proposals should be evaluated and allowed as needed.</i>
How to encourage community-informed and community-driven climate adaptation initiatives and inclusive planning?	Favor co-planning in climate adaptation plan processes, decision making, and objectives <i>Description: Climate adaptation planning that is administered top-down on behalf of communities will not only leave much to be desired, but may result in maladaptation.²⁸ But how do planners ensure authentic co-planning without specific instruction on how to do that well? Research, practice, reflection, and codification are needed to inform authentic co-planning moving forward.²⁹ Funding opportunities should favor the inclusion of specific methods—either tested or exploratory—to continue to improve co-planning.</i>
How to target a greater range of climate impacts?	Create a list of climate change impacts from which communities may draw upon in funding proposals <i>Description: Climate adaptation involves a complex suite of impacts and associated issues. This suite is inclusive of vulnerable infrastructure and subsistence resources, but also vulnerable mental health and cultural continuity. Communities will be best equipped to access funding for climate adaptation initiatives and plan for future scenarios if funding agencies actively affirm a broader range of climate issues.</i>

27 See Appendix B for evaluation criteria checklist (Cottrell, 2023).

28 Norton-Smith et al., 2016.

29 Figus et al., 2022.

2. Recommendations for Tribes and urban and rural communities facing climate change

ISSUE	RECOMMENDATION
How to position for achievable goals in grant proposals?	Break up components of adaptation planning into digestible parts and incorporate evaluation criteria as needed <i>Description: Climate adaptation planning and implementation involve considerable efforts. In many cases, time frames for climate adaptation planning have been underestimated and/or rushed. Proposal time frames should be commensurate with the scale of the project and allow for more time than expected to carry out certain objectives, particularly community engagement. Although certain evaluation criteria³⁰ might not make sense for a particular community or plan, it is a good rule of thumb to reference criteria associated with successful planning in developing climate adaptation objectives.</i>
How to ensure that climate adaptation plans are legible and usable for communities?	Prioritize creative and community-specific measures of inclusivity in planning <i>Description: In lieu of a well-defined structure³¹ for community engagement, planners will need to practice informed innovation to ensure that plans are usable by communities. Such a process will dovetail with co-planning as communities will need to understand what they are producing. In some cases, data-driven discussions will be useful. In others, discussions around climate adaptation initiatives will be values-driven. The onus is on community planners to incorporate creativity and inclusivity in the process.</i>
How to avoid duplication of efforts?	Mainstream climate adaptation plans with other community plans, especially CEDS plans <i>Description: Mainstreaming has been cited as a successful and widely adopted strategy in climate adaptation planning.³² Finding points of overlap between community plans will only serve to reinforce planning objectives and minimize planning efforts.</i>
How to collectivize adaptation efforts and resources?	Engage in professional development and peer-to-peer exchange forums <i>Description: Regional and community planners do not have time to reinvent the wheel. Strengthening regional relationships among climate adaptation professionals and practitioners through networking platforms and events will hasten the sharing of critical information such as successful strategies and pitfalls to look out for in climate adaptation planning and implementation.</i>

³⁰ See Appendix B for evaluation criteria checklist.

³¹ Such a standard may be precluded by the need to tailor planning processes to specific community values and needs.

³² Cottrell, 2023.

These recommendations will require ongoing learning, iteration, and adaptability. While they offer guidance on next steps, they are naturally iterative and will evolve with input from climate adaptation research and practice.

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APPENDICES

Appendix A: Chronological list of reviewed plans and assessments

COMPLETED						
TITLE	TYPE	DATE COMPLETED	DOCUMENT LINK	REFERENCED AS...	FUNDED BY...	TECHNICAL ASSISTANCE
City of Homer Climate Action Plan	Climate Action Plan	2007	link	Homer plan	City of Homer	Local Governments for Sustainability (ICLEI)
Climate Change in Point Hope, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2010	link	Point Hope assessment	USIHS	ANTHC
City and Borough of Sitka Climate Action Plan	Climate Action Plan	2010	link	Sitka plan	City of Sitka	Local Governments for Sustainability (ICLEI)
Climate Change in Kiana, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	link	Kiana assessment	USEPA, USIHS	ANTHC
Climate Change in Noatak, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	link	Noatak assessment	USIHS	ANTHC
Climate Change in Kivalina, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2011	link	Kivalina assessment	USIHS	ANTHC
Climate Action Plan: Juneau	Climate Action Plan	2011	link	Juneau plan	City of Juneau	Juneau Commission on Sustainability
Climate Change in Selawik, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2012	link	Selawik assessment	USFWS, USEPA, USIHS	ANTHC

COMPLETED

Climate Adaptation and Action Plan for the Norton Bay Watershed, Alaska	Climate Adaptation Plan	2013	link	Norton Bay Watershed plan	The Kresge Foundation	Climate Solutions University
Climate Change in Nondalton, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2013	link	Nondalton assessment	Western Alaska LCC, USEPA	ANTHC
Climate Change in Pilot Point, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2013	link	Pilot Point assessment	Western Alaska LCC, USEPA	ANTHC
Shaktoolik, Alaska: Climate Adaptation for an At-Risk Community	Climate Adaptation Plan	2014	link	Shaktoolik plan	National Sea Grant	Alaska Sea Grant
Climate Change in Atkasuk, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2014	link	Atkasuk assessment	Alaska DCCED, USEPA	ANTHC
Climate Change in Nuiqsut, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2014	link	Nuiqsut assessment	Alaska DCCED, USEPA	ANTHC
Climate Change in Levelock, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2014	link	Levelock assessment	Western Alaska LCC, USEPA	ANTHC
Climate Change in Wainwright, Alaska: Strategies for Community Health	Climate Adaptation Assessment	2014	link	Wainwright assessment	Alaska DCCED, USEPA	ANTHC
Climate Change in Upper Nushagak River	Climate Adaptation Assessment	2014	link	Upper Nushagak River assessment	USEPA	ANTHC
Climate Change in Bering Strait Communities	Climate Adaptation Assessment	2015	link	Bering Strait assessment	Western Alaska LCC, USEPA	ANTHC
Community Observations on Climate Change Arctic Village, Fort Yukon and Venetie, Alaska	Climate Adaptation Assessment	2016	link	Arctic Village et al. assessment	USGS, USEPA	ANTHC
Nome Tribal Climate Adaptation Plan	Climate Adaptation Plan	2017	link	Nome plan	BIA	ACCAP

COMPLETED

Native Village of Georgetown Climate Change Vulnerability Assessment	Climate Adaptation Assessment	2017	link	Georgetown assessment	BIA TCRP	GEOS Institute
Metlakatla Indian Community Climate Adaptation Plan	Climate Adaptation Plan	2018	link	Metlakatla Plan	BIA TCRP	Multiple
Climate Change in Port Heiden Alaska: Strategies for Community Health	Climate Adaptation Assessment	2018	link	Port Heiden assessment	BIA	ANTHC
Oscarville Tribal Climate Adaptation Plan	Climate Adaptation Plan	2019	link	Oscarville plan	BIA TCRP	ANTHC
Anchorage Climate Action Plan	Climate Action Plan	2019	link	Anchorage plan	City of Anchorage	Multiple
CCTHITA Climate Adaptation Plan	Climate Adaptation Plan	2019	link	Central Council plan	BIA TCRP	Multiple
Adapting to Climate Change in the Middle Kuskokwim	Climate Adaptation Plan	2020	link	Middle Kuskokwim plan	BIA TCRP	ANTHC
Igiugig Village Climate Adaptation Assessment	Climate Adaptation Assessment	2020	link	Igiugig assessment	BIA TCRP	Community Partners for Self Reliance, IARC
Resilience Planning for TLÁKW ANN (Klukwan)	Climate Adaptation Plan	2023	NA	Klukwan plan	BIA TCRP, DOE OIE	Sustainable Solutions
Fairbanks North Star Borough (FNSB) Climate Action and Adaptation Plan	Climate Action Plan	2023 (defeated)	link	Fairbanks plan	City of Fairbanks	Multiple

IN PROCESS						
TITLE	TYPE	DATE COMPLETED	DOCUMENT LINK	REFERENCED AS...	FUNDED BY...	TECHNICAL ASSISTANCE
<i>Tribe/Tribal Organization</i>						
Kodiak Area Native Association	Climate Adaptation Plan	in process	NA	KANA plan	BIA TCRP	
Chugach Regional Resources Commission	Climate Adaptation Plan	in process	NA	CRRC plan	BIA TCRP	
Aleutian Pribilof Islands Association	Climate Adaptation Plan	in process	NA	APIA plan	BIA TCRP	
Kawerak, Inc	Climate Adaptation Plan	in process	NA	Kawerak plan	BIA TCRP	
Hoonah Indian Association	Climate Adaptation Plan	in process	NA	HIA plan		

Appendix B: Evaluation criteria checklist for robust and actionable climate adaptation planning (adapted from Cottrell, 2023)

- ☐ The plan merges climate adaptation objectives with other community plans, such as Community Economic Development Strategic Plans or Hazard Mitigation Plans ('mainstreaming')
- ☐ The plan articulates a schedule to measure and evaluate progress towards the execution of climate adaptation objectives
- ☐ The plan includes a quantifiable metric that can be measured, assessed, and monitored over a specified period of time (e.g. measure variation in size and numbers of a sockeye population)
- ☐ The plan includes a quantifiable goal (e.g., reduce diesel fuel consumption by 25% through investments in energy efficiency over 5 years)
- ☐ The plan identifies a responsible party or parties for the implementation of climate adaptation objectives
- ☐ The plan identifies a responsible party or parties for monitoring and evaluating climate adaptation objectives
- ☐ The plan identifies sources of funding for the front-to-back completion of climate adaptation objectives
- ☐ The plan includes cost estimates for climate adaptation objectives
- ☐ The plan provides methods for revisiting and updating the contents of the plan (e.g., regional climate projections will be revisited annually and revised as needed)
- ☐ The plan identifies a responsible party for the overall management of the plan's climate adaptation objectives



Sea Grant

ALASKA

