Beyond Fossil Fuels

Planning a just transition for Alaska's economy

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Sustainable
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BEYOND FOSSIL FUELS

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Executive Summary

Across the state of Alaska, a post-oil future is coming into view and taking shape through the work of people, communities and organizations.

You can see it in the vegetables growing in Arctic greenhouses, in wind turbines replacing diesel to power community microgrids, and in the spread of innovative educational initiatives. This future could improve the lives of every Alaskan, but it needs faith and support from every level of leadership in the state in order to be fully realized. Without support from local, state and federal governments, these innovative efforts might remain only local and not achieve the growth needed to ensure a just transition for the people of Alaska.

This report seeks to describe key features of Alaska's economic landscape and highlight existing community projects and ideas that are signposts on the road to a sustainable economy. Many of these ideas were brought forth during two workshops in July 2016. Participants were predominantly Alaskans from across the state who hold a great diversity of knowledge and expertise in the different subject areas. In addition to these existing projects, the report includes recommendations for policies that could help amplify and accelerate this transition beyond a continued economic dependence on fossil fuels and toward a just and sustainable economy.

The Transition is Already Underway

Alaska is not unique in searching for a just transition to a better economy. Halting global climate change and building just, sustainable and inclusive economies are the twin inter-locking challenges of the 21st century. Each region of the world will have to develop solutions that are appropriate to their local culture and environment. Due to the circumstances of geography, geology and history, Alaska's inhabitants are being forced to confront these transitions much sooner than other places. Indeed, the path that Alaska forges in the next few decades can be a valuable example for other regions and economies.

As the recent plunge in oil prices has illustrated, state finances are overly reliant on oil and gas revenues and diversifying the Alaskan economy will be crucial for future sustainable economic development. This is happening against the backdrop of countries ratifying the agreement from the United Nations climate talks in 2015 in Paris and starting to make plans to fulfill their commitments. And even though the Trump Administration pulled the US out of the agreement, the science hasn't changed, a fact recognized by states and municipalities across the country. To avoid the worst effects of climate change, we know that at least two-thirds of proven fossil fuel reserves must stay in the ground and unproven reserves must remain off limits. To meet the goals agreed to in Paris, we will have to radically reduce demand for fossil fuels and virtually eliminate global carbon emissions by mid-century.

Adapting to Rapid Climate Change

Alaska – along with the rest of the circumpolar Arctic region – is ground zero for climate change, and the impacts of rising temperatures are visible today across the state. Scientific assessments have only confirmed what Alaskan communities (with thousands of years of accumulated knowledge) can see with their own eyes.

The National Climate Assessment shows that Alaska is already experiencing temperature increases well in excess of global averages. Rapid declines in sea ice cover raise the possibility that the Arctic Ocean will be largely free of ice by mid-century, and increasing coastal erosion is already threatening the very existence of several Alaskan villages. The changing climate is fueling larger forest fires and melting permafrost, and acidification of the oceans will strike at the very base of the marine food web.

Responding to these changes will require public investments to repair roads damaged by sinking land, to pay for fire suppression, and to ensure food security for Alaskans as local ecosystems shift. Additionally, a number of villages – including Shishmaref, Newtok and others – have voted to relocate in the face of rapid coastal erosion, and will require significant financial and logistical support to make it happen.

Assessing these various adaptation needs, the report concludes that the price tag for climate adaptation in Alaska could top $30 billion under a worst-case scenario.

2004 tundra fire. (Jim Dau / Northern Alaska Environmental Center)

Community Empowerment and Fighting Colonialism

As climate justice activist Quinton Sankofa has stated: "Transition is inevitable. Justice is not." U.S. history is replete with examples of colonization and oppression of Indigenous communities, together with evidence of injustice in past economic transitions.

Alaska continues to experience the impacts of the last 150 years of colonization, including the short sighted exploitation of natural resources and an associated 'boom and bust' economic system, undue influence of the oil industry on the political process, and a resulting heavy reliance on the fossil fuel industry that brings in economic development at great social costs. For any economic transition in Alaska to be truly just, it must be democratic and inclusive of all participants and respectful of the cultural traditions and sovereignty of Alaska Native tribes.

In constructing what a just transition might look like in the Alaskan context, there are local frameworks, like the Walker/Mallot Transition Team's sustainability recommendations, as well as global frameworks, such as the Rio+20 vision of "The Future We Want" and global Sustainable Development Goals (SDGs), that can help guide decision-making.

> "Transition is inevitable. Justice is not."
>
> — *Quinton Sankofa*
> *Climate Justice Activist*

Transition Opportunities Abound

While these are by no means comprehensive, we chose to focus on seven thematic areas for just transition policies in Alaska: investing in human capital, sustainable energy, greater local self-reliance in food and manufacturing, cleanup of fossil fuel infrastructure sites, protecting ecosystems, Indigenous tourism and sustainable fisheries. Within each thematic area, there are numerous examples of successful case studies that can serve as a blueprint for scaling up solutions to benefit all Alaskans.

- **Investing in human capital:** Alaska's greatest natural resources are its people. Key investments in broadband access as well as in expanding existing education and job training initiatives could help remote regions of Alaska grow their work-at-home economy. Similarly, using, protecting and restoring the traditional knowledge held by Alaska Native people and communities (as the Alaska Native Knowledge Network and other tribal initiatives are doing) would be of considerable value for scientific research and climate adaptation. Further opportunities exist in expanding education, health and cultural empowerment initiatives, such as the highly successful Alaska Native Science and Engineering Program.

- **Sustainable Energy:** Wind, solar and hydrokinetic installations in communities such as Kotzebue and Igiugig have already shown that renewable energy can help reduce high energy costs and open up new opportunities for development. And indeed Alaska is already a global leader on the integration of renewables into "islanded microgrids." Expanded investments in energy efficiency and renewable energy will be critical components of a just transition.

- **Greater local self-reliance in food and manufacturing:** Rural Alaskans are already among the most self-reliant in food production and the harvest of wild foods plays an important nutritional and cultural role for many communities. In addition, a number of local initiatives, such as the Arctic Greens project of the Kikiktagruk Inupiat Corporation, are helping to address the high costs of imported food that remains an issue for many communities. Again, expanded support and funding could help these existing initiatives grow and expand to more communities.

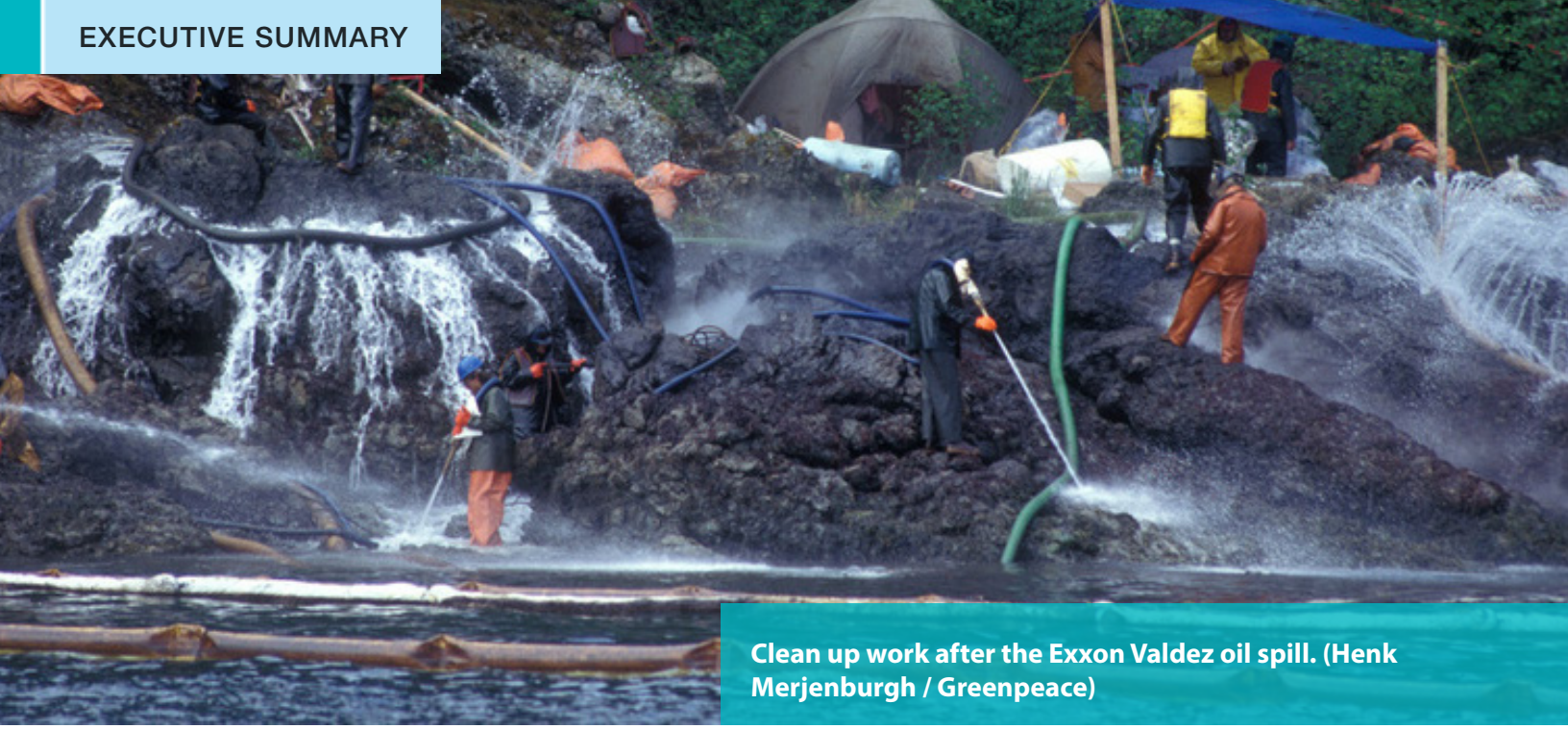
- **Cleanup of fossil fuel infrastructure sites:** Decades of fossil fuel extraction have left a network of drilling platforms, pipelines and other infrastructure across the Alaskan landscape that will need to be safely removed and adequately restored. Proper dismantling, removal and restoration ("DR&R") of this infrastructure could provide numerous jobs for Alaskans and bring economic benefits to the state. To ensure that this process occurs and is carried out satisfactorily, it will be necessary to strengthen state standards for cleanup and bonding.

Sea defence wall in Wainwright, Alaska. (Rose Sjölander / 70°)

- **Protecting ecosystems:** A healthy economy depends on a healthy ecosystem, and so too do healthy communities and families. Strong collaboration between Native communities and government agencies is needed to protect the bountiful lands and waters of Alaska, including those in the state's economically important national parks, refuges, and forests. Defending and expanding subsistence rights and economy could ensure the protection of the cultures and livelihoods that are so intricately linked. By working with those communities to protect the intact, naturally functioning lands and waters they depend upon and to restore impacted ecosystems, Alaska can benefit economically.

- **Indigenous tourism:** Indigenous tourism can be defined as responsible tourism activity in which Indigenous people are directly involved through control, ownership and guidance over economic, cultural and natural resources, and where tourism is part of a larger strategy of reinforcing or revitalizing political and cultural autonomy through intercultural encounters. However, before tourism can be a boon to Indigenous communities, there must be some changes, both to encourage greater awareness among tourists and to support Alaska Native communities. Indigenous communities continue to suffer the effects of colonization globally, and Alaska is no exception. They are in a period of healing and reclaiming human and land rights. They are succeeding but it is an important process that the tourism industry needs to recognize.

- **Sustainable fisheries:** Alaska's fisheries are considered some of the most productive, sustainable, and healthy in the world. This is no accident; Alaska is the only state in the US with a mandate to sustainably manage fisheries built into its constitution. Climate change will bring new opportunities, but also challenges. While yield, harvests, and associated jobs and income may rise for some species, changes in migration patterns, ocean acidification, and invasive species are likely to threaten the catch of others. Sifting through these opposing effects and honing in on strategies to ensure that local communities can adapt is a complex task that, ideally, will engage marine scientists, local fisher folk, Alaska Native communities, and fishery managers to succeed.



Clean up work after the Exxon Valdez oil spill. (Henk Merjenburgh / Greenpeace)

Policies to Accelerate the Transition

Fossil fuel extraction is not a stable foundation on which to build long-term economic growth for the state. Diversifying Alaska's economy and investing in a future beyond fossil fuel extraction will be essential in helping the state weather future "boom-and-bust" cycles.

Scaling these solutions up will require compatible policies and investments such as major investments in internet connectivity to bolster the work-at-home economy, dissemination of traditional knowledge and economic know-how, investments in efficiency and renewable energy infrastructure, new protected areas on land and at sea, and more stringent requirements for the cleanup and restoration of fossil fuel infrastructure.

Some potential policies to achieve these needed investments include cutting fossil fuel subsidies, fossil fuel risk bonds, a carbon fee and dividend, increased funding for federal programs, climate adaptation and mitigation funds for tribes, public or Native banks, and increased eligibility of Alaska Native tribes for federal funding.

The report summarizes these potential policy directions while recognizing that Alaskans will be the ones to choose the specific path forward. ■

Section I

I: The transition to an economy beyond fossil fuels is already underway and demands a timely response from policy makers.

Fossil fuels have played a defining role in the evolution of Alaska's formal market economy after statehood was granted in 1958. Prior to statehood, the fishing and mining industries along with the federal government accounted for most of the jobs and income in Alaska. Fishing, for example, represented 63 percent of the value of Alaska's natural resource production from 1867 to 1958. But after statehood and North Slope oil discoveries, oil became king. Between 1958 and 2002, oil and gas represented 84 percent ($294 billion) of the state's $350 billion production value from natural resources.[1]

A lot of this wealth has ended up as profits for major oil and gas producers, but Alaska's economy has benefited in other ways. Direct employment in the oil and gas industry is a small percentage of all wage and salary employment in Alaska (5-6,000 out of a total of 335,000 jobs), however, the impact of the industry on the larger Alaskan economy and, especially, state revenues is significant.

According to a 2014 study commissioned by the Alaska Oil and Gas Association, the oil and gas industry estimates 5,335 jobs in direct employment and another 45,665 in indirect and induced jobs supported by their expenditures in Alaska.

In addition, the industry attributes an additional 60,000 jobs to the statewide spending of oil and gas taxes and royalties.[2]

In 2014, oil and gas production related taxes provided nearly 90 percent of the state's fiscal 2014 general fund revenues.[3]

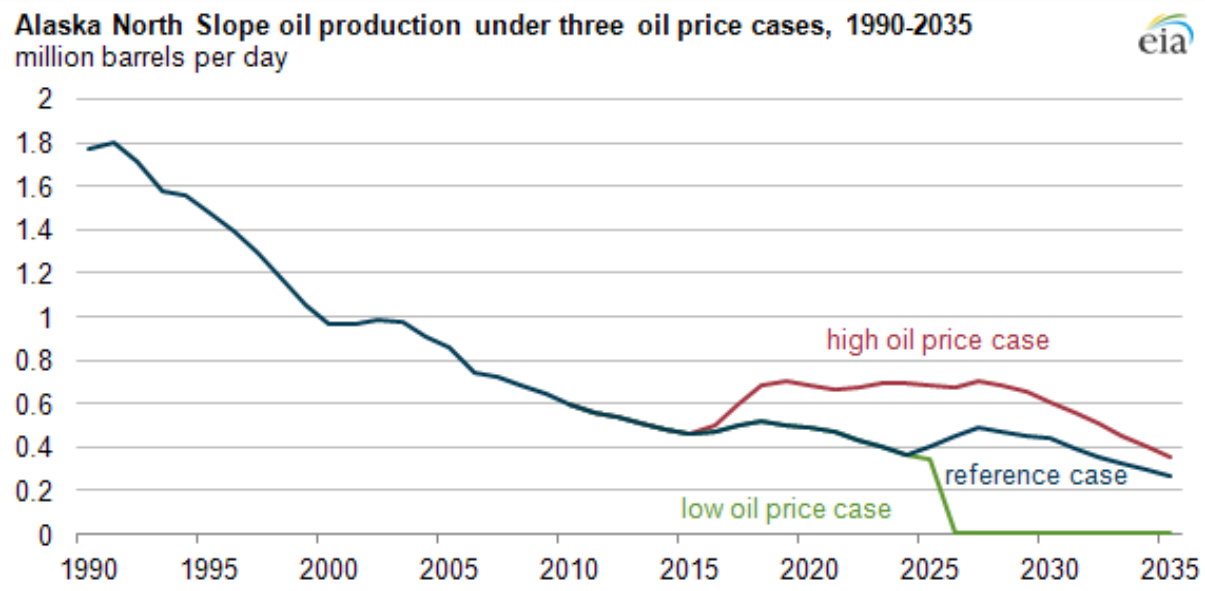


Figure 1: Source: Energy Information Agency

But in 2014, things began to change. Falling oil prices and revenues crippled the state's budget. Revenue sources have declined by more than 60 percent since then, even as Alaska's legislature expanded tax credits that oil companies used to incentivize exploration. A forecast for 2017 shows that the state's general fund will pay out more in tax credits to the oil industry than it receives in royalties and production taxes.[4]

To close the resulting budget gaps, the state tapped its substantial fiscal reserves, drawing down $2.8 billion in fiscal 2015 and an estimated $3.4 billion in fiscal 2016, even after cutting $1.1 billion of operating and capital expenditures from the 2016 budget.[5]

By way of comparison, the Alaska Permanent Fund is currently valued at around $56 billion.[6] Unemployment claims in the oil and gas sector doubled between 2014 and 2015.[7] Anchorage alone is expected to lose 1,600 jobs in 2016. Construction spending is forecast to fall by 18 percent statewide, largely due to declines in the oil and gas sector.[8]

This is not some passing trend. There are two fundamental transitions underway that underscore the urgency of planning for an economy beyond fossil fuels – declining profitability and demand for Alaska's fossil fuel resources and climate change.

Declining profitability and demand for Alaska's fossil fuels

On average, Arctic crude oil has the highest break-even price of any oil in the world.[9]

While the economics are complex, sustained production in the Arctic at prices below $75 per barrel is unrealistic and tapping new reserves is prohibitive. Current oil price forecasts don't bode well.

Even under the relatively rosy World Bank forecast, oil prices will continue to drop in 2016 before they start a slow but steady increase over decades.[10] But even under the long-term growth forecast, real prices only rise to $66.30 by 2025, a far cry from the $104.10/billion barrels of oil (bbl) peak in 2013.[11]

The International Monetary Fund (IMF) uses a separate forecasting model that foresees an even more modest rise – to $45.30/bbl in 2020.

A recent opinion piece summarized the situation succinctly: "[T]he oil industry is settling in for energy prices to stay around their current level for a long time. Alaskans should probably stop hoping for a return to glory days."[12]

What this means for production is underscored by the latest Alaska North Slope scenarios published by the Energy Information Administration (EIA) in 2012 (Figure 1). A revolution in oil and gas technology coupled with declining productivity of existing wells will make Alaska's oil and gas reserves less competitive than they have been historically. As such, under EIA's high price scenario, oil production peaks around 2027 and then begins a steady decline to below today's levels in 2035.

New natural gas proposals such as the massive North Slope-to-Nikiski project are facing enormous hurdles due to low price forecasts.[13] And while there are several new coal mining proposals in play, the most likely scenario for coal is that these new mines will never be permitted and that Alaska's single coal mine – Usibelli mine in Healy – will continue to struggle as foreign demand wanes.

Production at that mine has fallen from 2.2 million tons in 2010 to 1.2 million in 2015. In-state demand will not compensate for the drop in foreign demand. The mine currently supplies six small coal-fired plants in Alaska. Most were built in the 1950s and 1960s, and most have had problems with environmental compliance and outdated technology.[14]

From the perspective of needing to address climate change with the urgency it requires, Arctic oil and gas production should be phased out as soon as possible.

Climate change

While market forces alone justify more attention to the transition beyond fossil fuels, climate change makes the issue urgent and immediate. In the U.S, Alaska is at ground zero. The anticipated consequences of climate change in Alaska and the challenges and opportunities it represents for Alaska's economy are discussed below. But for now, the most salient issue with respect to fossil fuel markets is the nearly unanimous scientific consensus that to combat the worst effects of climate change and keep the mean global temperature increase at or below 2° C, 82 percent of proven global coal reserves, 49 percent of gas reserves, and 33 percent of known oil reserves need to stay in the ground.[15]

In the Arctic, it all must remain in place.

At the Usibelli mine – Alaska's only permitted coal operation – the owners' estimate proven reserves at roughly 500 million tons. Leaving 92 percent (the regional US figure) in the ground would suggest that just 40 million tons can be burned and still achieve global climate goals. Average production has fallen to about 1.5 million tons per year, but has averaged 1.9 million tons between 2009 and 2013. At this rate, the reserves could potentially be mined for another 21 years and still leave 92 percent of the reserves in the ground. But this assumes no further drops in demand. In actuality, demand for Alaskan coal exports has dwindled to near nothing and is likely to stay that way indefinitely, and local demand will vanish once coal-fired plants in use throughout Alaska are decommissioned or converted to renewable platforms.

From the perspective of needing to address climate change with the urgency it requires, Arctic oil and gas production should be phased out as soon as possible.

Before leaving office, President Obama took steps to permanently withdraw much of the Chukchi and Beaufort Seas from future oil and gas exploration. In this transition, decision makers can help to ensure that Alaskan communities across the state benefit from just and sustainable development opportunities along the way. This report investigates ways to do so that reflect the latest thinking on sustainable development while ensuring justice for Alaska Native communities, the economically vulnerable, and workers in the fossil fuel industry.

What does this just transition look like? ■

High Arctic winds in Utqiaġvik (Barrow), Alaska. (Rose Sjölander / 70°)

Section II

II: A just transition should address Alaska's socio-economic challenges.

One of the key principles of a just transition is that future economic development policies, programs, and projects serve as effective vehicles for improving the social and economic conditions of those historically disenfranchised or most at risk from a changing economy and climate.[16] To understand what this means in Alaska, it is important to review some recent data and trends on socio-economic challenges that any new development pathway should address.

Eradicating Poverty

Poverty is on the rise but can be kept at bay with, among many efforts, careful economic transition planning. In Alaska, a person is counted as being below the poverty line if they make less than $14,720 per year.

For a family of four, that is $30,320, according to the U.S. Department of Health and Human Services.[17] This figure is adjusted each year to compensate for the high cost of living in Alaska, which is well above the national average, especially in rural communities.

The poverty rate has climbed steadily from 9.5 percent in 2010 to 11.2 percent in 2014 – the most recent estimate.

Without careful economic transition planning, phasing out fossil fuel production entirely in Alaska will exacerbate poverty in two key ways: (1) an increase in the number of unemployed, and (2) a reduction in social services now funded by the State of Alaska that are derived from fossil fuel taxes and royalties. Both issues are discussed in greater detail below.

Maintaining Full Employment

Alaska's unemployment remains a serious challenge, one that should be met with an approach toward diverse job development options that are economically sustainable and can accommodate subsistence

A cabin along Alaska's Arctic coast was washed into the ocean because the bluff it was sitting on eroded away. (Benjamin Jones/USGS)

lifestyles and seasonal travel within the state. Overall unemployment rate currently stands at 6.8 percent (November 2016), the worst in the US and well above the US average of 4.6 percent. The rate for Anchorage and Fairbanks is lower than the statewide average, but the unemployment rate is significantly higher than the statewide average in a number of boroughs where the fossil fuel industry operates (Table 1).[18]

At its recent peak, the oil and gas industry estimates 5,335 jobs in direct employment and another 45,665 in indirect and induced jobs supported by their expenditures in Alaska. In addition, the industry estimates 60,000 jobs in Alaska are supported by the spending of oil and gas taxes and royalties.[19] The Usibelli coal mine supports 140 direct jobs and another 278 indirect and induced jobs associated with its expenditures.[20] It is unclear how many of the indirect, induced, and tax and royalty-related jobs would be affected by the transition away from fossil fuels because these jobs are also fueled by other sectors – like recreation and tourism – that may expand as Alaska steers economic resources towards sustainable options for development.

Closing the Inequality Divide

Alaska has the most equitable distribution of income in the nation based on the income inequality index maintained by Center for American Progress (CAP) through their Talk Poverty project.[22] But a focus on income inequality masks severe inequalities in many other dimensions. These include vast differences in employment, education, energy consumption, food security, leisure time, health risks and housing.[23]

These inequalities are most evident across geographic (urban/rural) and racial lines.

Solar energy array in Fairbanks, Alaska. (Northern Alaska Environmental Center)

For example, the unemployment rate in Alaska's urban centers is far below the rate in its rural boroughs (Table 1). In the Bethel, Denali, Hoonah-Angoon, Kusilvak, Lake and Peninsula, Northwest Arctic, and Yukon-Koyukuk boroughs or census areas of rural Alaska, the unemployment rate is above 15 percent. The incidence of poverty and those who lack health insurance is highest in rural Alaska as well. Additionally, access to health care and sufficiency of health services are issues of concern for remote communities.

The racial aspect of the income inequality divide is reflected in numerous ways, such as in the incidence of poverty. While the statewide poverty rate is 11.2 percent in the latest assessment, it is much higher for African Americans (31.7 percent), Native Americans (22.1 percent) and Asian Americans (17 percent). Another factor driving racial inequality is a lack of political representatives of color. According to the National Conference of State Legislatures, White/Caucasians make up 66 percent of the general population but 85 percent of legislators. All non-white ethnicities are under-represented. While American Indians/Alaska Natives make up 14 percent of the population, they comprise only 3 percent of the legislature.

Improving public health

Public health is a major concern in Alaska. Alaska has the third highest proportion of the population without health insurance in the country at 14 percent.[24] Of the 25 indicators identified in the Healthy Alaska 2020 Report, 14 are not on track to meet set targets. These include indicators associated with obesity, exercise, suicide, depression, caregiving, alcoholism, fluoridated water, hospitalizations, poverty and educational attainment.[25] Cancer is the leading cause of death in Alaska (25 percent of all deaths).[26] Among all health indicators, including stroke, chronic lower respiratory disease, cancer, and heart disease, Alaska Natives rank lower than the Alaska average.[27] Alaskans also don't use preventative services such as mammograms, cholesterol testing, and colonoscopy as often as other Americans.

Reducing import dependence and making life more affordable

While Alaskans do enjoy a rich and bountiful landscape, Alaskans also have a high cost of living.[28] In a recent analysis, Alaska ranked fourth in states with the highest cost of living. In terms of four major categories of expenses, Alaska ranked near the top for groceries, utilities, and health care in 2016.[29]

One reason for this is that most consumer goods, fuel, food – including even fish – and medicines are imported from afar and costly to distribute. For example, over 95 percent of the $2 billion worth of food Alaskans purchase is imported — meaning over $1.9 billion leaves the state each year.[30] Import dependency has left the economy highly vulnerable to both price and supply shocks associated with economic and political turmoil, natural disasters, or even routine delays. For example, Fairbanks recently experienced a severe food shortage when one of the barges the city relies upon for imports was delayed. The Alaska Division of Geological and Geophysical Surveys concluded that in the event of a catastrophic Pacific Northwest earthquake "[v]ital commodities from the Lower 48 such as gasoline, diesel, aviation fuel, food, and construction materials would diminish in variety and quantity and increase in cost."[31]

Point Hope, Alaska. (Rose Sjölander / 70°)

Enhancing food security

According to the Food Bank of Alaska, nearly 105,000 Alaskans struggle with hunger and 20 percent of Alaskan kids live in homes that may not have enough food.[32] Food insecurity is correlated with a wide array of physical impairments and harmful psychological conditions such as chronic depression and substance abuse. The risks to youth also include "decreased cognitive performance and academic achievement as well as increased behavioral and psychosocial problems."[33]

While import dependency and vulnerability to price and supply shocks certainly plays a role in food insecurity, so too do Alaska's high costs of agricultural production, climate change (which is causing unpredictability and wreaking havoc on the harvest of traditional foods), and changes in dietary preferences away from wild foods and toward processed foods from afar.[34] For Alaska Natives, food security rests on a foundation of six interconnected dimensions including availability, culture, decision-making power and management, health and wellness, stability and access. Climate change, a history of colonization, and a resource extraction-oriented economy threaten food security by undermining one or more of these key dimensions.[35]

Modernizing the housing stock

"Alaska has a housing crisis," according to the Cold Climate Housing Research.[36] The Alaska Housing Finance Corporation's 2014 Housing Assessment found that nearly half of all the homes in the state are 30 years old or older and in need of a retrofit.[37] High housing costs are partly to blame for the lack of upkeep. The assessment found that more than 75,000 households are cost-burdened, meaning a family spends more than 30 percent of its income on rent, mortgage, heat and electricity. Overcrowding is more than twice the national average, as is energy consumption compared with similar cold climate regions of the Lower 48. In addition, the assessment found that 58 percent of homes lack adequate ventilation, exposing inhabitants to a number of health-risks associated with indoor air pollution.

Improving educational attainment and vocational skills

There is an opportunity to make significant gains in education and vocational skills development across the state. Alaska lags behind the contiguous United States in a number of metrics related to educational attainment. A 2008 report commissioned by the Alaska Commission on Postsecondary Education put it bluntly: "Alaska consistently ranks at the bottom in educational performance indicators."[38] Educational performance indicators are not consistently reported annually, sometimes only once in ten years or so matching census data collection patterns, but most data from the past decade reaffirm this assertion.

The relative lack of formal educational attainment is mirrored by a lack in employable skills. In terms of skills, Alaska students perform poorly in reading and math according to the National Assessment of Educational Progress (NAEP). In fact, half of all University of

Geography	Population	Unemployed	U-rate	Persons in poverty	Persons w/o health ins.	Adults w/o HS diploma
Anchorage	301,010	8,311	5.3%	24,984	49,163	16,706
Matanuska-Susitna	101,095	4,001	8.6%	10,817	18,734	5,512
Fairbanks North Star	99,631	2,931	5.9%	9,464	17,232	4,900
Kenai Peninsula	58,059	2,495	8.9%	6,677	11,556	2,991
North Slope	9,687	342	5.9%	1,114	2,379	927
Valdez-Cordova	9,362	465	10.0%	927	2,135	601
Northwest Arctic	7,523	569	17.8%	1,798	2,201	1,025

Table 1: Socio-economic challenges in selected rural and urban areas of Alaska[21]

Alaska freshmen take remedial English and/or math. A recent Anchorage Chamber of Commerce survey illustrated that regional employers believe that the majority of their entry-level applicants don't have basic employability skills, even after graduating from college.[39]

Securing adequate funds for health, education, and welfare

One of the most alarming side effects of Alaska's fiscal crisis is its impact on social safety net spending and spending on other programs that yield broad-based benefits to all Alaskans. As revenues have crashed, Alaska's schools – from elementary to university level - face budget cuts for both teachers and support services they rely upon."[40] One existing proposal would cut back on subsidies for high-speed Internet in rural areas, something that would affect 90 percent of University of Alaska's students who take at least one course remotely.

Education is not the only program at risk. The Alaska Department of Health and Human Services FY 2016 budget was reduced by $80.3 million dollars over FY 2015 and Medicaid made up the largest share (65 percent) of the cuts.[41] The Department of Environmental Conservation's food safety and sanitation program took $624,000 in cuts last year and another $268,000 is being proposed for FY 2017.[42] ■

—CASE STUDY—

Oscarville's Holistic Approach to Community Sustainability

In 2014, Oscarville, a small community in the Yukon Kuskokwim Delta region, volunteered to be the subject of a pilot project that will use a holistic approach involving community engagement and interagency (local, state, federal) partnerships to address many different issues such as culture, housing and infrastructure, energy, economic development, community health, and water and sanitation. The aim of the pilot is to begin creating a statewide model for community development.

Some of the immediate needs to be addressed in the project include a well for the school, securing funding for energy efficiency upgrades, weatherization, and new housing, and implementing a board road extension to neighboring Bethel. The initial grant for the project was awarded through the Cold Climate Housing Research Center from the Association for Village Council Presidents and Wells Fargo.[43]

Section III

III: A just transition should also help Alaskans adapt to the catastrophic consequences of climate change.

Economic and social challenges of the just transition are many. But all these may be dwarfed by the challenges presented by rapid climate change. The ground-breaking Arctic Climate Impact Assessment in 2004 identified impacts on natural systems and society, indigenous communities, and economic consequences in Alaska.[44]

Climate change in Alaska is not just a matter of eroding coastlines, vanishing sea ice, and unprecedented wildfires. Impacts on Alaska's communities, economy and public finances are already dramatic as climate disasters continue to unfold and as the state incurs billions of dollars of costs to adapt. Alaska Native communities are the hardest hit. This section presents an overview of what climate change is already bringing as well as predictions for the future.

What climate change is bringing to Alaska

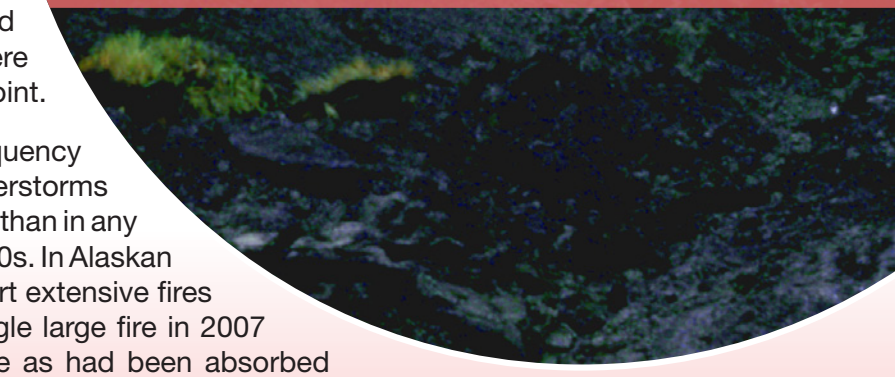
It has often been said that Alaska is "ground zero" for climate change, and for good reason. The most recent National Climate Assessment (2014) from the US Global Change Research Program presents an alarming overview of climate change effects already unfolding and even more dire predictions of what is to come if global climate agreements fail to meet their targets.[45] Unless otherwise noted, the following are excerpts from that report.

Beaufort Sea ice and the midnight sun. (Northern Alaska Environmental Center)

Observed climate change

- Over the past 60 years, Alaska has warmed more than twice as rapidly as the rest of the United States, with state-wide average annual air temperature increasing by 3°F and average winter temperature by 6°F, with substantial year-to-year and regional variability.
- Arctic sea ice extent and thickness have declined substantially, especially in late summer (September), when there is now only about half as much sea ice as at the beginning of the satellite record in 1979. Reductions in sea ice alter food availability for many species from polar bear to walrus, make hunting less safe for Alaska Native hunters, and create more accessibility for Arctic Ocean marine transport, requiring more Coast Guard coverage.
- With the late-summer ice edge located farther north than it used to be, storms produce larger waves and more coastal erosion. An additional contributing factor is that coastal bluffs that were "cemented" by ice-rich permafrost are beginning to thaw in response to warmer air and ocean waters, and are therefore more vulnerable to erosion.
- Several coastal communities are seeking to relocate to escape erosion that threatens infrastructure and services but, because of high costs and policy constraints on use of federal funds for community relocation, only one Alaskan village has begun to relocate.
- Permafrost near the Alaskan Arctic coast has warmed 4°F to 5°F at 65 foot depth since the late 1970s and 6°F to 8°F at 3.3 foot depth since the mid-1980s. In Alaska, 80% of land is underlain by permafrost, and of this, more than 70 percent is vulnerable to subsidence upon thawing because of ice content that is either variable, moderate, or high. Thaw is already occurring in interior and southern Alaska and in northern Canada, where permafrost temperatures are near the thaw point.

Coastal erosion at Drew Point, NPR-A. (U.S. Fish & Wildlife Service)



- Both wetland drying and the increased frequency of warm dry summers and associated thunderstorms have led to more large fires in the last ten years than in any decade since record-keeping began in the 1940s. In Alaskan tundra, which was too cold and wet to support extensive fires for approximately the last 5,000 years, a single large fire in 2007 released as much carbon to the atmosphere as had been absorbed by the entire circumpolar Arctic tundra during the previous quarter-century. Thick smoke produced in years of extensive wildfire represents a human health risk.
- Ocean acidification, rising ocean temperatures, declining sea ice, and other environmental changes interact to affect the location and abundance of marine fish, including those that are commercially important, those used as food by other species, and those used for subsistence. At some times of year, acidification has already reached a critical threshold for organisms living on Alaska's continental shelves. Certain algae and animals that form shells (such as clams, oysters, and crab) use carbonate minerals (aragonite and calcite) that dissolve below that threshold.

Fishing Boat in Unalaska. (Mark Meyer / Greenpeace)

What the future will bring

- Average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050. If global emissions continue to increase during this century, temperatures can be expected to rise 10°F to 12°F in the north, 8°F to 10°F in the interior, and 6°F to 8°F in the rest of the state.
- Models project that permafrost in Alaska will continue to thaw, and some models project that near-surface permafrost will be lost entirely from large parts of Alaska by the end of the century. In rural Alaska, permafrost thaw will likely disrupt community water supplies and sewage systems, with negative effects on human health.
- Annual minimum sea ice extent is decreasing at a rate of 12% per year. Forecasts of an ice-free Arctic Ocean range from 20-30 years from now to much sooner.[46]
- Uneven sinking of the ground in response to permafrost thaw is estimated to add between $3.6 and $6.1 billion (10 percent to 20 percent) to current costs of maintaining public infrastructure such as buildings, pipelines, roads, and airports over the next 20 years.
- Even if climate warming were curtailed by reducing [greenhouse gas] emissions, the annual area burned in Alaska is projected to double by mid-century and to triple by the end of the century.
- The polar ocean is particularly prone to acidification because of low temperature and low salt content, the latter resulting from the large freshwater input from melting sea ice and large rivers. Acidity reduces the capacity of key plankton species and shelled animals to form and maintain shells and other hard parts, and therefore alters the food available to important fish species.
- Shelled pteropods, which are tiny planktonic snails near the base of the food chain, respond quickly to acidifying conditions and are an especially critical link in high-latitude food webs, as commercially important species such as pink salmon depend heavily on them for food. A 10% decrease in the population of pteropods could mean a 20% decrease in an adult pink salmon's body weight.

Alaska Native communities are particularly affected

Alaska Native communities will feel the worst effects of climate change for three primary reasons. First, in rural areas, Native villages and communities are almost exclusively located along coastlines and rivers that will be subject to increased coastal and inland flooding and erosion. Most of Alaska's 200 or so villages have already been affected to some degree and 31 are in need of relocation or are in the process of being moved.[47]

Secondly, Alaska Natives, especially those living in rural areas, depend economically, nutritionally, and culturally on hunting and fishing for their livelihoods and so changes in the abundance and distribution of subsistence species affect Alaska Native populations more than other Alaskans who tend to rely more on foods bought and sold in the market.

Lastly, Alaska Native communities have seen inadequate resources for adaptation, which means more exposure to the effects of climate change.

Some of the climate change impacts of most concern for Alaska Native communities include:[48]

- Decreases in the amount of wild foods available due to adverse changes in ice patterns, vegetation, fish and game populations, fish and game migration patterns, water resources and access.
- Increasingly risky and costly travel across newly inundated lands, ice-free areas, and roads and bridges at risk from permafrost melting.
- Sanitation and health problems also result from deteriorating water and sewage systems, and ice cellars traditionally used for storing food are thawing. Warming also releases human-caused pollutants, such as poleward-transported mercury and organic pesticides, from thawing permafrost and brings new diseases to Arctic plants and animals, including subsistence food species, posing new health challenges, especially to rural communities.

—CASE STUDY—

Newtok In The Crosshairs Of Climate Change

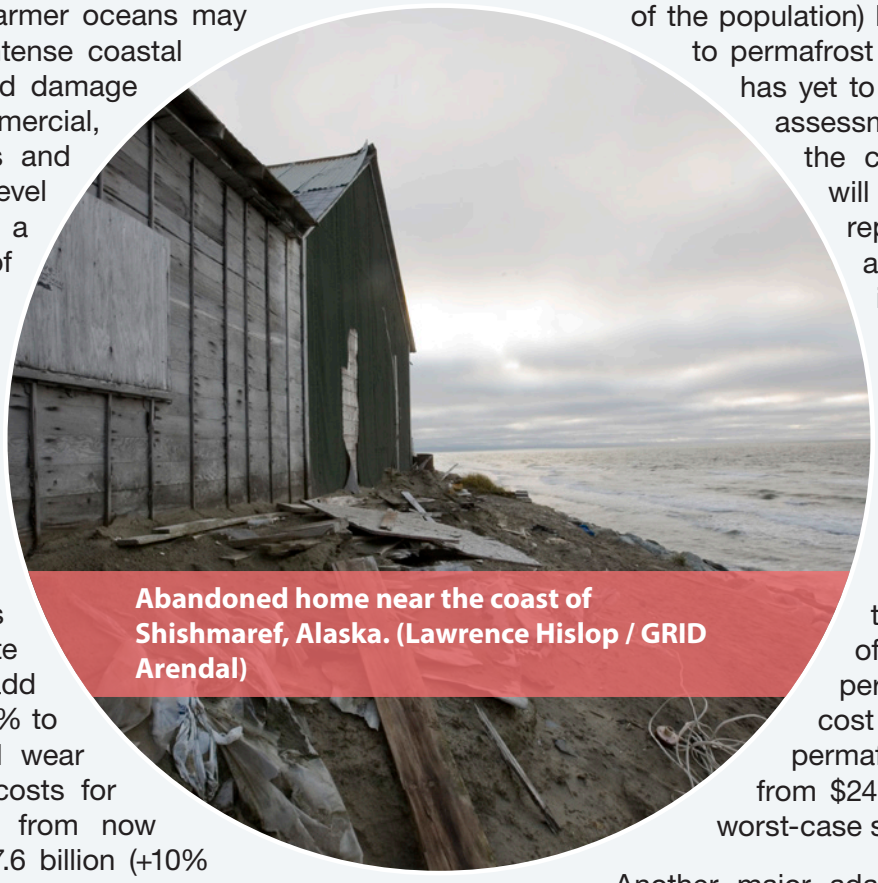
Newtok, a Yup'ik Eskimo community on the seacoast of western Alaska, is on the front lines of climate change. Between October 2004 and May 2006, three storms accelerated the erosion and repeatedly flooded the village water supply, caused raw sewage to be spread throughout the community, displaced residents from homes, destroyed subsistence food storage, and shut down essential utilities. The village landfill, barge ramp, sewage treatment facility, and fuel storage facilities were destroyed or severely damaged. The loss of the barge landing, which delivered most supplies and heating fuel, created a fuel crisis. Saltwater is intruding into the community water supply. Erosion is projected to reach the school, the largest building in the community, by 2017.

Newtok's situation is not unique. At least two other Alaskan communities, Shishmaref and Kivalina, also face immediate threat from coastal erosion and are seeking to relocate, but have been unsuccessful in doing so.

- It may be difficult to sustain traditional subsistence life ways when Alaska Native communities and settlements on ancestral land are collapsing due to permafrost thawing, flooding, and erosion combined with loss of shore-fast ice, sea level rise, and severe storms, especially along the coasts and rivers.
- It is uncertain how Alaska Native communities will be able to effectively relocate with an outcome most preferable to them, particularly because there are no institutional frameworks, legal authorities, or funding to implement relocation for communities forced to relocate.

Adaptation costs could top $30 billion

All of these impacts across the state will strain the financial resources of federal, state, and local government agencies. Thawing permafrost will place the state's network of roads, rail, airports, and energy and water supply at risk since most of this infrastructure is built on a permafrost foundation.[49] Warmer temperatures and warmer oceans may also lead to more intense coastal storms and increased damage to residential, commercial, and public buildings and infrastructure. Sea level rise will inundate a significant portion of coastal infrastructure. A recent study by Larsen et al. (2008) attempted to quantify the potential impacts of climate change on Alaska's public infrastructure at risk. The authors concluded that climate change could add $3.6–$6.1 billion (+10% to +20% above normal wear and tear) to future costs for public infrastructure from now to 2030 and $5.6–$7.6 billion (+10% to +12%) from now to 2080.[50] A recent study by Melvin et al. (2016) reached similar findings – cumulative expenses from climate-related damage to public infrastructure from 2015 to 2099 total $5.5 billion under the highest climate-forcing scenario (RCP8.5).[51] The study also found that mitigation and pro-active adaptation measures could significantly reduce those expenses.



Abandoned home near the coast of Shishmaref, Alaska. (Lawrence Hislop / GRID Arendal)

A significantly greater expense will be the costs associated with relocating villages and Alaska residents out of harm's way. According to the U.S. Army Corps of Engineers, the estimated cost of relocation for Kivalina's 400 residents runs between $95 and $125 million.[52] This means that government estimates to relocate run between $240,000 and $310,000 per resident. Newtok, Alaska, is in the process of relocating because of erosion, at a cost that could run as high as $130 million, according to an estimate by the Army Corps of Engineers.[53] With 354 villagers in Newtok, that amounts to roughly $370,000 per person. There are 30 to 60 villages that may need to be physically relocated as ocean ice, sea levels, and seasons become unpredictable in Alaska. At a cost of at least $100 million per village, the price tag could top $6 billion.

Resettlement may also be needed for those living in areas susceptible to melting permafrost. An estimated 100,000 Alaskans (about 14 percent of the population) live in areas sensitive to permafrost degradation.[54] There has yet to be a comprehensive assessment associated with the costs this population will face such as housing repair and replacement, although estimates indicate these costs could greatly exceed the estimated damages to public infrastructure. Assuming all 100,000 people would need to be resettled, and using the range of costs of resettlement per person, the resettlement cost alone due to melting permafrost could range from $24 to $37 billion in the worst-case scenario.[55]

Another major adaptation expense will be the increased cost of suppressing and containing wildfires.

Across the United States, climate change has led to fire seasons that are now 78 days longer on average compared to 1970.[56] U.S. wildfires have also grown dramatically in terms of acreage burned and in financial costs to communities, businesses, and residents. In Alaska, fire frequency has doubled over the past 25 years.[57] The annual acreage burned is likely to be two to three times greater by century's end. In 2015, the second costliest year, 5.1 million acres burned in Alaska at an expense of over $100 million – or roughly $20 per acre. The acreage burned was over 5 times the long-term average of approximately 1 million acres. If we assume that, on average, the annual acres burned doubles between now and 2080, then this implies the need for an additional $2.5 billion for fire suppression.

Thus, taken together, climate adaptation costs associated with public infrastructure, relocation of villages and communities located on melting permafrost, and fighting wildfires could easily run to the tens of billions of dollars. And this excludes many other categories of adaptation expense such as increased public health care costs. At present, there are no concrete mechanisms in place to pay for these climate adaptation expenses in Alaska.

Clearly, the federal government will play a role. In his FY 2017 budget proposal to Congress, President Obama included a Coastal Climate Resilience Fund at the Department of the Interior. Approximately $400 million of a $2 billion Coastal Climate Resilience program would be set aside "to cover the unique circumstances confronting vulnerable Alaskan communities, including relocation expenses for Alaska Native villages threatened by rising seas, coastal erosion, and storm surges."[58] Repealing offshore oil and gas revenue sharing payments authorized to a few states under current law would pay for this program, however Congress did not approve the President's proposal. But this still leaves a gaping hole in adaptation needs. Governor Walker has his own plan: increase oil drilling to boost state revenues. This approach, unfortunately, doesn't get Alaska out of the cycle of dependence on the fossil fuel economy and further exacerbation of climate change.[59]

While these are major challenges, they provide Alaska the opportunity for innovative solutions aimed at economic sustainability. For example, later in this report we make the case that the costs associated with climate adaptation should be paid for by the fossil fuel industry through implementation of a state Fossil Fuel Risk Bond program capitalized by a surcharge on all fossil fuel transactions. This program, along with many of the other solutions and ideas – some of which are already being embraced in places across the state - will enable greater resilience and economic stability for Alaskan communities into the future. ■

Permafrost melt in the Arctic National Wildlife Refuge. (Northern Alaska Environmental Center)

Section IV

IV: The sustainable development framework embraced by the US, the international community, and political leaders in Alaska can guide a prosperous path forward.

For decades, the international community has coalesced around a vision for sustainable development for all nations that remedies inequities of the past, provides all people with access to the resources they need to thrive, and reverses the degradation of ecosystems and the global climate. The most recent iteration of this vision is embodied in "The Future We Want," the outcome document from the 2012 Rio+20 United Nations Conference on Sustainable Development.[60] The Rio+20 process also set in motion a process to articulate a set of Sustainable Development Goals (SDGs) to implement the Rio+20 vision and replace the Millennium Development Goals, which expired in 2015. In September of 2015, the UN General Assembly adopted a resolution that enumerated 17 SDGs as well as targets and indicators to track progress. The United States government has firmly embraced the outcomes of both the Rio+20 and SDG processes, and because of this, they provide a rich framework for Alaskans to take charge of future development of the state in the era beyond fossil fuels.

Caribou at the Jago coast, Arctic National Wildlife Refuge 1002 Area. (Northern Alaska Environmental Center)

Rio+20: The Future We Want

The outcome document itself was negotiated over a 3-year period and is organized into six broad sections that (I) articulate a common vision; (II) renew commitments to previous frameworks; (III) define a green economy in the context of poverty eradication; (IV) identify institutions needed to advance sustainable development; (V) provide a framework for follow up actions, and (VI) discuss means of implementation. A list of thematic elements included in section V are among the most important results of the Rio+20 process because they identify where interventions are likely to be most beneficial. The thematic elements most relevant for Alaska include:

- Poverty eradication
- Food security, nutrition, and sustainable agriculture
- Clean and stable water supplies
- Access to sustainable modern energy services
- Sustainable tourism
- Universal access to quality health care
- Promoting full and productive employment, decent work for all and social protection
- Conservation and sustainable use of the oceans
- Reversing deforestation and forest degradation
- Disaster risk reduction
- Adaptation to climate change
- Conservation of biological diversity
- Sustainable consumption and production
- Universal access to quality education
- Gender equality and women's empowerment

This lengthy list of thematic areas is most useful for evaluating the success or failure of economic development policies, programs, and projects. In particular, a successful policy would simultaneously advance goals and targets developed for as many of these thematic elements as possible. The outcome document also acknowledges the imperative of preserving and restoring indigenous cultures, lifestyles, and economy. For example, an important condition placed on policies to promote the green economy is that they should:

"Enhance the welfare of indigenous peoples and their communities other local and traditional communities and ethnic minorities, recognizing and supporting their identity, culture and interests, and avoid endangering their cultural heritage, practices and traditional knowledge, preserving and respecting non-market approaches that contribute to the eradication of poverty.[61]"

Respecting traditional knowledge is critical. In particular, the outcome document recognized that "the traditional knowledge, innovations and practices of Indigenous peoples and local communities make an important contribution to the conservation and sustainable use of biodiversity, and their wider application can support social well-being and sustainable livelihoods."[62]

Sustainable development goals

The seventeen SDGs adopted by the UN closely track the thematic areas addressed by the Rio+20 outcome document.[63] Goals were developed for poverty, hunger, health, education, gender equity, clean water and sanitation, energy, employment, infrastructure, inequality, cities, production and consumption, climate change, oceans, terrestrial ecosystems, peace and justice and global partnerships. But unlike the Rio +20 outcome document, the SDGs provide a quantitative basis for monitoring progress. Most SDGs contain several quantitative targets and a date for achieving them.

Table 2 displays the text of 15 of the 17 sustainable development goals. Goals 16 and 17 relate to national or international level governance issues and so are not included. Beneath each of these goals is a set of quantitative targets for achieving progress by a certain date. For example, for SDG 8 target 8.4 includes the following aspiration:

"Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10 Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.[65]"

What is of significance in Table 2 is the confirmation that SDGs are universally applicable – applicable not only to developing countries but also to developed countries undergoing the process of decarbonizing their economies. Many of the goals and targets are directly relevant to the social, economic and climate challenges facing Alaska discussed in Section II and, as such, are extremely useful as a way to screen and prioritize sustainable development policy interventions.

One way to envision such a screening and prioritization process is through use of a "spider chart" that helps evaluate the simultaneous contribution of strategies to move beyond fossil fuels in relationship to achieving several sustainable development goals (Figure 3).

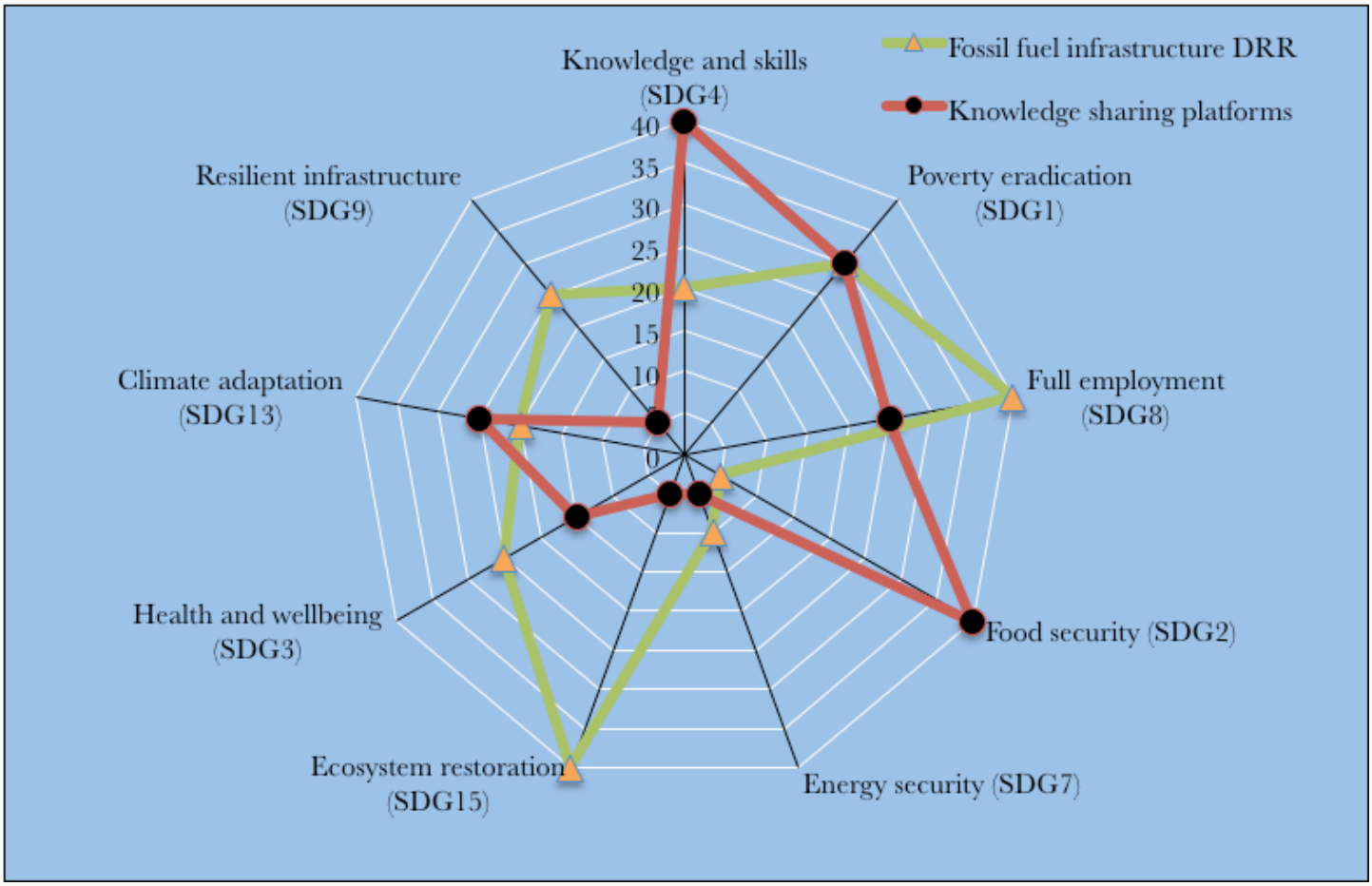


Figure 4: Stylized "spider chart" useful for scoring the contribution of beyond fossil fuels strategies to sustainable development goals. Each strategy (fossil fuel infrastructure DR&R and knowledge sharing platforms for food security) is ranked on a scale of 0-40 for each of nine sustainable development goals.

Data for Figure 4 are hypothetical but would be based on subjective evaluation criteria. Here, two beyond fossil fuel strategies discussed later on in this report – dismantling, rehabilitation, and restoring (DR&R) sites now occupied by fossil fuel infrastructure and knowledge platforms for local food solutions – are each presented in terms of a subjective score on a scale of 0-40 for each of nine sustainable development goals. So, for example, fossil fuel infrastructure DR&R could be an important strategy for retaining full employment of existing workers in the fossil fuel industry and restoring ecosystems (score of 40 for each of these goals) but contributes less to other goals. Likewise, knowledge sharing platforms for local food solutions directly contributes to food security and building knowledge and skills (score of 40 for each of these goals) and makes important, but lesser contributions to other goals. Solutions with the largest area on the chart are ones that represent those with the biggest sustainable development contribution across all goal areas.

> The most obvious danger, is "that of exploitation under the thin disguise of development."
>
> —E.L. Bartlett, Alaska's First Senator

SDG #	Goal statement
Goal 1	End poverty in all its forms everywhere
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5	Achieve gender equality and empower all women and girls
Goal 6	Ensure availability and sustainable management of water and sanitation for all
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10	Reduce inequality within and among countries
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Table 2: Sustainable Development Goals adopted by the US and 191 Other Nations[64] (Goals 16 and 17 not displayed)

Despite calls for more resource extraction, Alaska decision makers now recognize the need for an alternative, sustainable development pathway.

Many Alaskans have long recognized the importance of developing an economy that will provide sustainable economic benefits to all of the state's citizens. Notable within the state's history are Alaska's first senator, E.L. Bartlett's (1955) warnings to the constitutional convention about "the vital issue of resources policy." The most obvious danger, he warned, is "that of exploitation under the thin disguise of development." To guard against this danger, he encouraged Alaskans, "in their eagerness to get resources development," to "not lose sight of the absolute necessity for long-range policy in the resources field."

Economic development efforts since then typically have acknowledged these warnings and stressed the importance of sustainability. Few, however, have treated sustainability – both economic and environmental – as much more than an afterthought. Instead, they have called for expansion of resource-exploitation activities that focus on converting one resource into cash with insufficient attention to the negative spillover impacts. However, there have been positive examples of constituencies successfully holding these projects accountable and protecting local economies and bioregions, such as the case of Pebble Mine. This is a project-specific illustration of resource extraction accompanied by inadequate consideration of negative spillover impacts on sustainability. In 2015, the EPA concluded that the mine would jeopardize almost half of the world's wild

sockeye as well as a fishing industry that generates almost $0.5 billion in annual economic activity, and provides employment for more than 14,000 workers.[66] In addition, reductions in salmon populations would negatively affect the supply of nutrients that spawning salmon supply annually to the ecosystem of the Bristol Bay watershed. Mining operations also would lead to the loss of 1,100 or more acres of wetlands and five or more miles of streams, and alter more than 20 percent of the streamflow in nine or more miles of streams (U.S. EPA 2015).

Other economic-development efforts similarly have failed to consider the negative spillover impacts of industrial resource extraction on sustainability, but at a regional or statewide scale. Alaska Forward, for example, the "first statewide economic development strategy" has focused on stimulating the expansion of mining, oil/gas production, logging, and fishing without describing the negative spillover impacts on resource sustainability or making a meaningful commitment to minimize them.[67] Similarly, the Alaska Arctic Policy Commission (2015) has proposed initiating mineral mining, coal mining, and building new roads and port facilities to interact with outside markets, but its proposal offers no description of the negative impacts that inevitably would accompany these developments.[68] It contains no meaningful plan to control unsustainable impacts on water, wildlife, fish, and other resources.

Transition Team Committee	Illustrative Recommendations
Subsistence	• Manage all lands to sustain abundance • Meaningfully empower Tribes and other subsistence users • Sustainability of the resource comes first • Recognize subsistence use as customary and traditional use and as the priority use of wild renewable resources • Include traditional knowledge in subsistence management • Subsistence use and opportunity is sufficient to fulfill economic, cultural, social, and spiritual needs
Arctic Policy and Climate Change	• Community sustainability can be furthered by prioritizing lower cost energy, healthy environments, language and cultural preservation. • The State can work with communities to develop economic opportunities that improve infrastructure, increase culturally and technologically relevant educational opportunities, safeguard resources, and enhance and maintain unique and important Alaska Native cultures.
Consumer Energy	• Focus on reducing energy use as low hanging fruit • Within 4 years to reduce the cost of energy for all Alaskans. • Bring affordable energy to the Interior • Ensure local workforce participates in energy projects • Incentivize diversity in manufacturing
Economic Development	• Economic development should create sustainable Alaskan jobs and create individual wealth for Alaskans. • Provide high-speed and affordable communication in every Alaska Community • Reduce energy costs by 50% within 3 years through a combination of improving building stock and producing local affordable energy • Energy efficient affordable, available housing across rural Alaska • Build and/or upgrade commercial grade infrastructure including roads, ports and bridges with goal of improving land, air and sea transportation and access throughout Alaska
Infrastructure	• Fund only projects with a demonstrated long-term operational sustainability and financial feasibility

Table 3: A sample of pro-sustainability recommendations from the Walker/Mallot Transition Team[23]

Despite these new initiatives to continue down the road of resource extraction, Governor Bill Walker and Lieutenant Governor Byron Mallot recognize elements of the sustainable development agenda must be priorities. The Walker/Mallott Transition Team, comprised of nine committees focused on distinct issues facing the administration, called for an increased emphasis on sustainability from several different perspectives (Table 3). The Arctic Policy and Climate Change committee set the overall tone in this regard by highlighting this high-priority issue: Ensuring the sustainability of rural Alaska, particularly Alaska Native communities.

The Arctic Policy and Climate Change committee agreed that significantly more emphasis must be placed on, and resources dedicated to, sustainability, adaptation, and resilience in order to equip communities with the tools necessary to ensure their long-term viability. Community sustainability can be furthered by prioritizing lower cost energy, healthy environments, language and cultural preservation, and improved relationships between the State of Alaska, Alaska Natives, and other rural Alaskan communities. The State can work with communities to develop economic opportunities that improve infrastructure, increase culturally and technologically relevant educational opportunities, safeguard resources, and enhance and maintain unique and important Alaska Native cultures. These improvements would also reflect a value shift from a focus on short term success rooted in capitalism and exploitation to one focused on environmental and economic sustainability as the foundation for a thriving Alaska. ■

The village of Noatak, 70 miles north of the Arctic Circle. (Josh Foreman / U.S. National Park Service)

Section V

V: Sustainable development opportunities abound in Alaska but will require changes in policy and public investments to bring them to scale.

Sustainable development solutions abound in the State of Alaska. The most successful of these solutions harnesses community involvement and support at the local level and seeks to solve a problem or challenge that has been identified by the community with sensitivity to and an understanding of local environments and livelihoods. But in order to scale these solutions up, changes in public policy, spending and incentives will need to be made. In this section we discuss six thematic areas that could provide a policy focus as well as promising strategies and case studies that could serve as blueprints for advancing sustainable development goals for all Alaskans.

Thematic Area 1: Human Capital

From a socio-economic standpoint, human capital consists of the knowledge and skills present in a given population as well as states of mental and physical health that facilitate its use in the pursuit of individual and social wellbeing. In the modern economy, computer skills, for example, are an important manifestation of human capital:

"Your ability to work with computers is one of your individual productive capabilities. These capabilities depend not only on your knowledge, education, training, and skills; they also include useful behavioral habits as well as your level of energy and your physical and mental health.[70]"

In indigenous and subsistence societies, important forms of human capital include traditional knowledge (TK), sometimes also referred to as Indigenous knowledge, traditional ecological knowledge, or local traditional knowledge, although they all carry variations in meaning. These terms refer to knowledge acquired over thousands of years and associated with preparation and consumption of foods, medicines, clothing, and building materials hunted, fished or gathered in the wild. Human capital in both the formal market and traditional spheres are critical to Alaska's future. A 2010 economic outlook prepared for the northern territory of Nunavut, Canada underscored this point:

"Human capital is the overall capacity in terms of health, knowledge, education, and skills of people to be productive whether they are participating in the wage economy, active in the land-based economy, volunteering or supporting the family, or pursuing education (traditional or western) or training opportunities.[71]"

Among strategies for eradication of poverty and reducing inequality, investment in human capital is essential. As noted by Thomas Piketty, "[k]nowledge and skill diffusion is the key to overall productivity growth as well as the reduction of inequality both within and between countries."[72] Acquiring human capital through either formal or traditional educational systems can be "the most effective way for able young people of poor backgrounds to rise in the economic hierarchy, because human capital is the main asset of 90 percent of the population."[73]

Strategies to build human capital in Alaska can take several forms, including:

Using, protecting and restoring traditional knowledge

Traditional knowledge (TK) is a form of human capital – a set of knowledge and skills that makes harmonious and sustainable use of fish, game, medicinal and edible plants, and materials for dwellings, tools, boats, and other community infrastructure possible. It not only provides the foundation for livelihoods but also the inspiration for governance and cultural and spiritual rituals and practices that honor nature as a provider.

Alaska Native communities rely on TK to maintain subsistence-based lifestyles and maintain cultural integrity. The importance of TK in Alaska is illustrated by the wide range of goods and services ecosystems provide to Alaska Native communities as well as the cultural practices such goods and services support. TK provides the means to locate, extract, process, store and use these ecosystem goods and services for:[74]

- Food: Traditional foods contribute a significant amount of nutrients to the diet of all Alaska Native communities.[75]
- Clothing: Wild furs and hides are still the best materials for ruffs (wind guards), mitts, parkas, kuspuks, clothes lining, and mukluks (winter boots) in many regions.
- Fuel: Wood is a major source of energy in rural homes, and is used for smoking and preserving fish and meat.
- Transportation: Fish, seal, and other products are used to feed dog teams.
- Construction: Spruce, birch, hemlock, willow, and cottonwood are used for house logs, sleds, fish racks, and innumerable other items.
- Home goods: Hides are used as sleeping mats. Sealskins are used as pokes to store food. Wild grasses are made into baskets and mats.
- Sharing: Fish and wildlife are widely given out to support neighbors who cannot harvest for themselves because of age, disability, or other circumstances.
- Customary trade: Specialized products like seal oil are bartered and exchanged in traditional trade networks between communities. Furs sold to outside markets provide an important source of income to many rural areas.
- Ceremony: Traditional products are used in funerals, potlatches, marriages, dances, and other ceremonial occasions.
- Arts and crafts: Ivory, grass, wood, skins, and furs are crafted into beautiful items for use and sale throughout Alaska and beyond.

Despite its importance and a growing appreciation for TK in the Arctic among outsiders, there are many factors that challenge its continued use, protection, and restoration. Disappearing native languages is one important factor since TK is often language-specific – and in Alaska, there are 20 such languages at risk.[76] There are policy and cultural pressures at work, such as ostracization of native languages in the public school system, television, and youth being less interested in maintaining traditional ways or having opportunities to utilize it: "[p]arts of the traditional knowledge have faded since it is no longer needed among the younger generation and even if a younger member of the society shows interest in maintaining the traditional knowledge they might still lack the necessary practical ingredient."[77] Other challenges involve the difficulty and resistance to integrating TK into "modern educational, scientific, administrative, juridical, political, and resource-management regimes and structures."[78] There have been exceptions to this as a result of innovation and unique partnerships.

But a new and significant threat comes from climate change. Climate change stands to adversely impact species and ecosystems that produce traditional foods vital to Alaska Native culture, economy and traditional ways of life by changing their patterns of abundance, distribution and migration.[80] As the once permanently frozen landscape thaws, markings that hunters used to navigate their way have been lost or changed. For example, in the Canadian Arctic, Inuit elders who traditionally used their skills to predict the weather have observed changing cloud and wind patterns. Their weather and climate-related knowledge does not fit with today's weather conditions and patterns.[81]

In the face of these threats, the requisite TK and skills needed to keep subsistence as an important source of livelihood must be deliberately used, protected

and restored as a matter of public policy rather than ignored or – worse yet – ostracized. Otherwise, active TK may slip into dormancy (persisting in memories, written texts, or oral traditions but not used), and, eventually extinction,[82] especially as climate change alters the landscape in unpredictable ways. Protecting and restoring TK is not only critical for sustaining livelihoods, but can be an important tool for reversing cultural alienation and its attendant effects on mental health and well-being.[83] Policy interventions could be used to scale up a number of successful, ongoing initiatives, such as:

Knowledge inventories

The need to preserve and utilize TK in natural resource management decisions has been long recognized by federal and state agencies in Alaska.[84] The Alaska Native Science Commission has called upon the EPA and other federal agencies to provide resources for development of unique tribal policies to inventory and protect and utilize TK.[85] Best practices for these inventories include onsite interviews with willing informants, questionnaires, facilitated workshops, collaborative field projects, and review of historical documents. Protocols for these are well developed.[86] It should be made clear that such inventories are not being conducted for any purely academic or historical purpose; rather, they should be completed primarily for the purposes of facilitating dissemination of TK to Alaska Native youth.

Dissemination and training

Alaska Natives, as others in the indigenous world, rely on oral transmission for passing on TK to the next generation. However, a more deliberate system designed to preserve and enhance TK could include

—CASE STUDY—

First Indigenous-owned video game developer and publisher

A collaboration with Upper One Games, the “first indigenous-owned video game developer and publisher in US history”[79] established by the Cook Inlet Tribal Council, and education video game company E-Line Media, resulted in the creation of the innovative video game “Never Alone”, also known as “Kisima Innitchuna”.

A group of video game developers, an Alaska Native writer, and about over a dozen Iñupiat storytellers and elders worked together to create the story of Nuna, a young Iñupiat girl and Fox, her Arctic fox companion on their quest. Along the way, many characters from Iñupiat legends are woven into the story, which is narrated all in Iñupiaq. The game can be played by a single player or two together. The proceeds from the sale of the game benefit the Cook Inlet Tribal Council’s education efforts.

online resources, curricula, and educator training. The Alaska Native Knowledge Network presents a working model by providing resources for compiling and exchanging information related to Alaska Native knowledge systems and ways of knowing.[87] They provide cultural atlases and talking maps, cultural resources (such as dictionaries and study guides), books and other publications, curricula and links to Native educator associations.

Technological enhancements

One strategy for preserving and restoring TK is to complement its use with technology and western scientific methods. The merging of traditional ecological knowledge and western science "could improve efficiency of management decisions and enhance the validity and robustness of ecological inferences."[88] For example, in northern Canada, researchers compared caribou habitat modeling approaches using GPS vs. traditional ecological knowledge and found that both approaches had high model performance and successfully predicted caribou occurrence. The results point out how TK can be used in habitat modeling in situations where long-term ecological data is lacking. In 2006 researchers initiated the Iglinitt Trails Project in Nunavut to gather records of weather conditions and other observations made by Inuit hunters and travelers. The Project used this information to study changes in ice cover and how these changes affect Inuit communities. The project mapped travel routes using integrated snow machine-mounted GPS/mobile weather station/palm pilot technology.[89]

The merging of traditional ecological knowledge and western science "could improve efficiency of management decisions and enhance the validity and robustness of ecological inferences."

Incorporating traditional knowledge into climate change research

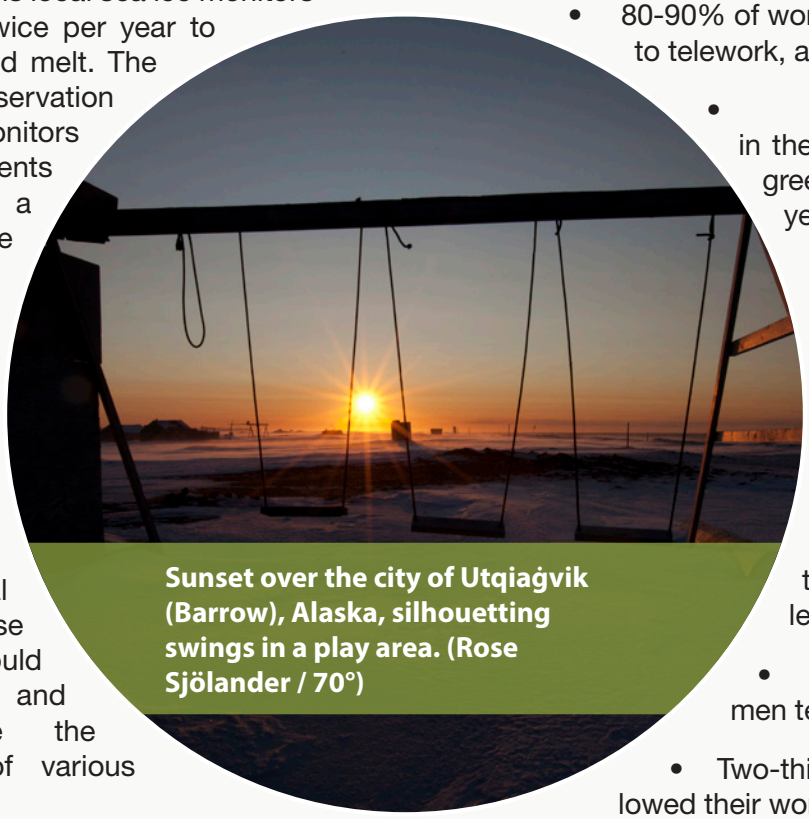
Several studies conducted with Indigenous peoples in northern regions suggest that TK allows them to account for and adapt to large numbers of variations in their environment, including those associated with recent climate change. As such, the detection of environmental changes, the development of strategies to adapt to these changes, and the implementation of sustainable land-management principles are all important climate action items that can be informed by TK.[90] For example, the Alaska Native Tribal Health Consortium documents the impacts of climate change on the landscape and on human health and also develops adaptation strategies. In doing so, they employ western science, traditional ecological knowledge, and a vast network of "Local Environmental Observers" to develop comprehensive, community-scaled climate change health assessments.[91]

Community-based monitoring

The Atlas of Community-Based Monitoring and Traditional Knowledge in a Changing Arctic is an interactive inventory of community monitoring initiatives in the Arctic that combine scientific methods with TK. The Atlas allows communities to connect with one another and get a sense of the big picture of climate change in the Arctic. The Atlas was developed as an environmental monitoring catalog, however it is used to document and map social and economic initiatives as well.[92] Alaska has hundreds of recorded projects in the online Atlas including local observer networks, suicide prevention programs, community health monitoring, and ecological knowledge co-ops.[93]

For example, the Arctic Borderlands Ecological Knowledge Co-op is a multi-community initiative that monitors the Porcupine Caribou Herd. The program was initiated by tribal and First Nations residents who conduct 20 structured interviews per year and has produced annual reports since 2000. Indigenous leaders had pressed for the International Porcupine

Caribou Agreement of 1987 due to concerns about caribou habitat and management.[94] The Sea Ice Monitoring Network trains local sea ice monitors and sends them out twice per year to document freeze-up and melt. The Local Environmental Observation (LEO) Network monitors extreme and unusual events and data is posted to a shared Google Map. The LEO is active across 108 Alaskan communities. The community-based Permafrost and Active Layer Monitoring Program monitors the thermal state of permafrost and is active across all Arctic states. Federal investment in these types of programs could employ local residents and significantly enhance the working knowledge of various government agencies.[95]



Sunset over the city of Utqiaġvik (Barrow), Alaska, silhouetting swings in a play area. (Rose Sjölander / 70°)

Investing in the work-at-home economy

Participation in telework (the practice of working from home, rather than commuting, by making use of the internet and telephone) is growing especially rapidly. The 2010 census found that, across the U.S., 13.4 million people, or 9.4 percent of the workforce, worked at home at least one day per week.[96] About 60 percent of work-from-home workers worked for a private company and 5 percent worked for a government.[97] This group grew almost 10 percent per year since 2005. The other 35 percent were self-employed, and their numbers declined slightly. Of all the workers who worked from home, 9.4 million worked exclusively from home, and the remainder worked both at home and at the job site. Data from Braverman (2014), and GlobalWorkplaceAnalytics.com (2016), show that:[98]

- From 2005 to 2014, the total number of teleworkers more than doubled.
- One-half of jobs in the U.S. are now compatible with telework.
- 20–25% of workers engage in telework at least occasionally.
- 80-90% of workers say they would like to telework, at least part-time.
- The average teleworker in the U.S. has a college degree, and earns $58,000 per year.
- In 2014, the number of teleworkers grew 5.6 percent, while the total number of workers grew 1.9 percent.
- 3.7 million workers, or 2.8 percent of the total, work from home at least half the time.
- A higher percentage of men telework than women.
- Two-thirds of employers allowed their workers to telework at least part-time.
- Policies allowing workers to telework can help employers attract and retain workers.

Telework has a significant, expanding presence in Alaska. In 2011, 61,000 Alaskan adults, or 17 percent of the workforce, used the Internet to work from home instead of commuting to their workplace.[99] Another 90,000 employed adults said they would telework if allowed by their employer. Improved broadband access, dissemination of work-at-home job skills, and locally created entrepreneurial jobs are vital components of an economic development strategy to take advantage of this potential.

Broadband access

A lack of access to broadband Internet service impedes growth in telework in many parts of Alaska. In 2011, 27 percent of Alaskans did not have broadband at home. Six thousand businesses didn't have broadband access. The average download speeds in Alaska do not exceed 5 mbps.[100] Limited broadband also impedes economic growth across the board in all sectors.

In rural areas of the state, a 10 percent increase in

access to broadband might accelerate growth in jobs and incomes by 1.4 percent.[101] These economic development benefits would materialize as improved communication increases workers' efficiency; improves the effectiveness of services, such as remote healthcare and online learning; enables rural producers to reach a larger set of suppliers and buyers electronically; and reduces barriers that contribute to inequities among different groups of Alaskans.

Alaska's Statewide Broadband Task Force offers a blueprint for expanding broadband service and exploiting it to generate jobs and to improve education and public safety services.[102] Overall, the Task Force defined two goals: 1) "[m]ake it possible for Alaskans to participate and be competitive in the global community by extending the full benefits of broadband technology to every Alaskan" and 2) "[b]y 2020, every Alaska household should have access to 100 megabits per second connectivity."

Its recommendations include guidelines for the technical specifications of an expanded broadband system, and a general framework of public and private institutions to develop and manage the system. As the system evolves, the blueprint calls for:

- Policies and procedures to encourage development of data centers and other industries that can take advantage of the system and create sustainable jobs for Alaska's workers.
- Training programs for knowledge workers, technicians, entrepreneurs, and small businesses.
- Incentives for Alaska-based innovators to patent their innovations.
- Development of e-learning resources that involve educational institutions and are available to students throughout Alaska.
- Reinforce communications networks for public safety institutions and individuals.
- The Task Force estimated that accomplishing its two goals by 2020 would cost more than $1.2 billion.

Private companies are beginning to rise to the challenge. For example, Quintillion plans to offer broadband to five coastal communities by early 2017 (Nome, Kotzebue, Point Hope, Barrow, and Wainwright).[103] But service to other areas may require federal or state subsidies, such as financial aid offered by the Federal Communications Commission under its universal service program[104], or the development of member-owned broadband cooperatives, such as those being developed in other rural areas of the U.S.

Skills and training

Improved online access is one important strategy for investing in the work-at-home economy. Another is to scale up projects that seek to bolster work-at-home skills and training. Alaska's Workforce Investment Board's Strategic Plan recognizes this need and includes goals to "expand access to short-term secondary and postsecondary training and registered apprenticeships through investments in interactive technology, distance delivery, intensive seminars and correspondence programs."[105] There are many examples that can serve as blueprints for scaling up state investments. For example, in 2014, Bethel Broadcasting was awarded a $780,000 grant from the USDA's Strikeforce for Rural Growth and Opportunity to transition to digital technology and provide advanced education resources and technical training to its viewers in remote villages. According to USDA's Patrice Kunesh,"[t]his newer, digital technology will give rural Alaskans more access to advanced teaching resources. It also will help them in their career goals as well as help expand their local economies."[106]

The three main campuses of the University of Alaska System provide both undergraduate and graduate degrees as well as certificates, occupational endorsements and courses that may be completed entirely online or in blended formats. The Alaska Department of Labor and Workforce Development's (DLWD) Mature Alaskans Seeking Skills Training (MASST) program is designed to foster individual economic self-sufficiency and promote useful opportunities in community service activities that shall include community service employment for unemployed low-income persons who are age 55 or older. The MASST program includes many work-at-home arrangements.

Another important model that could be reconfigured and scaled up is the DLWD's Vocational Rehabilitation (DVR) program, which is designed to nurture self-employment opportunities for disabled or disadvantaged persons through a number of services, such as:[107]

- Technical assistance and other consultation services to conduct market analyses and develop business plans.
- Training for the management of a small business.
- Obtaining necessary initial stocks and or supplies.
- Assistance with marketing including the costs

associated with custom web site design, development, maintenance, and E-commerce development within specified time frames;

- Assistance with accounting costs and financial reviews.
- Providing appropriate accommodations or assistive technology needed by the individual.
- Rent assistance and required security deposits.
- Referral to and coordination with community resources for basic business courses, assistance in the development of a business plan, and assistance with business start-up practices.
- Referral to resources for small business loans.
- Acquiring licenses and permits required to lawfully engage in business.

These programs could be broadened to include anyone seeking a work-at-home arrangement. When looking at a just transition beyond fossil fuels, this is an area the state could invest in heavily, given the growth potential of this sector and Alaska's need to find replacement employment for oil and gas workers.

Education, health, and cultural empowerment

Investments in formal education and job skills are critical development tools for sustainability, and there are many initiatives at the state, local, and tribal level in Alaska that reflect this. It is beyond the scope of this report to provide an inventory or evaluation of such programs. However, we can call attention to the health and cultural aspects of human capital since they are often neglected as well as a special focus on youth, rural Alaskans and Alaska Natives since the needs of these populations are the greatest. Some important examples of successful programs and projects that illustrate the human capital benefits of work in this space include:

Youth empowerment

There are several very successful youth empowerment programs in the State of Alaska that cater to Native youth education and traditional livelihoods training. The Alaska Native Heritage Center runs programs for

Seventeen wind turbines provide up to 1.14MW of electrical capacity to Kotzebue, reducing reliance on costly diesel fuel. (Wikimedia Commons)

middle school and high school students that provide after school native culture classes and activities. These programs help students academically, allow them to earn school credit, and engage them in their cultural history and traditions.[108]

There are many science and culture camps that link elders and youth on their traditional lands and waters for teaching and sharing knowledge, with many for communities near national parks and refuges. For example the Selawik National Wildlife Refuge partners with the Northwest Arctic Borough School District for a camp for K-12 students.[109] The Alaska Native Science and Engineering Program (ANSEP) offers three levels of summer programming aimed at increasing the number of Native Alaskans in STEM fields. It is the most successful and cost effective STEM education program in the United States. The programs begin in the 6th grade and continue through the college level. Middle schoolers participate in the Acceleration Academy, where 95 percent of graduates advance one level or more in math or science each summer.

Middle schoolers can also take part in Middle School Academy, which is a career exploration program that is expected to serve 650 kids by 2018. Seventy-five percent of ANSEP middle schoolers complete Algebra I before graduating from 8th grade. The Summer Bridge Program for high schoolers has over 250 participants, 90 percent of whom continued on to engineering or science B.S. programs in college. More than 75 percent of ANSEP students enrolled in a science or engineering B.S. program in 2010 are still enrolled in those programs or have graduated from college.[110]

There are many science and culture camps that link elders and youth on their traditional lands and waters for teaching and sharing knowledge...

Telemedicine

Alaska grants funding to remote communities to develop telemedicine capabilities through installing new technologies and educating residents. Many small communities in Alaska have no dedicated doctors and nurses, and without telemedicine residents either travel long distances for medical care or forego it. Tele-psychiatry is especially important for youth in Northern communities where instances of depression and suicide are high.[111] USDA grants awarded to Alaskan communities for telemedicine and distance learning amounted to almost $1 million in 2015.[112]

Suicide prevention

Alaska has the highest rate of suicide per capita in the United States. In 2014, the rate of suicide for Alaskan residents was 22.3 per 100,000 and the rate for Native Alaskan men (the most at-risk group) was 50.9 per 100,000.[113] There are, however, initiatives that are working to address this. Among them, the Teck John Baker Youth Leaders Program began in 2009 in the NW Arctic Borough School District as a peer education and mentoring program. It has been successful in reducing the suicide rate in the borough. The number of teen suicides decreased from eight in 2008 to 5 in 2009 and has dropped and remained at zero every year since. As of 2015, over 125 students have served as social captains in the program. Youth Leaders are training as peer counselors and gatekeepers. They are taught anger management, coping, refusal, decision-making and interpersonal skills.[114]

Holistic healthcare

Healthcare initiatives that include Indigenous and natural alternatives work well in Alaska for those who cannot always access conventional western medical facilities or treatments and who prefer integrated approaches to wellbeing. The Southcentral Foundation is an example. The Southcentral Foundation is a Native-owned and led non-profit healthcare provider. The Foundation specializes in the Nuka System of Care that combines physical, mental, and spiritual wellness with traditional medicine and social/behavioral care. According to a number of performance and quality measures, Southcentral is outperforming other providers in Alaska. In the past ten years, Southcentral has recorded a reduction in costs as well as in average hospital days, ER and Urgent Care visits. Southcentral highlights the importance of holistic medicine and serves over 140,000 Alaskans.[115] Southcentral is supported through national and regional grants.

Thematic area 2: energy efficiency and renewables

While Alaska's small population means it is not a major energy consumer—ranking 40th in the country in 2014—on a per capita basis, Alaska's energy consumption is significant. For residential consumption of energy per capita, Alaska is 39th in the country,[116] but including all sectors Alaska had the fourth largest per capita energy consumption nationally in 2014, at 818 million BTUs consumed per capita. According to the U.S. Energy Information Administration: 55 percent was consumed by the industrial sector in 2015; 27 percent for the transportation sector; 11 percent for the commercial sector; and 8 percent for residential consumption. Alaska is the number one consumer of energy per capita for transportation in the country, with the largest consumption of jet fuel per capita. However, given that Alaska is a major jet-refueling hub for military aircraft and commercial passenger and cargo flights between the U.S. and Asian countries, and that many communities in Alaska can only be reached via aircraft, this figure is not too surprising. Alaska is the fourth largest industrial energy consumer per capita in the country and the fourth largest energy consumer per capita in the commercial sector.

The Alaskan energy landscape is composed of more than 150 stand-alone microgrids.

The Alaskan energy landscape is composed of more than 150 stand-alone microgrids in additional to the large Railbelt electrical grid that stretches from Fairbanks through Anchorage to the Kenai Peninsula. The Railbelt electrical grid provides 80 percent of the state's electrical energy. Of the fossil fuels, natural gas is the predominant source of energy consumed in Alaska, with 329 billion cubic feet of natural gas consumed, 41.6 million barrels of oil consumed, and 1.2 million short tons of coal consumed in the state in 2014. As elsewhere in the US where climate goals are in focus, substantial investments in energy efficiency and renewable energy will be needed to make significant cuts in this fossil fuel consumption while allowing for economic growth. Federal and state investment in efficiency and clean energy projects combined with comprehensive communications about the projects, will help boost Alaska's position as a model region for piloting new technologies and will create local job training and development opportunities.

Energy efficiency

As all renewable energy proponents will tell you, energy efficiency is the first step in any renewable energy portfolio. Unless existing energy consumption is used efficiently, whether for industrial production, transport, heating or lighting, any additional energy – and money – will be wasted in proportion to that efficiency. Yet Alaska has yet to take up the issue of energy efficiency at the policy level with any real vigor.

A 2012 study of public facilities' energy consumption in Alaska found that the state spent an average of $641 million on utilities each year, much of that wasted on old, energy-inefficient buildings. The same study suggested the state could save approximately $125 million each year with greater building energy efficiency.[117] The Alaska Housing Finance Corporation is working with schools and other public facilities on energy efficiency upgrades, thereby saving the public money while employing workers in the construction trades.[118]

Alaska's residential and commercial sectors consume an estimated 440 trillion BTUs of energy for power and space heat.[119] Of this, 11 percent is used in residential buildings, 14 percent is used in commercial buildings, and 75 percent is used in industrial facilities. Alaska Energy Authority (AEA) has set a goal of lowering the cost of energy for Alaskans and improving energy efficiency by 15 percent between 2010 and 2020, with a focus on industrial, commercial, and public buildings and electrical efficiency.[120] Several initiatives have been taken to help meet this goal. For example, the AEA conducts commercial building energy audits that have provided rebates for more than 230 privately owned commercial buildings since 2011, identifying an average of 28 percent energy and financial savings for business owners.[121] The AEA also conducts outreach via the Village Energy Efficiency Program (VEEP), which provides grants for energy efficiency measures in public and tribal buildings.

In 2010, the Alaska Housing Finance Corporation initiated a program involving a $250 million revolving loan fund which provides financing for permanent

energy efficiency improvements for publicly owned buildings in the state. Additionally, the Alaska Department of Transportation and Public Facilities has improved the energy efficiency of more than 25 percent of state-owned facilities, saving the state more than $2.4 million.[122] For residential buildings, key findings in a 2014 Housing Assessment conducted by the Cold Climate Research Center identified three major challenges: (1) more than one in three households in Alaska spends more than 30 percent of their income on heat and electricity; (2) the average housing unit in Alaska uses more than twice as much energy per year as the average housing unit located in cold climate regions elsewhere in the U.S., and (3) over 19,000 homes in Alaska were rated at the lowest energy rating a home can have.[123]

Budget cuts have forced the Alaska Housing Finance Corporation to significantly curtail two residential energy efficiency programs: Home Energy Rebate Program and Weatherization. From 2008 to 2015, these two programs improved the energy efficiency of more than 40,000 households across Alaska, "resulting in an average energy savings of 30 percent, the creation of more than 4,000 jobs, and an estimated $56 million in energy saving to Alaskans per year."[124] Restoring state funding and increasing federal funding for these effective programs should be a high priority.

Renewable Energy

In 2009, former Governor Sarah Palin set a non-binding goal to generate 50 percent of the state's electricity from renewable sources by 2025. Lauded by environmentalists at the time, it was later revealed that Palin had intended the vast majority of the state's future renewable energy resources to be derived from the Susitna-Watana Dam, a megaproject that would pose long-term risks to wild salmon and other environmental impacts and was mothballed by Governor Bill Walker in 2016 due to budget constraints.[125] Indeed, today, the vast majority of Alaska's "renewable energy" is derived from large hydropower. Of the electricity produced in Alaska as of April 2016, 13.2 percent is petroleum-fired, 45 percent is gas-fired, 6.7 percent is coal-fired, 20 percent comes from hydropower, and 15.2 percent is from wind, solar and other "renewable" energy.[126] With the Susitna-Watana dam off the table, the 2009 energy goal is no longer being pursued with any vigor.

However, with the continued focus on reducing the high cost of energy, which is often diesel fuel that is barged or flown into remote villages, many renewable energy projects are developing across the state. In 2015, 54 renewable energy projects came online, replacing an estimated 22 million gallons of diesel fuel at an estimated value of almost $61 million, and the AEA estimates that even more than that will be replaced by projects in 2016. Compare this to the 287 qualifying projects that the state legislature appropriated funding to in 2008, and one can see the enormous potential for renewable energy development in the state.[127]

Alaska is already a national leader on "islanded microgrids," small electricity distribution systems that contain localized load, generation and storage systems to power electricity independent of connection to a larger grid. However, for many decades, the power source for these microgrids has been largely diesel, which has proven to be both expensive and polluting. It is the incentive to spend less on diesel fuel, together with Alaska's lack of energy infrastructure in rural areas, that makes renewable energy an ideal option for communities that want to achieve multiple goals: The generation of stably-priced, environmentally responsible, secure, and locally controlled energy.

Upfront investments are starting to realize profits. For example, thanks to funding from the Renewable Energy Grant Fund created by the Alaska legislature, and administered by the Alaska Energy Authority, capital costs of $494 million that went toward 54 renewable energy projects in Alaska are realizing $1.24 billion of lifecycle benefits, a benefit –cost ratio of 2.5.[128]

Wind

Alaska has enormous wind energy potential but, due to failed experiments with early wind technology in the 1980s, relatively few windmills have been developed in the state. There are currently over 40 wind projects in Alaska, mostly located in western and coastal regions where gusts are strong. Total installed capacity is 67 megawatts.[129] Several communities have harnessed wind power as a secondary source of energy production to supplement diesel and a few are beginning to explore supplementing other forms of energy as well, like hydropower. For example, through state and federal grants, Kotzebue has installed a total of 19 wind turbines that provide 60-65% of the town's electricity needs and saved nearly $900,000 in annual diesel fuel costs.[130] In 2009, Kodiak Electric Association installed the state's first megawatt-scale turbines. There are now six 1.5 MW turbines and a 3 MW battery system to store excess wind power on Kodiak that supply the island with over 14 percent of its electricity; the remaining electricity comes from the Terror Lake hydropower facility.[131] The utility has saved over $22 million as a result of not using diesel

power roughly half the year, which has resulted in lower utility rates for its customers.[132]

And there are many other examples of wind installations, mostly wind-diesel hybrids, including projects underway in the Railbelt region and scattered across the state to power many of the Alaska's microgrids. These projects reduce the villages' reliance on imported diesel and the total energy costs for utilities and customers. Sustained state and federal funding is needed for more wind installation – among many local benefits, this could bring local long term job development to villages and foster regional expertise in remote wind development that could be marketable elsewhere.

Solar

Alaska's northern latitude leads many to believe it is a region inhospitable to solar power. Yet, as a recent study released by the U.S. Department of Energy points out,[133] Alaska's insolation is actually far greater than Germany's, a country that has 35 gigawatts of installed solar capacity, and is on track to produce 52 gigawatts of solar, representing about 7 percent of the country's power production. During the summer, as in Germany, Alaska's 20+ hours of sunlight, make solar energy a reliable source of energy. However, solar energy is less accessible during Alaska's long and dark winters. Nevertheless, the DOE study found that there were several scenarios where solar (photovoltaic) PV was economically competitive with diesel fuel and suggested that solar had a role to play in reducing rural villages' reliance on diesel power or possibly in supplementing wind power. The most productive months for solar energy in Alaska vary by region from March to August, when the PV panels receive both direct sunlight and reflected light from snow. During cooler months, temperatures are low enough for the PV systems to exceed their rated output. Solar power in Alaska is also being used to heat water (solar thermal heating) and as passive heating.

There are 24 installed solar projects in the state, many of which are clustered near each other in towns where solar has become popular. For example, Kotzebue has three solar installations with a combined capacity of 22 kW and the community of Galena has multiple projects with a combined 40 kW capacity installed on schools, business, and residences between 2009 and 2014. Ambler, AK is the home to the first solar installation in the Arctic Northwest under the Coastal Impact Assistance Program. The project has an installed capacity of 8.4 kW and is expected to save over 12,000 gallons of diesel over the next 10 years.[134] But perhaps Alaska could learn some solar ambitions from the village of Batagay, Russia, which has installed 1 megawatt of solar, one of the largest solar power installations above the Arctic Circle.[135]

Hydroelectric

Hydroelectric power is the most popular form of renewable energy in Alaska and makes up approximately 20 percent of the state's energy profile.[136] Unfortunately, much of Alaska's hydropower comes from decades-old dams that are environmentally costly and interrupt the natural flow of Alaska's rivers and salmon runs. There are a number of hydro projects in the state that use run-of-the-river technology or river diversion, which is gentler on the environment than dam technology, but offers less storage potential. This lower impact technology is expected to grow as a means of displacing more expensive gas and diesel power.[137]

The South Fork Black Bear run-of-the-river project was constructed in 2004-2005 and supplies 2 MW to supplement the 4.5 MW Black Bear Lake Hydroelectric plant, supplying power to Prince of Wales Island. The Black Bear complex was the first hydro project in Alaska to be certified as low-impact by the Low Impact Hydropower Institute.[138] Another low impact project is the Goat Lake hydroelectric facility, which is a dam-less reservoir, providing power to Skagway and Haines – operating at a 4 MW capacity.[139]

Hydrokinetic (river, tidal, wave)

Hydrokinetic river energy – energy captured from the power of flowing water in rivers (and ocean currents) - holds great promise for Alaska, which has 17.1 percent of the country's total.[140]

Alaska has approximately 90 percent of the total tidal energy in the country, given the large range of tides experienced throughout the state.[144] However, slow developments in technology and the lengthy permitting process have impeded progress toward harnessing marine and hydrokinetic power. One place with potential, however, is the Turnagain Arm, which has tides as high as 40 feet, and where project developers hope to install 240 megawatts of power. The Turnagain Arm Tidal Energy Corp.'s project received its preliminary permit in February 2014.[145]

—CASE STUDY—

Harnessing the Energy Potential of the Kvichak River

After successfully piloting a hydrokinetic power project in Maine, Ocean Renewable Power Project deployed its turbine in the Kvichak River, near the village of Iguigig, Alaska in July 2015.[141] In March 2016, Igiugig was selected by the Department of Energy to receive up to $1.5 million to advance the design and operation of the system.

The 25 kilowatts of power being generated by the hydrokinetic energy is displacing diesel fuel that would otherwise be used for power in the village at a cost of $0.80 per kilowatt hour, nearly eight times the cost of power elsewhere in the U.S.[142] There has been no observed evidence of fish mortality as a result of the river turbine, and other communities, like Nenana are beginning to explore a similar technological approach.[143]

The RivGen® turbine in the Kvichak River provides power to the Village of Igiugig. (U.S. Department of Energy)

This may follow the example of Penzhin Bay, Russia – at a latitude similar to Turnagain Arm and with the highest tides in the Pacific Ocean at 44 feet,[146] tidal energy is being explored there with the goal of installing 87 gigawatts of energy.

As one energy analyst put it: "If [Turnagain Arm and other] tidal power configurations achieve the commercial break-through purported in their preliminary permit applications with FERC and successfully navigate the permitting process, they may have the potential to be 'game changing' renewable opportunities that substantially displace fossil fuels, position Alaska as a world leader in tidal power technology, provide extremely competitive electric rates for the northern Pacific Rim which could significantly enhance export industry opportunities, and encourage renewable market transformation in electrification of end-use energy demand and conversion from fossil fuel to renewable fuels for transportation."[147]

Wave

Wave energy in Alaska holds promise for some remote communities. The community of Yakutat, for example, is completely dependent on diesel for all of its energy needs, burning 35,000 gallons of diesel per month, and is exploring a wave energy project with the Alaska Center for Energy and Power. Yakutat aims to become the first community in North America to generate electrical grid power from wave energy. In

January of 2013, FERC approved a preliminary permit from Resolute Marine Energy to test the wave energy in the region and development research is underway.[148]

Geothermal

Alaska has a huge potential to harness geothermal energy, given its location on the volcanically active 'Ring of Fire.' In 1982, the USGS identified four major regions that warranted further study for their geothermal potential. These regions were the Interior Hot Springs, the Southeast Hot Springs, the Wrangell Mountains, and the Ring of Fire volcanoes.[149] United Technologies Corporation entered into a partnership with Chena Hot Springs Resort to develop the lowest temperature operating geothermal power plant in the world in Chena, Alaska in 2004. The hot springs powers a resort and several greenhouses that are used to grow hydroponic vegetables year-round.

A similar proposal is in the works for Pilgrim Hot Springs, 60 miles from Nome, Alaska. Gwen Holdmann, the project manager and engineer at the Chena Hot Springs site from the University of Alaska at Fairbanks, is also advising the developers of the Pilgrim Hot Springs site, to determine whether or not that site might produce enough power to develop another geothermal power plant in the region.

Other promising locations currently being explored for geothermal heat development are: Manley Hot Springs which is 160 miles west of Fairbanks; Granite Mountain near Buckland, Alaska, population 406; Division Hot Springs near Shungnak, Alaska, population 256; and Tenakee Springs on Chichagof Island in the Southeast.

Alaska has a huge potential to harness geothermal energy, given its location on the volcanically active 'Ring of Fire.'

Biomass

Alaska has great potential to use waste from wood, sawmill waste, and other waste products to create energy. While this method of energy generation is often classified as renewable, it does release harmful quantities of carbon dioxide and carbon monoxide into the air and consists of burning organic materials. However, some Alaskan communities have adopted wood pellet (made from sawdust and other waste wood) burning and biomass burning as a means to reduce diesel use and energy costs.[150] Other communities have begun generating energy through methane capture and heating greenhouses with biomass powered boilers.

Landfill methane capture

The municipality of Anchorage and Doyon Utilities have partnered to initiate a program for collecting methane emissions from a local landfill to generate energy for Joint Base Elmendorf-Richardson. The 5.6 MW project captures methane and uses it to displace natural gas and diesel. Thus far, the project has generated over 100,000 MW hours of electricity and displaced over 10 million gallons of diesel. The methane power plant provides over 25 percent of JB Elmendorf-Richardson's electrical demand.[151]

Thematic area 3: greater

local self-reliance in food and manufacturing

It is now widely accepted by sustainable development practitioners that after decades of almost zealous pursuit of free trade agreements and other strategies for globalization it is time for nations, states, and cities to embrace solutions that rebuild greater levels of local self-reliance in the production of food, energy, and manufactured goods. An economy that aligns local demand for goods and services with local production and local talent is one that generates a wide array of socio-economic benefits for its population:[152] (1) resiliency in the face of volatile global markets; (2) more abundant and diverse job opportunities; (3) a greater endowment of skills and knowledge; (4) more capability to adapt and take advantage of new economic opportunities as they arise; (5) more accountable, environmentally sound, and humanitarian business practices, and (6) more money circulating locally.

While it may be argued that self reliant economies are inefficient – in the sense that they produce goods and services that are more efficiently (and cheaply) produced elsewhere – studies have consistently documented that the externalized costs of an economy overly invested in trade (i.e. unemployment, accelerated environmental degradation) are often far greater than any gains associated with cheaper goods.[153] This could be especially true in Alaska, where local production actually has the potential to lower costs, especially with food. Consumers would receive the benefit of lower prices as well as the benefit of knowing that their food was produced locally and sustainably. Opportunities for local energy production in Alaska were discussed above. Here, we touch on the potential in two additional sectors: food and manufacturing.

Greater local self-reliance in food

Rural Alaskans are already among the most self-reliant in food. Wild food harvests in rural regions range from about 153 to 664 pounds per capita annually.[154] By way of comparison, the average American in the continental U.S. purchases about 222 pounds per person of meat, fish, and poultry annually from globalized markets. The highest levels of per-person food harvest occurred in the Arctic and Western Regions. If these subsistence foods were purchased

— CASE STUDY —

Locally Grown Opportunity

A new approach to farming has begun to emerge in the Arctic: hydroponic farming. Arctic Greens, located in Kotzebue, is the first company above the Arctic Circle to be certified as "Alaska Grown," and began selling produce to local grocery stores in June 2016.[161] The company, owned by Kikiktagruk Inupiat Corporation, has long-term plans to expand their operations to up to 30 other communities in Alaska, including Nome.

In the Village of Anaktuvuk Pass, there has also been an agricultural venture with Gardens in the Arctic, established by local resident Rainey Hopson with the purchase of a high tunnel greenhouse that will enable up to 90 days of growing around the summer.

"A lot of people on the North Slope want to put money into something that will help the communities so this is a way they can do it directly," said Hopson.[162]

And in the southern part of the state, over 200 high tunnel greenhouses – the highest rate per person in the US – can be found in the Kenai Peninsula partially funded by the US Department of Agriculture's Natural Resource Conservation Service.[163]

in the market, they would have a value of over $900 million per year.[155]

But for those who live in urban areas and do not engage in subsistence activities, and at times of the year when subsistence foods are not available, the opposite is true. Local fresh food is exceedingly difficult to come by. One key reason is that producers face a vicious cycle of high costs. The high cost of living means farmers must pay a higher wage to local laborers; the high cost of transporting food and essential inputs affects the price of the foods; and, as the price of oil has dropped, so too has the price of transport of goods from the Lower 48, giving out of state goods an additional competitive advantage. Even seafood, which is plentiful in Alaska, is often processed in Seattle then imported back to Alaska for local consumption.

As a result of these challenges, Alaskans spend $2.5 billion each year on food, 95 percent of which is imported from out of state, meaning up to $1.9 billion is leaving the state each year that could be supporting local producers.[156] In 1955, over half of the food consumed in Alaska was grown in-state.[157] Today, less than 5 percent is grown in-state. According to the 2012 census, Alaska is ranked last in the value of crops sold in the state. It ranks last or near last in every category of food production except aquaculture, where it is ranked 13th.[158]

To improve greater food security and sovereignty for Alaskans, a recent report produced by the Alaska Food Policy Council and the Alaska Department of Health and Human Services recommends setting aside "4,700 acres for all the potatoes that would be needed, 200 acres for carrots, 200 more acres for cabbage, and 600 acres for lettuce" with support from the state. The report also recommends: fostering subsistence harvesting; expanding expertise and support for local food production; an increased campaign to raise awareness among Alaskans of the importance of purchasing goods grown in Alaska; and expanding food processing, manufacturing, transport and distribution networks for in-state consumption.[159]

On the demand side, a promising new trend is emerging in Alaska: locavores – or those who realize the wide ranging benefits of consuming local foods and who are changing their diets accordingly. As a result, farmers markets are growing and with them, smaller-scale farming operations of less than 50 acres.[160]

As the climate changes, new opportunities for cultivation of foods and herbs will emerge. For example, Rhodiola rosea is a circumboreal herb consumed as a supplement to treat fatigue, depression, and infections, strengthen the immune system, and protect the heart.[164] It grows primarily in Arctic areas of Europe, Asia, and North America. The herb is becoming more popular in the mainstream herbal industry. Cultivation has recently begun in Alaska after extraordinary success in Alberta, Canada. The first Alaska harvest was reported in 2013 from ten growers with a commercial quantity of Rhodiola. The farming experience in Alberta has led experts to estimate that high-quality Rhodiola could yield $30,000 per acre.[165] Climate change may adversely affect wild populations through sea level rise and increased competition with invasive species. Cultivation provides a new way to ensure the species' abundance and use for rapidly growing medicinal markets.

Schools are also playing a role in ramping up markets for local fish. One of the more successful models to emerge is the "Fish to Schools" initiative. A pilot project in Sitka, Alaska, showed great promise, but relied on fish donated by local fisherman.[166] A recent subsidy provided by USDA has allowed schools to purchase local fish throughout the state, thereby supporting the local fishing economy. With a recent three-year grant from the U.S. Department of Agriculture, the University of Alaska at Fairbanks researchers are exploring how increased use of locally-caught fish in the schools could have a range of health, educational and community benefits.[167]

Growing potential is high both outdoors and in. Some schools in Alaska have begun to experiment with programs where biomass burners, used to heat the schools, are also providing heat for greenhouses, allowing students to grow and harvest their own greens. Among the benefits of this program: Schools have cut their heating bills almost in half; the school pays local community members to deliver cords of wood to the boiler, thus keeping money in the community; students are eating fresher, more nutritional food; students are raising a crop the excess of which they can sell to their community; and students are learning about the business of farming and even, in some cases, running a restaurant. In the Southeast Island School District, they have created a student enterprise, "Island Fresh," which sells student-raised greens. So far, the students have made over $50,000 in profits, moneys which are then reused to help pay for student activities.[168] Several other similar programs are now being put in place in other schools in the region and the district has purchased the only restaurant in Thorne Bay, where they employ local students and sell food grown locally, including the school's greens.[169]

As noted by the Alaska Food Policy council and others, expanding expertise and support for local food production is a critical strategy for achieving food sovereignty and food security. One way to achieve this is through knowledge-sharing platforms that can be used by all Alaskans to grow food at home, in their communities, or to bolster the efficacy their subsistence hunting, fishing, and gathering activities. An excellent example of such a knowledge-sharing platform is maintained by Eat Local Alaska, who maintains a website consolidating information on eating "Alaska grown, produced, hunted, fished, and foraged foods" including guidebooks and tutorial videos.[170]

and beverage manufacturing is a small but growing sector with "serious potential for expansion."[172] Breweries were found to be the fastest growing type of manufacturing; there are 25 registered with the Brewers Guild. Alaskan manufacturers also make food, specialty metals (for aviation and oil/gas), marine vessels (repair and construction), and soaps.[173] And with the recent legalization of marijuana in the state, there are new manufacturing opportunities as that sector develops. Businesses in all these categories can benefit from state interventions to help scale up their operations and provide new opportunities as oil and gas extraction tapers off.

Schools have cut their heating bills almost in half... students are raising a crop the excess of which they can sell to their community; and students are learning about the business of farming and even, in some cases, running a restaurant.

Greater local self-reliance in manufacturing

Manufacturing makes up approximately four percent of Alaska's Gross State Product and about the same percent of employment. Growth and diversification of this sector has large multiplier effects on other sectors. According to the Bureau of Economic Analysis, every dollar of new economic activity in the manufacturing sector generates $1.33 worth of economic activity in other sectors through indirect and induced effects as spending circulates through a local economy. By way of contrast, an additional dollar of economic activity in the professional and business services sector yields just $0.61 in indirect and induced economic activity.[171]

A recent study by the University of Alaska Center for Economic Development found potential for significant growth in manufacturing employment and income in Alaska. Currently, the largest manufacturing sector by employment is fish processing, although most jobs in this field are low-wage and seasonal. But beer, wine,

Priorities for state support identified by Alaska manufacturers in the study include:

- "Shipping/freight assistance was seen as a major need, from firms seeking to decrease transportation costs and inefficiencies. This includes both the sourcing of raw goods as well as movement of finished products to outside markets.
- Energy efficiency is a major need given Alaska's high electricity and heating costs, particularly outside of Southcentral Alaska and parts of Southeast Alaska.
- Marketing assistance, including web development and online marketing, is a need of many manufacturers. While mainly a concern of smaller manufacturers, several large firms also expressed this need.
- ISO (International Organization for Standardization) certification and Lean Manufacturing training were identified by a small number of manufacturers as needed services. Of interest, the companies demanding these services were often larger and displayed the most growth potential.
- HACCP (Hazard Analysis & Critical Control Points) training was seen as a major need of the food and beverage sector."[174]

Another way the state can bolster markets for Alaska goods is through marketing programs, such as Alaska Department of Commerce, Community & Economic Development's Made in Alaska program, to which vendors must apply and be accepted to the program to use the symbol that designates a product is derived from at least 51 percent Alaska goods. Native craftspeople can apply to use the 'Silver Hand' emblem to certify that the product was made by an Alaska Native artisan and wherever possible, products are made with Alaskan materials.[175] Many small-scale manufacturers benefit from the online economy, which reduces the overhead costs of a storefront and reaches a geographically diverse audience. In Alaska, these companies would benefit from greater web access and connectivity, innovative online marketing, and state-wide exposure through business development initiatives.

Thematic area 4: Dismantling, Rehabilitation and Restoration (DR&R) of fossil fuel infrastructure sites

Decades of oil and gas extraction in Alaska have created an immense network of infrastructure that will need to be dismantled and removed and tens of thousands of acres of affected lands and waters that will need to be restored in accordance with federal and state requirements to decommission, remove, and restore (DR&R) infrastructure once extraction activity ceases. The good news is that if the fossil fuel industry follows through on these requirements, DR&R spending will be more than adequate to sustain nearly every job now at risk from phasing out oil and gas production for well over a decade or more assuming that adequate training can be put in place to repurpose the existing workforce.

But the state must act swiftly to ensure that DR&R funding is secured and spent wisely and that the public is not saddled with financial liabilities as fossil fuel companies shift ownership or leave the state. In particular, DR&R obligations must be modernized to eliminate risky financial assurance options like self-bonding (where a company merely invokes a 'too big to fail' argument and is exempted from any third-party guarantee of meeting its DR&R obligations), to clarify what ecological standards restoration must meet, to extend obligations to infrastructure like pipelines or management buildings that will be abandoned but for which DR&R requirements are non-existent or ambiguous, and to ensure that DR&R activities commence in a timely manner.

Current extent of fossil fuel infrastructure in Alaska

The three primary areas of concentrated infrastructure include the North Slope, Cook Inlet, and the Trans Alaska Pipeline.[176] In the North Slope region, the oil industry has developed Prudhoe Bay and 35 other oil fields and directly filled with gravel, excavated, or disturbed more than 18,300 acres of tundra wetlands, rivers, and nearshore waters.[177] The oil field complex has drilled more than 6,000 exploratory and production wells[178] sited on 230 drill pads and 20 artificial offshore gravel islands, dug 36 gravel mines[179] into more than 6,700 acres of tundra and rivers, and built about 500 miles of roads, 500 miles of pipeline corridors, 27 production centers and industrial plants, 145 support pads, power stations and camps, and 250 transportation centers (docks, causeways, airstrips).[180] Cook Inlet fossil fuel infrastructure includes sixteen offshore platforms and associated equipment, twenty-one onshore gas production facilities, five onshore oil and gas processing facilities, the Drift River Marine Terminal, and over 1,000 miles of transmission, gathering, and distribution pipelines.[181] The Trans Alaska Pipeline (TAPS) spans 800 miles from Prudhoe Bay to Valdez and includes numerous support facilities associated with communication, emergency response and pumping as well as the Valdez Marine Terminal at its endpoint.[182]

Current DR&R requirements

In Alaska, a number of state agencies have authority over DR&R requirements for fossil fuel infrastructure either through statutes, regulations, or agreements made with individual companies that hold leases on public lands. But DR&R requirements are often vague,

and so as fossil fuel infrastructure shut-down and abandonment begins in earnest such requirements need to be strengthened and clarified to ensure that affected lands and waters are restored as best as possible to their natural state.

The Alaska Oil and Gas Conservation Commission (AOGCC) and the Department of Natural Resources (DNR) are the two state agencies with primary authority for regulating DR&R activities – however, local jurisdictions including boroughs also have DR&R authority.[183] DNR provisions for DR&R are typically contained in lease agreements. For example, a 1962 lease in Cook Inlet for an offshore platform requires removal of infrastructure within six months of expiration or termination of the lease and specifies that the site be returned in "good condition."[184] Alaska Oil and Gas Conservation Commission (AOGCC) regulations contain fairly explicit requirements for plugging and abandonment of wells prior to expiration of an owner's leasing rights on affected State lands (20 AAC 25.105 – 20 AAC 25.172). However, requirements related to platforms and the condition of affected lands and waters are unclear.

For example, in certain situations involving the shut-down of wells drilled from a beach, artificial island, or shifting natural island, AOGCC must approve plans for "maintaining the integrity of the location" (20 AAC 25.105.d). There is no further guidance clarifying what is meant by "integrity" and how, if at all, this requirement relates to DR&R. The application of DR&R obligations to drilling wastes is another area of uncertainty. For example, regulations associated with annular disposal of drilling wastes require that operators provide the AOGCC with information to support a finding that the waste will be confined, will not come to the surface or contaminate freshwater (20 AAC 25.080 b(3)). Logically, if these standards have not been met, they should be included in the context of DR&R activities, but no such guidance is currently in place.[185]

Requirements for offshore clearance of platforms contain several exemptions that have direct bearing on DR&R costs – i.e. requirements to remove the wellhead equipment, casing, piling, and other obstructions to a depth at least five feet unless otherwise approved by the Commission as adequate to protect public health and safety (20 AAC 25.172(b)). Other provisions entirely exempt operators from infrastructure removal, for instance, if a state agency "approves leaving the platform in place" or approves a "different disposition to facilitate a genuine beneficial use" (20 AAC 25.172(a); (d)). Additionally, some operators opt to simply "shut-in" wells for long periods of time, leaving platforms in a "lighthouse mode" where no DRR activities occur.

Unit and lease agreements are similarly vague. For example, each of the formal lease agreements signed for Cook Inlet platforms contains the following language pertaining to rights on termination: "[l]essee shall deliver up said lands or such portion or portions thereof in good order and condition."[186]

To date, there has been no guidance published on what does and does not constitute "good order and condition." Lease agreements also imply the State may require measures in the context of DR&R meant to ensure the prevention of waste and degradation of land. In particular, leaseholders are required to "carry out at Lessee's expense all reasonable orders and requirements of Lessor relative to the prevention of waste and the preservation of said land."[187]

DR&R obligations also overlap with requirements related to rehabilitation plans. As part of operations plans filed for each of the offshore platforms, leaseholders are required to include "plans for rehabilitation of the affected unit area after completion of operations or phases of those operations" (11 AAC 83.346 d(3)). However, and as DOG notes, at this point in time the nature of these rehabilitation plans is insufficient for assessing the risk of DR&R activities, the specific activities that will be performed by operators, and the cost and timeframe of those operations.

Due in part to all these overlapping provisions and lack of clarity, and as part of its 2002 review of DR&R obligations for existing oil wells, the General Accounting Office affirmed that requirements for surface restoration of areas now occupied by oil and gas infrastructure are vague, and noted that many other states have "more explicit requirements that create a fixed obligation to fully restore the land according to specific standards."[188]

Ecological restoration of fossil fuel infrastructure sites – best practice

Know-how for effective restoration of sites occupied and/or contaminated by fossil fuel infrastructure is already in place. The World Bank, for example,

has published a useful toolkit for sustainable decommissioning and closure of oil fields and mines that is in use internationally.[189] In Alaska, Jorgenson and Joyce (1994) evaluated the efficacy of six strategies for rehabilitating lands degraded by oil and gas development in the Arctic (specifically Alaska). The six methods they investigated were: (1) flooding gravel mines for fish habitat; (2) creating wetlands/perched ponds on overburden stockpiles; (3) revegetating thick gravel fill; (4) removing gravel fill to restore wet tundra; (5) restoring tundra on less severely modified lands, and (6) remediating areas contaminated by oil spills, seawater spills, and drilling mud.[190] Jorgenson and Joyce's methods are intended to create diverse and productive habitats. At the time of publication, many of these strategies were in the early phases of testing and development. Now, however, these strategies have been adopted by the Alaska Department of Fish and Game and the Department of Natural Resources.

According to Jorgenson and Joyce, rehabilitating lands disturbed by oil and gas development is very effective using the methods they outline. Jorgenson and Joyce define successful restoration as an ecosystem capable of supporting healthy vegetation and plant life but it may not be restored to original habitat conditions. Difficulties arise in areas with thick gravel fill, where grasses and other vegetation struggle to take root. In locations with thinner gravel cover, fertilization is enough to promote habitat restoration. Large-scale gravel removal has not proven to be cost-effective.[191]

In parts of Alberta, legislators are exploring an innovative approach to cleaning up thousands of abandoned oil wells that involves repurposing the wells to function as geothermal plants to power small greenhouses, even in the winter. Project proponents claim that with the energy industry providing some of the costs for less than they would pay to clean up the well, many of these wells can be converted to geothermal-powered greenhouses. The job and economic benefits for northern communities could be quite significant.

The economic benefits of DR&R

The World Bank estimates that 90 percent of offshore oil and gas structures will need to be completely removed in the coming decades.[192] As a result, the DR&R industry is booming, and its economic potential as a transition strategy in Alaska is huge. While the composition, location, and timing of dismantlement, removal, and remediation (DR&R) activities remains unknown, several analyses indicate that it will require spending billions of dollars spread over several decades. This spending may generate patterns of jobs and incomes similar to those experienced during the development of the oil/gas industry. The U.S. Bureau of Safety and Environmental Enforcement (BSEE) has a study underway to estimate DR&R costs in Alaska. The task is challenging insofar as Alaska has had limited experience with DR&R activities, because the industry's infrastructure generally remains in production. This study likely will consider the few Alaska-specific indicators of the potential level of spending:

- In 1985, the state and federal governments reached a settlement with the owners of the Trans-Alaska Pipeline, in which they agreed on the expected DR&R cost for the pipeline: $872 million in 1977 dollars.[193] This amount, when adjusted using the GDP price index, is equivalent to $2.7 billion in 2015 dollars.
- The Bureau of Land Management estimated that the total cost to plug and abandon more than 80 legacy wells in the National Petroleum Reserve in Alaska would exceed $100 million.[194]
- DR&R costs for assets in Cook Inlet owned by Pacific Energy Resources have been estimated to total $50–$200 million.[195]
- DR&R costs for 16 offshore platforms and 160 miles of oil pipelines in Cook Inlet will range between $402 million and $1.11 billion. Dismantling gas pipelines and other infrastructure will require additional spending.[196]

Experience elsewhere suggests the overall scope of what may occur in Alaska:

- UK North Sea: the industry will dismantle 5,000 wells and related facilities over the next 30 years, with a total cost of $61–$107 billion.[197] These numbers are equivalent to about 170 wells per year, $1.2–$2.1 billion per well, and $2.0–$3.6 billion per year. Actual spending may be higher, as average DR&R costs in the UK are increasing about 14 percent per year.
- Gulf of Mexico: DR&R costs run from $235,000 to $4.6 million per rig in shallow water, and exceed $50 million per rig in deep water.[198]
- Pacific outer continental shelf (California): $64

million per platform over the next 15 years, and costs are escalating about 4 percent per year.[199]

The precise number and nature of jobs that will be created in Alaska by DR&R spending remains unclear because of the ambiguity over what activities have to occur and when. However, with respect to TAPS, a system owners' environmental report from 2001 contains a useful analysis of job impacts of future DR&R spending. The report found that spending roughly $2.6 billion mainly over a three-year period would create an average of 3,497 jobs in the construction, transportation, and services sectors. Fewer workers over a longer time period are possible, as well. But this level of employment is more than enough to compensate for a reduction in the operations workforce of roughly 1,800 at the time the Prudhoe Bay oil fields and TAPS shuts down.[200]

If we extend these figures to a statewide DR&R expenditure tab of about $6 billion, it implies a direct employment potential of roughly 7,000 jobs. We can assume that the necessary skill sets are similar to those needed to construct, maintain, and operate the infrastructure that now exists, so the transition possibilities here for the existing pool of roughly 5,300 oil and gas workers is high.

What Alaska can do to ensure that DR&R is an effective transition strategy

To ensure that DR&R activities provide an effective tool for a just transition in Alaska, there are several actions decision makers can take at the state and local levels. These include:

1. Expand fossil fuel infrastructure inventories so that the state, boroughs, and municipalities all have the most up to date information on the extent of fossil fuel infrastructure in their jurisdictions. Relatively complete inventories are available for the North Slope, TAPS route, and Cook Inlet. But inventories are lacking or largely incomplete elsewhere.
2. Request that fossil fuel infrastructure owners work cooperatively to develop DR&R plans for all infrastructure that is likely to become inoperative as a result of phasing out oil and gas production activities. Such plans should be as specific as possible, and eliminate the ambiguity of obligations under existing arrangements. These

Robert Thompson, a resident of Kaktovik and local polar bear guide. (Rose Sjölander / 70°)

plans should also include cost estimates. The state as well as boroughs and municipalities all have authority to negotiate DR&R activities with fossil fuel infrastructure owners and so initiating this process now while those companies are still operating in state is critical. All infrastructure at risk should be addressed, even if it not directly related to production, transportation, or distribution. In Anchorage, for example, there are concerns over the dwindling workforce at ConocoPhillips headquarters and the extensive vacant parking spaces this is leaving behind. This land could provide fertile ground for urban redevelopment or green space if the sites were restored.[201]

3. Evaluate existing financial assurance mechanisms for adequacy. Given increasing concerns over the financial viability of even the largest fossil fuel companies – several major coal producers went bankrupt in recent years – all forms of self-bonding or self-insurance should be terminated in favor of more secure assurances such as bonds and trust funds managed by third parties.[202] Financial assurances should match cost estimates – otherwise, jurisdictions may have to pay for DR&R activities out of general funds if fossil fuel infrastructure owners default on their DR&R obligations.[203]

4. Require fossil fuel infrastructure owners to accelerate DR&R activities for idle infrastructure no longer in use and explore the feasibility of repurposing abandoned wells for geothermal powered greenhouses. For example, in Cook Inlet, there are several oil and gas platforms in idle "lighthouse" mode that could generate an immediate economic stimulus if DR&R activities were initiated now. This could help compensate for oil and gas job losses expected this year.

Thematic area 5: protecting and restoring natural ecosystems

A healthy economy depends on a healthy ecosystem, and so too do healthy communities and families. Nowhere is this truer than in Alaska. The state's land, rivers, sea, wildlife, and fish support jobs, generate incomes, provide families with food, and knit together Alaska's local, regional, and statewide cultures. The right of Alaska native communities to traditional subsistence use should be strongly defended and expanded, and by working with those communities to protect and restore natural ecosystems, Alaska can benefit economically.

Some of the most apparent economic impacts occur as residents and visitors spend money inside the state on equipment, services, and transportation related to fishing, hunting, and wildlife-viewing trips. Spending on these items totals about $12.2 billion per year (Table 4). This spending directly and indirectly supports about 120,500 jobs—almost one-half of the state's total. The workers in these jobs earn about $4.4 billion, more than one-fifth of the total income for the state's workers.[204]

The economic importance of fish and wildlife—and the ecosystems that support them—extends far beyond what people spend to catch, hunt, or view them. For most people who engage in these activities, the enjoyment they derive from these activities exceeds what they spend on them. A detailed survey found that, in 2011, Alaska residents took 1,052,000 hunting trips and 5,991,000 trips to view wildlife.[206] Trip participants who responded to the survey said that the total value they placed on the enjoyment they derived from the trips was 20–26 percent greater than what they actually spent on them. This difference constitutes a net economic benefit, i.e., an improvement in their economic wellbeing. The average net benefit per person was $438 per hunting trip and $268 per wildlife-viewing trip.

Those who hunted or viewed wildlife typically took more than one trip per year, and each trip involved more than one person per household. On average, each household that hunted realized a net economic benefit of $4,828. Wildlife-viewing trips generated a net benefit of $8,050 for the participating households. Statewide, hunting and wildlife-viewing trips in 2011 increased the economic wellbeing of Alaskans by more than $2 billion.

Many Alaskans enjoy additional value from the state's ecosystems by utilizing diverse subsistence resources. As noted above, both Alaska Natives and other Alaskans utilize subsistence resources for wild foods, clothing, medicines, fuels, transportation, construction, home goods, sharing, customary trade,

ceremonies and arts and crafts. One partial indicator of the value of this wild food is the amount of money households would have had to spend to purchase equivalent goods from commercial sources. For wild foods, the replacement-cost value was about $500 million in 2012.[207] This amount is about one-quarter of the total value of food Alaskans eat in a year, and some research indicates that the replacement-cost value of wild food is even larger.[208, 209]

The replacement-cost value of wild food addresses only one aspect of the overall economic, social, and cultural importance of subsistence activities. The gathering, sharing, and use of wild food and other subsistence products are core elements of Alaska's cultural heritage and of life in many communities. One researcher describes this relationship in these terms:

"[P]eople who live in communities with a long history of reciprocity and working together, are better off because they have developed institutions to weather rapid change. Conventional wisdom is that life on the North Slope is better following the oil discovery because there are jobs and money. … [I]t is more likely that jobs and financial success have come to the North Slope Inuit because they have a long history of working together and been able to incorporate economic development into their culture. … The continued importance of subsistence practices and its importance for adapting to change means that aboriginal people need to be at the center of discussions and policy planning about the future of their regions." [210]

Alaska's ecosystems do more than generate benefits for Alaskans via fishing, hunting, wildlife viewing, and the provision of wild food and other subsistence products. These contributions to the quality of life influence the decisions of many to live and work in Alaska. Across the state's five regions, 50 to 70 percent of Alaskans stated, in response to a survey, that wildlife and wildlife-related activities exert a "very important" or "extremely important" influence on their decision to live in Alaska (Figure 5). Only 3 to 7 percent of Alaskan respondents to the survey said that wildlife and wildlife related activities are "not important at all" to their decision to live in Alaska.

This influence on household location, in turn, affects the size and distribution of the region's labor force, household expenditures, business activity, employment, and investments. To the extent that households and businesses locate in this region because they want to be closer to opportunities to interact with its ecosystem amenities, it is reasonable to attribute to these resources all their in-state expenditures, and the jobs and incomes they generate. These expenditures, jobs, and incomes can materialize in all sectors of the economy. To ensure that Alaskans continue to reap the economic benefits of healthy aquatic and terrestrial ecosystems and that its pristine environment can serve as a magnet for new job opportunities, there are several areas where policy interventions could make a difference:

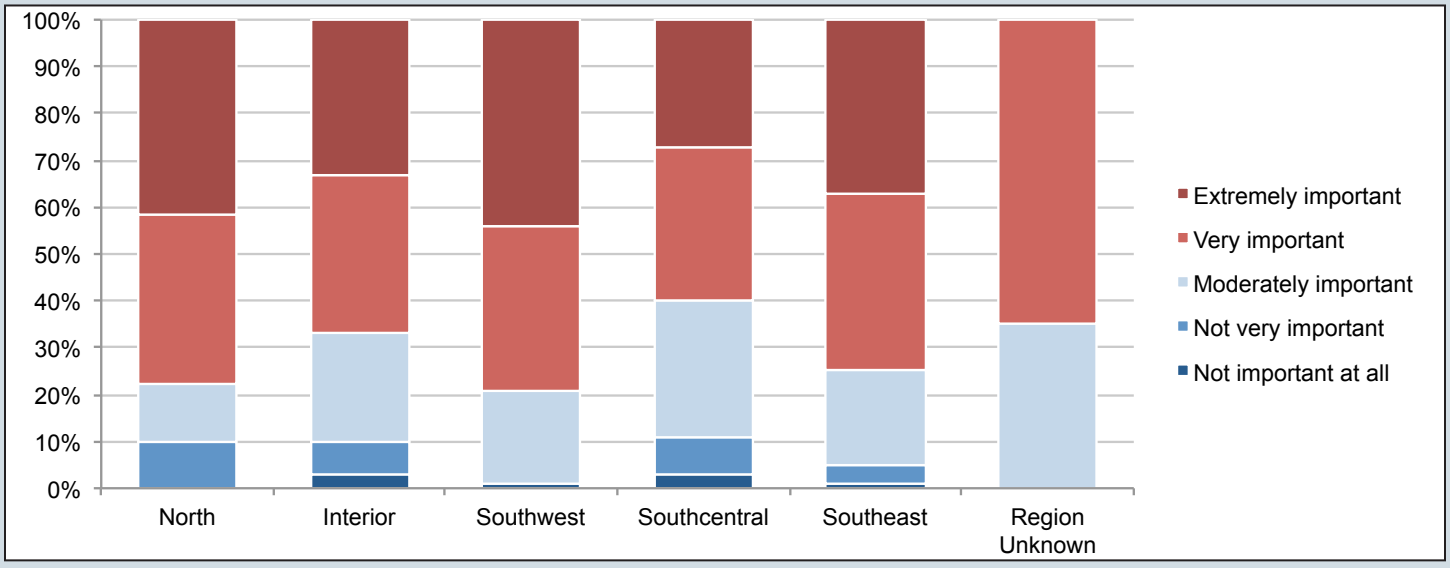


Figure 5: Importance of wildlife to Alaskans' reasons for living in Alaska in 2011, by region of residence[211]

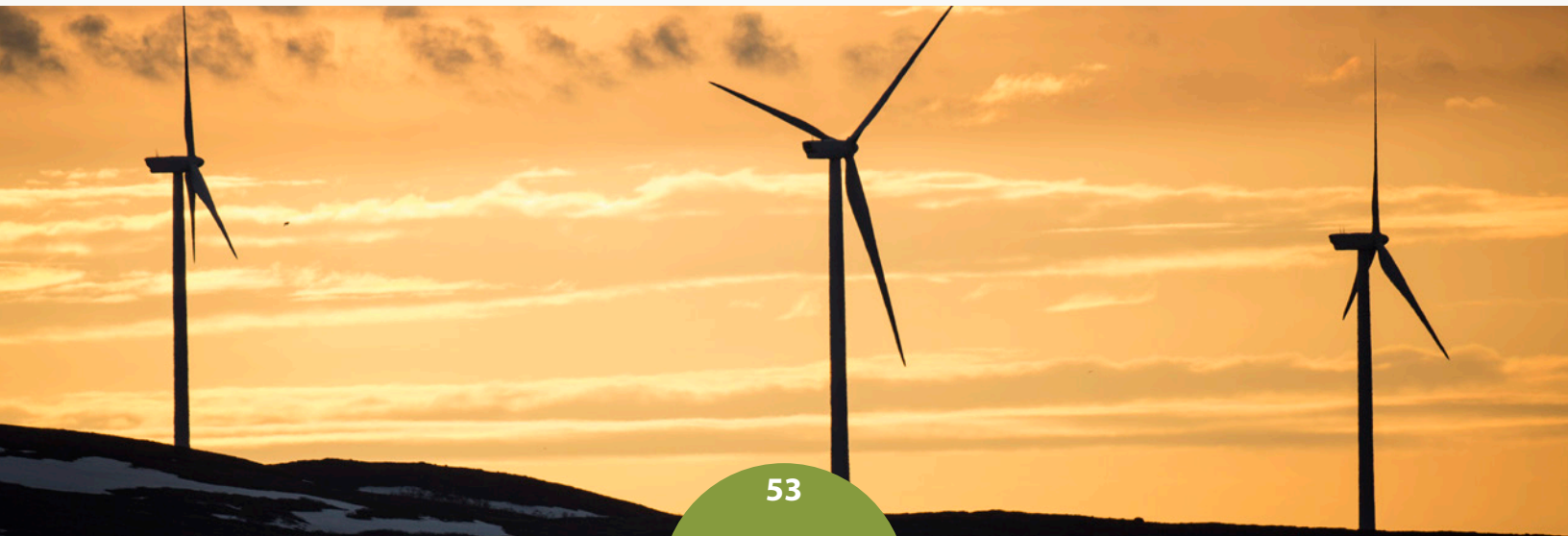
Planning for climate change

Climate change to date has harmed ecosystems and their ability to produce economic benefits, and research indicates that additional changes anticipated in the future will cause even more harm. Of particular concern are these expected impacts:[212]

- Changes in the habitat for and availability of wildlife. For example: warmer temperatures enable shrubs and trees to expand into the tundra, displacing lichens, an important food source for caribou in the winter.
- Reductions in sea ice affect the food supply for walruses, polar bears, and other ice-dependent species, and they also can make hunting more difficult.
- Warmer temperatures increase the risk of diseases to fish and wildlife.
- Displacement by invasive species of native plants, including plants important for subsistence uses.
- Displacement of or reduction in the size of some local stocks of salmon and other temperature-sensitive fish species.
- Reductions in the populations of crabs, clams, mussels, and other shellfish from increased ocean acidification and warming.
- Reductions in populations of ducks and other migratory birds as warming and changes in precipitation cause small lakes to go dry.
- Increases in wildfires.

While there is little policy-makers can do to prevent these impacts from occurring, deleterious impacts on subsistence and other uses of wild ecosystems could be mitigated through a number of interventions. For example, in response for an increase in diseases affecting marine mammals, researchers and advocates have called for a predictive framework to anticipate impacts of climate change on infectious diseases, "especially in the Arctic where the climate change signal is strongest and issues of food safety are particularly acute among indigenous people who rely on marine mammals for cultural and nutritional subsistence."[213] A prototype for such a framework has already been developed for terrestrial ecosystems, and is being suggested as a template to extend to marine areas.[214] As another example, there is widespread agreement among land managers on the need to provide for migration corridors to allow species free movement to occupy new lands and waters as climate change unfolds.[215] There is also the need to provide more flexibility around timing of hunting seasons in response to changing weather.

The key for identifying effective interventions is through adaptation planning that engages all subsistence and other users of Alaska's wild ecosystems in specific adaptation plans in areas that they use and enjoy. As one example, the Naskapi Nation in the Canadian Arctic teamed up with researchers from the University of Montreal to complete an assessment of climate change impacts on the caribou and other hunted species and to identify a series of specific adaptation measures that should be prioritized to maintain their relationship to these species for their livelihood and cultural identity.[216] The community identified adaptation actions and the time frame of actions in the context of a Naskapi Climate Change Adaptation Action Plan that applies across four sectors: animals, hunting and travelling on the land, health and wellbeing, culture and learning. Similar planning exercises can be sponsored at the state, borough or village level throughout Alaska.



New protective designations on land

The importance of new protective designations – done in collaboration with Alaska Native communities so as to ensure the protection of subsistence rights - like wilderness areas or parks for Alaska's economy cannot be understated. Such areas – where ecosystems are offered their highest level of protection against harmful uses such as oil and gas development, mining, logging, and roads – not only represent a fundamental component of Alaskans' quality of life, but also represent a critical tool for maintaining and protecting subsistence uses. Designated wilderness areas offer one example.

Most Americans think of wilderness areas as places almost entirely off limits to human uses – places where nature is allowed to take its course and where people are only occasional visitors. The main motivation for designated wilderness areas in the Lower 48 states is for non-consumptive purposes. But in Alaska things are different. While designated wilderness areas found in Alaska certainly have outstanding ecological traits, much of it is managed differently and for the benefit of local people and traditional uses.

"The most distinct difference is that these areas are treasured by local residents not for their wilderness character per se but for their economic contributions by providing food and income through hunting, fishing, fur production, and other traditional activities. This enables local people to continue their culture of living off the land and allows many to avoid having to move to distant urban centers to completely join the cash economy."[217]

As such, designating new wilderness areas, parks, wildlife refuges and other protective land use categories is a tool for maintaining the subsistence economy and achieving sustainable development goals such as increased food security. But new designations are not just of benefit to those who participate in subsistence. Alaska's tourism industry is a major beneficiary. The Alaska visitor industry is the only private sector basic industry that has grown almost continuously since statehood and continues to grow.[218] Over 1.6 million visitors came to Alaska each summer and 91 percent of them come primarily to see the state's mountains, glaciers, and wildlife. Alaska's visitor industry accounted for an estimated 37,800 full- and part-time jobs from May 2011 to April 2012, including all direct, indirect, and induced employment. Estimated peak employment was 45,000. These jobs resulted in total labor income of $1.24 billion. Visitors spent $1.7 billion in Alaska, most of it in the summer months.[219]

While these economic impacts cannot be completely attributed to the presence of designated wilderness, wilderness characteristics are a significant driver of Alaska visitation. In the summer 2001 Alaska Visitor Statistics Program (AVSP) Visitor Opinion Survey, specific questions regarding wilderness were included. For over 80 percent of respondents, Alaska's wilderness character and the opportunity to see or spend time in wilderness places influenced their decision to come to Alaska and was an important factor in trip planning. Wilderness was also important to a decision to visit Alaska again in the future by 73 percent of respondents.[220]

All this suggests that candidates for wilderness designation and other hot spots of biological diversity should be protected as a tool for a sustainable Alaska. There are many gaps in Alaska's protected area network worthy of attention by policy makers. President Obama's proposal to designate 1.55 million acres of oil-prospective land as new wilderness in the Arctic National Wildlife Refuge is one of the most visible proposals in play. But there are many others. For example, despite years of advocacy, the Chugach National Forest is unique within the national forest system in that it does not contain a single acre of permanently protected wilderness.

New protective designations at sea

Addition to Alaska's network of marine protected areas (MPAs) is another important sustainable development strategy to scale up. Since 1976, the National Ocean and Atmospheric Agency's National Marine Fisheries Service has managed federal fisheries (three to 200 miles offshore) off the coast of Alaska based on recommendations from the North Pacific Fishery Management Council.[221] MPAs are one of their most important policy tools. MPA's are defined as "any area of the marine environment that has been reserved by Federal, State, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein."[222] Over forty MPAs have been established across Alaska's coastline, including most of the state waters where commercial fishing takes place. All MPA's prohibit

bottom trawls, which are highly destructive to local ecosystems, and some MPAs virtually prohibit all commercial fishing activities.[223] While the effectiveness of individual MPAs varies, taken together they provide a strong tool for managing fisheries and conserving marine animals, ranging from sea cucumbers to sea lions.

MPAs provide a refuge for marine species that face threats from overfishing and pollution and also protect underwater habitats with high scenic values for scuba divers. MPAs are a big draw for eco-tourism ventures, but also enhance local fisheries by allowing fish and other sea life within the MPA boundary and adjacent waters to grow larger and more valuable for commercial and subsistence fisher folk. According to the Alaska Department of Fish and Game, evidence for changes in size and abundance within and adjacent to reserves is compelling.[224] For example, in a review of 89 studies by Halpern (2004), overall changes due to reserve creation were a doubling of densities, a near tripling of biomass, a 31 percent increase in average size, and a 23 percent increase in species richness.[225]

The Alaska Department of Fish and Game issued a report on July 18, 2002 with a set of recommendations for a public process for establishing additional marine protected areas (MPAs) in Alaska. These recommendations were developed by a ten-member task force of Alaska Department of Fish and Game (ADFG) personnel as guidance for development of an MPA policy by the Alaska Board of Fisheries. These recommendations could form the basis of a comprehensive approach to new MPAs, and help refine management recommendations for MPA proposals now in play.

—CASE STUDY—

Adventure, wildlife, and hospitality at Icy Strait

Surrounded by towering rainforest and the abundant waters of Port Frederick and Icy Strait, Icy Strait Point is a destination that offers unparalleled access to adventure, wilderness, wildlife, and genuine Native Tlingit hospitality. Located in Alaska's largest Native Tlingit village of Hoonah (about 35 miles west of Juneau), Icy Strait Point features 20+ exciting tours, a restored cannery and museum, nature trails, restaurants, 100% Alaskan-owned retail shops, and a beach.

The 1930s Hoonah Packing Company facility has been converted into a museum, restaurant, and shops. At the dock, traditionally garbed presenters offer a look at Huna Tlingit culture, along with an indoor theatrical production. All local shops are owned by Alaskans. Alaska's Wildest Kitchen shows visitors the importance of salmon and subsistence fishing in the Tlingit culture and features a culinary instruction space where local residents demonstrate how to fillet salmon and halibut and turn them into burgers, spreads, casseroles, and grilled entrees. The local town of Hoonah is a mile's walk from Icy Strait Point and showcases contemporary Tlingit life.

Owned and operated by Huna Totem Corporation, Icy Strait Point is Alaska Native owned-and-operated and all profits directly support the local community. With roughly 85% of staff calling Hoonah home, Icy Strait Point is dedicated to providing a one-of-a-kind experience for visitors by sharing Alaska's natural beauty and native culture. Icy Strait Point is renowned for its exemplary responsible tourism practices and has received numerous awards since opening. [233]

Thematic area 6: Indigenous tourism

The year 2015 was a boom year for Alaska's tourism industry: A record 1.78 million out-of-state visitors came to the state.[226] Tourism brought in more revenue - $136 million – to state and local government coffers in 2015 than did the fishing ($121 million) or mining industries ($119 million). Nevertheless, in 2016, Alaska Governor Walker slashed state expenditures for tourism to $1.5 million, one of the lowest levels of state support ever.[227]

Most of Alaska's visitors in 2015 – 56 percent– entered and exited the state via cruise ship; 39 percent traveled via air.[228] Alaska's tourism industry in 2015 showed a more rapid growth than other areas of the U.S.[229] As part of this, the potential growth of Indigenous tourism among Alaska Native communities that want to pursue its development holds both promise and perils.

Indigenous tourism can be defined as responsible tourism activity in which Indigenous people are directly involved through control, ownership and guidance over economic, cultural and natural resources, and where tourism is part of a larger strategy of reinforcing or revitalizing political and cultural autonomy through intercultural encounters. Within this framework, several factors are paramount, which include respect for local cultures and their decision-making processes as well as community or local control over the social and natural resources involved.[230] Indigenous tourism shares much with responsible tourism, ecotourism, sustainable tourism and other forms of alternatives to destructive mainstream, mass tourism activities but it is distinct in that it is in full control of Indigenous Peoples and enhances their cultural and human rights.

The demand for Indigenous tourism is skyrocketing, and thus providing an important sustainable development option for Alaska Natives. Indeed, the Rio+20 process recognized that well-designed and well-managed tourism could contribute to the three dimensions (economic, environmental, social) of sustainable development, to job creation and to trade.[231] The United Nations General Assembly has approved the adoption of 2017 as the International Year of Sustainable Tourism for Development in a resolution that recognizes "the importance of international tourism, and particularly of the designation of an international year of sustainable tourism for development, in fostering better understanding among peoples everywhere, in leading to a greater awareness of the rich heritage of various civilizations and in bringing about a better appreciation of the inherent values of different cultures, thereby contributing to the strengthening of peace in the world."[232] Indigenous tourism fits cleanly within this vision.

Due in part to the work of Indigenous tourism organizations, tourism is becoming a major economic and cultural driver for Indigenous communities across the world. If managed carefully, the roughly 100,000 Alaska Native residents stand to benefit from this expanded form of tourism. However, before tourism can be a boon to Indigenous communities, there must be some changes, both to encourage greater awareness among tourists and to support Alaska Native communities. Indigenous communities continue to suffer the effects of colonization globally, and Alaska is no exception. They are in a period of healing and reclaiming human and land rights, an important process that the tourism industry needs to recognize. In Alaska, this precarious situation is coupled with the need to preserve and protect a region where climate change is bringing disproportionate impacts to its peoples and their future livelihoods.

Indigenous tourism development is a complex process and its success to a large degree depends upon hospitality-based skills development, access and control of traditional resources and community support. For any type of tourism-driven development to be successful and effect positive change in the economic, social and cultural dimensions, Native communities must develop the capacity to undertake these development initiatives themselves. There are key investments state and local leaders can make to enhance Indigenous tourism in Alaska, while avoiding potential problems and pitfalls. Some of these are listed below.

Cleaning up industrial activity on Native lands

Existing extractive industrial activity on Native lands must be cleaned up and planned extractive activity must only proceed with the free, prior, informed consent of Alaska's Native peoples. Current threats from extractive industries are a threat to the lands and

With green technologies and alternative energy integrated into Indigenous tourism planning, Alaska Native businesses could cut their energy costs while ensuring the long-term sustainability of their enterprises

Native peoples of Alaska and thus an obstacle to expanded Indigenous tourism. For example, some advocates for Indigenous tourism in the Arctic complain that their time and resources have for decades been spent fighting to keep the Arctic National Wildlife Refuge off limits to oil drilling, to the detriment of their ability to develop a far more lucrative tourism industry in the region.[234] Mining may bring some wealth to local communities, but it too often leaves behind a toxic legacy and extracts far more in mineral wealth than it shares with state and local governments. According to the U.S. Environmental Protection Agency's Toxics Release Inventory, metal mining is the nation's number one toxic polluter.[235]

Faced with enormous cleanup expenses, many mining companies find that it's cheaper to simply abandon their mines when they are done - leaving them to pollute forever. Few tourists—much less year-round inhabitants—choose to spend time in toxic surroundings and Alaska Native communities where such activities have taken place should be the first targeted for cleanup. Should continued mining activity occur on Native lands, it must be done according to the UN Declaration on the Rights of Indigenous Peoples, with full, free and prior informed consent by all residents.[236]

Sustainable energy

Sustainable energy resources are critical to Indigenous tourism. UN Secretary General Ban Ki-Moon states, "One of the world's largest economic sectors, tourism is especially well-placed to promote environmental sustainability, "green" growth and our struggle against climate change through its relationship with energy."[237] With green technologies and alternative energy integrated into Indigenous tourism planning, Alaska Natives could create a win-win situation for themselves, cutting their own energy costs while ensuring the long-term sustainability of their enterprises.

Indigenous tourism training

Iḷisaġvik College in Utqiaġvik, Alaska, provides training in tourism with an emphasis on tourism opportunities on the North Slope. This includes internships with hands-on experience in the growing field of ecotourism. Another series of classes are offered introducing students to the skills involved in local guiding.[238] Local Native guides in remote villages point out that often the only additional guides who can be insured to take on the work of, for example, river rafting are not always local and often non-Native, thus reducing opportunities for young local residents to find employment.[239] In order to expand the benefits to Native communities, training and certification programs targeting Alaska Natives should be expanded in the guiding and hospitality sector.

Increased access to financing

There is a need for increased access to credit, financing and insurance for Alaska Natives. Basic precursors to business ownership are needed to ensure Indigenous peoples are in fact the beneficiaries of an expanded tourism business. One barrier: No access to credit to start up a business.[240] In a culture where fewer people have a history of payments, a credit rating, and bank accounts, especially in remote locations, how does one begin to start up a business? Other obstacles for Indigenous peoples interested in starting their own businesses in the guide, expedition or tourism business is the issue of how to most profitably gain access to global markets.

Meeting basic sustainable development needs

Basic issues of development must be addressed. In communities that want to pursue or expand Indigenous tourism, basic infrastructure needs in support of that tourism must first be met. Some of the communities that could economically benefit from it the most may at present be unable to host sizeable groups of tourists due to local food insecurity, lack of adequate lodging and transportation, and a gap between the need for and availability of trained local guides. Tourism training programs, local communities, and the borough or state or federal land management agencies may be able to identify creative solutions to some of these challenges and test them as they see fit. The remote locations, isolation, and small, dispersed populations that comprise Alaska Native villages make these areas difficult to develop for tourists without up-front government support, which is sorely needed.

Food security and showcasing Indigenous foods

Greater food security for Alaska Natives could mean greater Indigenous tourism. A significant share of tourism expenditures—a quarter of all travel expenses, by some estimates—is spent on food, making food service the highest category of travel spending.[241] Most Alaska Natives consume a fairly narrow range of foods, often hunting and gathering 80 percent of their diet. Expanding the range of foods available for tourists could be a win-win for Native communities: It could enhance their own food security while expanding access to a variety of foods for tourists.

Over one thousand years ago, European settlers in Greenland were growing food.[242] In Alaska, Russians, missionaries and other settlers introduced gardening and farming as early as the 1800s.[243] With new incentives and resources encouraging sustainable, small-scale farming beginning to reach Alaska,

—CASE STUDY—

Oomingmak Musk Ox Producer's Co-Operative

Around the world, artisan collectives create local economies while celebrating local craftwork and culture, often in rural and remote areas, and Alaska is no different. One notable example is Oomingmak Musk Ox Producer's Co-Operative. Started in 1969, the co-operative is located in Anchorage but represents artists from throughout Alaska, including in many remote coastal villages. Qiviut, the underwool of the musk ox, is collected each spring as it is shed from animals at the Musk Ox Farm in Palmer and from animals in other locations. It is then processed into yarn, which is sent to knitters around the state who are members and owners of the co-operative. The knitters make as many pieces as they like, featuring traditional designs from various regions of Alaska, and send them in to the Anchorage shop, which sells the pieces and gives the knitter a percentage of the sale. Revenue from the sales and an annual dividend help to supplement the income for many knitters and their families, who contend with low employment and a high cost of living in their remote villages.

The Oomingmak Musk Ox Producer's Co-Operative brings original quiviut handknits from remote villages to visitors and Alaska residents (U.S. National Park Service)

"locavores" and food tourists, a growing segment of the tourism sector, are also coming. Rural areas are becoming increasingly popular destinations for travel that allow a glimpse into how rural people live, work and subsist. Cultural tourism and agritourism are both feasible strategies for local economic development and to promote traditional sustainable agriculture, hunting, fishing, and gathering.

The development of agritourism tours and demonstrations as attractions in rural areas provides the potential for creating or expanding micro-, small-, or medium-sized enterprise core and supply chain businesses, including transport, food service and products, and handicrafts. It can improve agriculture value chain linkages, smallholder access to export markets, product diversification, increased food security, and promotion for agricultural products within the tourism sector of a destination. In Homer, for example, a local organic farmer enjoys free weeding from young tourists who choose to work in his fields as part of their cultural experience.[244]

Environmental justice and advocacy

The transformative potential of Indigenous tourism should not be ignored. Adding an environmental justice and advocacy component to Indigenous tourism could help create more equality and participation by the community, with the tourism industry and with tourists themselves. Kyle Powys Whyte, an enrolled member of the Citizen Potawatomi Nation and Associate Professor of Philosophy and Community Sustainability at Michigan State University, addresses moral and political issues concerning Indigenous peoples. Whyte points to transformation as one of the goals of the environmental justice movement that could and should be applied to tourism - using tourism as a way to transform injustice in Native communities and their lands. In his essay, an Environmental Justice Framework For indigenous Tourism, in order to achieve environmental justice, Whyte states:

"The tourism industry and communities [should] develop practices that include forums of direct participation. That means these practices are, in part, initiated, designed, and shaped by the community members, where the understanding and function of environmental identities and heritages is co-constituted by all participants."[245]

With regard to advocacy and solidarity tours in particular, Whyte states, "These practices do provide a forum for direct participation, which in turn furnishes the conditions for coalition building [among the tourists, tourism operators, and community members] … that do more than educate, reverse stereotypes, or transfer knowledge." Whyte continues: Such "coalition development is a worthy ideal and one that should be initially promoted before having to settle for mutually advantageous exploitation."

Dr. Freya Higgins-Desbiolles, a lecturer in tourism with the School of Management of the University of South Australa who focuses on human rights and social justice issues in tourism, hospitality and Indigenous tourism, warns that Indigenous tourism risks "advancing Indigenous Peoples into the neoliberal economy where there is little vision of self-determination, acceptance of cultural diversity and, sometimes, covert assimilation." "However," she continues, "Indigenous rights have made great progress through the United Nations and international treaties and conventions and Indigenous Peoples are leading their own way with initiatives that advance community rights in tourism while fostering understanding, best practices, and resistance to the negative impacts of tourism."[246]

Thematic area 7: sustainable fisheries

Alaska's fisheries are considered some of the most productive, sustainable, and healthy ones in the world. This is no accident; Alaska is the only state in the US with a mandate to sustainably manage fisheries built into its constitution. Sixty-three thousand people work in the seafood industry in the state, making it the state's largest private sector employer, and 56 percent of the seafood harvested in the United States comes from Alaska.[248] Since 2010, the commercial fishing industry has generated $121 million in revenues each year, far surpassing annual operating and capital expenditures by state and local governments ($96.8 million).[249] Maintaining and expanding this industry provides an important thematic area for sustainable development policies.

Climate change will bring new opportunities for sustainable fisheries, but also challenges. While yield,

harvests, and associated jobs and income may rise for some species, changes in migration patterns, ocean acidification, and invasive species are likely to threaten the catch of others.[250] Sifting through these opposing effects and honing in on strategies to ensure that local communities can adapt is a complex task that must engage marine scientists, local fisher folk, Alaska Natives, and fishery managers to succeed. Initiatives with these goals in mind are proliferating, not only for capture fisheries but for the emerging aquaculture and mariculture industries as well.

Capture fisheries

In response to these opportunities and challenges, many independent nonprofits are working on marine conservation and sustainable management of fisheries, especially when it comes to supporting coastal communities that rely on the industry. For example, the Alaska Marine Conservation Council has spent the last 20 years protecting the integrity of Alaska's marine ecosystems while at the same time working to improve the vitality of the coastal communities that rely on the ocean for their livelihoods. On the one hand, the organization is actively working to reduce bycatch, fight against ocean acidification, and influence federal and state fisheries policy to protect salmon and halibut. On the other, it is working in partnership with the University of Alaska Fairbanks and Alaska Sea Grant on a project called "Graying of the Fleet," which examines the social, cultural, economic, and geographic factors turning young people away from participating in the local fishing industry.[251]

Another organization working in the same vein is the Alaska Sustainable Fisheries Trust, which helps young fishermen in Southeast Alaska overcome barriers to entry in the local fishing industry by providing loans to purchase initial fishing quotas, and then sharing the annual value of the catch with fund investors.[252] In this way, the Trust is countering the graying of the fishing industry and helping strengthen fishing communities through access to opportunity and employment.

A third organization working on this front is the Alaska Fisheries Development Foundation, a collaboration of fishery harvesters, processors, and support sector businesses founded in 1978 in Wrangell, Alaska. The organization identifies problems related to the Alaska seafood industry and collaborates with coastal communities, research institutes, and government agencies to develop effective, equitable solutions.[253] This includes projects analyzing fishing vessel energy efficiency, fish-product development competitions, and aquaculture economic analyses for various coastal Alaskan communities.

Indigenous-led organizations are active in promoting sustainable fisheries and coastal communities as well. For example, the indigenous-led Eyak Preservation Council, based in Cordova, Alaska, was conceived by commercial fisherman Dune Lankard and has the stated goal of honoring Eyak tradition and creating sustainable communities in which the wild salmon way of life is upheld and passed on from generation to generation.[254] In the past it has supported the preservation of over 700,000 acres of ancestral rainforest, promoted clean renewable energy projects in the Eyak community, and worked with indigenous community members to fight against destructive development practices that threaten the Eyak and salmon's communal ecosystem.

Sitka Salmon Shares, a completely integrated boat-to-doorstep seafood company founded in 2011 that operates a "Community Supported Fishery," connects fishermen and processers in Sitka, Alaska with customers across the Midwest.

Finally, innovative businesses are being developed in Southeast Alaska to revitalize the fishing industry and promote sustainable, ethical seafood consumption. One of the best examples of this is Sitka Salmon Shares, a completely integrated boat-to-doorstep seafood company founded in 2011 that operates a "Community Supported Fishery," which connects fishermen and processers in Sitka, Alaska with customers across the Midwest in Illinois, Iowa, Michigan, Wisconsin, Indiana, and Minnesota.[255]

The organization allows customers to buy individual shares of seasonal seafood harvests collected by

independent, small-boat fishermen in Sitka, ranging from "Regular" (5 lbs per month) to "Family" (10 lbs per month) and "Neighborhood" (15 lbs per month), which are then hand delivered to customers' doorsteps each month. Harvests include Halibut in May, Black Bass in June, Lingcod in July, King Salmon in August, Sockeye Salmon in September, Coho Salmon in October, Spot Prawns in November, and Dungeness crab in December. One percent of revenues are returned to fishery conservation and habitat protection efforts, and the company offsets its carbon emissions related to transporting the catches from Alaska to the Midwest.[256]

Sustainable aquaculture and mariculture

Commercial finfish farming is banned in Alaska (including salmon, halibut, and cod), but shellfish and other marine invertebrates have been legal to grow with the appropriate State permits since the passage of the Aquatic Farm Act in 1988. [257]Mariculture (aquaculture in saltwater) in the state is still quite small, however. In 2013, the 68 shellfish mariculture farms in operation across Alaska sold less than $800,000 worth of shellfish.[258] That number may soon explode, however, if the efforts of the Alaska Fisheries Development Foundation (AFDF) in the area of mariculture prove successful.

Thanks to a grant of over $200,000 from the National Oceanic and Atmospheric Administration, the organization launched the Alaska Mariculture Initiative (AMI) in the second half of 2014, and the organization believes the shellfish mariculture industry in Alaska could hit a billion dollars in revenue within 15 to 20 years.[259] Oysters and geoducks are the two shellfish currently being considered by the project. AFDF is optimistic that the right stakeholders are aligned for the industry to develop, and points to the fact that shellfish and seaweed mariculture was one of the top professed areas of interest for the North Pacific Research Board in their 2016 Annual Request for Proposals.[260]

In addition, AFDF has been working with Governor Bill Walker's Administration to create an Alaska Mariculture Task Force to increase visibility and resources attracted by this industry.[261] Some of the policy interventions being discussed include mimicking the state's successes around its salmon enhancement program. In the context of that program, the state of Alaska backed a $100 million revolving loan fund so hatcheries could get built and operate for several years. This bought enough time to develop tax and cost recovery programs to help pay back the long-term loans.[262]

Section VI

VI: Concluding thoughts – from crisis to opportunity.

In the 1990s, Oil, Chemical and Atomic Workers (OCAW—now merged with the Steelworkers) Union Secretary-Treasurer Tony Mazzocchi coined the term "just transition." He recognized that OCAW members worked in some of the most dangerous and toxic industries on the planet and, if they were to survive, both individually and collectively, they needed to begin to plan a transition away from these hazardous industries that was just. Tony used to say, "There's a Superfund for dirt; there ought to be a superfund for workers."[263] Despite Mazzocchi's visionary call for a just transition, it wasn't until after his death in 2002 that his work was embraced more broadly by elements of labor, environmentalist, and environmental justice communities who saw in his call for a "just transition" for workers a similar need for a "just transition" for people in so-called "fenceline" communities, close to toxic and extractive industries, and for their environment. [264]

Quinton Sankofa, a staff member of the nonprofit group Movement Generation, was quoted by writer Naomi Klein as saying: "Transition is inevitable. Justice is not." A great transition is underway in Alaska, but justice is not yet part of that transition. Alaska's short-sighted and near total dependence on oil and gas revenues should be a cautionary tale for the rest of the country, if not the world. With little to no planning, the entire state of Alaska is now suffering through an extraordinarily unjust transition. But nothing focuses the mind like a crisis, and many people throughout Alaska are beginning to explore the opportunities of abundance and self-reliance that lie on the other side of dependence on the fossil fuel industry. It is that opportunity that remains to be fully embraced by most elected officials in Alaska, who remain largely beholden to their sponsors in the fossil fuel industry.

This report focuses on the sustainable development opportunities this crisis creates – economic opportunities that are designed to benefit those least well off, protect Alaska Native rights and culture, and maintain the productivity of aquatic and terrestrial ecosystems even as the climate change signal deepens. To ensure that the transition is as just and seamless as possible, decision makers in Alaska should begin to embrace these new opportunities now. The era of high oil prices is probably over for good, the state's untapped oil, gas, and coal reserves and resources are expensive to extract and need to stay in the ground if the planet—much less, Alaska – has any decent chance of avoiding the most dire consequences of climate change.

The framework of sustainable development embraced by the U.S. and 191 others in "The Future We Want," the outcome document from Rio+20, and the new Sustainable Development Goals provides a hopeful way forward. Both sets of agreements and commitments are universal: they apply equally to both developed and developing countries in recognition of the fact that even in the richest nations there are regions with high poverty, deteriorating social and economic conditions, and environmental degradation. As such, they provide an alternative blueprint for Alaska's future that focuses on meeting the social, environmental, and economic needs of the population in more direct ways than resource extraction has done in the past.

The UN's sustainable development framework puts a high priority on food security, quality education, affordable energy, resilient infrastructure, sustainable resource management, and eradication of poverty. We believe that economic development options in Alaska that advance one or more of these goals simultaneously—with a particular focus on the needs of Alaska Native communities – must be a high priority. In this report, we suggest seven thematic

areas that could provide fertile ground for solutions that can be scaled up, strengthened, and invested in. These include human capital – the degree of know-how, skills, and knowledge a population embodies. Human capital requires investments in education and connectivity in Alaska, yet this sector's budget is now on the chopping block. We also explore some very promising developments in renewable energy of all sorts around Alaska. Ironically, many of these developments are in response to the high price of diesel, not climate change, yet they hold promise for building more self-reliant communities. Self-reliant communities can also benefit from policies to bolster local production of food and manufactured goods.

Knowledge Sharing Networks

A recurring theme among the July 2016 workshop discussions on these topics was the need for knowledge sharing networks – that is, intentionally developed resources and structures for communication so that information can be shared among regions, especially among rural communities and between urban and rural communities. These networks would foster the sharing of valuable information between communities and individuals including: lessons learned from local initiatives, skills development, proposals, resources, opportunities for advocacy, and regional successes in implementing just transition solutions.

We also discussed the many ways in which existing fossil fuel infrastructure can and must be dismantled – without the state picking up the tab – and the economic importance of protecting and restoring the state's pristine marine and terrestrial ecosystems to benefit subsistence uses, tourism, and Alaska Natives. Indigenous tourism is another thematic area with great potential for development, but only if it is guided by safeguards to ensure that Alaska Natives are the primary beneficiaries instead of tourism ventures owned by distant corporations. And fisheries are without a doubt a major resource for all of Alaska. The challenge now is to ensure that the sector does a better job of meeting Alaska's food security challenges and that the wealth from processing and exporting these fish stocks stays within the state.

Policy interventions are desperately needed in these and other sectors to remove barriers and steer investments and development in the right direction. First, and most importantly, tribal, federal, state, and local government agencies should engage in economic transition visioning and planning processes wherever it makes sense to do so and use the resulting plans to guide policies and investments to scale up sustainable development solutions that emerge from the process. Of course, a just transition will not be cheap. For example, substantial investments need to be made to ensure the relocation of communities now suffering severe consequences from climate change, a task that may cost in excess of $30 billion. But we believe there are many financing options to consider:

Cut fossil fuel subsidies

An immediate step that can be taken to ensure that the fossil fuel industry pays its fair share of the just transition is to end the enormous subsidies this industry receives from both state and federal programs. Subsidies distort oil and gas markets by financing production that would not otherwise occur. Oil and gas operations in Alaska are subsidized by the state through a variety of tax credits. Some are refundable, meaning they are essentially worth cash and others can be sold or traded to other companies and used to erase the taxes a company would otherwise pay to the state. These subsidies are substantial, and terminating them will free up state revenues for many other uses, including planning for and investing in the just transition. The state Department of Revenue has determined the value of tax credits it will likely owe in the next fiscal year to companies with no tax liability plus those carried forward to top $1.4 billion.[265] In recent years, the annual state subsidy for oil and gas has been roughly $800 million.[266]

Federal subsidies for the fossil fuel industry are equally generous, and have been rising in recent years. According to Oil Change International, federal production and exploration subsidies – "some of the most inefficient and least defensible subsidies" – increased from $12.5 billion in 2009 to $18.5 billion in 2013.[267] These data are not broken out by state, but Alaska producers receive a large share. Both federal and state subsidies make a big difference to many producers. For example, according to figures from the Department of Revenue, oil and gas companies spent $1.09 billion in Cook Inlet between fiscal year 2007 and fiscal year 2015. About $450 million of that was provided by the state via tax credits.[268] The Walker Administration and the legislature have begun to scale back these subsidies, but political opposition has prevented major cuts.

Fossil fuel risk bond programs at the state, borough, and municipal level

Looming on the horizon is the cost of dismantling, removing, and restoring fossil fuel infrastructure sites if policies are not immediately reformed to limit public financial liabilities. It is only fair to make sure these costs are not passed on to ordinary citizens and already stressed state and local public agencies.

Approaches to ensuring that the fossil fuel industry pays its fair share include shoring up financial assurances for DR&R activities, as discussed in Section V. But that will still leave climate adaptation expenses uncovered. Fossil Fuel Risk Bond (FFRB) programs – a concept developed by the Center for Sustainable Economy – could help close this funding gap. FFRBs can be put in place by both state and local governments and would lock in adequate financial assurances for all forms of fossil fuel infrastructure DR&R and other risks to public finance. They would also establish surcharge-based trust funds that can be used to finance climate adaptation expenses – like the cost of relocating villages and infrastructure – and response and recovery costs associated with wildfires, floods and other climate disasters. CSE estimates that a $38/mt-CO2-e surcharge on the carbon content of all fossil fuels traded in the state could generate over $9 billion in revenues each year earmarked to cover these public financial costs.[269]

The first step to ensure that the fossil fuel industry pays its fair share of the just transition is to end the subsidies this industry receives from state and federal programs.

Fee and dividend

Another option that could be explored in Alaska is the imposition of a "fee and dividend." Given that industrial end users are both the least efficient energy consumers and the largest in the state, a carbon fee on their energy consumption would achieve two things: it would provide financial resources that would revert to those communities and individuals that use the least amount of fossil fuels, including Alaska Native communities, and it could incentivize greater efficiency of industrial operations in Alaska.

Increase federal spending

The federal government should pay its fair share as well. There are vast swaths of federal public land and both military and non-military federal facilities throughout the state. And the federal government has been instrumental in sustaining Alaska's oil-based economy for decades. The federal government is already investing a great deal in Alaska – federal expenditures support about a third of all jobs.[270] But much more needs to be done. Specific areas of new federal spending could include: economic transition and relocation planning, renewable energy, climate change monitoring and science, and climate change adaptation.

The military should be a catalyst for scaling up energy efficiency and renewable energy solutions

The U.S. Military is the largest single employer in the state of Alaska, with 19,436 active military in the state[271] and an additional 5,157 civilian personnel.[272] The Pentagon not only recognizes that climate change is a grave threat to the planet,[273] but is also investing heavily in renewable energy.[274] The Navy alone is scheduled to provide over a gigawatt of energy from renewable energy by 2020,[275] enough to

provide half of the power for all of its military bases nationwide. It thus makes sense for Alaska's military bases to be powered by renewable energy. While the Air Force's Tin City Long Range Radar Station is developing a 250 kW wind turbine project to cut diesel fuel use at the remote Alaska station by 30 to 35 percent,[276] this is a small share of the military's carbon footprint in Alaska. At a minimum, the military should begin to retrofit all of their bases in Alaska to run at maximum efficiency and on renewable energy to the greatest extent possible, in keeping with their shift to greater renewable energy uptake in the Lower 48. And, in order to enhance the local food security and economy of the state, the U.S. military should commit to buying Alaska-grown food and to procuring goods and services in-state to the greatest extent possible.

Allow Alaska Native communities to be eligible for federal funding that excludes them

There is also the need for a significant scaling up and redirection of federal expenditures targeting Alaska Native communities. Currently, tribal governments, including Alaska Native tribes, are ineligible for many federal funds that other state and local governments can receive for programs for relocation, or to incentivize renewable energy, energy efficiency, forest protection, sustainable fisheries management, coastal zone management or estuarine research, and education—all critical arenas in the climate change challenge. Alaska Natives have a key role to play in all of these arenas and should be eligible for federal funds to engage more deeply in them.

For example, according to a 2009 GAO report, "64 villages do not qualify for affordable housing and relocation assistance from the Department of Housing and Urban Development's Community Development Block Grant program because the federal law governing the program does not recognize unincorporated Alaska Native villages in Alaska's unorganized borough as eligible units of general local government."[277] The National Congress of American Indians identified several such programs in the natural resources arena, particularly striking in light of the interrelationship indigenous peoples recognize and have with the ecosystems upon which they depend.[278]

International climate adaptation and mitigation funds for tribes

Though it is distinct from a "just transition," the UN Climate Convention recognizes a similar equity issue in calling for the compensation for climate change adaptation and mitigation costs that developing countries will incur. However, the UN does not now recognize the rightful needs of Alaska's Native nations who are being harmed most dramatically, and most immediately, from a crisis they played little to no part in creating.

Currently, the UN Framework Convention on Climate Change does not view nations within nations—such as the Inupiat or the Yupik—as distinct from the nation that surrounds them, the United States. This oversight means that tribal nations that might otherwise be viewed under the UN as eligible for international climate change adaptation and mitigation funding, are ineligible. As one of the leading greenhouse gas emitters in the world, the U.S. has a major role to play in redressing this wrong at the international level. Until the UN recognizes the national status of Indian tribes, the U.S. government must begin by ensuring that federal funds sufficient to meeting the sustainable development goals as outlined by the UN are provided to Alaska Natives and other tribes.

Philanthropy

The philanthropic community has a critical role to play in ensuring that Alaska's transition away from fossil fuels is just. The funding community could engage in ensuring support and capacity-building for organizations on a range of transition-related services in the state, with a focus on attracting private capital for economic opportunities for Alaska Natives in sustainable enterprises, and ensuring non-profits are capable of managing transition funds. One of Alaska's leading foundations, Rasmuson Foundation, recognizes the urgency of acting now on the state's fiscal crisis, and is working to ensure it does not worsen.

Public banks

The state of North Dakota is the only state to have established its own publicly-owned bank. The bank survived the financial recession of 2008 and continues to thrive, despite the downturn in the oil and gas industry. It provides low-interest student loans, small business loans, agricultural loans, and loans to community banks that provide home mortgages. The Bank of North Dakota has helped ensure that the benefits of economic growth in North Dakota stay in North Dakota. A Bank of Alaska could provide much-needed financial support to struggling Alaskan business-owners, homeowners, students, and farmers, while keeping Alaska's economic growth sustainable. An evaluation of credit union versus bank economics with respect to helping Alaskan's economy may empower Alaskans to evaluate their choices.

Native banks

It is important to provide support for Alaska Natives who choose to remain outside the formal economy to the extent they wish to, while also providing for the financial needs of Alaska Natives. There are a variety of ways to achieve this goal, but one way is via micro-credit lending. On a larger scale, tribes can choose to own their own national banks. A move in this direction by tribal leadership could ensure that the benefits of economic growth remain within the tribe.[279]

The seven thematic areas we discussed are by no means exhaustive. There are many other exciting possibilities for sustainable development solutions that are even more fundamental, such as new metrics to guide economic policy and new kinds of corporations that make sustainable development part of their DNA. The Genuine Progress Indicator (GPI) is an example of the former. The GPI is one of the few "Beyond GDP" indicators that has been fully vetted by economists and that takes income inequality, environmental degradation, and social ills into account when it measures economic wellbeing.[280] Among the states that have embraced the GPI as a measure of economic well-being are Hawaii, Maryland, Washington, and Utah.

An additional innovative solution for Alaskan business owners is the Benefit Corporation, or "B Corp."[281] Two B Corps currently call Alaska home: Alaska Glacial Mud and Arctic Solar Ventures Corporation. B Corps allow socially responsible investors to find and invest in corporations committed to enhancing the "triple bottom line" of environment, economic and social wellbeing. They are "for-profit companies certified by the nonprofit B Lab to meet rigorous standards of social and environmental performance, accountability, and transparency." As Alaska moves to a more diverse, non-extractive economy, B Corps could help lead the way while providing investors, including local investors, an opportunity to ensure their money is helping all of Alaska move forward sustainably. Native Corporations may find a greater pool of socially responsible investors if they were to become B Corps.

These are all additional options to consider over and above reforms already being implemented by the Walker Administration. Taken together, the sustainable development framework offered here and the various funding options available hold great promise for a smoother, more equitable, and more sustainable transition to a prosperous future. But it will require bold leadership from elected officials willing to risk breaking their ties with their sponsors in the oil and gas industry to ensure Alaska's future is no longer tethered to their fortunes, good and bad. ■

Gillnet salmon fishing boats near Kenai, Alaska. (Robert Visser / Greenpeace)

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