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Recipient Organization: Makah Indian Tribe of the Makah Indian Reservation

Project Title: Makah Tribe's Resilience, Adaptation, and Mitigation Planning

Date of Report: 15-Jul-21

Award Number: DE-IE0000069

Total Project Costs: \$225,403

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ACKNOWLEDGMENT

This material is based upon work supported by the Department of Energy, Office of Indian Energy Policy and Programs, under Award Number DE- IE0000069

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Executive Summary:

Our aim was to develop a Climate Adaptation and Resilience Plan through gathering community input through personal interviews and individual surveys, building from our Climate Impacts Assessment work completed in 2018.

This project has collected traditional, cultural, and local knowledge to support the ongoing multi-departmental environmental planning processes of the Makah Tribe. This information was then used to identify specific human wellbeing indicators to inform and enhance Makah tribal policy, management, and decision-making processes. Combined our tribal environmental planning to include the work of the Tribal Resilience Work Group (TRWG) and Oil Spill Work Group (OSWG), which relied on publicly available Western science-based data. While this information provided a strong basis for tribal environmental planning, it does not capture the unique traditional, cultural needs, and local knowledge and tribal voices of the Makah community.

Incorporating traditional, cultural, and local knowledge into tribal environmental planning processes is important because it: 1) fills gaps in historical baselines that can't be filled with Western science and monitoring; 2) identifies important cultural information, resources, areas, and sites to prioritize and enhance community resilience; 3) identifies culturally appropriate resilience strategies; and 4) increases the Makah community's strengths in their own resilience planning through engagement.

Data in this project was collected through three primary methods: 1) focus groups with specific tribal "user groups" (e.g. fishermen, elders), 2) semi-structured key informant interviews with individuals in the Makah community to refine focus group data, and 3) spatially specific data in the form of stories, photos, and details about resource use compiled in an interactive map to support environmental planning. We selected this combined qualitative methodological approach to capture the nuances of different knowledge types (which could be missed with a quantitative survey approach), incorporate diverse forms of knowledge (e.g. stories, spatial

information) identified as useful for environmental management and planning, and to explicitly recognize the cultural traditions of storytelling common in indigenous communities worldwide.

Effective and resilient environmental planning in the unique context with the Makah Tribe incorporates community knowledge and perspectives as well as the Western science-based information. It also requires active involvement of the various departments of the Makah Tribal Organization and their respective levels of expertise. To that end, this project involved collaboration among several staff from the following Makah departments and offices: Fisheries, Marine Affairs, Cultural and Research Center and Museum (MCRC), Forestry, Habitat, Emergency Management, Public Works, Planning, and the Clinic. This project aimed for a high impact, as it worked to incorporate traditional, cultural, and local knowledge across our departments, and their respective management plans, and the Tribe's decision-making process, which we hope will enhance the Makah Tribe's resilience to changing environmental conditions.

3. Project Objectives:

In order to be more resilient the Makah began to develop an adaptation plan that would guide a coordinated approach to natural resource management, cultural research and practices, and policy and administrative development. The plan will serve as a guide for all tribal environmental policy departments on how to leverage their inherent sovereign authority, traditional cultural awareness, and science relevant to environmental impacts. Our end hope and result will be an enhanced internal ability to address the environmental impacts we have control over, while building resiliency for those we cannot change. Beyond adaptation, we must also set forth a mitigation policy framework that is informed by what the Makah Tribe's current environmental impacts are and what energy options appropriately meet the tribal community needs.

Task 1.0:

Synthesize environmental impact assessment with Traditional Ecological Knowledge (TEK)

Task Details: The Makah have already compiled and reviewed a substantial body of scientific literature to assess environmental impacts identified as relevant to tribal resources. Now the tribe must cross-examine scientific projections with the TEK within the tribe itself in order to, as a community, identify what tribal resources are both most at risk or deserve priority. The deliverable will be a prioritization of tribal resources and adaptation planning areas unique to the Makah tribe in terms of both localized impacts and resiliency perception, which will be delivered to the MTC for policy consideration.

Milestone 1.1

Interview 10% of tribal population concerning environmental impacts and tribal resources at risk

Milestone 1.2

Identify 10 priority tribal resource planning areas at risk according to both tribal concerns and projected environmental impacts

Milestone 1.3

Deliver consensus tribal resource planning areas to MTC

Task 2.0:

Set adaptation goals and develop tribal adaptation plan

Task Details:

With approval from the MTC, the priority tribal resources and planning areas will need to be addressed under one uniform Makah adaptation plan. A formal adaptation plan will result in increased coordination among Makah natural resource staff and increased institutional capacity for Makah to participate in adaptation consultation. Results and deliverables will include formal adoption of Makah adaptation plan, a framework outlining adaptation policy, and a streamlined and more efficient Core Team.

Milestone 2.1:

Establish both a shared vision and guiding principles for a resilient community

Milestone 2.2:

Adaptation goals for each identified tribal resource planning area

Milestone 2.3:

Develop, select, and prioritize all adaptation goals

Milestone 2.4:

Finish draft, finalize, and formally adopt Makah adaptation plan

Task 3.0:

Conduct Tribal Government energy assessment and identify feasible energy options

Task Details:

Future tribal mitigation steps require a baseline comparison, which could be provided by a comprehensive assessment of current environmental impacts originating from Makah Tribal Government infrastructure.

Milestone 3.1:

Complete GHG assessment of all Makah Tribal Government buildings and infrastructure

Milestone 3.2:

Identify 5 tangible steps to reduce the environmental impact at both the tribal level and for each of the top five emission sources

Milestone 3.3:

Integrate both the GHG assessment and tangible steps into a comprehensive mitigation plan aimed at identifying future energy sources

4. Description of Activities Performed:

- Makah Cultural Resource Center (MCRC) i.e. Makah Museum, conducts interviews with 13 Makah Tribal members on climate change impacts. Mike Chang, WA Sea Grant Hershman and team code and post-process interviews to develop a Traditional Knowledge report
- Energy Audit completed for 16 tribally owned buildings (Tribal Center Offices, Marina, and Forestry buildings) to identify energy use and ways to improve efficiency. Report is complete and can be used to seek funding to implement recommendations. Cascadia Consulting was contracted to do this work.
- Cascadia Consulting Graphic Design work was used for community outreach. We have a Changing Ocean Conditions nine-pager and have drafted content language for the remaining four topics.
- Hosted a community dinner in October 2018, with adaptation oriented surveys, 90 surveys were completed to date. We plan to share results of the project with the community during the summer of 2021.
- Modified the budget to shift funds from salary and fringe to contracts as no staff was able to spend down under this budget. Mike Chang's contract has been amended for this amount to complete the Adaptation Plan.
- Technical Assistance provided by DOE and National Renewable Energy Lab for Relocation and Resilience Planning. Site visit completed in June 2019. Report provided to Makah October 2019. Makah Planning is taking the lead on this action.

Other approaches in strategies:

- Makah Fishing Fleet Repower Program, securing funds to alter fishing fleet engines to become more sustainable and emit less greenhouse gases, but engine change outs for certified EPA emission standards for propulsion engines. Four years of funding and 14 vessel repowered.
- Clean Air-Healthy Homes Woodstoves, upgrade households with new EPA certified woodstoves that burn cleaner with seasoned woods. Approximately 33% or 55 of the current count of 150 non EPA certified wood stoves were upgraded within senior housing. As a joint effort in the AQ program we implemented the Federal Air Rules for Reservations (FARR) and offered to build and install modular woodsheds to store and season their wood for burning.

5. Conclusions and Recommendations:

There are many documented health and well-being impacts based from climate change. From a physical health perspective, the Makah Tribe may face enhanced risk to injury or death from extreme weather events, increased acute health risks to extreme heat or extreme cold days, increased prevalence and risk of vector-borne diseases, and increased risk to respiratory illnesses, such as asthma and allergy. These increased physical health risks, all potential effects from climate change will compound current acute and chronic health risks that many

Indigenous and Tribal communities face, such as increased rates of heart disease, diabetes, asthma, substance abuse, mental health risks, exposure to pollution and high infant mortality rates. In particular, elders and youth are particularly susceptible and vulnerable to decreased air quality and seasonal extreme heat and cold days.

Climate change will also have an effect on mental health within our Makah community. Impacts to fish abundance and habitat will likely alter future commercial and subsistence fishing activities and current trends and patterns, causing direct loss of economic opportunity for commercial fishers, which may lead to other mental and physical health impacts, such as depression, anxiety, and substance abuse. Experiencing and surviving extreme weather events, such as winter storms or earthquakes, can lead to post-traumatic stress, depression, and anxiety. Furthermore, observations of gradual environmental change can negatively affect an individual's emotional well-being. The loss of access to traditional and cultural foods and its associated tribal activities, such as harvesting and preparation. This would have vast implications for the cultural health, well-being, and sense of place for Makah community members.

Almost every household within the Makah community participates in subsistence gathering, harvesting, hunting, or fishing, and relies on the food gathered from subsistence activities as part of their regular diet. The loss or shifting access of traditional and cultural foods will also have direct implications on food security and sovereignty for the Makah community. Routinely having these types of discussions and projects help Makah to forge and sustain their engagement and to further the implementation of creative and constructive work that has come from this program funding. We want to ensure our community is as prepared and resilient to imminent coastal hazards, with a focus on the worst case scenario, a tsunami following an earthquake. In order to ensure adequate preparedness and response we need to understand what and where our risks are located, costs for relocating and/or armoring to reduce our risks, and how we plan to respond and adapt to such disturbance. This project is the first phase in the development and implementation of this Resilience Plan.

A TsunamiReady® community is recognized by NOAA's National Weather Service as having defined tsunami hazard zones, producing evacuation maps, and installing evacuation route signs. These communities support ongoing tsunami public education and outreach, including to schools in tsunami hazards zones, such as the case in Neah Bay. Annual exercises and formal tsunami operations plans are also requirements to be recognized as TsunamiReady®. While we have been a TsunamiReady® community and planning any new developments out of the Tsunami Inundation Zone (TIZ), we want to take our recognition of being TsunamiReady® a step further to reduce our existing risks of critical infrastructure and populations within the TIZ. Since 2015, the Makah Tribe has been recognized as a TsunamiReady® community.

Approximately 60% of the Neah Bay population lives within the TIZ. The Makah Tribe's critical infrastructure (clinic, water treatment plant, emergency services, Makah Museum, and schools) also lie within the TIZ. A harsh impact of an earthquake and tsunami would disproportionately affect the Makah Tribe due to our remote location at the end of Highway 112, which is prone to landslides and would likely become blocked after an earthquake or tsunami preventing outside emergency assistance from reaching the Makah Reservation. The potential impacts from tsunamis will be further outlined in the Makah Tribe's Emergency Management Plan.

Finally, there will also be a multitude of cascading community impacts from climate change, some of which are still not well understood. These include the impacts of increased school or work absences on the community, clinic preparedness to handle increased patient loads, job and economic loss within the natural resource economy and subsequent impacts to our secondary businesses (e.g. hotels, restaurants, services), and how a rural community workforce could potentially be displaced or disrupted by changes or fluctuations within job placement or opportunities.

6. Lessons Learned:

Although this report documents the climate impacts to various and specific resource sectors for the Makah Tribe, this report is only the first step within the climate change planning process. This report is a living document, and we anticipate that this report will constantly be updated as new research and projections emerge and new work is completed by Makah staff; our future Tribal Resilience Work Group (TRWG). Ongoing species vulnerability assessments will be developed by Makah staff to coordinate their combined resources, for now and into the future, in order to uniformly identify treaty resources that are most vulnerable to protect, and to understand climate impacts from the unique perspective of the Makah people.

Another point to understand is looking at risks and vulnerabilities in the context of both immediate threats of natural disasters, as well as long-term climate change impacts increasing the holistic approach to resilience planning. Identifying the needs of a community or tribe and how those needs are met aids in the planning process. During or following a disaster, a community like Neah Bay may rely on its medical clinic for essential community services, such as food, water or basic shelter. If the roads in and out of Neah Bay are compromised during a disaster event it will be essential for the Tribe to operate with existing supplies. It is estimated that Neah Bay would be isolated for a year following a Cascadia event. Creating a village that can support emergency services through on-site reliable energy and energy storage components, locally grown food, resilient clean water supplies, and fishing will help preserve our community for an undetermined length of time.

Exploring vulnerabilities can help set a baseline, as well as outline the goals of the community. Vulnerabilities could include the system shocks, stressors, or hazards such as natural hazards,

technological hazards, threats or human-caused incidents. Planning for one threat or vulnerability can often help mitigate, or plan for other types of events.

7. Community Engagement Climate Adaptation Poster:



COMMUNITY ENGAGEMENT FOR CLIMATE ADAPTATION PLANNING WITH THE MAKAH TRIBE

L. NELSON¹, M. CHANG¹, F. HOWK², K. WRUBEL¹, D. SARFF¹, S. MCGEE¹

1. MAKAH FISHERIES MANAGEMENT, NEAH BAY, WA, 2. MAKAH OFFICE OF MARINE AFFAIRS

BACKGROUND AND GOALS

- Help us to identify community concerns so that we can address those in the climate adaptation plan.
- Learn about the community's understanding of climate change.
- Understand the level of support for climate planning efforts.
- Explore the challenges natural resource managers face when trying to incorporate climate change planning into their work; are there things the CCGW can do to make this easier.



COMMUNITY EVENT

- Held a dinner in Neah Bay in February 2017, roughly 200 people attended.
- Members of the climate change workgroup discussed ongoing and future work.
- Had a table set up for people to take the community survey, had 140 people participate.

COMMUNITY CONCERNS



Figure 1: Word tree of the Makah's community concerns of climate change impacts. Community members filled out an open ended question and could list up to five concerns.

PRELIMINARY RESULTS



Figure 2: Institutional barriers of Makah staff to address climate change impacts within planning processes.

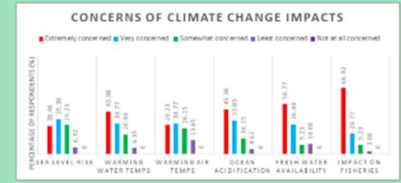


Figure 3: Ranked concerns of climate change impacts from the Makah community. Impacts to fisheries ranked the highest concerns.

How worried are you about climate change?



Figure 4: Community members' level of worry about climate change impacts to the Makah Tribe.

NEXT STEPS

- Carbon footprint and mitigation assessment
- Traditional Ecological Knowledge assessment
- Plan a series of educational sessions based upon topics identified from survey
- Work with natural resource staff to identify specific tools and resources would help them incorporate climate change planning into routine work
- Securing more funding and capacity to implement the Makah Adaptation Plan