

PERCEPTIONS OF SUCCESS:
A CASE STUDY OF PLANNING FOR CLIMATE CHANGE IN
SHAKTOOLIK, ALASKA

By

Stefan G. Tangen, B.A. Political Science

A Project Submitted in Partial Fulfillment of Requirements
for the Degree of

Master of Natural Resources Management

University of Alaska Fairbanks

December 2017

PERCEPTIONS OF SUCCESS:

A CASE STUDY OF PLANNING FOR CLIMATE CHANGE IN SHAKTOOLIK, ALASKA

Executive Summary

By Stefan Tangen

Masters of Natural Resources Management Project, University of Alaska, Fairbanks. December 2017.

Introduction

This research report focuses on two central research questions: 1) What is the historical context of climate adaptation planning in Shaktoolik, Alaska? and 2) How do community and non-community actors perceive successful climate adaptation planning in Shaktoolik, Alaska. In this research, I partnered with the Tribal Council of Shaktoolik and worked directly with the Community Coordinator ensure ethical and culturally appropriate methods. The research methods used to answer these questions include document analysis (n=18), participant observation, and semi-structured interviews (n=26). Data collection began in October 2016 and finished in October 2017. The people involved in this research were community members of Shaktoolik including elders, Tribal Council members and employees, City Council members, and Village Corporation council members. Non-community participation in this research included representatives from state and federal agencies, and consultants. Data analysis consisted of a two-step process: first, I used a framework consisting of seven dimensions to understand the perceptions of success across community and non-community actors. These dimensions were flexibility, sustainability, legitimacy, equity, efficiency, effectiveness, and replicability. The second step was a grounded theory approach which involved reviewing the data without prior theory and allowing themes to emerge.

Findings

- Due to a history of relocation in the region (4 times since the 1800s) the community of Shaktoolik is familiar with adapting to the local environment, but this is becoming more difficult as western infrastructure systems increased following the last relocation in the 1970s. The majority of households now have running water, indoor plumbing, fuel oil heating systems, modern communication systems, and western appliances such as televisions, refrigerators, and freezers.
- Western infrastructure systems are expensive to relocate, yet the expectation among community members is to at least maintain, but preferably improve the standard of living.
- Proactive climate adaptation planning in Shaktoolik, involving state and federal agencies, started in 2005 after three years of fall storm surges which threatened the safety and security of the community. In the past 12 years community leaders have crafted 8 different plans addressing climate change impacts and other community priorities.

- Both community and non-community actors agreed on the roles actors should play in planning for climate change: the community leads the process, state agencies directly support communities, federal agencies are active in the policy realms and provide funding, and consultants work on behalf of the community.
- Key factors supporting climate adaptation planning in Shaktoolik are: social learning, social capital, leadership, and relationships among stakeholders. Strong leaders, a sense of community, and effective institutions have been community strengths in Shaktoolik during the climate adaptation planning process.
- The Tri-org Council is a key institution in Shaktoolik which enabled the leadership to speak with a unified voice when working with non-community actors. The Tri-org involved members from each of the three governing entities in Shaktoolik (Tribal Council, City Council, Shaktoolik Native Corporation) as well as one elder and one youth creating a legitimate process and prioritizing equitable outcomes in the climate adaptation plan.

Recommendations

Collaboration and coordination among non-community actors, especially among state and federal agencies, is critical for delivering effective support to rural, indigenous communities. Community entities in Shaktoolik work with a plethora of non-community groups making it a challenge to coordinate with all of them simultaneously. This makes it increasingly important for various entities to collaborate to maximize resources, to ensure a cohesive strategy and a coordinated approach to planning and implementation. Establishing an Alaskan specific model or framework for this would be useful in streamlining this effort. Newtok's model for planning which was adapted for Shishmaref, Kivalina, and Shaktoolik may be the best starting point for this. However, further analysis is necessary to assess the extent to which this framework has been effective.

Lastly, funding may need to be reconfigured in the planning and implementation process. In Shaktoolik, planning funding was separate from the implementation of those plans which makes it a challenge to keep momentum going and achieve progress after the planning is completed. The most common concern in Shaktoolik's case among both community and non-community interviewees was the accessibility and availability of funding to implement plans. A potential solution to this is to include implementation funding when writing planning grants.

Abstract

Climate change planning is increasingly used in places like northwest Alaska where people are dealing with the effects of global climate change in dramatic and life altering ways. Planning for climate change often involves multiple actors from all levels of government working together with various goals, motivations, and perceptions of success. This research provides a perspective on what compelled the community of Shaktoolik to formally plan for climate change, documenting who they worked with throughout the process, the dynamics involved, and the outcomes created. I used a case study approach and qualitative methods in the form of participant observation, semi-structured interviews (n=26), and document analysis (n=18) to understand the ways in which community and non-community actors perceive successful climate adaptation planning in Shaktoolik, Alaska. I utilized seven dimensions of success from the literature to provide a framework during the data collection process and for data analysis. Due to a history of relocation in the region the community of Shaktoolik is familiar with adapting to the local environment, yet this is becoming more difficult as western infrastructure increases. In climate adaptation planning in Shaktoolik actors agreed on the roles different actors should play in planning for climate change at the community level. Additional findings include the importance of several key concepts such as social learning, social capital, leadership, and relationships among stakeholders. The climate adaptation planning model in Shaktoolik is moving in a positive direction and may be useful for other rural indigenous communities to replicate.

Acknowledgements

Thank you to the members and employees of the Tribal Council of Shaktoolik who partnered on this research project. Especially Genevieve Rock who supported and guided this research throughout the process. A special thank you to my committee Dr. Sarah F. Trainor, Dr. Courtney Carothers, Dr. Nathan Kettle, and Dr. Susan Todd for their guidance and support. Without them this work would not be possible. Thank you to all my financial supporters: UAF Global Change Student Research Grant Competition, Cooperative Institute for Alaska Research, ASUAF Student Government, Alaska Center for Climate Assessment and Policy, School of Natural Resources and Extension, and the Resilience and Adaptation Program. Thank you to all the participants who volunteered their time to share their perspectives and knowledge.

Table of Contents

Chapter 1. Introduction	9
Chapter 2. Literature Review	12
2.1 Climate Change Adaptation	15
2.2 Climate Adaptation Planning	16
2.3 Community Climate Adaptation Planning in Alaska	19
2.4 Hazard Mitigation Planning	20
2.5 Context in Planning for Climate Change	21
2.6 Defining and Measuring Successful Climate Adaptation	25
2.7 Dimensions of Success in Planning for Climate Change	27
2.8 Perceptions of Success in Climate Adaptation Planning	30
2.9 Differences in Perceptions of Success	33
2.10 Challenges in Assessing Perceived Success	35
2.11 Research Gaps	37
Chapter 3. Background	38
Chapter 4. Methods	45
Chapter 5. Results	52
5.1 The Historical Context for Climate Change Planning in Shaktoolik	52
5.2 Perceptions of Success in Climate Adaptation Planning	57
5.2.1 Flexibility/Addressing Uncertainty	57
5.2.2 Sustainability	59
5.2.3 Legitimacy	61
5.2.4 Equity	63
5.2.5 Efficiency	65
5.2.6 Effectiveness	67
5.2.7 Replicability	70
5.3 Factors Supporting Climate Adaptation in Shaktoolik	72
5.3.1 Perceptions of Success Among Each Actor Group	72
5.3.2 Leadership and Institutions in Climate Adaptation Planning	75
5.3.3 Social Capital	76
5.3.4 Social Learning	78

Chapter 6. Discussion.....	81
6.1 The Historical Context for Climate Adaptation in Shaktoolik	81
6.2 Local Focus Improves Legitimacy & Equity	82
6.3 The Importance of Relationships and Multiple Timelines	83
6.4 Funding: Effects on Efficiency & Effectiveness	85
6.5 The Importance of Replicability	87
6.6 Community Focused Planning.....	87
Chapter 7. Conclusion.....	89
7.1 Recommendations	91
References	93
Appendix A.....	102
Appendix B.....	103
Appendix C.....	104

Tables

Table 1: Dimensions of Success in Climate Adaptation Planning	29
Table 2: Top Ten Storm Surge Events in Shaktoolik from 1954-2009	41
Table 3: Data Collection Methods and Details	50
Table 4: Groups Interviewed.....	51

Figures

Figure 1: Map and location of Shaktoolik, Alaska.....	39
Figure 2: Visual Timeline of Events Related to Climate Adaptation in Shaktoolik.....	55
Figure 3: Cycle of Climate Adaptation Planning in Shaktoolik.....	56

Acronyms

BIA: Bureau of Indian Affairs

CAP: Climate Adaptation Plan

DMVA: Department of Military and Veteran Affairs (State agency)

DCCED: Department of Commerce, Community, and Economic Development (State agency)

DCRA: Division of Community and Regional Affairs (State division under DCCED)

DOT&PF: Department of Transportation and Public Facilities (State agency)

DEC: Department of Environmental Conservation (State agency)

EPA: Environmental Protection Agency (Federal agency)

HMP: Hazard Mitigation Planning

HUD: Housing and Urban Development (Federal agency)

IAWG: Immediate Action Work Group (State organization)

IGAP: Indian General Assistance Program (Federal program of EPA)

IRA: Indian Reorganization Act (also used to refer to the Tribal Council)

LEO: Local Environmental Observation network

NOAA: National Ocean and Atmospheric Agency (Federal agency)

NBITWC: Norton Bay Inter-Tribal Watershed Council (non-profit entity)

NGO: Non-governmental Organization

SMP: Strategic Management Plan

VSW: Village Safe Water (State program of DEC)

USACE: United States Army Corps of Engineers (Federal agency)

Chapter 1. Introduction

Rural indigenous communities in Alaska are being disproportionately impacted by the effects of climate change (Chapin et al., 2014). Some of the impacts these communities are experiencing include sea ice decline, permafrost thaw, and changes in animal migration patterns (Ibid.). To address these impacts many of these communities are engaging in climate adaptation planning which is a process that often occurs in coordination with state and federal agencies, consultants, and non-profit organizations. One of the first communities to engage in this planning in Alaska is the Inupiat community of Shaktoolik.

Shaktoolik is a unique community which developed distinctly from other communities in the region (Koutsky et al., 1981). The location, culture, history, and population are exclusive to Shaktoolik and the residents that call it home. However, the planning in Shaktoolik may be instructive for other communities dealing with climate change impacts. The community of Shaktoolik has characteristics which are common in other northern indigenous communities such as it's relatively small population size (250), proximity to urban centers, cost of goods, a mixed subsistence-cash economy, a predominately indigenous population (95%), colonial legacies, and a reliance on government funding (Bronen & Chapin, 2013; Chapin et al., 2014; Kawerak Inc., 2016; Loring et al., 2011).

The purpose of this study is to understand how the stakeholders involved in climate adaptation planning in Shaktoolik perceive success. Climate adaptation planning is becoming an important strategy for communities to address impacts related to climate change. As this strategy becomes increasingly used it will be necessary to understand perceptions of success

across the actors involved to maximize resources, ensure equitable outcomes, and sustainable solutions (Chapin et al., 2016; Gordon et al., 2010). This is especially important for non-community actors working with indigenous communities in the context of colonial legacies and historical traumas (Bronen, 2011; Marino, 2012; Whyte, 2015).

This research addressed two questions related to planning for climate change in the community of Shaktoolik, Alaska.

1. What is the historical context for climate adaptation planning in Shaktoolik, Alaska?
2. How do community and non-community actors perceive success in climate adaptation planning in Shaktoolik, Alaska?

To answer these questions, I utilized qualitative research methods including semi-structured interviews, participant observation, and document analysis. I employed seven dimensions of success from the literature to establish a framework for understanding how stakeholders perceive success in climate adaptation planning in Shaktoolik. These dimensions of success were used to develop an interview protocol and for analyzing data to inform findings.

The next section in Chapter 2 is a literature review of the key concepts relevant to this research. In Chapter 3, I give a brief history of the community of Shaktoolik and the actors they have worked with in planning for climate change. Chapter 4 highlights the methods used to collect data and the process used for analyzing the data. Then in Chapter 5 I present findings related to the context of climate adaptation planning in Shaktoolik and the perceptions of

success across actor groups. Chapter 6 is a discussion of those findings and Chapter 7 will conclude the research and give recommendations for future research endeavors in this field.

Chapter 2. Literature Review

Understanding the historical context of climate adaptation planning in an indigenous community and assessing the perceptions of success among actors involved requires a thorough understanding of key themes in the relevant literature. In this chapter I introduce key concepts such as climate change adaptation, actor roles at different levels of government in climate adaptation, and themes relevant to the context of working with indigenous communities in Alaska. I also discuss perceptions of success in planning for climate change, defining and measuring success, dimensions of success which provide a framework for understanding perceptions of success among actor groups, and the gaps in knowledge related to understanding success in climate adaptation planning. This review and the background section that follows in Chapter 3 provide justification for this research and the methods used.

Human beings are having a direct and unequivocal impact on the climate system. Anthropogenic emissions of greenhouse gases are the highest in the history of the planet with each of the last three decades successively warmer at Earth's surface than any preceding decade since 1850 (IPCC, 2014). Due to human induced climate change, dramatic impacts are occurring on natural and human systems across all continents and oceans (Ibid.).

Several regions across the US are experiencing extended periods of intense heat in the summers and shorter, warmer winters. Rapidly melting glaciers, rising sea levels, sea ice loss, permafrost thaw, and ocean acidification are all strong indicators that not only is the climate changing, but the world as we know it will be very different in the near future (Chapin et al., 2014). For some regions these changes are happening on a shorter timescale and with more

serious implications. In the past 40 years the Arctic has experienced the greatest regional warming on earth (Ibid.). Average annual temperatures have risen 2 to 3 degrees Celsius since the 1950's and winter has seen an increase of 4 degrees (Ibid.). Climatic changes in the Arctic are not limited to warming but also include an increase in precipitation and decrease in snow cover (Ibid.).

Alaska is the only Arctic region in the United States of America and is home to 40% (229 out of 566) of the federally recognized tribes in the United States (BIA, 2012). Low employment, high costs of living, rapid social change, reliance on subsistence food sources, and imported commercial foods make rural indigenous Alaskan communities highly vulnerable to climate change impacts (Chapin et al., 2014; Loring & Gerlach, 2009). Alaska is warming twice as fast as the rest of the U.S. which is having widespread impacts on both human and natural systems (Stewart, 2013). Many rural indigenous Alaskan communities are facing eroding coastlines, shifting animal migration patterns, and coastal flooding all of which impact the way they live their lives and experience the world (Brubaker et al., 2010; Brubaker et al., 2011; Chapin et al., 2014; Cochran et al., 2013). Some of the biggest impacts of climate change are occurring in the northwest region of Alaska where the temperatures are predicted to increase by 3.3 to 4.4 degrees Celsius by the end of the century (Stewart, 2013). Coastal erosion and inundation is a concern due to decreasing shore fast sea ice leaving these areas exposed to storm surges and increasing wave action (Barnhart et al., 2014; Terenzi et al., 2014). Lack of sea ice is increasing ocean fetch which contributes to the intensity of storm surges experienced by communities and ecosystems (Squire et al., 1995; Vermaire et al., 2013).

The climatic changes documented in this region are pronounced and there is uncertainty as to how much and how fast change will occur. For example, some projections of sea ice extent show an ice free Arctic Ocean by mid-century while other projections are more conservative showing sea ice decrease occurring at various rates from 50 to 100 years (Douglas, 2010; Lindsay & Schweiger, 2015; Stroeve et al., 2012). The uncertainty of outcomes related to climate change poses challenges for practitioners in climate adaptation planning particularly due to the variability in scientific models. Not all planners are familiar with climate models leading to the risk of confusing historical data and model output added to the fact that climate outputs often resemble actual climate data (Hallegatte, 2009). Uncertainties related to climate models lead to further uncertainties regarding effects in socio-ecological systems. An ice-free Arctic Ocean by mid-century will have a very different impact on the environment and local communities in the Bering Straits Region than an ice-free Arctic Ocean at the end of the century requiring different responses and strategies for coping.

Communities on the northwest coast of Alaska are being impacted by climate change in many ways. The impact on subsistence practices are particularly concerning since communities depend economically, nutritionally, and culturally on the animals and the land (Huntington et al., 2005). Thinning ice, changing permafrost, rising sea levels, and tidal fluctuations are making access to food sources increasingly difficult (Chapin et al., 2014; Krupnik & Jolly, 2002; McNeeley, 2012). Development activities in the form of natural resource extraction, tourism, and shipping are also changing with the potential for positive and negative impacts (Huntington et al., 2015). Increasing traffic through Arctic water ways could bring employment opportunities and lower shipping costs for critical goods like fuel and food (Ibid.). However,

with more vessel traffic there is the potential for oil spills, disruption of subsistence activities, and social impacts (Ibid.). Additionally, communities are experiencing climate change impacts in tandem with and often compounded by pronounced social, cultural, and political changes such as industrialization, consumerism, and youth outmigration (Moerlein & Carothers, 2012).

2.1 Climate Change Adaptation

Novel and proactive strategies are needed for inhabitants to address the unprecedented impacts experienced in northwest Alaska. The strategy of climate adaptation has become a key approach for addressing impacts of anthropogenic climate change. This strategy is now considered necessary since the effects of climate change are unavoidable and must be dealt with for the foreseeable future (Wheaton & Maciver, 1999). There are a variety of definitions for climate adaptation in the social sciences. Burton (1992) states,

“Adaptation to climate is the process through which people reduce the adverse effects of climate on their health and well-being, and take advantage of the opportunities that their climatic environment provides.”

The Intergovernmental Panel on Climate Change (IPCC) describes adaptation as

“an adjustment in ecological, social, or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities” (IPCC, 2014).

This research will use the IPCC definition of climate adaptation to establish a consistent and commonly accepted definition within the literature. The IPCC fifth assessment report (2014) points out that a working definition is useful in defining the scope of the challenge as it provides a framework for discussing all the questions that come with understanding climate adaptation.

The closer we get to agreeing what exactly constitutes climate adaptation the easier it will be to establish workable agreements and to make progress on sustainable solutions (IPCC, 2014).

2.2 Climate Adaptation Planning

Climate adaptation planning is the purposeful intention to prevent adverse impacts of current and future climate change and can be either reactive or proactive (Füssel, 2007).

Planned adaptation may occur over several months or many decades and involves a wide range of actors at different levels in many public and private organizations (Ibid.). In the U.S., climate adaptation planning is increasingly being utilized across multiple levels of government to prepare for and anticipate climatic changes (Bierbaum et al., 2013; Preston et al., 2009). On the federal level, all government agencies were directed under the Obama administration to develop adaptation plans as part of their annual strategic sustainability performance (Bierbaum et al., 2013). State governments are also engaging in climate adaptation planning and as of 2017 there were 33 states that established plans for addressing climate change impacts (Center for Climate Strategies, 2017). At the state level governments are creating independent plans and agencies are creating sector specific ones which take into consideration long term effects. For example, by 2011 there were 16 states with biodiversity conservation plans to address how climate change will affect wildlife (AFWA, 2011). At the local level, since the first municipal climate adaptation plan in Keene, New Hampshire (2007), there have been over 80 independent climate adaptation plans among local governments including Homer, Alaska (2007) (Woodruff & Stults, 2016). Tribal governments are also increasingly involved in developing climate adaptation plans, often with financial support from the Bureau of Indian Affairs (BIA). These plans target community health, natural resources, and other important

sectors (Brubaker et al., 2010; Swinomish Tribe, 2010). The majority of adaptation planning among indigenous groups is occurring in regions across the Arctic (Ford et al., 2011). Climate adaptation planning among tribal governments is likely to escalate as funding allows and as communities are increasingly affected by climate change impacts (Ibid.).

The increase in climate adaptation planning in the United States illustrates a multitude of governmental actors involved. Actors at these different levels of government have different roles and responsibilities, which reflects differences in priorities and motivations (Adger et al., 2005). Federal agencies have played key roles in the development of national adaptation strategies including coordinating adaptation efforts of local and sub-national governments, protecting vulnerable groups, supporting economic diversification, and providing information, policy and legal frameworks, and financial support (IPCC, 2014). In Alaska, the Environmental Protection Agency (EPA) has become an important resource for adaptation efforts. The EPA's Indian General Assistance Program (IGAP), which funds community efforts to address environmental impacts, is one example of this (EPA, 2016). The BIA has also been a driver of climate adaptation planning in indigenous communities through funding efforts (BIA, 2012). State level priorities are often concerned with actions like data monitoring systems as well as identifying key risks, vulnerabilities, and impacts. Strategies at the state level also aim to increase public awareness of potential risks and responses, and provide resources such as trainings, tools, and funding (IAWG, 2009; NOAA, 2013).

In Alaska specifically, the Division of Community and Regional Affairs provides technical assistance, tools, training, and funding for community resilience and adaptation by working directly with tribal governments in the state (DCCED-DCRA, 2017). The Governor's Subcabinet

on Climate Change was also critical in developing strategies to address climate change impacts at the state level such as increased coordination within and outside the state, data collection or assessment, regulatory or programmatic changes, capacity building and education, capital improvements, and financial assistance (Adaptation Advisory Group, 2010). Alaska local governments are critical for adaptation on the local level especially for actions like scaling up adaptation of communities, households, and civil society as well as managing risk information and financing (Bierbaum et al., 2013; NOAA, 2013). In 2007, the city of Homer, Alaska adopted a Climate Action Plan which aims to adapt to the impact climate change will have on local businesses, infrastructure, and households (Homer, 2007). Civil society organizations, such as non-governmental organizations (NGO's), play a major role in climate adaptation depending on the locale and the context (Agrawal, 2010). An NGO in Alaska, the Alaska Native Tribal Health Consortium (ANTHC), has been involved with climate adaptation for several years focusing on community health and now branching out with the Local Environmental Observation (LEO) Network which aims to document environmental changes across the region (ANTHC, 2017). In many regions, non-governmental entities and private consultants are major actors providing assistance in the form of planning guidance, implementation tools, climate information, best practice exchange, and bridging the science-policy divide (Bierbaum et al., 2013). The private sector is also realizing the benefit of climate adaptation with big and small companies alike factoring the impacts of climate change into their bottom line (Ibid.).

At all levels of government mainstreaming is a strategy that is utilized to address climate change impacts. Mainstreaming can be defined as integrating climate adaptation planning into existing policies and processes to increase opportunities for innovations (Huq & Reid, 2004;

Smit & Wandel, 2006). Mainstreaming has become a recommended approach in climate adaptation planning worldwide in order to maximize resources and capitalize on efficiencies (Friend et al., 2014). This is contrasted by independent plans which have not been incorporated into existing processes (Woodruff & Stults, 2016). Mainstreaming is a holistic approach for utilizing existing resources which are often insufficient for stand-alone climate adaptation measures (Uittenbroek et al., 2013). Particularly in the international development arena integrating climate adaptation planning with existing responses is the best way to achieve sustainable outcomes (Huq & Reid, 2004). However, this strategy can be applied to any policy area or sector that aligns with the climate adaptation intervention to be implemented. For example, in Alaska, the U.S. Army Corps of Engineers take climate change projections into account when assessing natural hazards particularly related to erosion and flooding in rural communities (USACE, 2009).

2.3 Community Climate Adaptation Planning in Alaska

Across the state of Alaska local planning for climate change is increasing. Planning efforts are more prevalent at the local level and yet few formal climate adaptation plans have emerged (Meeker & Kettle, 2017). Some of the current climate adaptation plans that have emerged were conducted in Shaktoolik, Nome, and in Norton Sound (Johnson & Gray, 2014; Kettle et al., 2017; Murray & Shepherd, 2013). Other efforts related to climate adaptation planning include workshops, trainings, and needs assessments (Meeker & Kettle, 2017). Currently, 88 planning related efforts have been identified across tribal communities in Alaska of which 31 were trainings, 43 were workshops, and 15 were impact assessments (Ibid.) Notable recent trainings occurred in the hub communities of Nome, Unalaska, King Salmon, and

Kotzebue facilitated by the Landscape Conservation Cooperatives (LCCs) in Alaska in partnership with local communities and local organizations (Pletnikoff, 2017). These trainings aimed to increase resilience in local communities by providing training for participants from communities in the region (Ibid.)

Several barriers have been identified in Alaska related to tribal climate adaptation and climate adaptation efforts which include financial, cultural, institutional, and regulatory constraints (Meeker & Kettle, 2017). Funding is the most cited barrier to climate change and is a critical component of climate adaptation planning for staffing, vulnerability and hazard assessments, travel, and implementation of adaptation interventions (Meeker & Kettle, 2017; Pletnikoff, 2017). Other key barriers are institutional related to a lack of support from state and federal agencies as well as conflicting or ineffective governance (Meeker & Kettle, 2017). In Kivalina, erosion adaptation efforts were hindered during a shoreline armoring project which failed due to a lack of local participation and insufficient oversight by project managers (Shearer, 2012). Meeker & Kettle (2017) point out that the successful implementation of future climate adaptation plans will require an improvement in agency coordination to align adaptation objectives as well as community goals for self-sufficiency.

2.4 Hazard Mitigation Planning

A strategy for addressing environmental changes, which generally includes climate related effects, is called Hazard Mitigation Planning (HMP). While there are some differences between hazard mitigation planning and climate adaptation planning there are many commonalities which make HMP important to include in a discussion about planning for climate

change. Key commonalities between HMP and climate adaptation planning are the approach to risk management and environmental impacts, the reduction of vulnerability and enhancement of resilience, as well as the focus on a multi-stakeholder planning process (Gero et al., 2011; Thomalla et al., 2006). The biggest difference between the two planning processes is in the timescale of the threat since disasters are often short-term and immediate whereas climate change impacts are often long-term and more gradual (Thomalla et al., 2006). Due to the overlapping nature of these two fields there have been calls for integration to reduce duplication of efforts and take a more holistic approach to address community needs related to disaster management (Gero et al., 2011; ICLEI, 2014; Thomalla et al., 2006; Trainor et al., 2017). In the Bering Straits Region hazard mitigation planning and climate adaptation planning often address similar threats related to environmental impacts such as the increase in storm surges and coastal erosion. Importantly, as is discussed later, the distinction between these two planning processes may not be differentiated by the community perspective.

2.5 Context in Planning for Climate Change

Understanding the context of climate adaptation planning provides an opportunity to gain a holistic perspective of what key aspects created the need for a planned climate adaptation process. Climate change impacts often occur in the context of a changing environment and are embedded into or compounded by existing exposures (O'Brien & Leichenko, 2000). Especially for indigenous communities in Alaska perceptions and experiences of climate change are embedded among numerous other factors associated with social and economic changes (Carothers et al., 2014). For communities faced with the risk of displacement or threats to their traditional way of life an understanding of the total

environment of change helps to contextualize climate adaptation planning and the outcomes pursued (Ibid.).

In Alaska relationships between indigenous communities and government entities exist in the context of historical injustice which resulted from colonialization (Whyte, 2013). The United States played a fundamental role in establishing the current vulnerability of many indigenous communities and will require appropriate responses to facilitate future sustainability of these communities (Whyte, 2015). Beyond the injustices which occur due to colonialization there are the inequitable outcomes of natural resource extraction and development (Raik et al., 2008). Indigenous communities often receive few benefits from development of natural resource extraction industries (oil, gas, and mining) while being disproportionately affected by the negative effects on the environment (Ibid.). Shearer (2012) points out that vulnerability to climate change in communities like Kivalina can be traced back to prioritization of natural resource extraction over indigenous rights which are antithetical to Alaskan Native ways of living. Additionally, in the wake of the terrorist attack on September 11, 2001 the Federal Emergency Disaster Agency (FEMA) was restructured under the newly created Department of Homeland Security (DHS) cutting \$80 million dollars from FEMA and community assistance related to disaster management (Shearer, 2012; Steinberg, 2006).

In addition to the continued exploitation of indigenous lands and resources there exists a power imbalance between Alaska Native communities and government agencies (Whyte, 2015). The lack of recognition of tribal sovereignty by state government entities and the lack of cohesion between federal and state agencies in Alaska creates a tense and often unproductive relationship for planning (Shearer, 2012). These are significant challenges and important

considerations for planning for climate change in indigenous communities in Alaska and require an understanding of the historical underpinnings of tribal-federal-state government relations.

There are several Alaskan communities relevant for discussion when considering the context of climate adaptation planning. There are two communities, Shishmaref and Newtok, particularly suitable for this discussion due their coastal location, community demographics, and the extent of climate change impacts threatening their way of life which has made adaptation a priority (Bronen, 2011; Marino, 2012). Bronen (2011) highlights the lack of a governance framework to assist communities like Newtok in need of relocation due to climate change impacts such as erosion. Newtok has pursued three strategies to deal with dramatic environmental changes: erosion control, co-location to other established villages in the region, and relocation of the entire village to a new site (Bronen, 2011). Only relocation has proven to be a viable strategy among community members as erosion control efforts have been unsuccessful and co-location would separate extended families and potentially sever community ties (Ibid.). In Newtok, climate change impacts are compounded by challenges often experienced in remote Alaskan communities such as the high cost of goods, limited access to services, and unsustainable infrastructure (Ibid.). In Shishmaref, climate change impacts related to coastal flooding, erosion, and storms have left residents exposed to life threatening disasters which have motivated the community to seek relocation (Marino, 2012; Marino & Lazrus, 2015). In a survey of community residents Marino (2012) found that respondents perceived climate change to be the greatest threat to Shishmaref's future. The same respondents did not believe they would be relocated in a timely manner before a major disaster occurs (Ibid.). Interview data corroborates these findings and shows that the

adaptation strategy of relocation has caused significant stress and frustration among community members leading to distrust of governance structures in place and a lack of understanding from outside entities (Ibid.). Residents of Shishmaref also experience the high cost of living, limited access to services, and unsustainable infrastructure which compounds the threat of a natural disaster (Ibid.). Additionally, a housing shortage is prevalent in Shishmaref which exacerbates social and environmental problems (Ibid).

Concepts relevant to the context of planning for climate change in small Alaskan communities are social learning and social capital. Tabara et al. (2009) define social learning as the process by which agents and organizations continuously frame and reframe the issues at stake and develop enhanced content and relational capabilities to deal with common problems which individuals often cannot resolve on their own. This concept highlights that responses to climate change at the local level do not occur in a vacuum. Communities in the Bering Straits region are connected through social networks which enable communication and information sharing. These shadow systems are informal interactions which exist outside of, but interact with, formal institutions and inter-relationships (Nilsson & Swartling, 2009; Stacey, 1996). The concept of 'shadow spaces' describes how these relational spaces allow individuals or subgroups within organizations to experiment, imitate, communicate, learn and reflect on their actions in ways that surpass the formal processes within policy and organizational settings (Nilsson & Swartling, 2009; Pelling et al., 2008).

Social capital as defined by Putnam (1993) and Coleman (1994) consists of features of social organization, such as networks of secondary associations, high levels of interpersonal trust and norms of mutual aid and reciprocity, which act as resources for individuals and

facilitate collective action. Putnam (1993) goes on to say that communities rich in social capital are more likely to have effective civic institutions and are therefore more likely to prosper (Lochner et al., 1999).

2.6 Defining and Measuring Successful Climate Adaptation

As the practice of climate adaptation planning increases at all levels it becomes critical to understand what constitutes success. Climate adaptation planning is a strategy of climate adaptation and is included in this analysis of understanding and defining successful climate adaptation. Defining success helps establish a framework to determine the key attributes of successful climate adaptation (Gordon et al., 2010). One definition, developed through three iterations of consensus building by surveying experts in the field, states that

“successful adaptation is any adjustment that reduces the risks associated with climate change, or vulnerability to climate change impacts, to a predetermined level, without compromising economic, social, and environmental sustainability” (de Franca Doria et al., 2009).

Or as Adger et al. (2005) put it:

“the success of an adaptation strategy or adaptation decision depends on how that action meets the objective of adaptation, and how it affects the ability of others to meet their adaptation goals.”

These definitions are useful in establishing a preliminary framework which helps to better understand successful climate adaptation however, research has shown that expert elicitation of subjective concepts is less useful than evaluation by those adapting to climate change or affected by adaptation measures (de Franca Doria et al., 2009). Scholars are particularly interested in locally defined success as a way to democratize the process and better address community-identified concerns (Balazs & Morello-Frosch, 2013; Chapin et al., 2016).

There are several metrics used by researchers to evaluate the success of climate adaptation strategies. Kind et al. (2015) analyzed 48 publicly funded research papers or guidelines to identify good practice criteria in the context of climate adaptation. After several iterations, the authors settle on six criteria of good practice in the field of climate adaptation which are effectiveness, robustness, sustainability, financial feasibility, positive side effects, and flexibility. Adger et al. (2005) argue that elements important in judging success in terms of sustainability should include effectiveness, efficiency, legitimacy, and equity. In operationalizing a framework for identifying successful adaptation projects Ding (2012) compares possible metrics from several studies which include effectiveness, flexibility, side effects, equity and legitimacy, efficiency, and sustainability. Scholars are concerned with identifying metrics which have the most benefit to all parties in order to build adaptive capacity including technical know-how, institutional capacity, and social capital (Arnott et al., 2016). However, the importance of these various criteria to individuals within communities, land managers, policy makers, and other actors involved in climate adaptation and affected by decisions is under researched deserving further investigation (Arnott et al., 2016; Sherman & Ford, 2014).

A different way to look at success in climate adaptation planning is to define what is not success. This may not be sufficient in providing a comprehensive definition of success, but it provides another perspective for thinking about success in climate adaptation. On the success to failure continuum maladaptation lies at the opposite end of the spectrum from success (Moser & Boykoff, 2013, p. 12). Therefore, another way of viewing successful adaptation is to avoid maladaptation. Maladaptation is identified by one of five categories: 1. it increases the

vulnerability of other systems, sectors, or groups by increasing emissions of greenhouse gases, 2. it disproportionately burdens the most vulnerable, 3. it has high opportunity costs, 4. it reduces the incentive to adapt, or 5. it sets paths that limit the choices available to future generations (Barnett et al., 2013). A lack of success is not limited to maladaptation and may occur in other forms such as inadequate responses which only partially address the causes or symptoms of degradation (Kasperson et al., 1995; Moser & Boykoff, 2013).

2.7 Dimensions of Success in Planning for Climate Change

Dimensions of success in climate change planning are often conceptualized into two phases: process or outcome (Adger et al., 2005; Smit et al., 1999; Smith et al., 1996). Process refers to the events, occurrences, or actions that took place during adaptation planning. The outcome of climate adaptation occurs after the planning has concluded and is often temporally distinct from the process. There were two papers that provided the dimensions of success for this research due to the comprehensiveness of their analysis of success metrics in the field of climate adaptation. These papers were Sherman & Ford (2014) *Stakeholder Engagement in Adaptation Interventions: An Evaluation of Projects in Developing Nations* and Kind et al. (2015) *Development and Application of Good Practice Criteria for Evaluating Adaptation Measures*. Sherman and Ford (2014) analyze success criteria of top-down and bottom-up climate adaptation projects which is relevant for this research due to the examination of a multi-level, multi-stakeholder case study. Kind et al. (2015) identify key evaluation criteria by analyzing theoretical literature, utilizing the judgement from experts in the field of climate change adaptation, and applying the criteria to a set of implemented measures to test their applicability. The final dimensions of success derived from these two sources and utilized in

this research are replicability, legitimacy, effectiveness, efficiency, sustainability, equity, and flexibility. Table A gives greater detail to these dimensions of success with additional references from the literature.

Leadership is another topic discussed in climate adaptation planning success literature. Leadership is not used as a dimension of success, but it is an important topic to recognize in climate adaptation planning for several reasons. A lack of leadership and guidance undermines the capacity and willingness to make adaptation decisions particularly at different levels of government (Moser & Ekstrom, 2010). Leadership is a key element used for characterizing governance regimes (Pahl-Wostl, 2009) and it has been shown that success related to climate change governance can be attributed to strong political leadership (Tribbia & Moser, 2008). In climate adaptation planning, leadership can be critical at any stage of the process, it can help overcome barriers, and a lack of leadership may create barriers (Moser & Ekstrom, 2010).

In Table A, the dimensions of success are organized into three categories depending on when they occur during climate adaptation planning in the process, both the process and the outcome, or in the outcome. Two dimensions, effectiveness and efficiency, fit into both process and outcome categories. An explanation is provided for each dimension.

Table 1: Dimensions of Success in Climate Adaptation Planning

Process Oriented	Description of the Dimension of Success	References
1. Replicability/ Repeatable	The ability or potential to scale up at the same site or implement interventions at another site. Can the project be transferred to another place, scenario, or region?	(Kind et al., 2015; Mustelin et al., 2010; Rickards et al., 2014; Simonsson et al., 2011; Woodruff & Stults, 2016)
2. Legitimacy	This dimension reflects the level of participation of various groups during the process. Concerned with who is involved and how the process was run. How was the process viewed by actors involved and affected by the planning? Were all appropriate people and entities involved in the process?	(Kind et al., 2015; Mustelin et al., 2010; Patt & Schröter, 2008; Sherman & Ford, 2014)
Process/Outcome Oriented		
3. Effectiveness	Achieving objectives while planning as well as accomplishing ones that were set during the plan. Establishing productive relationships, collaborating with stakeholders, reducing impacts and exposure to threats, reducing risk, avoiding danger, and promoting security. Objectives must be context specific since climate change will affect regions differently.	(Ding, 2012; Grothmann & Patt, 2005; Jaja & Dawson, 2014; Kind et al., 2015; Picketts, 2015; Sherman & Ford, 2014)
4. Efficiency	Cost-benefit analysis which is not solely focused on market value, but also values of social/public goods. This includes distribution of the costs and benefits of the action, costs and benefits of changes in those goods that cannot be expressed in market values, and timing on climate adaptation actions.	(Ding, 2012; Hopkins, 2014; Kind et al., 2015; Mustelin et al., 2010; Sherman & Ford, 2014)
Outcome Oriented		
5. Sustainability	Short term solutions can become a maladaptation. Sometimes short-term actions create path dependencies with negative results. The focus should be on adaptations that create long term solutions and promote resilience.	(Bisaro et al., 2010; Eriksen et al., 2011; Hopkins, 2014; Kind et al., 2015; Sherman & Ford, 2014)
6. Equity	Participation of underrepresented groups is a critical factor in this dimension. Related to legitimacy of the process, but regarding who benefits from the outcome and the way those benefits are distributed across population groups. Some groups are more vulnerable than others and may require more representation in outcomes.	(Jaja & Dawson, 2014; Kind et al., 2015; Mustelin et al., 2010; Sherman & Ford, 2014)
7. Flexibility/ Addressing Uncertainty	Adaptation decisions should be robust and flexible. Adaptations that are beneficial under multiple scenarios of climate change are the priority. Measures should be low cost and easily modified to the context. The uncertainty of the extent of climatic changes should be considered.	(Kind et al., 2015; Mustelin et al., 2010; Rickards et al., 2014; Sherman & Ford, 2014; Simonsson et al., 2011; Woodruff & Stults, 2016)

2.8 Perceptions of Success in Climate Adaptation Planning

An understanding of the perceptions of success across stakeholders involved in climate adaptation planning is critical for improving this field of practice (Arnott et al., 2016; Sherman & Ford, 2014). In the climate adaptation planning literature, participation emerged as a critical theme related to success and it is a central component in the legitimacy and equity dimensions of success. Many top down processes of climate adaptation planning recognize the importance of prioritizing public participation and engagement (Burton & Mustelin, 2013; Moser & Boykoff, 2013, p. 270). Participation helps foster stronger community ties and build social capital (Burton & Mustelin, 2013; Woodruff & Stults, 2016). Several performance metrics are achieved through high levels of participation by legitimizing the process when actors have the opportunity to create an equitable outcome (Adger et al., 2005).

The involvement of groups affected by climate adaptation planning is a necessity to achieve intended outcomes (Mustelin, 2010). After coastal flooding in Mozambique in the year 2000 the government and aid organizations carried out various adaptation actions. Their goal was to provide housing and other services for displaced communities in the region. However, they carried out their planning and projects without receiving local input or feedback. As a result, the housing services were never utilized as they were located too far from the floodplain where people engaged in farming activities (Patt & Schröter, 2008). In the Caribbean community of Paget Island, local engagement and participation were key factors for holding project leaders accountable in constructing a water desalination plant. Without local buy-in and support the success of the project would not have been possible since community acceptance of the project was an indicator of success (Jaja & Dawson, 2014).

The importance of local knowledge also relates to participation and highlights the necessity of including local actors in the process (Eriksen et al., 2011; Vogel et al., 2007). Local knowledge can often make the difference as to whether an adaptation is successful. In one local community in Zanzibar, Tanzania coastal erosion was a serious threat to community well-being. Climate adaptation strategies developed in planning involved local stakeholders and community elders to develop interventions that could be effective in addressing threats. For example, elders identified endemic plant species to stabilize coastal areas which was a no regret solution accepted by all stakeholders (Mustelin et al., 2010). Project leaders legitimized the process by involving local stakeholders and community elders and implemented solutions utilizing place based knowledge. Similarly, Kofinas et al. (2015) detail how adaptive co-management of natural resources in interior Alaska could create novel solutions in adapting to social and environmental problems related to climate change impacts. Adaptive co-management is a governance structure in which cross-scale institutional arrangements manage socio-ecological systems in dynamic and reflexive ways (Armitage et al., 2009; Kofinas et al., 2010). The focus of adaptive co-management is to empower residents to participate in managing local resources thereby strengthening and legitimizing the management process (Ibid.).

The dynamic of top-down versus bottom-up planning is a critical theme in any process which involves stakeholders from various levels. Sherman & Ford (2014) compared 18 climate intervention projects to see how top-down and bottom-up approaches compared in their impacts on various dimensions. Their analysis found that bottom-up approaches performed better across all dimensions especially in flexibility, efficiency, and equity. It also found that

stakeholder engagement had important implications for performance of all dimensions demonstrating how important these arrangements can be for project outcomes. Top-down approaches, led by actors at higher levels, tend to value participation as outcome-oriented by strengthening project implementation using local knowledge and resources (Reed, 2008). This is contrasted by bottom-up approaches, which are community and locally focused, where participation is a way to build capacity and emphasize empowerment (Balazs & Morello-Frosch, 2013; Chapin et al., 2016; Reed, 2008). Though both approaches value participation they have different ways of achieving it. Additionally, the level of involvement of those involved may be more important than which stakeholders participate particularly in their ability to share information and have an impact on the final outcome (Burton & Mustelin, 2013; Sherman & Ford, 2014).

Participation may create challenges since it is likely there are different perceptions of success across actors at different levels or scales (Brockhaus et al., 2012). What is effective for one actor will not necessarily be effective for another. As Brockhaus et al. (2012) show with their analysis of multi-level stakeholders in Mali and Burkina Faso actors at various levels have different perceptions of successful actions. In both Mali and Burkina Faso national and subnational level actors viewed technologically driven solutions to be most beneficial and saw climate impacts as a matter of controllability to be solved by technological fixes. This was contrasted by community level actors which focused on institutional and social changes as primary solutions. Representatives of pastoralists explained that mobility is a key strategy to respond to drought whereas government representatives perceived mobility as the cause of vulnerability.

The dynamic of participation is unique for indigenous communities in the US especially in Alaska. There are 229 federally recognized tribes in Alaska that have sovereign tribal governments. These tribes possess inherent powers of self-government including authority or jurisdiction over citizens, land, and over people who enter their land (Alaska Department of Law, 2000). An important feature of sovereign tribal government in Shaktoolik and other federally recognized tribes is the government-to-government relationship with the federal government of the United States of America (Ibid.). This relationship with the federal government is unique to federally recognized tribes and makes climate adaptation planning dynamics different than planning with non-tribal local governments. However, this relationship is complicated by the financial reliance on federal and state governments for critical functions within tribal communities such as infrastructure, education, transportation, and utilities. Reliance on state and federal funding for climate adaptation efforts further adds to the complication of tribal governments enacting their sovereignty.

2.9 Differences in Perceptions of Success

Differences in perception of success may be related to the way different groups view the world. In Alaska, traditional ecological knowledge (TEK) has been in use for thousands of years and dictates how many Alaska Native communities view the world (Krupnik & Jolly, 2002). TEK and western science are often complementary in relation to experiential knowledge, field observations, and understanding complex socio-ecological systems (Ibid.). However, they are based on different paradigms of nature-human interactions and understanding with western science separating humans from the environment and TEK viewing nature and humans as an inter-related, all-encompassing system where treatment of animals and the environment has

biophysical and social implications (Berkes, 1999). Western science often emphasizes the facts (“what is”) whereas indigenous perspectives emphasize relationships between people and living or non-living things (“how to”) (Cochran et al. 2012). Through mutual respect and understanding of these and other forms of knowledge the stage can be set for collaboration and coordination across diverse perspectives (Kofinas et al., 2007). Western science and TEK paradigms influence human perceptions and as a result affect the actions that people choose for adapting to change (Kofinas et al., 2010).

Perceptions of success related to risk also determine behavior and dictate how an actor will respond to climate or non-climate risks. In the Mozambique example mentioned above, farmers had drastically different perceptions of changing stressors (both climate and non-climate) compared to policy makers (Patt & Schröter, 2008). Farmers were more concerned with increases in drought and impacts on farming than climate related increases such as flooding whereas policy makers perceived climate related stressors to be more threatening than non-climate related ones (Ibid.). Social, cultural, and economic conditions determine how people perceive climate risk and these perceptions influence behavior (Ibid.). These factors also have implications for the perception of success since individuals will view interventions positively or negatively depending on the perception of risk and how that risk was addressed.

In other fields, perception of success is a critical area for analysis and yet it is under-researched like the project management field (Davis, 2014). In that field, it has been shown that perceptions of success, performance, and evaluation criteria among stakeholders are important for informing practice and reducing project failures (Ibid.). Davis (2014) performed a key literature review of 29 peer reviewed articles to understand several questions related to

perceptions of project success including: what are the different perceptions of project success factors between different stakeholders which have been identified in the literature? Findings showed that overlapping perceptions of project success between the three major stakeholder groups of senior management, project core team, and project recipients varied widely. Project recipients and the project core team agreed on four success factors out of nine (communication, time, stakeholder satisfaction, and cost/budget). The project core team and senior management agreed on three factors, and project recipients and senior management only agreed on one factor of project success. These findings highlight the discontinuity between the three major stakeholder groups and leads to the question: what effect do these differences have on collaboration (Davis, 2014)?

2.10 Challenges in Assessing Perceived Success

The spatial and temporal scale of climate adaptation planning pose challenges for assessing success. The spatial scale of climate adaptation planning refers to the geographic area in the location of concern that is affected by climate change and climate change responses. Instances may occur where an adaptation in one location may be successful, but come at the expense of people in another location. One relevant example is shoreline armoring that reduces erosion for one community, but shifts sediment distribution and changes wave action down shore thereby creating problems for others (Adger et al., 2005; Gordon et al., 2010). The spatial delineation of the adaptation can be contentious as well since an actor may focus on one area while ignoring others. This occurs in situations where an agency focuses resources on one intervention leaving unresolved issues to other agencies and potentially viewing that as another agency's problem (Adger et al., 2005).

There are various timelines in which climate adaptation planning occurs. Ongoing adaptation planning may become the status quo since climate change impacts will need to be addressed for the coming decades and centuries (Moser & Boykoff, 2013). Ongoing climate adaptation planning will make it necessary to continuously evaluate the process as opposed to relying solely on outcome evaluation. In analyzing the process it will be important to take stock mid-course against predetermined metrics and goals (Ekstrom & Moser, 2013). Monitoring and evaluating throughout the process may be necessary for iterations and reanalysis as this is an essential part of adaptive management and social learning (NRC, 2010). A challenge to this process may be disruptions due to electoral cycles or inconsistencies in funding. This was the case in the City of Prince George where local government prioritized climate adaptation planning, but were unable to mainstream their plans after a new administration took office (Picketts, 2015). The incoming administration was more fiscally conservative regarding climate adaptation and less inclined to invest in such programs therefore much of the progress made previously was in vain and seen as unsuccessful by actors involved (Ibid.).

In addition, the future unknown state of the world, related to human and natural systems, creates a temporal challenge for climate adaptation planning. Making decisions in the present that will affect society well into the future is a challenge due to the extent of these rapidly changing systems. However, making decisions under increasing uncertainty will be required of actors now and in the future (Adger et al., 2005; Gordon et al., 2010).

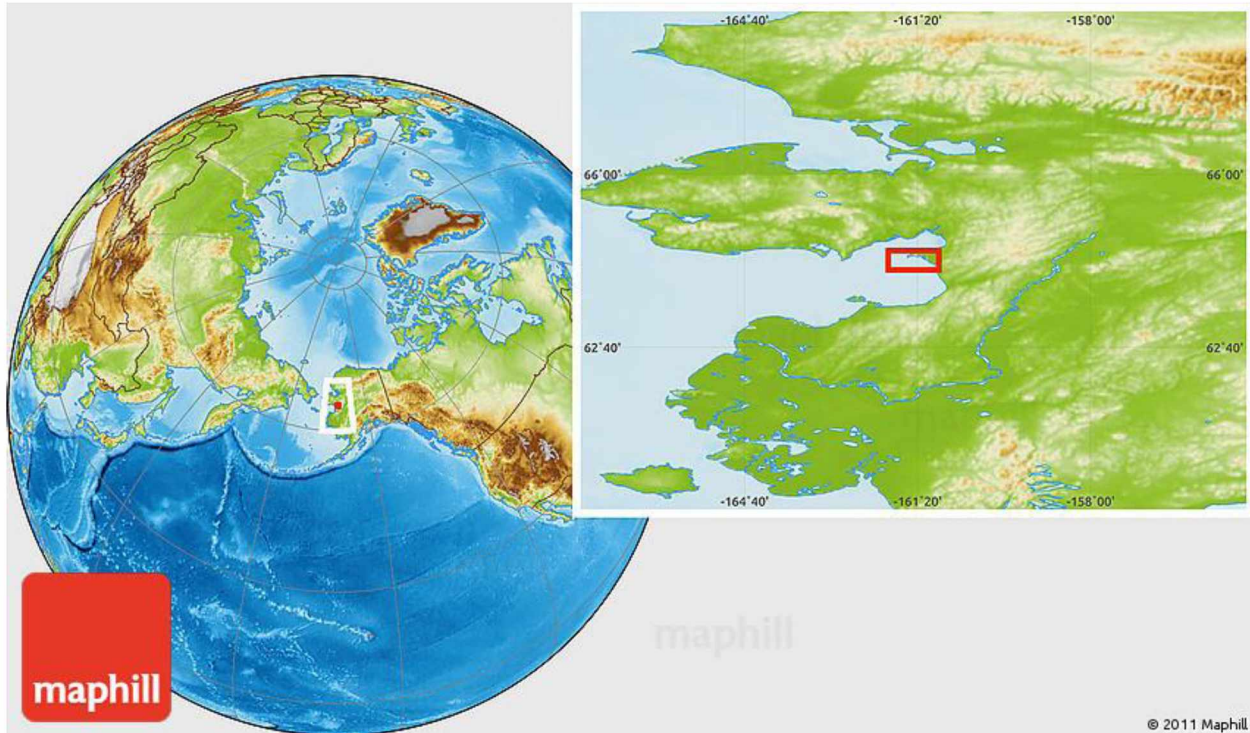
2.11 Research Gaps

I found three important areas in the field of successful climate adaptation planning to be under reported in peer reviewed publications. The first area is related to the factors that lead a community to begin the climate change planning process. For example, motivation and willingness to engage in climate adaptation planning are necessary precursors, but information on what leads to those factors is often not clear. Once the climate adaptation planning process begins the dynamic that occurs between community and non-community actors is not sufficiently documented from the community point of view (Sherman & Ford, 2014). This is particularly the case as it relates to the legitimacy of the process, the level of equity in the outcome, and how participation may affect other dimensions of success (Ibid.). Lastly, empirical, community-based definitions of success in climate adaptation planning is an under-researched area that has the potential to provide critical information for non-community actors to improve collaboration when planning and implementing climate adaptation interventions (Chapin et al., 2016; Gordon et al., 2010).

Chapter 3. Background

The community of Shaktoolik is located on a spit along the coast of Norton Sound in Northwest Alaska at 64°21'N, 161°11'W (Google, 2017). The population is approximately 260 people of which 95% are Alaska Native predominately descending from Unalit Yup'ik and Malemiut Inupiat peoples (Census Bureau, 2010). Shaktoolik is bordered on both sides by water with Norton Sound to the west and the Tagoomenik River, also the source of community drinking water, to the east. Shaktoolik is approximately 125 miles east of Nome and 40 miles North of Unalakleet (AEIDC, 1975). The Tagoomenik River and the Shaktoolik River converge nearly two miles northwest of the village site and then empty into Norton Sound. The region is separated into two geographic provinces, the lowlands which begin at the coast and extend inland to the east for approximately 13 miles (Ibid.). These coastal lowlands are mostly treeless and dotted with small tundra lakes. The Nulato Hills rise 1,000 to 2,000 feet running north to south and separate the river drainages to Norton Sound in the west from the Yukon River in the east (Ibid.).

Figure 1: Map and location of Shaktoolik, Alaska



Source: Maphill, 2011

The residents of Shaktoolik rely upon a diverse array of foods and resources. The sea provides large marine mammals such as beluga whale, bearded seal (ugruk), and harbor seal. The rivers provide many fish species such as salmon, burbot, and whitefish. Land animals include arctic ground squirrel, hare, muskrat, wolf, fox, lynx, wolverine, caribou, and moose. Other animal resources include birds such as geese, ptarmigan, crane, and duck. The land provides a wealth of various berries, greens, wild potatoes, and other foods, medicines, and culturally significant plants.

Shaktoolik's climate is subarctic with maritime influences. Average temperatures in the summer are between 47-62°F and between -4 and -11°F in the winter (AEIDC, 1975). Extreme

temperatures are not uncommon and vary between -50°F in the winter and 87°F in the summer. Winds are strong along the coast averaging 20 miles per hour. Average annual precipitation is 14 inches of rainfall with 43 inches of snowfall. Shore fast sea ice typically accumulates in late fall or early winter and helps buffer the coast from storm surges which are common during this time of year.

The region around Shaktoolik has been occupied for at least 6,000 to 8,000 years (Giddings, 1964; NPS, 2010). The Unalit people which are Yup'ik were the main inhabitants prior to the nineteenth century (Ray, 1975). Malemiut Inupiat traders from the Kotzebue area slowly migrated into the region over several years attracted by trade with the Russian-American Company trading post in St. Michael (Ibid.). By 1880 Shaktoolik was the southernmost Malemiut village. Historically, the people of the region utilized seasonal settlements pursuing economic opportunities and capitalizing on seasonal harvests. Winter settlements occurred along the coast while in the spring people moved up river, inland and along the coast. The social organization of the community was typical of the Bering Straits region with a large village surrounded by several socially and linguistically related settlements (Ray 1964:61).

By the turn of the 20th century permanent settlements became more common in the greater Shaktoolik area and as a result relocations were necessary. For example, the community of Rabbitville was established around a school up the Shaktoolik River several miles (Koutsky et al., 1981). Unfortunately, the river was too shallow to allow barge resupply and boat access so the community relocated five miles from the mouth of the river. A government schoolhouse was established here, but this site was also abandoned due to lack of accessibility for resupply. The community relocated to the coast in the 1930's approximately five miles

south of the mouth of the Shaktoolik River. This location is referred to as Old Site and was susceptible to erosion and severe fall storm surges. Following severe flooding in 1969 the community voted to relocate approximately two miles North to the current location. This location was chosen because of the proximity to subsistence resources and the shallow location would offer more protection from fall storms. A list of the top ten storm surge events as identified by the U.S. Army Corps of Engineers in Shaktoolik over a 56 year period is shown below in Table 2.

Table 2 below ranks the 10 most severe storms in Shaktoolik, number 1 being the most severe, according to the U.S. Army Corps of Engineers. It shows the date the storm started, the maximum surge in feet at mean lower low water (MLLW), the wind direction, and the return period which is equal to the percentage likelihood of exceedance in any particular year (10 year return period = 10% chance of exceedance) (USACE, 2011).

Table 2: Top Ten Storm Surge Events in Shaktoolik from 1954-2009

Rank	Starting Date	Max. Surge, MLLW (ft)	Max Wind Direction	Return Period in Years
1	Oct. 1, 1960	16.24	SW	58.2
2	Nov. 10, 1974	14.44	SSE	48.1
3	Nov. 26, 1970	12.70	SW	26.2
4	Nov. 14, 1966	12.47	SSE	24.8
5	Nov. 8, 1978	12.07	SSE	20.1
6	Aug. 25, 1975	11.16	SSW	14.8
7	Oct. 15, 2004	11.12	SSW	14.7
8	Sept. 18, 2005	10.76	SSW	11.4
9	Nov. 12, 1965	10.63	S	10.6
10	Oct. 25, 1996	10.6	S	10.1

Source: USACE, 2011, p. 11

Currently in Shaktoolik, there are three governing entities: The Tribal Council, the City Council, and the Shaktoolik Native Corporation (*Alaska Native Claims Settlement Act of 1971, 43 USC Chapter 33, 1971*). The Tribal Council, also called the IRA, or officially the Native Village of Shaktoolik IRA Council, was established in 1940 and is the federally recognized Tribal governing authority in Shaktoolik. The City Council, or the Municipal Government for the City of Shaktoolik, was incorporated in 1969 and is often the point of contact when working with state level agencies. The Shaktoolik Native Corporation, also referred to as the Village Corporation or just the Corporation, was created in 1971, has land entitlements of approximately 121,000 acres and 205 shareholders.

The climate adaptation planning process in Shaktoolik involves many different entities. Each entity plays a different role and has a different focus. It is important to note that many agencies and organizations have been involved in Shaktoolik in various capacities. Tribal government actors include individuals representing the three governing entities of the Tribal Council, the City Council, and the Village Corporation. Some individuals are involved in more than one organization as they hold positions in multiple organizations within the community.

At the state level, the main agencies involved in climate adaptation planning in Shaktoolik are: The Division of Community and Regional Affairs (DCRA), Department of Military and Veteran Affairs (DMVA), Department of Transportation & Public Facilities (DOT&PF), and Department of Environmental Conservation's Village Safe Water (VSW). DCRA has been the main player at the state level and has been a conduit for getting grants and bringing resources to Shaktoolik to engage in the climate adaptation planning process. DMVA are focused on the emergency management aspect of climate adaptation planning specifically focused on how to

plan for a natural disaster such as a mass flood or a severe storm. DOT&PF are charged with maintaining airports, roads, and public infrastructure in Shaktoolik and provide technical expertise. VSW assists with water and sewer infrastructure in Shaktoolik and their involvement in the planning process was limited yet their perspective is valuable due to their role working with the community.

Federal agencies involved are the Denali Commission, the Environmental Protection Agency (EPA), Housing and Urban Development (HUD), and the United States Army Corps of Engineers (USACE). The Denali Commission is a state-federal partnership that was established in 1998 to invest in and develop rural communities in Alaska (Denali Commission, 2016). In 2015, the Obama administration shifted the Denali Commission's responsibility to be the federal lead entity for addressing relocation and climate related issues for rural communities in Alaska (White House, 2015). The Denali Commission was not very involved in the planning process, but has become a central actor during the implementation phase to assist with carrying out some of the actions identified during planning. The EPA is also a resource utilized particularly for funding related to air, water, and waste. The EPA's Indian Environmental General Assistance Program (IGAP) provides annual funding that can be used for climate change related programs (EPA, 2016). HUD is also a resource that provides technical or financial resources related to housing if requested. HUD might become an important player if relocation becomes the priority in Shaktoolik. USACE played a key role early on in surveying and studying erosion sites in Shaktoolik as well as looking at historical and current flood impacts. However, USACE have not been directly involved throughout the planning process.

Other groups involved in Shaktoolik's climate adaptation planning include non-profit entities and consultants. The most significant non-profit entity is Kawerak, Inc. which is the Alaska Native non-profit corporation for the Bering Straits region. In Shaktoolik, Kawerak has assisted in attaining funding for planning and other projects and is often a valuable resource for financial or technical assistance as well as advocacy. Alaska Sea Grant, a partnership between the University of Alaska Fairbanks and NOAA, was also involved in facilitating the planning process which produced Shaktoolik's Climate Adaptation Plan in 2014 (Johnson & Gray, 2014). Of the many consultants involved in climate adaptation planning in Shaktoolik the key players are: Glenn Gray & Associates and HDR, Inc. Glenn Gray & Associates were first contracted by Kawerak in 2010 to "compile existing information about threats from natural hazards to Shaktoolik to assist the community in future planning" (Gray, 2012). This firm then went on to partner with Alaska Sea Grant and work with the tri-org council on developing the Climate Adaptation Plan or CAP (2014). Another consulting firm HDR, Inc. were chosen by DCRA in a request for proposal to develop a Strategic Management Plan (SMP) for Shaktoolik, Shishmaref, and Kivalina. Shaktoolik's plan was completed in 2016 and is now the guiding document used by the Denali Commission for implementation. The last consulting firm included in this research is Water Policy Consulting, LLC which leads the Norton Bay Inter-Tribal Watershed Council (NBITWC) of which Shaktoolik is a member. NBITWC's goals are to develop local and region wide strategies for adapting to climate change (Shepherd, 2017).

Chapter 4. Methods

This project took a case study approach (Bernard, 2011; Yin, 2013) to better understand how the community of Shaktoolik, located on the northwest coast of Alaska, is and has been adapting to the impacts climate change. A case study approach was chosen because it proposes to answer how and why questions, the investigator has little or no control of the events, and the focus is on a contemporary phenomenon within a real life context (Yin, 2013). This project was done in partnership with the Tribal Council of Shaktoolik over a 12-month period starting in October of 2016 and finishing in October of 2017. Other participating community entities included the Shaktoolik City Council and the Village Corporation. This project also involved non-community actor groups familiar with and involved in climate adaptation planning in Shaktoolik. Non-community actor groups included state agencies, federal agencies, non-profit organizations, and consultants. Data was collected in Shaktoolik over the course of 4 weeks and 3 separate trips. I also spent four days in Shaktoolik in August of 2017 to get feedback from participants and the Tribal Council. In addition, one week was spent in Anchorage to interview representatives of non-community actor groups.

There are several reasons why Shaktoolik was considered for this research. Shaktoolik is currently listed as one of the most climate change threatened communities in Alaska (IAWG, 2009; USACE, 2009). For approximately 12 years the local government has been working with non-community actors to address existing climate change impacts and planning for future ones. The extent of planning and the amount of involvement from all levels of government including consultants and non-profit entities made Shaktoolik an ideal case study to better understand perceptions of success in climate adaptation planning among key actors involved.

Ethical guidelines for conducting research with indigenous populations (AFN, 1993; Faculty of Social and Human Development, 2003; IARPC, 1995) were used to guide this research process. In the research design phase I contacted the Shaktoolik Tribal Council to gauge their interest in a research partnership. The Tribal Council was receptive and after an initial scoping visit to align interests we agreed upon project terms. The Tribal Council was involved throughout the research process and gave valuable feedback to guide and direct the research. This was done during Tribal Council meetings and informal conversations with members and employees of the Tribal Council. All materials produced through this research were cleared with staff and members of the Tribal Council prior to distribution or publication. The research questions that drove this project were developed in coordination with the Tribal Council and are as follows:

1. What is the historical context for climate adaptation planning in Shaktoolik, Alaska?
2. How do community and non-community actors perceive success in climate adaptation planning in Shaktoolik, Alaska?

Qualitative research methods were used to answer the research questions in this project. These methods were document analysis, participant observation, and semi-structured interviews. Table C below summarizes the data collection methods and details related to this process. There were 18 documents used for analysis which were found through a web based search using the terms “Shaktoolik climate planning”, “Shaktoolik climate change”, “Shaktoolik planning”, and “Shaktoolik environmental planning”. The documents utilized included planning documents, assessments, and reports done over the past 12+ years of climate adaptation

planning. These documents were used to design interview questions and drive conversations as well as to check and corroborate responses to interview questions. Site visits to Shaktoolik provided opportunities to collect data via participant observation and semi-structured interviews. Site visits to Shaktoolik occurred in October 2016 (1 week), January 2017 (2 weeks), April of 2017 (1 week). A final trip in August of 2017 (4 days) provided an opportunity to get feedback from interviewees about research findings. Participant observation was utilized to gain data on how different people in the community talk about climate change (Bernard, 2011; Taylor et al., 2015). The purpose of participant observation was to better understand the insider point of view while inevitably remaining an outsider (Ibid.) by observing people in Shaktoolik, how they talked about climate change, and the way various institutions operated. Observations were recorded via pen and paper in real time or as soon as possible. A report of daily events and happenings were kept daily and all notes were analyzed in Nvivo to inform findings (Bernard, 2011, p. 387; Strauss & Corbin, 1990).

A total of 26 semi-structured interviews were conducted as shown in Table C below. Interviews with three elders provided much of the information on the historical aspects of climate adaptation planning. There were 15 interviews conducted with past and present leaders from the Shaktoolik Tribal Council, City Council and Village Corporation as well as employees from each of these entities. There were two people interviewed twice since they are elders and one serves on the Tribal Council while the other serves on the Village Corporation board. Only one individual from the Tribal Council was unavailable for an interview due to time constraints. Semi-structured interviews were conducted with 11 representatives from non-community actor groups that were involved in climate adaptation planning in

Shaktoolik. The entities included in this research were those most involved and aware of Shaktoolik's process. They were identified through snowball sampling, interagency working group meeting minutes, and planning documents.

In Shaktoolik, interviews were conducted in homes, offices, and the school building during the months of January and April of 2017. There were 12 non-community actors interviewed in the coffee shops and office spaces of Anchorage in March 2017. There were three non-community actors contacted for interview that declined to sign consent forms or did not complete the interview in a way that enabled usage of the information and therefore their responses were omitted.

There were numerous topics covered with interviewees regarding successful climate adaptation planning in Shaktoolik. Major topics discussed included the interviewee's role and involvement in planning for climate change in Shaktoolik, their perspective in working with other entities, and whether the dimensions of success (Table 1) were important and if so, why. Other topics included barriers to planning for climate change in Shaktoolik, ideas for improvement, as well as the spatial and temporal aspects of planning. Interview protocols for both community and non-community actors can be found in Appendices A & B. Appendix C shows a summary of themes from data analysis which demonstrates how themes were coded including the sources (how many interviewees discussed each theme) and the references (how many times the theme was discussed).

This research was approved by the ethical Institutional Review Board (IRB) of the University of Alaska Fairbanks [948377-2]. Interviews were recorded with an audio device at the consent of participants which was over 90% of the interviews. One participant requested

the interview not be audio recorded and one recording was lost due to technical difficulties.

There was 1 indiscernible audio recording however, written notes supplemented the interview and were used for analysis. Interviews were transcribed from audio format with transcription software and analyzed using Nvivo Analysis software.

The seven dimensions of success (Table 1) were used for generating interview questions. During data analysis, the first examination of the data also used these dimensions as a framework for understanding how different actors perceived success in climate adaptation planning. A list of these dimensions and their descriptions are shown in Table 1. The second examination of data used Grounded Theory to identify themes inductively that were commonly discussed across interview participants and explored these themes to understand their importance in the context of this research (Strauss & Corbin, 1990). Data from document analysis was used to reference and verify findings in both phases of analysis of the data. The process of data sampling, data analysis and the development of theory was completed when saturation was reached and new data did not change the developed theory (Strauss & Corbin, 1990). Table 3 below shows each method of data collection, the amount of resources associated with each method, when they occurred, and details related to each one.

Table 3: Data Collection Methods and Details

Method	Amount	Timeline	Details
Document Analysis	18 total documents	Mar 2016-Oct 2017	-Identified through web based search using key words -Used to provide background information, design interview questions, and verify or illuminate findings
Participant Observation	NA	Oct 2016 (1 week) Jan 2017 (2 weeks) Apr 2017 (1 week)	-Occurred during 4 weeks of field work -Included informal interactions and conversations related to planning, climate change, institutional dynamics, and community behaviors -Notes analyzed with Nvivo software
Semi-structured Interviews	26 total interviews	Jan 2017 (2 weeks) Mar 2017 (1 week) Apr 2017 (1 week)	-7 dimensions of success informed core interview questions for understanding perceptions of success -Participants identified through snowball sampling, interagency working group meeting minutes, & planning documents -A week of field work in March spent in Anchorage interviewing non-community stakeholders -Data analyzed using Nvivo software

In Table 4 below, each actor group is shown, then I note if they were interviewed, the total interviewed from each actor group, the response rate, and related comments. As noted in the table, two participants did not respond to inquiries for an interview in a way that enabled data collection. There was one individual interviewed but unwilling to sign a consent form. As mentioned above there were two elders interviewed twice since one was also interviewed as a Tribal Council member and the other was interviewed as a Village Corporation board member.

Table 4: Groups Interviewed

	Stakeholder Group	Interviewed	Number	Response Rates	Comments
Tribal	Shaktoolik Tribal Council	Yes	8	88%	1 unable to respond
	Shaktoolik Local Corporation	Yes	2	100%	
Local	Shaktoolik City Council	Yes	2	100%	
	Shaktoolik Elders	Yes	3	100%	
State	Division of Community & Rural Affairs (DCRA)	Yes	1	100%	
	Dept. of Military & Veteran Affairs (DMVA)	Yes	1	100%	
	Village Safe Water (VSF)	Yes	1	100%	
	Dept. of Transp. & Public Facilities (DOT&PF)	Yes	2	100%	
Federal	Environmental Protection Agency (EPA)	Yes	1	100%	Lack of consent Unable to respond
	Housing and Urban Development (HUD)	Yes	0	0%	
	U.S. Army Corps of Engineers (USACE)	No	0	0%	
	Denali Commission	Yes	1	100%	
Other	Glenn Gray & Associates	Yes	1	100%	Lack of consent
	Kawerak, Inc.	No	0	0%	
	Alaska Sea Grant	Yes	1	100%	
	HDR, Inc.	Yes	1	100%	
	Water Policy Consulting, LLC	Yes	1	100%	

Chapter 5. Results

5.1 The Historical Context for Climate Change Planning in Shaktoolik

In the following section I will discuss what was found regarding the context for climate change planning in Shaktoolik. These findings were developed through the data collection process particularly during participant observation and interviews as participants highlighted many details that gave a richer context for understanding success. The story that emerged was mainly derived from community participants and corroborated by agency representatives and consultants.

When discussing climate change planning in Shaktoolik it was striking that residents frequently start by discussing previous relocations that have taken place. Fall storms are not a recent phenomenon for the community of Shaktoolik. Community members (n=6) note that since moving to the coast at the location referred to as Old Site in the 1930's they had been exposed to storm surges. Old Site is located on what the coastal engineers call a source. A source is an area of coast where sediment material is transported to other areas of the coastline through wave action and ocean processes (Rosati, 2005). The coastline in front of Old Site is prone to erosion which left the community increasingly exposed to storms so that even smaller storms were having a detrimental impact on the safety and well-being of the community.

According to elders interviewed (n=3), throughout the 1960's storms consistently threatened the safety of the community and in 1970 a particularly large storm struck the region. The storm flooded the community and left debris strewn across the airport and the

village. It took three days and every able person to clear the airport of the debris so that flights could resume. Around this time the community decided to relocate to safer ground. Several locations were possible but only two were seriously considered. One location was at a place referred to as Foothills located approximately 11 miles inland at the base of the Nulato Hills. The other location was two miles north, along the coast, towards the mouth of the Shaktoolik River which is now known as New Site. The decision to move was extremely contentious, split along family lines, resulting in three more votes for the New Site location. The main motivation for moving to New Site was the proximity to subsistence resources. Establishing a location near the coast and having easy access to the Shaktoolik and Tagoomenik Rivers was a priority for hunting, fishing, and other subsistence purposes.

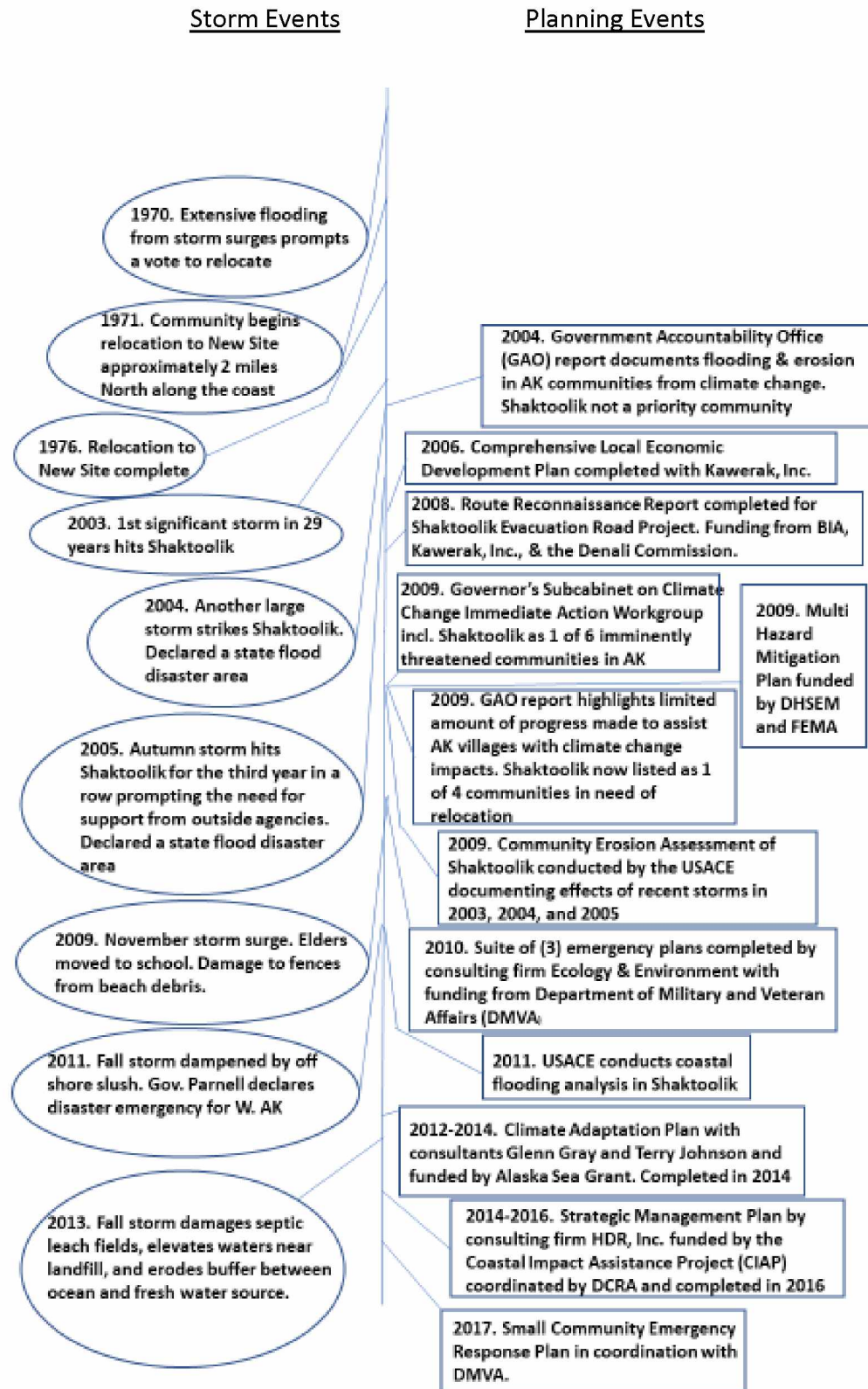
The move to New Site occurred over the course of several years and by 1976 the community was living at this new location. The first people to move were elders and their families. Alaska Housing Authority and Housing and Urban Development (HUD) provided financial support and resources to assist with building at the new location. Community leaders continued to develop New Site over the course of the next 3 decades establishing indoor plumbing, running water, tank farms for heating fuel, a school building, telecommunications and many modern conveniences that have dramatically increased the quality of life as well as the amount of infrastructure in the community.

For nearly three decades the move to New Site provided safety and protection from storm surges. Though the U.S. Army Corps of Engineers have documented storms occurring in Shaktoolik between the time of relocation to New Site (1976) and the early 2000's other evidence points to a lack of significant storm impacts for approximately 29 years. Then fall

storms in 2003, 2004, and 2005 struck the community leading to renewed concerns over how to address these natural disasters. The impact of three consecutive years of significant storms prompted the Tribal Council to seek financial and technical support from federal agencies, state agencies, state representatives, and federal representatives. However, state and federal agencies required the community of Shaktoolik to have a plan of action and strategy for how technical and financial assistance would be allocated. This prompted the Tribal Council with the support of the City Council and the Village Corporation to engage in an extensive planning process that spanned over a decade. Figure 2 below, shows the history of storms and planning that occurred in Shaktoolik starting at Old Site and continuing to present day. As shown in Figure 2, planning in Shaktoolik has been ongoing since the three consecutive storms in 2003, 2004, and 2005, and the damage from storms has increased in recent times as well.

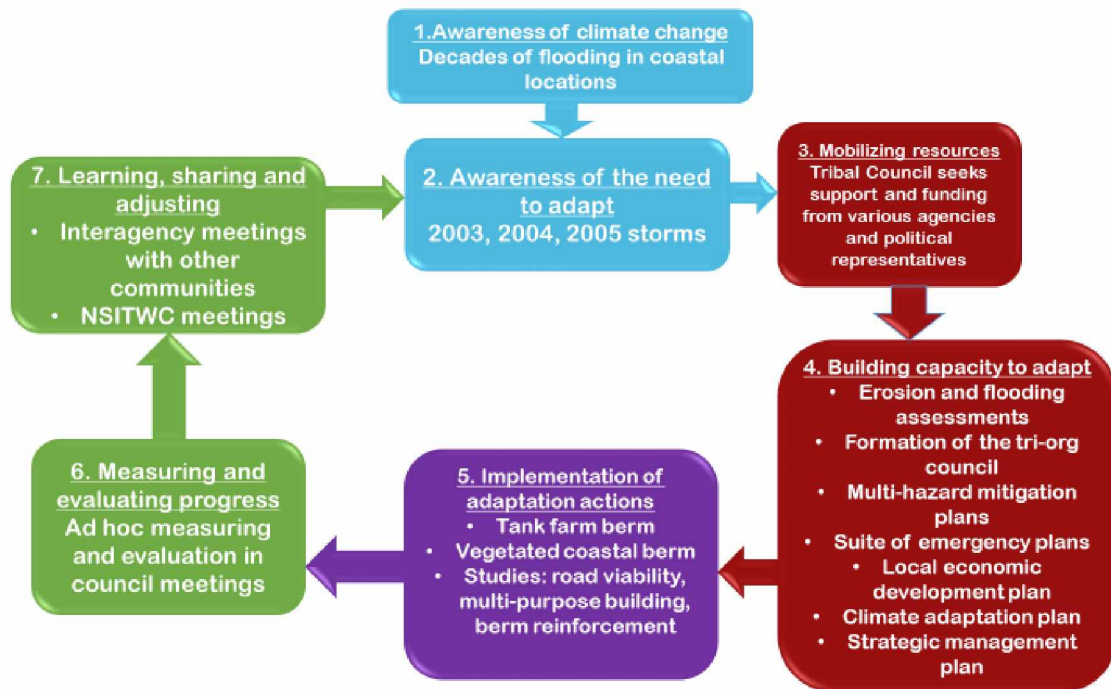
The most notable change that residents highlighted was decreasing sea ice in and around Shaktoolik. Shore fast sea ice plays a vital role in buffering storms in Shaktoolik and historically it would form by mid-November to mid-December. Freeze-up is occurring later each year and often it does not form a cohesive ice pack until January. In the winter of 2015/2016 residents (n=6) explained that there was no ice pack and the ocean in front of the village was open water and slush. When the shore fast sea ice takes longer to form there is a bigger window of time for storms to strike the coast with nothing to impede wave action. This also increases erosion since there is more time each year for waves to erode susceptible areas.

Figure 2: Visual Timeline of Events Related to Climate Adaptation in Shaktoolik



In Figure 3 below, Shaktoolik’s cycle of climate adaptation planning is presented which shows the extent of this planning in Shaktoolik and the iterative nature of the process. This cycle of climate adaptation planning shows events that have already taken place in Shaktoolik while planning for climate change. The figure shows how the decades of flooding in coastal locations created an awareness and a need to plan for climate change impacts and address these impacts. It is important to note that planning in Shaktoolik has occurred over several different individual planning processes spanning the past 12 years (2005-2017). This process is ongoing as local leaders continue to implement their climate adaptation strategies such as building a road and improving berms.

Figure 3: Cycle of Climate Adaptation Planning in Shaktoolik



(Trainor et al., 2017)

5.2 Perceptions of Success in Climate Adaptation Planning

The findings on the perceptions of success of stakeholders involved with climate adaptation planning in Shaktoolik are organized using the seven dimensions of success from the literature. As noted previously these dimensions were used as a framework for the interviews and for the analysis of the data from those interviews. The following section goes through each dimension and discusses the themes that were prevalent across stakeholder groups. The dimensions were not ranked by participants by level of importance however, several dimensions were discussed in greater detail and depth than others. Effectiveness, legitimacy, and sustainability generated the most discussion and interest among participants which could justify prioritizing these dimensions over the remaining four dimensions.

During the interviewing process, it became evident that planning for climate change in Shaktoolik is not limited to one or two planning processes. For community members climate change planning has occurred over the past 12 years and included numerous different agencies and stakeholders. Therefore, findings are related to climate change planning that began in 2005 at the community level and continues to present day.

5.2.1 Flexibility/Addressing Uncertainty

The dimension of flexibility is concerned with interventions that are low cost, modified to the context, beneficial under multiple scenarios, and robust (Kind et al., 2015). Initially, interviewees were questioned about flexibility, however for some the concept was confusing and those participants had a difficult time answering. The question was rephrased to specify if uncertainty was important to address and if so, why. Though this deviates slightly from the

complete definition of flexibility found in the literature it does provide insight into adaptation actions that are beneficial under multiple scenarios of climate change.

When asked about addressing uncertainty, interviewees from Shaktoolik (n=4) often focused on emergency preparedness because for them safety and well-being of the community is priority number one. Preparedness is a low-cost strategy that enables the community to respond to scenarios related to storm surges. This is also a priority for non-community representatives as multiple interviewees (n=3) emphasized the importance of emergency preparedness. A federal agency interviewee stated, “for me success is keeping people safe because I think first and foremost there are major health and safety issues (19).” In Shaktoolik storms can strike at any time though they are most common in the fall to early winter. Participants highlighted that having established protocols and options in place to deal with these events is critical. Respondents felt that this was the best way to deal with the uncertainty of when a storm might happen or the intensity of it. At the time of this report the community was engaging in a Small Community Emergency Response Plan with the support of DMVA. Short term responses include having an evacuation plan, having emergency supplies ready, and practicing emergency drills.

Leaders in Shaktoolik are also looking at mid to long term solutions to address flooding and erosion including how a storm might affect infrastructure and how erosion might affect the viability of the community. Mid-term strategies included establishing a storm surge mound, like a tsunami mound, where people could go in case of a mass flood that wipes out the current evacuation site which is the school building. Other mid-term solutions include reinforcing the berm and improving evacuation routes by using lighted buoys. The long-term response is

developing a road that would lead to a potential relocation site. The relocation site is called Foothills and was the other option for relocation in the 1970's. A road is particularly important during times of high water since the village is on a spit and could become an island if the barrier between Norton Sound and the Tagoomenik River is breached.

The consultants interviewed confirmed that flexibility was important for dealing with the increasing impacts of storms and flooding (n=3). In the Strategic Management Plan or SMP (2016) flexibility was built in by having a mix of action items, some being low cost and easy to implement while others might take longer and require more funding and agency support. Another consultant added that the initiatives in the Climate Adaptation Plan or CAP (2014) were a nine-item wish list. He said, "Any of those items could be dropped or a new item could be added. All it was saying is here's a list. These are things you want to pursue (1)." This is consistent with a federal agency representative's point of view when asked how well the consultants did incorporating flexibility in the plans. "They did well enough. The plans were more like a guidance about what the community thinks is important and what they want to do about it (9)." For DMVA, accounting for the uncertainty of storms is a clear-cut task by putting an emergency plan in place and having that document to turn to in the event of a disaster. Beyond that DMVA's strategy is to stay actively involved with Shaktoolik's process to support them in what they want to do. DMVA see this type of relationship as an important step for achieving a more resilient community and moving towards sustainability.

5.2.2 Sustainability

The dimension of sustainability includes the time component of adaptation strategies. Often short-term solutions can become a maladaptation and sometimes short-term actions

create path dependencies with negative results. The focus for sustainable interventions should be on adaptations that create long term solutions and promote resilience.

For community members the topic of sustainability has to do with location (n=7). Their current 'defend in place' strategy has become more viable as they explore and pursue options to mitigate for natural disasters. Strategies for this include constructing a storm surge mound, developing a road which could help in the event of an evacuation, and reinforcing the berm which provides a buffer between the community and storms. A long-term focus on moving, but defending in place in the meantime was prevalent throughout the community not only among interview participants, but also among other community members who offered their opinion. Some community members think the previous generation did not fully consider sustainability when they relocated to their current site in the 1970's. During a site visit of erosion sites an elder shared his dismay that his grandpa did not think about him when they relocated before. This is something that the current leaders are concerned about since they do want this to happen again. As one community member mentioned, "they [community leaders] are looking further down the road not just five years, ten years. They're looking further, they're looking at their grandkids, their great grandkids (24)."

Several important perspectives were noted by non-community actor representatives on the topic of sustainability. Among consultants and several state agency representatives there is agreement that a holistic approach should be a priority (n=3). According to non-community interviewees a holistic approach is one that creates a sustainable Shaktoolik where the community is safe, secure, functioning economically, has access to reliable and affordable food, has control over their own infrastructure, and can determine for themselves the best path

forward. It is important to note that these aspects of sustainability are not all directly related to a changing climate. Self-determination and independence were themes discussed by several non-community actor interview participants regarding sustainability. A state interviewee emphasized,

“The whole outcome of the project was that the community took charge of their own project. Give them the tools instead of building it for them. We tried to educate them on the coastal processes and through the three year process continued to improve their confidence in their observations so that if an engineer comes out they know how to interact and respond (6).”

5.2.3 Legitimacy

The dimension of legitimacy is tied to participation of various stakeholders especially groups affected by the outcomes and it is concerned with the level of transparency of the process. Legitimate planning involves all groups relevant to the process and provides an opportunity for those groups to participate in a meaningful way.

Among state agencies creating a legitimate process is a priority. Several interviewees (n=2) noted that achieving a legitimate process is necessary for developing a plan that does not end up on the shelf. A state representative highlighted this problem.

“We were spending a lot of money to have contractors write plans on behalf of communities and then we would hear from communities, ‘Well we weren’t involved in writing this and we don’t want this.’ And sometimes that’s because the people you’re talking to at the moment weren’t involved. It’s not that the community wasn’t involved but that entity or that hierarchy wasn’t involved (9).”

To create an inclusive process the consultants working in Shaktoolik made it a priority to confer with the City Council and the Local Corporation instead of only working with the Tribal

Council. For example, the CAP (2014) was crafted over two years in meetings between consultants, state agencies, and the governing entities in Shaktoolik. Involving all three governing entities in the community (the Tribal Council, the City Council, and the Corporation) was important among community members and to outside agencies. In fact, 12 interviewees mentioned how important it was that all three governing entities have been involved in planning efforts. This reflects the strength of these institutions within the community as they are the recognized governing bodies essential in the planning process.

There were, and there continues to be, efforts by community leaders to include different groups within the community in the planning process. At the beginning of developing the SMP (2016) elder interviews were conducted to better understand how elders felt about the challenges they experienced in the community and what should be done about it (RIM, 2015). There was also a community wide survey to make sure various points of view were being considered. The SMP (2016) was created by working with the tri-org in Shaktoolik and inviting “nearly 80 organizations to participate” as part of the agency workshops.

Community participants (n=5) responded to the question about legitimacy by noting that all three of Shaktoolik’s governing bodies were involved in planning (the Tribe, the City, and the Corporation also known collectively as the tri-org) and two people noted that meetings and workshops are always open to the public. It is well accepted that the Tribal Council is often the lead entity in coordinating with outside agencies and organizations. The Tribal Council employs the Community Coordinator which is a full time, grant funded, position to focus mainly on climate adaptation issues. The Community Coordinator often facilitates tri-org meetings

such as the Small Community Emergency Response Plan (SCERP) meeting. The SCERP planning process includes the tri-org as well as rotating seats for an elder and a youth participant.

The only real criticism of legitimacy was among community interviewees regarding outside entities that work in Shaktoolik. There is a concern that these outside entities don't fully understand what it means to live in Shaktoolik. Two respondents mentioned that agency representatives could spend more time in Shaktoolik so they can get to know the people and the area. The idea of agency people visiting Shaktoolik during a storm was also mentioned (n=3) to better understand the severity of these events.

5.2.4 Equity

Equity is another dimension of success related to participation of stakeholders in climate adaptation planning except that it is evident in the outcome and not in the process. Equity is closely tied to legitimacy since a legitimate process is more likely to produce equitable or fair outcomes (Olazabal et al., 2017; Paavola & Adger, 2006). A major concern in creating equitable outcomes is that vulnerable and minority populations are represented and that benefits are distributed across population groups.

Non-community respondents (n=4) stated that they did not know if outcomes were equitable and that community members were best to ask. When asked about equity many community respondents cited all the community leaders and local governing entities involved in the process. They also noted the transparency of planning as evidence of the equitable outcomes created. As noted by Adger et al. (2005) equitable adaptations can be evaluated from the perspective of who decides on the adaptation to take. In Shaktoolik this was the tri-

org representatives and the governing bodies in the community with input and guidance from interested or concerned community members.

Several Shaktoolik (n= 3) interviewees pointed out that most of the outcomes established through the planning process were equitable because they were beneficial for the whole community. For example, one action item calls for reinforcing the berm at the location known as First Bend where the shoreline is eroding. If left unchecked the Tagoomenik River will be breached and inundated thereby affecting drinking water for everyone (CAP, 2014. SMP, 2016). Other examples of this are the measures addressing emergency situations. Critical actions identified in the SMP (2016) include building an evacuation center and escape route lighting which would improve navigation during poor weather conditions. Again, these adaptations are meant to serve everyone in the community in the event of a major storm. The topic of unity and sense of community was mentioned several times particularly related to emergency situations. As one community member stated,

“When there is a storm in the community the community responds right away. We have young people, young adults that go and check on the elders and take them to the school [the evacuation center]. A lot of that stuff is already being done but we are going through the SCERP to get it documented (24).”

Participation was high among community members in the planning process and it was made clear there were many opportunities to state opinions and be involved. This high level of participation equates to a legitimate process in Shaktoolik and one that is equitable in representing different groups within the community particularly for elders and youth.

5.2.5 Efficiency

The dimension of efficiency is related to a cost-benefit analysis which values social/public goods in addition to the market rate of goods and services. This includes distribution of the costs and benefits of the action. There is also a time component to efficiency particularly related to climate change since it may take time to develop useful strategies and yet there is a sense of urgency to address impacts before they become devastating. Efficiency is prevalent during both the process and outcome of planning since time and money and the value of social goods are ongoing components to account for.

Responses to the efficiency of climate adaptation planning in Shaktoolik were the most varied of all the different dimensions of success. Both non-community and community respondents talked about efficiency in both the process and the outcome of climate adaptation planning as opposed to just the outcome. For some community respondents (n=3) there had been too much planning which wasted resources such as time and money. Other community respondents said more planning was needed which would require more time and more money (n=3).

Non-community actor respondents had a variety of perspectives as well. Some individuals couldn't understand why certain types of planning were occurring while others felt like there is still more to be done. One consultant summarized this issue,

“that’s sort of the paradox in this particular area because you want to get these plans done as quickly as possible because of the urgency of the situation but at the same time you want to create an efficient plan. A plan that will be effective. Part of that is you’re writing the plan so that it addresses the specific needs of that particular village. And that takes time. So it’s a trade-off. It’s kind of uh... it’s a conflict there (12).”

The consultants involved with the CAP (2014) felt that their process made good use of time, money, effort and laid the groundwork for the berm to be constructed (n=2). The berm project was exactly the outcome they had envisioned and hoped for. The consultant involved with the SMP (2016) also felt their process made appropriate use of time, money, and effort. A major issue regarding the planning process during the SMP had to do with Shaktoolik's community coordinator being extremely sick. The Tribal Council elected to have him continue the work as best he could until he passed away right before completion of the plan. Since the community coordinator was the point of contact for consulting firms this was a challenge in making progress on the SMP. The loss was devastating to the community and a setback to the plan when he passed away. It created an issue when finding someone to fill this role and giving them time to get up to speed. What is interesting about these two planning processes is that they occurred back to back and much of what was established in the CAP (2014) was reiterated in the SMP (2016).

The timing of funding was noted as the reason why these two planning processes happened the way they did. In 2012, Alaska Sea Grant had funding to do a climate adaptation plan for a community in need. They connected with Glenn Gray & Associates who were wrapping up a climate change assessment project for Kawerak, Inc. in Shaktoolik. A climate adaptation plan was a natural progression for the assessment work being done in Shaktoolik. DCRA was included in the CAP (2014) project, but was also in the process of getting a grant funded for three separate comprehensive plans in the communities of Shishmaref, Kivalina, and Shaktoolik. The timing and the funding for DCRA did not line up until 2014 which is why the SMP (2016) started when it did following the conclusion of the CAP (2014). This turn of events

may explain the perspective in the community about too much planning. The SMP (2016) did lead to an interagency working group that attempts to bring all the relevant entities to the table to assist Shaktoolik in implementing their plan. Efforts to collaborate across all entities working in Shaktoolik has the potential to maximize resources and streamline the planning and implementation of those plans.

A challenge related to efficiency mentioned by both community representatives and non-community actor representatives (n=4) is the amount of time required for subsistence activities in Shaktoolik. From spring until late fall most community members are focused on hunting, fishing, gathering, and other activities connecting them directly to the land and their culture. This is a priority for community members which makes it difficult to operate on a western timeline to complete plans, carry out action items, and work with outside agencies. This highlights the power dimensions of working with state and federal agencies. As a tribal government reliant on state and federal funding the underlying assumption is that Shaktoolik will conform to a western timeline.

5.2.6 Effectiveness

Similar to efficiency the dimension of effectiveness can be evaluated during the process and during the outcome. This was evident in the way interviewees talked about the effectiveness of planning in Shaktoolik. The dimension of effectiveness looks at achieving objectives while planning as well as accomplishing objectives that were established in the plan. There are several key themes that emerged from the topic of effectiveness: restoration of funding, the formation of the tri-org, and the construction of the berm.

The restoration of funding from state and federal agencies is an important outcome of planning for climate change. Funding for Shaktoolik was put on hold due to concerns from outside agencies that they were not a viable community. Shaktoolik went through 8 years of planning and assessments to restore funding and get support from state and federal organizations. A former Tribal Council member explained why these plans were necessary.

“They [state and federal agencies] wanted to know if their investment is going to be safe. If it’s going to last. There was a couple plans I don’t think were necessary to get funding restored but they were necessary for... they were helpful (3).”

During those eight years of planning the tri-org became a critical institution for both outside entities and within the community. The importance of the tri-org has been discussed previously, but it should be noted that the tri-org may not have been established if not for the climate adaptation planning process. The creation of the tri-org through the planning process is important since it played a critical role in other accomplishments.

The most notable accomplishment and a direct result of the tri-org was the construction of the berm. The construction of the berm was mentioned by many interview participants (n=10). The idea to buffer the coastline with some type of barrier came from a community project in 2006. The goal of this community project was to protect the tank farm at the south end of town with a small berm which was established by using gravel and beach materials such as drift wood. Though it only lasted five years the tank farm berm was an effective short-term solution. When DOT&PF coastal engineers began working with the tri-org on erosion and storm protection the idea to create a soft barrier was already established. A berm that buffered the entire coast in front of the community became a priority action item in the CAP (2014).

However, due to a lack of support from DOT&PF the community was compelled to implement the project on their own. All three community entities were critical to completion of the berm and interview respondents highlighted that it provided a measure of security, community pride, and notoriety for them in Alaska and outside the state.

With regards to the SMP (2016), very little time has passed since it's completion so it was difficult for participants to assess the effectiveness of its outcomes. However, there was feedback on how effective the process was in terms of creating a plan that is implementable. As noted by a state representative referring to the SMP (2016),

"I completely think they are implementable plans. I don't think there's anything in there that we've prioritized at a high level that can't be carried out. It's important for the community to have this document that they can provide to funders and say we've thought this out. We've given a lot of careful thought for what we need and this is our plan for how we want to go about it (5)."

A federal interviewee confirmed this line of thinking.

"...it could help the community directly or indirectly go to EPA or apply for a grant through EPA. We can say it's identified in their strategic management plan. We've gotten the design and so now it's your turn so it kind of helps build that (19)."

The community members interviewed believed that they are making progress and although these planning processes may be redundant they do provide a mechanism for maintaining relationships with agencies. The community leaders in Shaktoolik have preserved their status as a priority community which means they are top of the list for whatever funding and resources are available.

5.2.7 Replicability

Replicability or repeatability is concerned with the ability or potential to scale up an intervention at the same site or at another site. A driving question to assess this dimension is whether the project be transferred to another place, scenario, or region. Replicability is a dimension of success that is often considered to be more important to non-community actors than for community ones (Ding, 2012). Creating the capacity to assist many different small communities in adapting to climate change would seem to matter more to state and federal level entities. Yet, community leaders in Shaktoolik (n=3) also felt this was an important aspect of planning.

The response to whether it was important to create a replicable process among non-community respondents varied slightly across participants. Non-community respondents (n=4) highlighted the importance of creating a framework that can be applied to climate change adaptation planning in communities. The notion that each community is different and should be treated as such was a key theme. Somewhat contradictorily was the point that to be fair to all communities there needs to be a replicable process. An example of this in practice is the SMP (2016) process where Shishmaref, Kivalina, and Shaktoolik were all subject to the same methodology, but their individual plans were quite different. Additionally, the framework used for the SMP (2016) was based off the work in Newtok since that planning process has progressed further than any other community (DCCED-DCRA, 2016).

The response to questions regarding replicability among community respondents was interesting. Three community respondents mentioned the social learning aspect of creating a replicable process. They expressed their hopes for other communities to learn from their

experience and help in their efforts to adapt to climate change. These community members also mentioned that if Shaktoolik can learn from other communities and their experiences that would be a positive thing, too. A tribal council employee explained why it is important to create a replicable process.

“Sharing our own experiences and the stuff that we go through with other communities, other people may be beneficial and that’s what Alaska is all about. The Alaska Native people are sharing, sharing type of people. It’s part of our history, part of our culture, to help others (24).”

In Shaktoolik there is a strong connection to other communities in the Bering Straits region which was highlighted by several participants (n=4). Being part of the Norton Bay Inter-tribal Watershed Council has strengthened that connection since it provides opportunities for members to share and collaborate.

5.3 Factors Supporting Climate Adaptation in Shaktoolik

5.3.1 Perceptions of Success Among Each Actor Group

Throughout the interviews across non-community and community participants there was consensus (n=13) on relationship dynamics in planning for climate change which situates the community as the lead entity and outside entities playing a supporting role. Interviewees agreed that communities should be driving the process with direct support from other agencies. The consensus across community members, agency representatives, and consultants is that state and federal agencies are there to directly support communities. However, these agencies should also take a broader view and be active in the policy realms and potentially providing financial resources. Consultants and non-profit entities are there to work on behalf of communities and should be providing services and products that are useful.

As one Tribal Council employee commented about outside agencies, “They provide us with whatever assistance we need and are there to assist when needed (24).” This is consistent with how non-community actors talked about the dynamic between the community and outside agencies. A state representative asserted,

“Really all planning, all of the things that happen in communities that they would like to see changes need to start with them. They have to have the buy-in and then the agencies are there to kind of support what they want to do (9).”

This point is critical since top-down versus bottom-up strategies for addressing climate change impacts is a contentious issue (Sherman & Ford, 2014).

The dimensions of success are useful in understanding the intricacies of planning for climate change. It was evident that representatives from all the different actor groups

considered these dimensions to be important to consider when planning for climate change at the community level. A definition of success defined by those involved is also useful in informing the process of planning for climate change. Among state and federal agency representatives there was agreement (n=4) that success involves keeping people safe and it involves making progress towards a resilient community. These agencies prioritize relationships with community members and they prioritize a process that supports communities in adapting to climate change. When asked about success in planning for climate change in Shaktoolik a state representative explained,

“I think a community that’s able to actually become proactive and moving forward and becoming safer and more resilient. I mean because that’s the whole reason why we’re doing it is to increase life and safety. We wouldn’t be doing it for any other reason. You know we don’t want to see the process end here and just have this [planning document]. The last thing I want is to see is this document go onto the book shelf and have people forget about it and there’s ways to pull out portions of it so that people remember and you know have it on their radar that they need to be working on these things (5).”

For consultants, success is providing services and products that were useful to the community and ensuring the community was involved in the process. Consultants work on behalf of the community and are providing a service. As one consultant responded when asked about successful climate adaptation planning in Shaktoolik,

“To me it’d be a double answer to that. One, is the community happy with the product? And second, do they have information they need to address the problems and did you involve people (13)?”

This is different than how community members defined success and talked about success related to climate adaptation planning. For community interviewees (n=4) a definition of success was more outcome oriented though there were some similarities with non-

community actors. For example, community members also viewed success as keeping people safe and healthy. As one community member stated,

“Success is, first of all, nobody losing their life. No loss of life. Then the next would be keeping our infrastructure in tact so that people don’t get sick. We have a major storm and say nobody dies, but our water and sewer system gets destroyed and then we gotta go back to honey buckets. That’s a disaster (4).

Continuing to develop and maintain their way of life were also important elements of success among community members. Another community member explained, “Success is being able to sustain our lifestyle regardless of climate change (24).” So for the community success is action which means moving forward on action items that were established in the various plans. Action items like developing a road and reinforcing the berm were specifically mentioned, but also making visible progress. A community interviewee specified that “Success is something planned for the summer. The berm and the road. Those are the two that I know of that are hopefully in the process of being done this summer (16).”

What is notable about the perceptions of success in climate adaptation planning is that the different actors place a great deal of focus on the community point of view. Consultants (n=3) tie their success to how useful their services were and whether they helped the community. State and federal agencies noted that it all starts with communities and that communities should be driving the process. Communities and federal and state agencies all agree on the importance of safety and well-being within the community as it relates to climate adaptation. Ultimately, the perception of success within the community is the priority. If that is present it will meet the criteria for success across state and federal agencies. Additionally, if

consultants are doing their job they are providing services that contribute to community member's perceptions of success.

5.3.2 Leadership and Institutions in Climate Adaptation Planning

Among the many aspects notable about Shaktoolik's recent history of relocation and adaptation are the people involved in leadership. Shaktoolik's leadership is considered by outside entities to be what makes them unique and makes them stand out among other communities (n=7). As one consultant put it,

"Shaktoolik is one of the better organized communities that I've ever worked in. Their leadership is very together; they speak with a unified voice and they have a lot of consistency in their approach (8)."

In responding to what made them so organized the interviewee added, "the city, the tribe, the corporation, they all seemed to have leaders that were willing to participate throughout the process (8)." A state representative went further to say, "that really impressed me about their planning process. How they made decisions as a community was a strength of the leadership that they had (5)."

The ability to make decisions as a community can be attributed to several institutions. The 'tri-org' was mentioned by nearly every interview participant and often was viewed as a positive outcome of planning for climate change. Early in the planning process a body was formed with representatives from the three governing entities within the community. These entities include the Tribal Council, the City Council, and the Village Corporation. Each entity had two members who attended regular meetings open to the public. This organization worked with consultants and state organizations on the major planning documents such as the Climate Adaptation Plan or CAP (2012-2014) and the Strategic Management Plan or SMP (2014-

2016). Another key aspect of Shaktoolik's decision making ability can be seen in their inclusion of their elders as well as their youth. In the beginning of the formal planning process, following the storms of the early 2000's, an elder council was utilized to inform and guide planning. Unfortunately, many elders passed away and the elder council became defunct. In recent years, the tri-org has created a membership position for one elder and one youth representative to be involved in the decision-making process. As one community member put it, "elders are the backbone of the community and youth are the next generation to follow so they [the community leaders] really watch those two groups (20)."

Establishing the tri-org has enabled Shaktoolik to speak with one voice and move forward as a unified group. A non-community representative stated, "Shaktoolik is in my experience one of the better cooperating communities where their so-called tri-org of the city, the tribe, and corporation meet regularly and work together (19)." This makes the community an attractive place for investment and reduces barriers to working with funders. As one consultant noted, "agencies look upon it favorably when you have a community that has a vision and is able to work that and advocate for themselves (8)." A state representative added,

"You really can't get a lot done when one wants to do this the other wants to do that or they won't even talk about a consideration to find a middle ground because then almost always nothing gets done or you have planning in a vacuum where the city says we're going to do this, but you've got no buy in from the traditional council. And then it's really difficult to get anything done (9)."

5.3.3 Social Capital

The level of social capital in Shaktoolik can be seen in their ability to create an organization like the tri-org as well as collaborating and cooperating as a unified entity. A

community member commented about their time working as a Tribal Council member when much of the planning occurred.

“The IRA [Tribal Council] was the lead entity of the village, but whenever we met, we met with the City, the Corp., and the IRA. In one room wearing all our authority hats. We called all meetings to order. The City, the Corp. and the IRA, we all mitigated to plan for our direction. One direction to go (3).”

A strategy of “collective solidarity” has been used by other communities in the Bering Straits region as well like Shishmaref’s vote to relocate in 2002 (Marino & Lazrus, 2015).

Collective efficacy is evident in Shaktoolik and it was mentioned by many non-community actor representatives interviewed (n=6). One consultant recalled an interaction during a tri-org meeting.

“You know they [the leaders in Shaktoolik] don’t think they get along which is the funny thing. And I keep telling them, ‘You’re very functional, you guys get along incredibly well. When you have an argument it’s a good argument.’ And I don’t know what they thought about that, but it was true (13).”

Collective efficacy is a social psychology term which refers to “a sense of collective competence shared among individuals when allocating, coordinating and integrating their resources in a successful concerted response to specific situational demands” (Lochner et al., 1999; Zaccaro et al., 1995). One former community interviewee put it this way, “We all want to survive, we all want to stay here. I think everybody stays here because we love it here. We have everything here (4).”

The connection to the land was central in conversations with community members throughout my time in Shaktoolik. Hunting, fishing, picking berries, trapping, and being out on the land are priorities for Shaktoolik residents. These activities are essential for survival (the

cost of food in Shaktoolik is often double or triple the price in Anchorage) and these activities are important culturally. Food connects people in Shaktoolik and residents help each other especially the people unable to catch their own. During my visit in April the first beluga and bearded seals were harvested. The hunters went house to house delivering meat to elders and those in need. This is customary in Shaktoolik and demonstrates the connection to the land as well as the connection to each other.

5.3.4 Social Learning

Shaktoolik's status as a 'stay and defend' community can be understood by looking at what happened to the community of Newtok. In the beginning of their planning process leaders in Shaktoolik were seriously discussing a relocation option. It was around this time that the situation in Newtok was becoming a disaster (Bronen, 2011; Bronen & Chapin, 2013; DCCED-DCRA, 2016). Newtok has been dealing with climate impacts for decades due to riverine erosion and permafrost thaw and have been in the process of relocation since 1994 (Bronen, 2011; DCCED-DCRA, 2016). Funding from state and federal agencies for infrastructure projects disappeared once Newtok declared their intent to relocate (Bronen, 2011). Relocation might take decades and the concern in Shaktoolik was that they would end up like Newtok without a reliable water source, a functioning sewage system, or viable roads. A state representative confirmed,

“communities are seeing this and they said well it's because they announced that they are going to relocate so the funders decided that they would not invest in the existing community and we don't want that to happen to us because there's no money for relocation. It takes a really long time (5).”

According to community members (n=3), Shaktoolik also experienced a blockade in funding once they began considering the relocation option. In fact, it was this loss of funding that prompted the Tribal Council to engage in the Multi-Hazard Mitigation Planning process which was completed in 2009. As noted by one community leader,

“because of two words that were said, evacuation and relocation, all projects were put on hold. We couldn’t get any state funding for projects couldn’t do anything until we get that hazard mitigation plan done. Both agencies the state and the federal government has that weapon against the community so that was words we couldn’t use (17).”

This comment highlights the policy of the National Flood Insurance Program which prevents government agencies from using funds to repair damaged infrastructure in disaster prone areas unless they can be protected (Bronen & Chapin, 2013; IAWG, 2009). The Stafford Act is another federal barrier, mirrored at the state level in Alaska, which prioritizes rebuilding in place post-disaster and provides no mechanism for relocation of whole communities (*Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended, 2003*). The combination of Newtok’s experience and Shaktoolik’s own experience has shaped their strategy going forward to maximize access to resources and continue developing in place.

The concept of shadow systems helps explain why the tri-org was formed in Shaktoolik to address climate change impacts. The discord and lack of unity that was occurring in other climate change threatened communities sent a clear message. The community leader went on to explain,

“After hearing about Newtok we heard about them. Their organization fighting among each other and we didn’t want to do that so we formed the tri-org so that we could all work together (17).”

To make progress they would need to do so as one community and not two or three separate entities. Shaktoolik leaders understood that each entity, the Tribal Council, the City Council and the Village Corporation, brought valuable resources to the table. An elder explained how they built the gravel berm in front of the community in 2015 which helps to buffer storm surges from the sea and adds peace of mind for many community members. “It was a cooperation between the three entities. Corporation donated the gravel and the IRA [Tribal Council] purchased the equipment, the dump trucks anyway and the City funded it (14).”

Chapter 6. Discussion

6.1 The Historical Context for Climate Adaptation in Shaktoolik

Two major themes resulted from discussions about the context for planning for climate change in Shaktoolik. The first theme is related to the extent of infrastructure now prevalent in the community. Over the past 35 years the community has developed indoor plumbing, running water, renewable energy, modern communication systems including phone lines and internet, and an airport which connects Shaktoolik to other communities, urban centers in the state, and to the rest of the world. This level of infrastructure is a point of pride for many residents especially the leaders of the community involved with bringing this development and jobs associated with it. This level of infrastructure has also increased the standard of living in Shaktoolik and established a level of comfort not available in previous times. Community interviewees (n=4) pointed out that they want to continue to develop and improve their quality of life through infrastructure projects like a paved road for example. However, several people (n=3) acknowledged that western infrastructure such as indoor plumbing makes them susceptible to harm during storm events and flooding. Community interviewees added that this level of infrastructure is an expectation for wherever they live. A state agency representative noted that western infrastructure in rural Alaska makes relocation both expensive and logistically challenging and that new ways to develop rural Alaskan communities maybe necessary in the future (5).

The second theme is related to the previous relocation from Old Site to the current location and the vote that decided where the community would move. The community was

divided by family lines on whether to move to foothills or to the current location. According to community interviewees the situation was tense since people felt strongly about where they wanted to relocate to. Also, the familial structure is a determining characteristic of politics in Shaktoolik and elected positions may be filled depending on what family that individual belongs to. The negative influence of family politics in Shaktoolik was brought up in several interviews. Yet, the ability to stay together through previous relocations and continue to make decisions cohesively is indicative of the social capital that exists in the community.

6.2 Local Focus Improves Legitimacy & Equity

Shaktoolik's climate adaptation planning process has been driven by local government from the start. By 2005, after three consecutive years of threatening storms were occurring, the governing entities within the community took the initiative to address the problem. This established legitimacy among community members and reinforced that legitimacy by forming the tri-org. A definition of authority used by Sikor and Lund (2009) demonstrates legitimacy established by these governing entities. "Authority characterizes the capacity of politico-legal institutions such as states and their constituent institutions, village communities, religious groupings and other organizations to influence other social actors." Nightingale (2017) expands on this definition by noting that this formulation is relational and not static.

In Shaktoolik the tri-org has been primary to exerting authority over the process and engaging non-community actors to support their process. This made it possible for DMVA and DCRA to work with them as a community that has bought in to the process communicating with a unified voice. It helped Shaktoolik become a priority community at the top of the list to

receive support and funding from state and federal agencies. Lastly, it enabled Shaktoolik to dictate the terms in which they would adapt to climate change. The 'stay and defend' status of Shaktoolik puts them in a position where they can continue to develop at their current site while also making progress on an eventual relocation.

Local decision making in Shaktoolik produced equitable outcomes from the climate adaptation planning process. It is important to create and implement programs at the local level since projects conceived at the national and global levels reshape people's understanding of their own needs, and capitalize upon their desires for improvement (Nightingale, 2017). Power dynamics and political authority are central to equitable and just outcomes. It cannot be assumed that adaptations will be based on objective evaluations of biophysical threats and needs but rather bound up in contested understandings of whose needs and desires should be prioritized (Ibid.). In Shaktoolik the diversity of leaders and transparency of the process created an inclusive environment which reflected the needs of different constituents. This is apparent in the action items implemented in Shaktoolik such as building the berm, establishing emergency evacuation procedures, and maintaining community wide access to clean water (HDR, 2016; Johnson & Gray, 2014). Equity and legitimacy are goals to be achieved in climate adaptation, they define our relationships to the natural world through fair public action and they are components of long term sustainability (Adger et al., 2005; Gleeson & Low, 2002).

6.3 The Importance of Relationships and Multiple Timelines

Among interview participants in Shaktoolik there is a positive perception of how non-community actors worked with them in their climate adaptation planning process. As one

community member noted when asked if there were any challenges to working with outside agencies, “No challenges. They’re willing to help us. The state of Alaska and other groups (17).” Non-community actors such as DMVA, DCRA, VSF, and the Denali Commission have focused on creating relationships with leaders in Shaktoolik. Instead of prioritizing the final product, these agencies have made a concerted effort to focus on the local people involved in the process, supporting them in their work, and giving them the tools to succeed. Sustainability is an ongoing process so building and maintaining relationships prioritizes the process instead of just the outcome. In talking about DCRA a federal interviewee acknowledged, “In my experience here that’s one of the things [they] have been able to do is spend the time and build those relationships and listen to what people are saying and you know bring to that an understanding of state. What the state can do (19).” Additionally, the priority for some agencies has been to invest in projects that can be maintained locally. For DOT&PF this was the determining factor on whether to prioritize building a road to Foothills.

The focus on the process and relationships within the community is also important. Creating a space for dialog, discussion, and information sharing within the community is an important element of success in planning for climate change. A state interviewee elaborated, “I think they [Shaktoolik] have been successful if they’re even participating and having discussions about what if and what to do. Truly some of the best things that people can get out of planning and planning processes is just having discussions with themselves and other agencies so at least they know what’s available to them (9).”

In addition to relationships and a focus on the process a resilient and sustainable community is one that is flexible and responsive to uncertainty. To create flexibility in

Shaktoolik multiple timelines have been used to address the various impacts of climate change. Short term solutions involve emergency plans and procedures to ensure safety and security of the populace. Mid-term adaptations involve developing the current site by reinforcing the berm, upgrading the water tank, and paving the road through the town. Long term adaptations are centered on the extensive process of relocation. The strategy of utilizing multiple timelines empowers local leaders to implement projects as funding and support becomes available. There are low cost to high cost action items as well as action items which do not require outside help so progress can continue under various circumstances.

6.4 Funding: Effects on Efficiency & Effectiveness

External funding plays a very important role in Shaktoolik and is directly related to effectiveness and efficiency. The effort to bring funding to the community to address climate change impacts has been a primary motivator for eight years of planning (the time it took to get funding established for climate adaptation efforts) and it continues to affect local decision making. External funding is critical for the economy since many jobs in Shaktoolik are created by funding from external entities. External funding is also important for improving the quality of life in Shaktoolik since major infrastructure projects are often possible only through state and federal funding.

The dimension of effectiveness is tied to action and funding. When there are tangible actions being taken within the community public perception is that progress is occurring. This is key for community members to feel like positive gains are being made and that their local leaders are doing something to address climate change impacts. Additionally, projects

occurring in the community means that funding is available and more money is circulating in the community. More money circulating in the community is considered a positive thing for the whole village economy.

Funding directly affects the timing of climate adaptation planning. Grant funding can be inconsistent so projects in Shaktoolik are contingent on when that money is available. The action items in Shaktoolik's plans come to fruition depending on when or if funding becomes available. Then the actual project itself occurs within that timeframe allocated on the grant. Instead of the project informing the grant and carrying it out accordingly, the grant funding informs the project and how quickly it needs to occur. This is a challenge in efficiency because it takes away a systematic planning and implementation process which would allow consistency in adapting to climate change. Fortunately for Shaktoolik, the Denali Commission presently provides funding for implementation of some action items. Providing consistency in funding streams can increase efficiency and then improve the perception of effectiveness.

The dimension of efficiency is also a product of community expectations. In Shaktoolik the individuals with the most knowledge of the process had the most realistic expectations regarding outcomes. Communication and transparency inform expectations and are critical for maintaining support. Much of the daily communication that occurs within Shaktoolik is from word of mouth, but other mechanisms include flyers, VHF radio, or Facebook. In rural Alaskan communities, utilizing all of these methods may be necessary to reach a large percentage of the community.

6.5 The Importance of Replicability

Creating a replicable process is something state and federal agencies mentioned often. Frameworks and capacity building were constant buzzwords in non-community actor interviews. Shaktoolik community leaders also expressed interest in learning from other communities and following in the footsteps of other successful processes (n=5). Community leaders in Shaktoolik (n=3) also expressed their willingness to assist other communities that were not as far along in the process. This provides opportunities for regional partnerships and learning exchanges. Building up or maximizing social networks within regions may be an effective way to build capacity and enable social learning. Partnering with existing regional organizations like the Norton Bay Inter-Tribal Watershed Council (NBITWC) is one way the Tribal Council in Shaktoolik has done this.

The caveat to this is that agencies must be careful not to create a competition related to funding. In Shaktoolik there is a belief that Kivalina and Shishmaref are both competing with them for funding. This is a threat to regional capacity building and information sharing. If communities are reluctant to share information or support each other there could be negative side effects detrimental to progress.

6.6 Community Focused Planning

As shown in Table C, many groups have been involved with various aspects of climate adaptation planning in Shaktoolik. When interview participants from Shaktoolik were asked what groups or organizations they remember working with when planning for climate change, they noted several entities. A few that were mentioned included DCRA, USACE, Denali

Commission, NOAA, FEMA, and Kawerak, Inc. However, it was rare for a community interviewee to talk specifically about any one non-community actor (n=2). Often non-community actors were referred to broadly when community interviewees were making a point or answering a question. Thus, from the community point of view it would be difficult to analyze any one organization as to how they worked with or interacted with organizations in Shaktoolik. Additionally, when discussing the dynamics of working with outside agencies participants from Shaktoolik did not distinguish between different phases of planning or different planning processes with the non-community actors involved. This made it difficult to analyze any single planning process such as the Strategic Management Plan process in 2014-2016. Therefore, this report analyzed the continuous process of climate adaptation planning in Shaktoolik which started in the 2005 and continues up to the time of writing this report.

When discussing the dynamics of planning for climate change most participants from Shaktoolik (n=11) were inclined to answer questions as they related to planning within the community as opposed to how they worked with outside entities. Unless they were specifically asked about outside entities the community interviewees talked about planning by entities in Shaktoolik. The conversation was centered on local level planning unless otherwise directed.

Chapter 7. Conclusion

The purpose of this research was to develop a better understanding of how stakeholders involved with climate adaptation planning in Shaktoolik perceive success. In doing so I hope to provide information useful for improving the planning in Shaktoolik and for other communities that engage in this process now or in the future. The research questions I attempted to answer were:

1. What is the historical context for climate adaptation planning in Shaktoolik, Alaska?
2. How do community and non-community actors perceive success in climate adaptation planning in Shaktoolik, Alaska?

To understand the context of climate adaptation planning in Shaktoolik I found there is a long history of adapting to the environment in the region and that relocation is not a new phenomenon for them. However, the extent of western infrastructure which now exists in Shaktoolik makes relocation more expensive and more challenging than ever before. I found that the previous relocation in the 1970's may explain the level of social capital in Shaktoolik and the ability of community leaders to come together to plan and implement strategies as a cohesive group. It was also clear that consecutive storms in 2003, 2004, and 2005 were the motivating factors for community leaders in Shaktoolik to seek outside assistance from state and federal agencies.

In looking at the perceptions of success among community and non-community actor groups involved in planning for climate change in Shaktoolik I used seven dimensions of success to provide a framework for answering this question. Community members were largely

positive about the progress being made since Shaktoolik is a priority community for receiving state and federal funding and they have a strong relationship with the Denali Commission and the Division of Community and Regional Affairs (DCRA). A key feature of the community in Shaktoolik is the strength of the local leadership which is evident in the tri-org council and makes them stand out as a unified entity. Notable themes that emerged in looking at success in Shaktoolik include the importance of social learning which demonstrates the various ways communities navigate the adaptation process and the value of regional partnerships which provides an opportunity for collaboration among communities. Actors agreed that planning should be driven by the community and that other entities are there to support the process. Building strong relationships and collaborating effectively were key components for both internal dynamics (within and among community entities) and external dynamics (between community and non-community actors).

The significance of this research is that it took a community centered approach to highlight perceptions of success across actor groups involved in climate adaptation planning. Documenting the community point of view is a critical aspect of this research which provides valuable information for non-community actors for how to work with indigenous communities. In partnering with the Tribal Council of Shaktoolik and following ethical guidelines for research with indigenous communities I have shown that this type of research is feasible and should be the standard for research in indigenous communities.

The seven dimensions of success were useful in providing a framework for understanding perceptions of success and certain dimensions such as legitimacy, sustainability, and effectiveness were deemed to be particularly important among community members.

Effectiveness was the most discussed dimension since it is linked to outcomes and implementation of action items which are particularly important among community members. While all dimensions were discussed and valued by participants these three dimensions may be the most important to focus on when planning for climate adaptation.

Limitations of this research are related to the use of broad dimensions of success to define perceptions related to climate adaptation planning. For example, the dimension of flexibility/uncertainty were difficult concepts to convey and were interpreted differently across several actor groups. It may be that these dimensions of success do not precisely encapsulate how actor groups perceive success. Also, this research did not specifically provide any measurement of the various dimensions such as which dimensions are most important to different actors which makes a ranking system impractical. Future research could test these dimensions to see if they truly encapsulate perceptions of success. Imposing measurements on these dimensions might be useful to see if some dimensions are valued more than others among different actor groups. Comparing these dimensions in several different Alaska Native communities would be a valuable way to test these dimensions in places other than Shaktoolik.

7.1 Recommendations

Findings from this research may be helpful for both communities and non-community entities when working on climate adaptation planning. Strong leaders, a sense of community, and effective institutions are all evident in Shaktoolik. This has been one of their strengths during this process. The community has faced adversity, sometimes due to a change in

leadership, yet as new leaders have emerged they have continued to make progress towards their goals.

Collaboration and coordination among non-community actors is critical for delivering effective support to rural indigenous communities. Community entities in Shaktoolik work with a plethora of non-community groups making it a challenge to coordinate with all of them simultaneously. This makes it increasingly important for various entities to collaborate to maximize resources, to ensure a cohesive strategy and a coordinated approach to planning and implementation. Establishing an Alaskan specific model or framework for this would be useful in streamlining this effort. Newtok's model for planning which was adapted for Shishmaref, Kivalina, and Shaktoolik may be the best starting point for this. However, further analysis is necessary to see if this has worked in communities other than Shaktoolik.

Lastly, funding may need to be reconfigured in the planning and implementation process. In Shaktoolik, planning funding was separate from the implementation of those plans which makes it a challenge to keep momentum going and achieve progress after the planning is completed. The most common concern in Shaktoolik's case among both community and non-community interviewees was the accessibility and availability of funding to implement plans. A potential solution to this is to include implementation funding when writing planning grants. Not all communities will be able to rely on the Denali Commission once the planning process is completed to advocate for them and provide funding.

References

- Adaptation Advisory Group. (2010). *Alaska's Climate Change Strategy: Addressing Impacts in Alaska*. Retrieved from https://climatechange.alaska.gov/aag/docs/aag_all_rpt_27jan10.pdf
- Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global environmental change, 15*(2), 77-86. doi:10.1016/j.gloenvcha.2004.12.005
- AEIDC. (1975). *Alaska regional profiles: Northwest region*. Salt Lake City, Utah: Wheelwright Lithographing Co.
- AFN. (1993). Natives Guidelines for Research. Retrieved from <http://ankn.uaf.edu/IKS/afnguide.html>
- AFWA. (2011). *State climate adaptation summary report*. Retrieved from American Association of Fish and Wildlife Agencies.
- Agrawal, A. (2010). Local institutions and adaptation to climate change. *Social dimensions of climate change: Equity and vulnerability in a warming world*, 173-198.
- Alaska Department of Law. (2000). *State-Tribal Relations Team: A Short History of the Federal Recognition of Tribes in Alaska and the Evolution of the State's Position*.
- Alaska Native Claims Settlement Act of 1971, 43 USC Chapter 33*. (1971). Washington D.C. Retrieved from commerce.alaska.gov.
- ANTHC. (2017). Local Environmental Observer Network. Retrieved from <https://anthc.org/what-we-do/community-environment-and-health/leo-network/>.
- Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., Diduck, A. P., Doubleday, N. C., Johnson, D. S., & Marschke, M. (2009). Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment, 7*(2), 95-102.
- Arnott, J. C., Moser, S. C., & Goodrich, K. A. (2016). Evaluation that counts: A review of climate change adaptation indicators & metrics using lessons from effective evaluation and science-practice interaction. *Environmental Science & Policy*.
- Balazs, C. L., & Morello-Frosch, R. (2013). The three Rs: How community-based participatory research strengthens the rigor, relevance, and reach of science. *Environmental Justice, 6*(1), 9-16.
- Barnett, J., O'Neill, S., Waller, S., & Rogers, S. (2013). Reducing the risk of maladaptation in response to sea-level rise and urban water scarcity. *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World*, 37-49.
- Barnhart, K., Overeem, I., & Anderson, R. (2014). The effect of changing sea ice on the physical vulnerability of Arctic coasts. *The Cryosphere, 8*(5), 1777-1799. doi:10.5194/tc-8-1777-2014.
- Berkes, F. (1999). *Sacred ecology: traditional ecological knowledge and management systems*: Taylor & Francis, Philadelphia.
- Bernard, H. R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches*: Rowman Altamira.
- BIA. (2012). Alaska Region Overview. U.S. Department of the Interior. Retrieved from <http://www.bia.gov/WhoWeAre/RegionalOffices/Alaska/>.

- Bierbaum, R., Smith, J. B., Lee, A., Blair, M., Carter, L., Chapin III, F. S., Fleming, P., Ruffo, S., Stults, M., & McNeeley, S. (2013). A comprehensive review of climate adaptation in the United States: more than before, but less than needed. *Mitigation and adaptation strategies for global change*, 18(3), 361-406. doi:10.1007/s11027-012-9423-1.
- Bisaro, A., Hinkel, J., & Kranz, N. (2010). Multilevel water, biodiversity and climate adaptation governance: evaluating adaptive management in Lesotho. *Environmental Science & Policy*, 13(7), 637-647.
- Brockhaus, M., Djoudi, H., & Kambire, H. (2012). Multi-level governance and adaptive capacity in West Africa. *International Journal of the Commons*, 6(2).
- Bronen, R. (2011). Climate-induced community relocations: creating an adaptive governance framework based in human rights doctrine. *NYU Rev. L. & Soc. Change*, 35, 357.
- Bronen, R., & Chapin, F. S. (2013). Adaptive governance and institutional strategies for climate-induced community relocations in Alaska. *Proceedings of the National Academy of Sciences*, 110(23), 9320-9325. doi:10.1073/pnas.1210508110.
- Brubaker, M., Berner, J., Bell, J., Warren, J., & Rolin, A. (2010). Climate change in Point Hope, Alaska: Strategies for community health. *ANTHC Center for Climate and Health*, 1-40.
- Brubaker, M., Berner, J., Chavan, R., & Warren, J. (2011). Climate change and health effects in Northwest Alaska. *Global health action*, 4. doi:10.3402/gha.v4i0.8445.
- Burton, P., & Mustelin, J. (2013). Planning for climate change: Is greater public participation the key to success? *Urban Policy and Research*, 31(4), 399-415.
- Carothers, C., Brown, C., Moerlein, K. J., López, J. A., Andersen, D. B., & Retherford, B. (2014). Measuring perceptions of climate change in northern Alaska: pairing ethnography with cultural consensus analysis. *Ecology and Society*, 19(4), 27.
- Census Bureau. (2010). United States Census. Retrieved from <http://www.factfinder.census.gov>.
- Center for Climate Strategies. (2017). State and Local Climate. Retrieved from http://www.climatestrategies.us/policy_tracker/state.
- Chapin, F. S., Knapp, C. N., Brinkman, T. J., Bronen, R., & Cochran, P. (2016). Community-empowered adaptation for self-reliance. *Current Opinion in Environmental Sustainability*, 19, 67-75.
- Chapin, F. S., Trainor, S. F., Cochran, P., Huntington, H., Markon, C., McCammon, M., McGuire, A. D., & Serreze, M. (2014). Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment. In J. M. Melillo, T. Richmond, & G. W. Yohe (Eds.), *National Climate Assessment* (pp. 514-536): U.S. Global Change Research Program.
- Cochran, P., Huntington, O. H., Pungowiyi, C., Tom, S., Chapin III, F. S., Huntington, H. P., Maynard, N. G., & Trainor, S. F. (2013). Indigenous frameworks for observing and responding to climate change in Alaska. *Climatic Change*, 120(3), 557-567.
- Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management*, 32(2), 189-201.
- DCCED-DCRA. (2016). Network Planning Group. Retrieved from <https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/NewtokPlannin gGroup.aspx>.

- DCCED-DCRA. (2017). Community and Regional Affairs. Retrieved from <https://www.commerce.alaska.gov/web/dcra/>.
- de Franca Doria, M., Boyd, E., Tompkins, E. L., & Adger, W. N. (2009). Using expert elicitation to define successful adaptation to climate change. *Environmental Science & Policy, 12*(7), 810-819.
- Denali Commission. (2016). Denali Commission Fiscal Year 2016 draft work plan. Retrieved from <https://www.federalregister.gov/documents/2016/04/26/2016-09708/denali-commission-fiscal-year-2016-draft-work-plan>.
- Ding, L. (2012). Application of an Operational Framework for Identifying Successful Adaptation Projects in the Lower Mekong Basin. *Asian Journal of Environment and Disaster Management, 4*(4).
- Douglas, D. (2010). *Arctic sea ice decline: projected changes in timing and extent of sea ice in the Bering and Chukchi Seas* (2331-1258). Retrieved from <https://pubs.usgs.gov/of/2010/1176/pdf/ofr20101176.pdf>.
- Ekstrom, J. A., & Moser, S. C. (2013). Institutions as key element to successful climate adaptation processes: results from the San Francisco Bay Area. *Successful adaptation to climate change: linking science and policy in a rapidly changing world*. Routledge, New York, New York, USA, 97-113.
- EPA. (2016). Indian Environmental General Assistance Program. Retrieved from <https://www.epa.gov/tribal/indian-environmental-general-assistance-program-gap>.
- Eriksen, S., Aldunce, P., Bahinipati, C. S., Martins, R. D. A., Molefe, J. I., Nhemachena, C., O'brien, K., Olorunfemi, F., Park, J., & Sygna, L. (2011). When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development, 3*(1), 7-20.
- Faculty of Social and Human Development. (2003). *Protocols & Principles For Conducting Research in an Indigenous Context*. Retrieved from <https://www.uvic.ca/hsd/research/igovprotocol.pdf>.
- Ford, J. D., Berrang-Ford, L., & Paterson, J. (2011). A systematic review of observed climate change adaptation in developed nations. *Climatic Change, 106*(2), 327-336.
- Friend, R., Jarvie, J., Reed, S. O., Sutarto, R., Thinphanga, P., & Toan, V. C. (2014). Mainstreaming urban climate resilience into policy and planning; reflections from Asia. *Urban Climate, 7*, 6-19. doi:<http://dx.doi.org/10.1016/j.uclim.2013.08.001>.
- Füssel, H.-M. (2007). Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability science, 2*(2), 265-275.
- Gero, A., Méheux, K., & Dominey-Howes, D. (2011). Integrating community based disaster risk reduction and climate change adaptation: examples from the Pacific. *Natural Hazards and Earth System Science, 11*(1), 101-113.
- Giddings, J. L. (1964). *The Archeology of Cape Denbigh*. University of Wisconsin-Madison.
- Gleeson, B., & Low, N. (2002). *Justice, society and nature: An exploration of political ecology*: Routledge.
- Google. (2017). Shaktoolik Google Earth Location. Retrieved March 14, 2017.
- Gordon, E., Dilling, L., & Assessment, C.-N. W. W. (2010). An Empirical Approach to Defining Success in Climate Adaptation.

- Gray, G. (2012). *Shaktoolik Planning Project Final Situation Assessment*. Retrieved from https://www.commerce.alaska.gov/web/Portals/4/pub/2012_Shaktoolik_Final_Situation_Assessment.pdf.
- Grothmann, T., & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global environmental change*, 15(3), 199-213. :<http://dx.doi.org/10.1016/j.gloenvcha.2005.01.002>.
- Hallegatte, S. (2009). Strategies to adapt to an uncertain climate change. *Global environmental change*, 19(2), 240-247. <http://dx.doi.org/10.1016/j.gloenvcha.2008.12.003>.
- HDR. (2016). *Shaktoolik Strategic Management Plan*. Retrieved from Shaktoolik, AK:
- Homer (2007). *Climate Action Plan*. Retrieved from <https://www.cityofhomer-ak.gov/citycouncil/climate-action-plan>.
- Hopkins, D. (2014). The sustainability of climate change adaptation strategies in New Zealand's ski industry: a range of stakeholder perceptions. *Journal of Sustainable Tourism*, 22(1), 107-126.
- Huntington, H., Daniel, R., Hartsig, A., Harun, K., Heiman, M., Meehan, R., Noongwook, G., Pearson, L., Prior-Parks, M., & Robards, M. (2015). Vessels, risks, and rules: Planning for safe shipping in Bering Strait. *Marine Policy*, 51, 119-127.
- Huntington, H., Fox, S., Berkes, F., & Krupnik, I. (2005). The Changing Arctic - Indigenous Perspectives *Arctic Climate Impact Assessment* (pp. 61-98). New York: Cambridge University Press.
- Huq, S., & Reid, H. (2004). Mainstreaming adaptation in development. *IDS bulletin*, 35(3), 15-21.
- IARPC. (1995). Principles for the conduct of research in the Arctic. *Arctic Res. United States*, 9, 56-57.
- IAWG. (2009). *Recommendations to the Governor's Subcabinet on Climate Change*. Retrieved from <http://climatechange.alaska.gov/iaw.htm>.
- ICLEI. (2014). *Integrating hazard mitigation and climate adaptation planning: Case studies and lessons learned*. Retrieved from <http://icleiusa.org/wp-content/uploads/2015/08/Integrating-Hazard-Mitigation-and-Climate-Adaptation-Planning.pdf>.
- IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]* (9291691437).
- Jaja, J., & Dawson, J. (2014). What contributes to climate change adaptive capacity? A retrospective case study in a Caribbean small island community *International Perspectives on Climate Change* (pp. 123-133): Springer.
- Johnson, T., & Gray, G. (2014). *Shaktoolik Climate Plan. Climate Change Adaptation for an At-Risk Community*. Retrieved from <https://seagrant.uaf.edu/map/climate/shaktoolik/index.php>.
- Kasperson, J. X., Kasperson, R. E., & Turner, B. L. (1995). *Regions at risk*: United Nations University Press.
- Kawerak Inc. (2016). Bering Straits Communities. Retrieved from <http://www.kawerak.org/tribalpages.html>.

- Kettle, N., Martin, J., & Sloan, M. (2017). *Nome Tribal Climate Adaptation Plan*. Retrieved from <https://accap.uaf.edu/sites/default/files/resources/Nome%20Tribal%20Climate%20Adaptation%20Plan%20%28Final-LowRes%29.pdf>.
- Kind, C., Vetter, A., & Wronski, R. (2015). Development and Application of Good practice Criteria for Evaluating Adaptation Measures. *Handbook of Climate Change Adaptation*, 297-317.
- Kofinas, Chapin, F. S., BurnSilver, S., Schmidt, J. I., Fresco, N. L., Kielland, K., Martin, S., Springsteen, A., & Rupp, T. S. (2010). Resilience of Athabascan subsistence systems to interior Alaska's changing climate This article is one of a selection of papers from The Dynamics of Change in Alaska's Boreal Forests: Resilience and Vulnerability in Response to Climate Warming. *Canadian Journal of Forest Research*, 40(7), 1347-1359.
- Kofinas, Herman, S., & Meek, C. (2007). Novel problems require novel solutions: Innovation as an outcome of adaptive co-management. *Adaptive co-management: collaboration, learning, and multi-level governance*. University of British Columbia Press, Vancouver, 249-267.
- Koutsky, K., University of Alaska, F. A., & Unit, H. P. C. P. S. (1981). *Early Days on Norton Sound and Bering Strait: The Shaktoolik area: Anthropology and Historic Preservation*, Cooperative Park Studies Unit, University of Alaska.
- Krupnik, I., & Jolly, D. (2002). *The Earth Is Faster Now: Indigenous Observations of Arctic Environmental Change*. *Frontiers in Polar Social Science*: ERIC.
- Lindsay, R., & Schweiger, A. (2015). Arctic sea ice thickness loss determined using subsurface, aircraft, and satellite observations. *The Cryosphere*, 9(1), 269-283. doi:10.5194/tc-9-269-2015
- Lochner, K., Kawachi, I., & Kennedy, B. P. (1999). Social capital: a guide to its measurement. *Health & place*, 5(4), 259-270.
- Loring, P. A., GERLACH, C., Atkinson, D. E., & Murray, M. S. (2011). Ways to help and ways to hinder: Governance for effective adaptation to an uncertain climate. *Arctic*, 73-88.
- Loring, P. A., & Gerlach, S. C. (2009). Food, culture, and human health in Alaska: an integrative health approach to food security. *Environmental Science & Policy*, 12(4), 466-478.
- Marino, E. (2012). The long history of environmental migration: Assessing vulnerability construction and obstacles to successful relocation in Shishmaref, Alaska. *Global environmental change*, 22(2), 374-381.
- Marino, E., & Lazrus, H. (2015). Migration or Forced Displacement?: The Complex Choices of Climate Change and Disaster Migrants in Shishmaref, Alaska and Nanumea, Tuvalu. *Human Organization*(2015), 341-350.
- McNeeley, S. M. (2012). Examining barriers and opportunities for sustainable adaptation to climate change in Interior Alaska. *Climatic Change*, 111(3-4), 835-857.
- Meeker, D., & Kettle, N. (2017). *A synthesis of climate adaptation planning needs in Alaska Native Communities*. Retrieved from https://accap.uaf.edu/Tribal_synthesis_report.
- Moerlein, K. J., & Carothers, C. (2012). Total Environment of Change: Impacts of Climate Change and Social Transitions on Subsistence Fisheries in Northwest Alaska. *Ecology and Society*, 17(1). doi:10.5751/ES-04543-170110.
- Moser, S. C., & Boykoff, M. T. (2013). *Successful adaptation to climate change: Linking science and policy in a rapidly changing world*: Routledge.
- Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*, 107(51), 22026-22031.

- Murray, E., & Shepherd, H. (2013). *Climate Adaptation and Action Plan for the Norton Bay Watershed, Alaska*. Retrieved from http://www.mfpp.org/wp-content/uploads/2011/04/Norton-Bay-Watershed-Climate-Adaptation-Action-Plan_2013-Final.pdf.
- Mustelin, J., Klein, R., Assaid, B., Sitari, T., Khamis, M., Mzee, A., & Haji, T. (2010). Understanding current and future vulnerability in coastal settings: community perceptions and preferences for adaptation in Zanzibar, Tanzania. *Population and Environment*, 31(5), 371-398.
- Nightingale, A. (2017). Power and politics in climate change adaptation efforts: Struggles over authority and recognition in the context of political instability. *Geoforum*.
- Nilsson, A. E., & Swartling, Å. G. (2009). Social learning about climate adaptation: global and local perspectives. *Stockholm Environment Institute, Working Paper–2009*.
- NOAA. (2013). *Planning for Climate Change*. Retrieved from NOAA Coastal Services Center:
- NPS. (2010). National Historic Landmarks Program Database. Retrieved February 21, 2017, from National Park Service.
- NRC. (2010). *National Resource Council. America's Climate Choices: Advancing the Science of Climate Change*. Retrieved from <http://www.climateneeds.umd.edu/reports/NRC-America's%20Climate%20Choices.pdf>.
- O'Brien, K. L., & Leichenko, R. M. (2000). Double exposure: assessing the impacts of climate change within the context of economic globalization. *Global environmental change*, 10(3), 221-232. Retrieved from: [http://dx.doi.org/10.1016/S0959-3780\(00\)00021-2](http://dx.doi.org/10.1016/S0959-3780(00)00021-2).
- Olazabal, M., Galarraga, I., Ford, J., Lesnikowski, A., & de Murieta, E. S. (2017). Towards successful adaptation: a checklist for the development of climate change adaptation plans.
- Paavola, J., & Adger, W. N. (2006). Fair adaptation to climate change. *Ecological economics*, 56(4), 594-609.
- Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global environmental change*, 19(3), 354-365.
- Patt, A. G., & Schröter, D. (2008). Perceptions of climate risk in Mozambique: implications for the success of adaptation strategies. *Global environmental change*, 18(3), 458-467.
- Pelling, M., High, C., Dearing, J., & Smith, D. (2008). Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. *Environment and Planning A*, 40(4), 867-884.
- Picketts, I. M. (2015). Practitioners, priorities, plans, and policies: assessing climate change adaptation actions in a Canadian community. *Sustainability science*, 10(3), 503-513.
- Pletnikoff, K. e. a. (2017). *Promoting Coastal Resilience and Adaptation: a synthesis from four regional workshops in the Alaska Arctic [in prep.]*.
- Preston, B. L., Westaway, R., Dessai, S., & Smith, T. F. (2009). *Are we adapting to climate change? Research and methods for evaluating progress*. Paper presented at the Fourth Symposium on Policy and Socio-economic Research. 21st Conference on Climate Variability and Change. American Meteorological Society.
- Raik, D. B., Wilson, A. L., & Decker, D. J. (2008). Power in natural resources management: an application of theory. *Society and natural resources*, 21(8), 729-739.

- Ray, D. J. (1975). *The Eskimos of Bering Strait, 1650-1898*: University of Washington Press.
- Reed, M. S. (2008). Stakeholder participation for environmental management: a literature review. *Biological conservation*, *141*(10), 2417-2431.
- Rickards, L., Wiseman, J., Edwards, T., & Biggs, C. (2014). The Problem of Fit: Scenario Planning and Climate Change Adaptation in the Public Sector. *Environment and Planning C: Government and Policy*, *32*(4), 641-662. doi:doi:10.1068/c12106
- RIM. (2015). Shaktoolik Strategic Management Plan. Community Participation Report: Phase I. Retrieved from https://www.commerce.alaska.gov/web/Portals/4/pub/3_Appendix_B2-Shaktoolik_Community_Gathering2_Participation_Report.pdf.
- Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended. (2003). Washington, D.C. Federal Emergency Management Agency, [2003]. Retrieved from <https://search.library.wisc.edu/catalog/999945518702121>.
- Rosati, J. D. (2005). Concepts in Sediment Budgets. *Journal of Coastal Research*, 307-322. doi:10.2112/02-475A.
- Shearer, C. (2012). The political ecology of climate adaptation assistance: Alaska Natives, displacement, and relocation. *Journal of Political Ecology*, *19*, 174-183.
- Shepherd, H. (2017). Norton Sound Communities Climate Adaptation Training. Retrieved from <http://waterpolicyconsulting.com/?q=node/274>.
- Sherman, M. H., & Ford, J. (2014). Stakeholder engagement in adaptation interventions: an evaluation of projects in developing nations. *Climate Policy*, *14*(3), 417-441.
- Sikor, T., & Lund, C. (2009). Access and property: a question of power and authority. *Development and change*, *40*(1), 1-22.
- Simonsson, L., Swartling, Å. G., André, K., Wallgren, O., & Klein, R. J. T. (2011). Perceptions of Risk and Limits to Climate Change Adaptation: Case Studies of Two Swedish Urban Regions. In J. D. Ford & L. Berrang-Ford (Eds.), *Climate Change Adaptation in Developed Nations: From Theory to Practice* (pp. 321-334). Dordrecht: Springer Netherlands.
- Smit, B., Burton, I., Klein, R. J., & Street, R. (1999). The science of adaptation: a framework for assessment. *Mitigation and adaptation strategies for global change*, *4*(3-4), 199-213.
- Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global environmental change*, *16*(3), 282-292. doi:10.1016/j.gloenvcha.2006.03.008
- Smith, J., Ragland, S., & Pitts, G. (1996). A process for evaluating anticipatory adaptation measures for climate change. *Water, Air, and Soil Pollution*, *92*(1-2), 229-238.
- Squire, V. A., Dugan, J. P., Wadhams, P., Rottier, P. J., & Liu, A. K. (1995). Of ocean waves and sea ice. *Annual Review of Fluid Mechanics*, *27*(1), 115-168.
- Stacey, R. D. (1996). *Complexity and creativity in organizations*: Berrett-Koehler Publishers.
- Steinberg, T. (2006). *Acts of God. The Unnatural History of Natural Disaster in America*. Oxford, USA: Oxford University Press.
- Stewart, B. K., KE; Stevens, LE; Sun, L; Walsh, JE. (2013). Regional Climate Trends and Scenarios for the US National Climate Assessment: Part 7. Climate of Alaska. *NOAA Technical Report NESDIS*, *142*(7), 60.
- Strauss, A. L., & Corbin, J. M. (1990). *Basics of qualitative research: grounded theory procedures and techniques*: Sage Publications.

- Stroeve, J. C., Kattsov, V., Barrett, A., Serreze, M., Pavlova, T., Holland, M., & Meier, W. N. (2012). Trends in Arctic sea ice extent from CMIP5, CMIP3 and observations. *Geophysical Research Letters*, 39(16), n/a-n/a. doi:10.1029/2012GL052676.
- Swinomish Tribe. (2010). *Swinomish Climate Change Initiative: Climate Adaptation Action Plan*. La Conner, WA: Swinomish Tribal Community.
- Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to qualitative research methods: A guidebook and resource*: John Wiley & Sons.
- Terenzi, J., Jorgenson, M. T., Ely, C. R., & Giguère, N. (2014). Storm-surge flooding on the Yukon-Kuskokwim Delta, Alaska. *Arctic*, 67(3), 360-374.
- Thomalla, F., Downing, T., Spanger-Siegfried, E., Han, G., & Rockström, J. (2006). Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation. *Disasters*, 30(1), 39-48.
- Trainor, S. F., L. Abruтина, F. Stuart Chapin III, V. Chashin, D. Driscoll, L. Hartig, N. Kettle, A. Klepikov, G. Kofinas, D. Lemmen, P. Loring, M. Muir, E. Nikitina, A. Perrin, N. Poussenkova, N. Pozhilova, S. Tangen, & Valeeva, V. (2017). *Adaptation Actions for a Changing Arctic - Perspectives from the Bergin/Chukchi/Beaufort Region*.
- Tribbia, J., & Moser, S. C. (2008). More than information: what coastal managers need to plan for climate change. *Environmental Science & Policy*, 11(4), 315-328.
- Uittenbroek, C. J., Janssen-Jansen, L. B., & Runhaar, H. A. (2013). Mainstreaming climate adaptation into urban planning: overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies. *Regional Environmental Change*, 13(2), 399-411.
- USACE. (2009). *Alaska baseline erosion assessment: Study findings and technical report*. Retrieved from Elmendorf Air Force Base: <https://www.commerce.alaska.gov/web>
- USACE. (2011). *Shaktoolik Coastal Flooding Analysis*. Retrieved from <https://www.commerce.alaska.gov/web/>
- Vermaire, J. C., Pisaric, M. F., Thienpont, J. R., Courtney Mustaphi, C. J., Kokelj, S. V., & Smol, J. P. (2013). Arctic climate warming and sea ice declines lead to increased storm surge activity. *Geophysical Research Letters*, 40(7), 1386-1390. doi:10.1002/grl.50191
- Vogel, C., Moser, S. C., Kaspersen, R. E., & Dabelko, G. D. (2007). Linking vulnerability, adaptation, and resilience science to practice: Pathways, players, and partnerships. *Global environmental change*, 17(3), 349-364.
- Wheaton, E., & Maciver, D. C. (1999). A framework and key questions for adapting to climate variability and change. *Mitigation and adaptation strategies for global change*, 4(3-4), 215-225.
- White House. (2015). FACT SHEET: President Obama Announces New Investments to Combat Climate Change and Assist Remote Alaskan Communities [Press release].
- Whyte, K. P. (2013). Justice forward: Tribes, climate adaptation and responsibility. *Climatic Change*, 120(3), 517-530.
- Whyte, K. P. (2015). Indigenous Peoples, Adpatation and the Responsibility of Settler States. *Ethics & the Anthropocene*.
- Woodruff, S. C., & Stults, M. (2016). Numerous strategies but limited implementation guidance in US local adaptation plans. *Nature Climate Change*.
- Yin, R. K. (2013). *Case study research: Design and methods*: Sage publications.

Zaccaro, S. J., Blair, V., Peterson, C., & Zazanis, M. (1995). Collective efficacy *Self-efficacy, adaptation, and adjustment* (pp. 305-328): Springer.

Appendix A.

Community Interview Protocol

1. First, I'm interested in hearing about you and your history here in Shaktoolik and outside, too. Things like how long you've lived here, what kind of work you do, your family history, etc.
2. What has been your role in the climate change planning that has occurred in Shaktoolik?
 - a. How long have you been involved?
3. When you think back about the planning that has occurred in Shaktoolik what organizations and people do you remember?
4. What was your experience with these people?
 - a. What was your impression of the work they were doing?
5. In Shaktoolik who was involved in planning? What would you have done differently?
6. What input and involvement did different groups have such as elders or youth? Did the planning create fair outcomes for the whole community?
7. Who is best positioned to be leading or running the planning process?
 - a. What about when carrying out those plans? Is it best when led by a state or federal agency or community led or something in between? Why?
8. What timeline was used for planning? Long term or short term or other?
9. Was it important to deal with the uncertainty of a changing environment in Shaktoolik?
 - a. How did you address that uncertainty in the planning?
10. Was sustainability considered during planning? If so, how?
11. How well were resources (money, time, effort) used for climate change planning and implementing the plans?
 - a. Would you have done anything differently?
11. What places are necessary to include in planning? For example, in the immediate community area? Places that the community uses for hunting, fishing, subsistence gathering, etc.? Regionally?
12. What positive things have occurred as a result of these planning efforts in Shaktoolik?
 - a. Are the plans being implemented? Has that been effective?
13. Was it important that the planning process to address climate change impacts in Shaktoolik be replicable or repeatable for other communities? Was that addressed during the process?
14. What are the barriers to planning for climate change and for implementing those plans?
15. What would improve climate adaptation planning in Shaktoolik?
 - a. What would improve implementation of those plans?
16. What is your definition of success in planning especially as it relates to climate change?
17. Is there anything else you would like to add?

Appendix B.

Non-Community Actor Interview Protocol

1. Can you tell me a bit about yourself and how you started working in this field and in your current position?
2. From what you understand why did the Tribal Council in Shaktoolik begin planning for climate change?
3. What led you to begin working in Shaktoolik?
4. What organizations and people in Shaktoolik do/did you work with most?
5. Within the community of Shaktoolik what groups were involved in climate adaptation planning such as youth, elders, women, etc.?
6. In your mind did the planning create equitable/fair outcomes for the whole community? How so?
 - a. Would you have done anything differently?
7. Was there anything unique about working in Shaktoolik? How was/is it different from other work you've done?
8. Was it important to deal with the uncertainty of a changing environment in Shaktoolik?
 - a. How did you address that uncertainty in the planning?
9. Was/is it important to create a process and an outcome that is replicable for other communities? How so?
10. What timeline is used for planning for climate change impacts in Shaktoolik?
 - a. What about for implementing plans?
11. What areas are necessary to consider when planning for climate change? In the immediate area around the town? All subsistence lands? The region?
12. Was/is sustainability factored into planning for climate change in Shaktoolik?
 - a. Was this a priority for you, your organization, or the community?
13. How well are resources (time, money, effort) used for climate change planning?
 - a. What about for implementing those plans? Would you have done anything differently?
14. Based on your experience what role could be best played by state and federal agencies in planning for climate change?
 - a. What about when carrying out those plans?
15. When do you expect to see the benefits of the planning that has taken place in Shaktoolik?
16. What positive things have occurred as a result of these planning efforts in Shaktoolik?
 - a. Are the plans being implemented? Has that been effective?
17. What challenges did you experience when doing this work in Shaktoolik?
18. What would improve climate adaptation planning in Shaktoolik?
 - a. What would improve implementation of those plans?
19. What is your definition of success in planning especially as it relates to climate change?
20. Is there anything else you'd like to add?

Appendix C.

Summary of Themes in Data Analysis

Number	Name	Sources	References	Dimensions
1	Adaptations	1	4	
2	Barriers	13	25	
3	Berm	4	4	
4	Communications	4	4	
5	Definition of Success	17	19	
6	Effectiveness	13	27	X
7	Efficiency	18	35	X
8	Emergency Preparedness	2	4	
9	Environment Impacts	1	5	
10	Equity	15	16	X
11	External partnerships	16	37	
12	Food Impacts	2	6	
13	Funding and grant spending	11	16	
14	Government Reliance	2	3	
15	History	11	28	
16	Individual priorities	4	7	
17	Lack of progress	4	6	
18	Legitimacy	18	44	X
19	Now vs Then	7	14	
20	Planning benefits	14	22	
21	Planning success	6	7	
22	Family Mentality	8	21	
23	Recommendations	18	35	
24	Replicability	13	15	X
25	Social Capital	19	39	
26	Social Learning	10	18	
27	Spatial	13	17	
28	Sustainability	17	24	X
29	Timeframes	14	22	
30	Uncertainty	16	19	X