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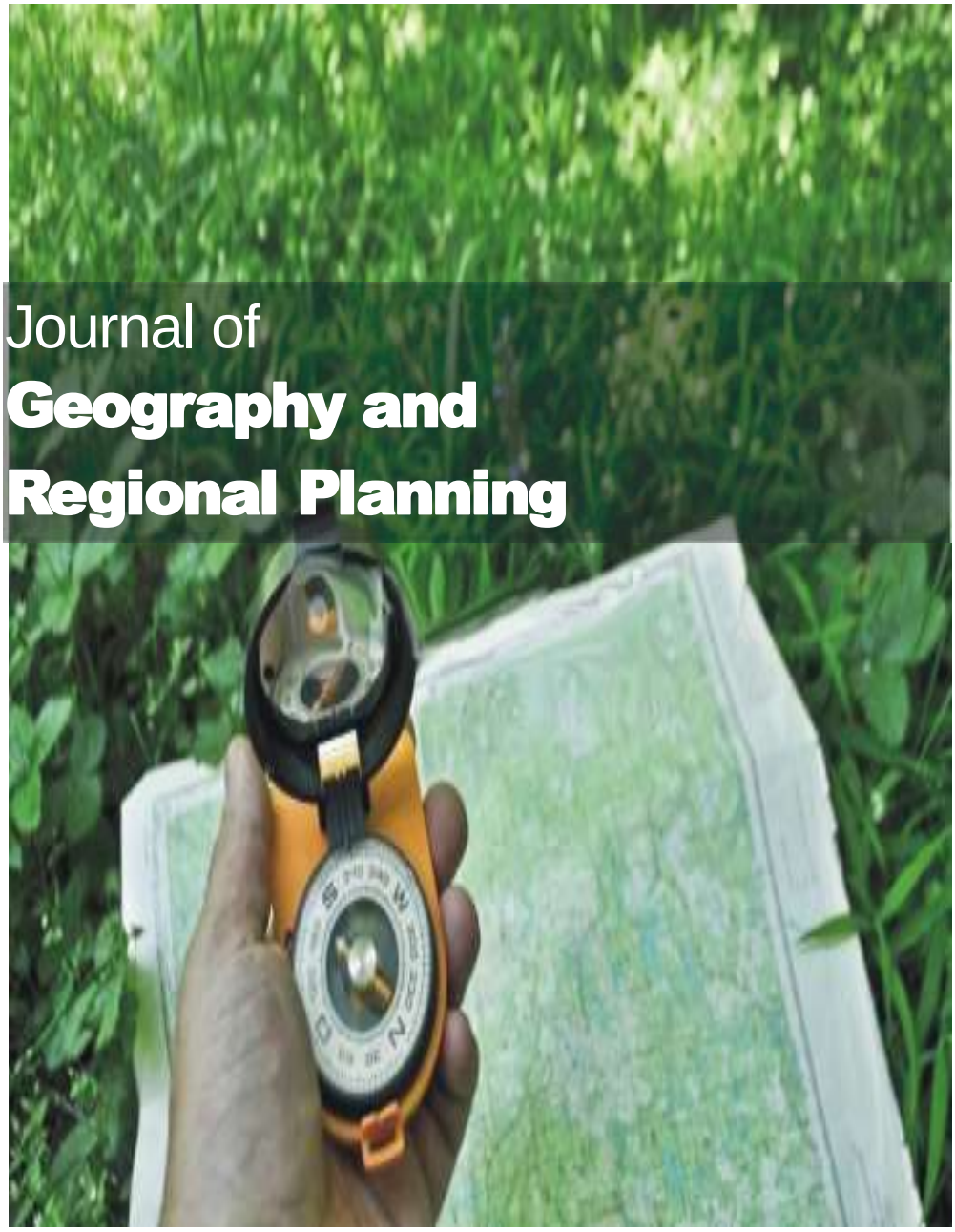

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Table of Contents: Volume 11 Number 10 November 2018

ARTICLES

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Full Length Research Paper

Improving the quality of Alaska Native Village climate change planning

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Alaska Native Villages (ANVs) are trying to adapt to some of the most extreme climate change in the nation; but the planning systems in place for these communities are not necessarily leading to adaptive actions. Based on reviews of existing plans as well as interviews and conversations with 153 people that live in ANVs or influence ANVs plans and policies, this article describes how climate change adaptation and hazard mitigation planning is taking place and provides suggestions for improvement. Since few ANVs have stand-alone climate change plans, hazard mitigation plans are the primary plans for addressing climate-related hazards. Many ANVs have generic, externally produced plans which may enable communities to get funding for particular projects, but fail to address subsistence and other ANV concerns, and may never be implemented. While planners must grapple with limitations in time and funding as well as rigid requirements for hazard mitigation plans, they could improve planning by better incorporating community knowledge and lessons from past planning processes, developing action items to protect subsistence, and formatting plans so they are more accessible and useful.

Key words: Hazard mitigation plans, climate change adaptation, Alaska Native Villages, indigenous communities, plan quality, subsistence.

INTRODUCTION

Alaska Native Villages (ANVs), federally recognized tribes and the communities in which they are based are grappling with climate change. Many are experiencing changes in flooding and erosion, changes to the species on which they subsist, melting permafrost and later formation of ice along their shores each fall-ice that used to serve as a protective barrier from destructive fall storms (Chapin et al., 2014; Field et al., 2014; Ristroph, 2010). Responding to these changes is difficult for a number of reasons. Many ANVs are located in remote, Arctic or sub-Arctic areas off of the road system and far from centers of power and commerce (Cochran et al., 2013; McNeeley, 2009). Most have few resources to implement large-scale infrastructure to address climate change and related natural hazards (Klein et al., 2014: p. 907). Further, most ANVs rely on a traditional hunting and fishing lifeway ("subsistence"), for which there is no readily available substitute (Loring et al., 2011; Cochran et al., 2013; Ristroph 2010). Subsistence lifeways have been particularly impacted by changes in species populations and migratory routes as well as reduced access due to insufficient snow and ice (Brinkman et al., 2016;

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Chapin III et al., 2014; Nuttall et al., 2005).

Recognizing these limitations, the State of Alaska and other entities have made efforts to assist ANVs with plans to address climate change, natural hazards, and other community concerns. Since climate change impacts and ANVs' ability to respond to them is not uniform, however, there should not be a one-size-fits-all model for ANV planning. Problematically, ANVs have been subject to externally led and implemented plans that fail to account for their particular geographic conditions, population numbers, cultures, political systems, and degrees of development.

This article explores how ANVs are planning for climate change and consider the fit between the resulting plans and expressed community concerns (namely, subsistence). In contrast to literature hailing the benefits of climate change adaptation planning (Bajracharya et al., 2011; Berke et al., 2014; Berke and Lyles, 2013; Crane and Landis, 2010; Head, 2014; Hirokawa and Rosenbloom, 2013; Huang et al., 2011; Pearce et al., 2012; Schmidt, 2009), it was discovered that the current process of planning is not particularly useful to ANVs, and the result is an overly long document that can garner funding for projects that may or may not help with climate change adaptation.

BACKGROUND ON CLIMATE CHANGE PLANNING

Climate change is associated with problems that planners have grappled with for the past century, from damage to infrastructure and housing to public health and safety concerns (Donaghy, 2007, p. ii). However, climate change planning is different from other types of planning, as there is uncertainty regarding future climate scenarios and policies and funding that may emerge to address climate change (Bedsworth and Hanak, 2010, pp. 478, 485; Hirokawa and Rosenbloom, 2013, p. 326; Foss 2018, p. 333; Kettle and Dow, 2014; Camacho, 2011, p. 1839; Snover et al., 2007, p. 28; Verschuuren 2013, p. 10). Researchers have called for scenario planning to account for this uncertainty (Berke and Lyles, 2013; Boyd et al., 2015; Quay, 2010; Serrao-Neumann et al., 2013; Trainor et al., 2009), but this kind of planning is relatively limited outside of large municipalities (Bartholomew, 2007; Chakraborty and McMillan, 2015).

While some states set standards for local planning (such as, la. Stat. Ann. § 163.3177(6) (a); Ga. Admin. Code, Chapter 110-3-2); there is no standardized method across the United States or Alaska for how state and community planning processes take climate change into account (Stults, 2017; Werner and Svedin, 2017). A number of American communities have no form of climate change planning at all (Foss, 2018; Susskind, 2010). Some communities are adopting stand-alone adaptation plans, while others have mainstreamed climate change considerations into other plans and programs (American Planning Association, 2011; Gerrard and Fischer, 2012; Hamin et al., 2014; Hirokawa and Rosenbloom, 2013).

A number of communities address aspects of climate change through hazard mitigation plans (HMPs) ((Hamin et al., 2014, p. 112), which may or may not mention the words "climate change" (Stults, 2017). HMPs can play a significant role in adaptation, as they are a vehicle for funding from the Federal Emergency Management Agency (FEMA) to address natural hazards (42 U.S.C. § 5165(a)). All U.S. states and territories have state-wide HMPs, but not all localities have these plans—especially in Alaska. State plans are required to consider risks related to climate change, while local plans are not (FEMA, 2015, p. 3).

As with any other form of planning, HMPs and adaptation plans may not lead to action if they lack community participation and fail to reflect a community's needs and limitations (Brooks, 2002; Corburn, 2003; Forester, 1999; Foss, 2018; Frazier et al., 2013; Godschalk et al., 2003; Haverkamp, 2017; Healey, 1999; Horney et al., 2017; Sager, 2009). There is little research on the adequacy of stand-alone climate change adaptation plans in addressing community needs, but several studies call attention to problems with HMPs in addressing climate-related hazards.

First, there can also be a disconnection between HMPs and other community plans (Lyles et al., 2014a, p. 2; Smith, 2014, p. 306), including stand-alone adaptation plans (Stults, 2017). This may relate to lack of political will and funding (Frazier et al., 2013, p. 57) or the fact that HMPs are often prepared by risk managers rather than those who prepare other community plans (Horney et al., 2017). FEMA itself has acknowledged the lack of integration between planning efforts (FEMA, 2013), although it requires HMPs to incorporate existing plans where appropriate (see 42 C.F.R. §201.6(b) (3)).

Second, HMPs tend to follow a strict, narrow template that includes hazard identification, a vulnerability assessment, and a list of hazard mitigation actions that will garner the Federal Emergency Management Agency's (FEMA) approval (FEMA, 2017a, 2011). Particularly for small or rural communities that rely on external consultants, HMPs may be "copy-and-paste" documents that do not sufficiently reflect local hazards (Frazier et al., 2013; Horney et al., 2017) or local views (Monitoring Arctic, 2017). There can be a disconnect between a community's goals, the mitigation actions proposed to carry out these goals, and the resources available to do so (Lyles et al., 2014b, p. 96; Frazier et al., 2013, p. 53; Horney et al., 2017, p. 62).

Planning challenges related to disparities between communities and external planning entities can be even more problematic for indigenous communities, as they often have a history of external intervention (Hibbard et al., 2008; Lane, 2003; Matunga, 2013; Ostrom, 2004; Porter, 2010; Sandercock, 2004). While all planning

processes should take into account community needs and values, this is especially important for indigenous communities, since their needs and values may be distinct from those of non-indigenous communities (Abate and Kronk, 2013; Wuttunee, 2004).

Third, even where plans do reflect community needs, they may not be carried out if action items are not prioritized, lack sufficient detail, or extend past the political terms of those who support the plans (Frazier et al., 2013; Woodruff and Stults, 2016). Insufficient political prioritization, leadership, and funding are additional barriers to implementation (Dilling et al., 2017; Flo and Smith, 1999; Frazier et al., 2013; Meerow and Mitchell, 2017; Ostrom, 2004).

METHODOLOGY

This research involved interviews and conversations with a diverse sample of individuals across the state, as well as a review of the plans for the 59 ANVs from which participants for the research was drawn. The Alaska Division of Community and Regional Affairs library of plans (AK Division of Community and Regional Affairs, 2018) was searched and a more general Internet search for all plans as of 2017 relevant to the 59 ANVs, as well as any adaptation plans for other ANVs was conducted. This research generally limited its analysis to plans produced in the previous 20-years. This resulted in a review of about 70 plans, with some plans (such as the North Slope Borough HMP) applying to more than one ANV.

To better understand how planning is carried out for ANVs, 153 interviews and interview-like conversations with ANV residents as well as those outside ANVs who make or influence ANV plans and policy was carried out. Questions related to climate change impacts to ANVs, adaptation actions observed and recommended, adaptation obstacles, knowledge of adaptation plans, the role of planning in facilitating adaptation, and the roles of different entities in facilitating adaptation planning and actions. About half of the communications were with ANV residents. Rather than randomly selecting participants, information-rich "cases" (individuals) whose experience and knowledge captured the main themes of this research questions across a varied group were soughted (Bernard and Ryan, 2009; Corbin and Strauss, 2008; Creswell, 2007; Patton, 2001; Stake, 2000). The research focused on getting at least one participant from each of Alaska's twelve cultural/geographic regions, and on having ANVs with a diversity of economic, political, and development characteristics.

The other half of the communications were with participants from outside of ANVs, including legislative and agency representatives, researchers who had published articles related to ANV adaptation, lawyers who had worked with ANVs on subsistence and other matters, and planners who had facilitated plans for ANVs. Initially, these outside participants were selected from the agencies that play a role in ANV adaptation and used a "snowball" technique to get recommendations for additional participants (Bernard and Ryan, 2009; Jacobs and Brooks, 2011; Tongco, 2007). Different sets of interview questions were made for ANV residents and for those outside of ANVs, and most participants did not answer all the questions asked. Still, almost all interviews and conversations included a discussion on the role of planning in facilitating ANV adaptation, as well as challenges to adaptation and suggestions for changes in the ways that external entities facilitate adaption.

Qualitative content analysis was used (Corbin and Strauss, 2008; Miles and Huberman, 1994) to identify major adaptation actions, relevant laws and agencies, facilitators, barriers, recommendations for change, and other themes that arose from interviews and those conversations that covered interview questions, as well as in ANV plans. Themes arose deductively from the questions asked during the interviews (based on concepts in the literature) as well as inductively from new themes raised by participants (Bernard et al., 2016; Miles and Huberman, 1994; Ryan and Bernard, 2000).

The differences in the questions and themes each participant chose to discuss limited the ability to quantitatively compare responses between different participants. Given this limitation and the subjectivity of the coding, it was decided that using statistical analysis was not appropriate (Bernard and Ryan, 2009, p. 288; Zhang and Wildemuth, 2016, pp. 2, 5). Thus, referring to specific numbers of participants was avoided, except to give the reader a general sense of how many participants provided a similar comment. To give an order of magnitude of the responses gotten, "a few" (about 2 to 5), "several" (about 6 to 10), "a number of" (11-30), or "many" (more than 30) were referred to. These categorizations are not statistically significant and should not be interpreted in that manner.

For purposes of this article, there are a few instances where the author supplemented the research findings with his experience as a lawyer and planner for the North Slope Borough, a county-level government in Arctic Alaska (2007 to 2011), and for the ANVs of Allakaket (2016 to 2018) and Newtok (2017 to 2018).

KEY FINDINGS ON ANV ADAPTATION AND HAZARD MITIGATION PLANNING

There is a great deal of planning across Alaska concerning key aspects of climate change such as flooding and erosion. But the manner in which these plans are created and the resulting products are not necessarily preparing ANVs for climate change impacts—especially those related to subsistence.

Summary of publicly available plans

The research began with an overview of the plans found pertaining to climate change and other ANV concerns. Most ANVs that still have residents living at their village sites have some form of written community plan on file with the Alaska Division of Community and Regional Affairs. Of the 59 ANVs from which my participants were drawn, 38 had plans providing for land use and economic development, and 43 had their own HMP or were part of a multi-jurisdictional HMP. Thirty-five ANVs had other types of plans related to economic development, tourism, transportation, relocation, housing, infrastructure, and emergency preparedness. Only four of the 59 ANVs lacked publicly available plans of any kind. Climate change is mentioned in many recent ANV plans: HMPs for 26 ANVs and four other plans refer to climate change as contributing to hazards, while three relatively recent HMPs (from 2015) refer to climate change as a stand-alone hazard. Even where HMPs do not specifically mention climate change, almost all refer to flooding, erosion, and severe storms—key hazards associated with climate change in Alaska (Chapin III et al., 2014).

For the remainder of this subsection, the highlights of ANV plans specifically related to climate change adaptation was reviewed. There are a number of

community-specific reports about climate change impacts that are sometimes characterized by the literature and websites as climate change plans, but are not actually plans. An example is “Climate Change in Nuiqsut, Alaska, Strategies for Community Health,” which describes climate change impacts and potential adaptations but contains no goals or action items (Brubaker, 2014). These were not consider to be adaptation plans in this study.

Two ANVs, Shaktoolik and Nome, had stand-alone climate change adaptation plans as of 2017, and participants from some other ANVs said they were working on adaptation plans.

Shaktoolik’s plan was written in 2014 with help from Alaska Sea Grant, a private consultant, and input from the community’s Tribal Council, City Council, and Village Corporation (Johnson and Gray, 2014). The plan is relatively simple, with nine key adaptation measures (Johnson and Gray, 2014). The three most concrete measures call for construction of protective infrastructure, including a coastal berm. Other measures include consideration of relocating infrastructure, guidelines for future development, monitoring, research, looking for funding, and updating Shaktoolik’s HMP. The plan does not provide specific measures related to subsistence.

The Nome adaptation plan, written in 2017, is the effort of four ANVs (the Nome Eskimo Community and three ANVs whose residents mostly live in Nome), along with Alaska Sea Grant and the University of Alaska (Kettle, Martin, and Sloan 2017). Like the Shaktoolik plan, the Nome plan was relatively simple, with eight key measures supported by more detailed strategies. Four are specifically related to subsistence, including a call for increased tribal representation in subsistence management. Other measures include increased awareness, protecting tribal cemeteries from erosion, research and monitoring, and building capacity for addressing concerns about increased shipping.

The Norton Bay Watershed Council, a non-profit tribal entity for the west coast villages of Shaktoolik, Unalakleet, Koyuk, and Elim, worked with the Model Forest Policy Program and others on a project to explore climate change impacts and potential adaptations. This led to a lengthy report with a section on adaptation-related goals, including obtaining funding for emergency preparedness, obtaining water quality data, increasing access to and protecting subsistence, increasing climate change awareness, and improving economic conditions (Murray et al., 2013).

Newtok has a written plan to relocate to a new settlement known as Mertarvik. Outside consultants prepared the plan in 2011 for the State of Alaska, Division of Community and Regional Affairs, which was actively assisting Newtok with relocation efforts at that time (Agnew Beck Consulting et al., 2011). While the plan does a strong job of providing guiding principles for the relocation and contains clear graphics, it does not begin to delve into the complexity of relocating through the federal grant programs currently available to the community (Ristroph, 2017).

None of the plans reviewed contained any form of scenario planning. Given the attention in the literature and at the University of Alaska Fairbanks to scenario planning as a means for addressing climate-related uncertainties (University of Alaska Fairbanks, 2018), a number of participants (about half in ANVs) were asked whether this could be useful for ANV planning. Those outside of ANVs seemed enthusiastic about the potential for scenario planning to help adaptation in the face of uncertainty, and it is already being used in some agency planning processes. But while there was some interest among ANV participants in scenario planning, there was little understanding of how it had been or could be used; no ANV plans that outlined alternative scenarios was found.

In short, though there are only a few stand-alone climate change adaptation plans for ANVs, climate change impacts are raised in many plans, and there are few ANVs that lack any plan whatsoever. There is potential for using scenario planning to help ANV adaptation planning, but it has not yet been embraced by ANVs.

Problems with plan quality and utility limited community participation

Based on the conversations with participants and review of community plans, it was found that planning for ANVs is generally initiated, led, and may be carried out by people outside of ANVs. No plan reviewed was developed solely by an ANV. For hazard mitigation planning, the process typically starts with the State of Alaska’s Division of Homeland Security, which contacts communities regarding the need to update their local hazard mitigation plans and provides a contractor to do so. These contractors ensure that the plans conform to specific federal regulations (44 C.F.R. 201.6).

Aside HMPs, planning processes may be less formal, yet not less externally driven.

For example, “comprehensive” or “local economic development” plans may be initiated by regional Native non-profit entities, whose staff complete the plans based on a standard template. Alternatively, for ANVs situated within a county-level government (known as a borough), plans may be initiated by the borough and completed by contractors.

Often only a small segment of the community comes to planning meetings and is engaged in the planning process. A number of ANV participants were unaware that their communities even had plans. Only a few referred to their communities’ HMPs, though HMPs are in place for 43 of the ANVs from which participants came. Several (twice the number referring to HMPs) referred to Small Community Emergency Response Plans

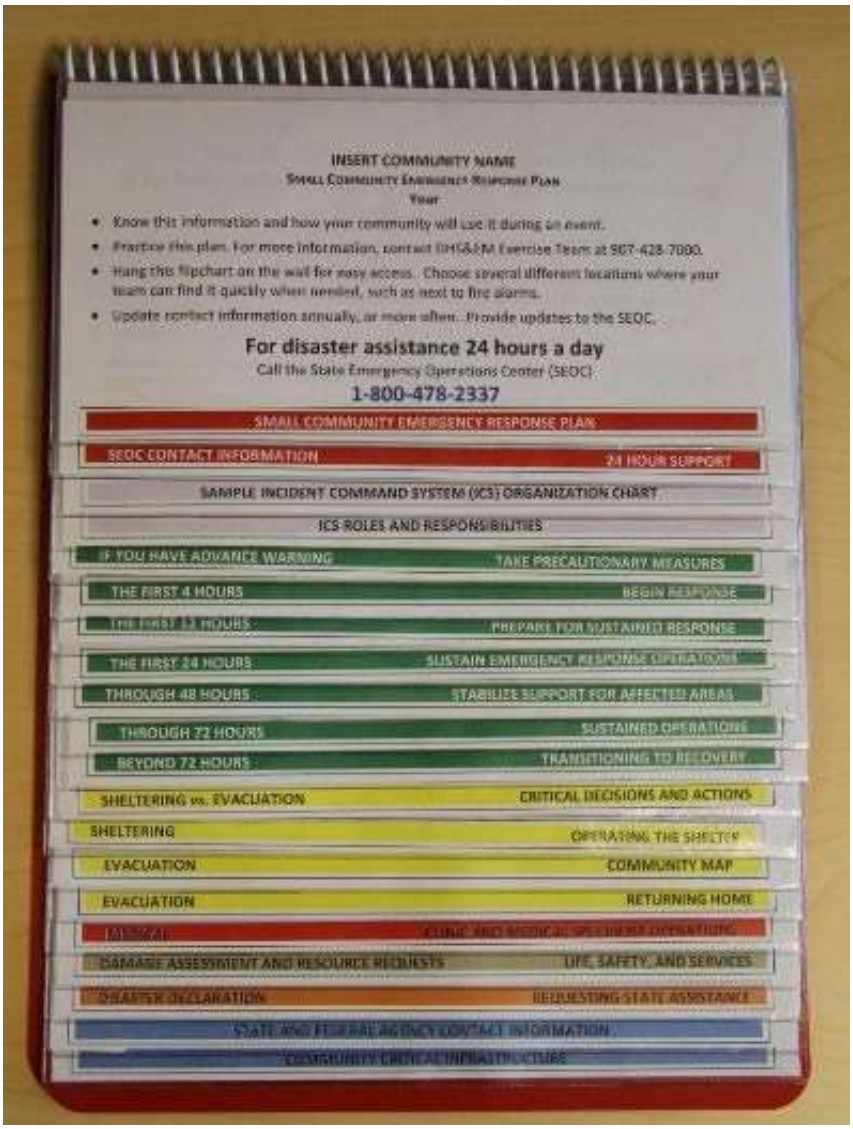

Figure 1. Small Community Emergency Response Plans (Alaska Division of Homeland Security, 2010).

(SCERPS), which are simple flipbooks with emergency shelter, evacuation, and contact information (Figure 1). These may be more accessible than other types of plans.

Based on the review of HMPs, contractors rely on public meetings (sometimes only with teleconference participation) and newsletters rather than personal engagement. This meets FEMA's public involvement standard, which does not require any sort of meeting (44 CFR § 201.6(b)). As one participant that worked on HMPs explained, "The contractors that write these plans end up (the author included) writing them without too much input from the village. There's public input requirement, you have to let them know you're writing the plan during the drafting process; then you have to have them review the final draft, but that's it."

Cookie-cutter, check-box plans

Contractor-prepared HMPs are quite similar to each other. Despite Alaska's diverse geography, just about all HMPs list the same five hazards—earthquakes, floods, fire, severe weather, and erosion—each with a similar description of these hazards. HMPs lack an explanation of how and why these particular hazards were selected, instead of hazards more closely tied to permafrost melt and thin ice. It is difficult to sort out which of the included hazards actually affect a community, since there is so much background information on various types of natural

hazards. For instance, the St. Paul HMP spends a great deal of time talking about permafrost before noting that St. Paul is in a "zone is classified as having 'zero percent' permafrost" (AECOM, 2016).

HMP is an example of an apparent mismatch between listed hazards and actual circumstances (LeMay Engineering, 2015b). The plan profiles wildfires as a hazard, even though the community is on a treeless island with little vegetation and no record of wildfire anywhere in the vicinity (LeMay Engineering, 2015b, p. 60). Yet permafrost degradation is not profiled as a hazard, despite the fact (admitted in the HMP) that it is a major contributor to erosion (*Ibid*, p. 50).

Hazard mitigation actions (action items that are supposed to address the hazards identified for the community under 44 C.F.R. 201.6 (c) (3) (ii)) are similarly generic. It appears that the contractor often presents the village planning team with a list of generic mitigation actions to choose from, without thought for whether these are most relevant to ANV problems. For example, Teller's 2013 HMP says, "On May 2, 2013, the Planning Team reviewed and considered potential mitigation actions from a comprehensive list" (URS, 2013). Many ANVs have selected actions to mitigate fire (that is, become a "Fire Wise" community) even though they may be located in humid or treeless places (including islands) that have not experienced fires since settlement. For example, Shishmaref's HMP calls for five fire mitigation actions (LeMay Engineering 2015a, p. 90).

FEMA requirements may contribute to this "cookie-cutter" nature. A planner for the State described HMPs as following very particular criteria in the Code of Federal Regulations: "FEMA requests for the plans to follow this order so they can more easily check them." A planner that has worked on HMPs said, "Some of the federal requirements for hazard mitigation plans are just ridiculous. There's pretty much a script to follow, so they're all alike. FEMA wants them that way."

The requirements do not lend themselves to "thinking outside of the box." One planner described his experience working on a HMP for a Lower 48 tribe as an example of this kind of mentality. The draft plan included non-natural (manmade) hazards to address interstate and rail lines passing through the tribe's reservation. FEMA determined that the plan did not meet its standards due to the inclusion of non-natural hazards, even though the planner felt that the plan was meeting the letter of the regulations and serving the tribe's needs.

In addition to FEMA's standards, another factor that contributes to "cookie-cutter" plans is that HMPs for ANVs are done by the same handful of contractors. A State of Alaska official explained to me the State puts out a request for proposals to renew HMPs that are expiring at the end of their five-year terms. A single planning firm is hired to work on 12 to 15 local plans at a time for about a quarter million dollars. Of the HMPs reviewed for 43 ANVs, 17 were done by the same contractor. All are professionally put together with extensive data sets, photographs, charts, and action items. They look great on paper but do not comport with real life in ANVs.

In some cases, a contractor's cutting and pasting between plans may have led to inaccuracy. Ice jams are listed as a hazard in the Angoon and Hydaburg HMPs even though there are no ice jams there (E and E, 2011; URS, 2012). Eagle's HMP suggests that there are still houses next to the river at risk of flooding, yet the entire village relocated in 2009 (URS, 2014). The relocation should have significantly reduced flood/erosion risk, but the plan doesn't reflect this. Ruby's 2010 HMP calls for educational pamphlets "to facilitate continued compliance with the NFIP [National Flood Insurance Program]" despite the fact that Ruby does not participate in NFIP (URS, 2010a,b, p. 7-5).

Not holistic or integrated

This subsection describes the lack of integration between planning processes and plans that focus on narrow sets of issues. An elder from Southeastern Alaska shared his attitude regarding this disconnect when he was asked if his community had a plan: "A written plan is for people who need to compartmentalize. Western Society does not have a holistic view."

The lack of holism is apparent in the division between HMPs and other types of community plans. HMPs do not really address economic issues, infrastructure needs (unless they relate to hazard mitigation), subsistence, building social connections, or other aspects of community wellness. "Comprehensive plans" that cover land use do better at addressing these issues, but they typically do not incorporate hazard and emergency preparedness concerns. Sixteen HMPs brought in some information from comprehensive plans, while only two comprehensive plans considered information from their corresponding HMPs. Many HMPs simply listed other plans for the community rather than drawing material from these plans. This disconnection between plans seems to violate the FEMA requirement for HMPs to incorporate existing community plans (42 CFR §201.6(b) (3)).

Part of this disconnect may relate to the fact that HMPs are often done for the city government by state-hired contractors, while many comprehensive plans are done for the tribal council with help from the regional Native non-profit. This is not so dissimilar from the Lower 48, in the sense that HMPs may be handled by emergency managers, while community plans are handled by planners (Lyles et al., 2014b, p. 2; Smith, 2014, p. 306).

For ANVs, two major problems relate to the lack of integration between HMPs and other plans. One is that, if the mitigation actions from a HMP do not make their way into a community plan that form the basis for community expenditures, these mitigation actions may not be implemented in the absence of a specific hazard

mitigation grant. For example, mitigation actions such as community education about hazards (mentioned in all HMPs reviewed) and studies of infrastructure or environmental conditions (mentioned in HMPs for 30 ANVs) do not appear in other community plans and are unlikely to be carried out, since they are not the kind of infrastructure-related project typically supported by FEMA hazard mitigation grants (FEMA, 2017b).

A second problem, which is especially significant to ANVs and other indigenous communities, is that activities supporting the ANV lifeway—namely subsistence, traditional values, and cultural continuity—are left out of hazard and disaster planning. Thirty-five out of the 43 HMPs were reviewed and 11 plans for ANVs without HMPs described the importance of subsistence to the communities, yet mitigation actions in HMPs did not really address subsistence. An important exception to this trend is Nome's adaptation plan, where half of the key measures relate to subsistence (such as, adapting food preservation techniques for changing weather and climate conditions) (Kettle et al., 2017).

The plans for Shaktoolik provide an example of the lack of integration between different planning processes. The planning process for the 2014 adaptation plan considered but rejected the idea of an evacuation road as being technically difficult and far too expensive to accomplish (Johnson and Gray, 2014). Instead, it called for a coastal berm and an evacuation mound, similar to the concept of tsunami mounds in Japan. It stated, "If a large storm was to occur with short notice, evacuation from the current village to higher ground in the Foothills more than a dozen miles away would not be possible, but the entire population could find safety on the mound from rising sea waters in less than an hour" (Johnson and Gray, 2014). The mayor of the City of Shaktoolik took steps to implement the adaptation plan almost as soon as it was written, starting by building a coastal berm with funding from small grants and local employees (Associated Press, 2014).

Planning and adaptation efforts went in a different direction with the 2015 HMP (LeMay Engineering, 2015a) and the 2016 Strategic Management Plan (SMP) (HDR Consulting, 2016a). Both of these plans, which were produced by different entities from the team that worked on the adaptation plan, reinvoked the evacuation road, calling for a 17-mile road that would end in an undeveloped location inland with no facilities. The 2015 HMP refers to the discussion of the mound (LeMay Engineering, 2015a, p. 44) but does not include this as a mitigation action, instead opting for the standard copy-and-paste action items such as structural elevation and relocation, which were not considered in the 2014 plan. The 2016 SMP buries the mound as one of 26 actions to increase emergency preparedness, and one of about 97 action items overall.

A participant familiar with the 2014 adaptation planning process commented on the 2016 SMP process: "They were really basically starting some aspect of the planning process all over again." He said that part of the problem concerned the funding opportunity for the plan: "If you offer someone a quarter million dollars to do a plan, they're going to use all of it." He described another problem relating to outsiders who come into a community, lead planning processes, and then leave: "If outsiders come in and do a plan, they really don't have much invested in it, and it's really easy for them to change their minds." Referring to a planner who later convinced the community of the necessity of an evacuation road, this participant said, "If you go in there with a preconceived idea, you can always find someone to support it."

Lack of implementation

The previous subsections focused on problems in the planning process and the resulting plans, while this subsection discusses the finding regarding the lack of plan implementation and what impedes implementation.

Although this study did not evaluate whether any measures called for in HMPs and other plans were actually implemented, the sense was gotten from participants and from the list of uncompleted/ongoing items in HMPs that many measures are not ever implemented. A FEMA regulation requires the HMP to explain how it will be implemented (42 CFR §201.6(c) (4) (ii)). This requirement tends to be fulfilled by a very brief section on implementation: less than a page out of one or two hundred pages. A staff member from an ANV that was about to complete an updated HMP said the updated version was almost exactly the same as the previous version: none of the mitigation measures had been completed.

Implementation failure is not limited to HMPs. A federal agency representative noted that some ANVs have been talking about and planning for relocation for 50 to 60 years. A federal agency participant said that "Shishmaref has spent about $42 million since the 1990s on studies: with this money they probably could have moved a third of the village." A lawyer for one ANV said angrily,

Money is not being spent on adaptation. Money is going into planning: the planners are being bought off. There comes a time when you have to say you have planned enough, and you need to get in there and implement. The imminently threatened villages all suffer from over-planning and lack of implementation. The Subcabinet put in place by [Governor] Sarah Palin was an excellent start, but there was no agency charged with implementation and no resources were committed.

Part of the implementation problem may be that plans are too long, with numerous actions items that are not sufficiently prioritized or championed. A single ANV may have multiple, 200+ page plans full of technical background information on the community and potentially conflicting action items, with no clear direction

on how to put these plans together and implement them. An example is Kivalina's 2016 Strategic Management Plan (HDR Consulting, 2016b). It has 93 action items hardly consistent with being "strategic"—although seven are considered "critical." One of the action items is basically planning to plan: "3.7.7.

Identify and Prioritize Community Needs." Item 3.7.15 calls for the formation of a Relocation Committee, which already exists.

The HMP process take a stab at prioritization by subjecting potential mitigation actions to a cost-benefit analysis (see 42 CFR §201.6(c) (3) (iii, iv)). Most HMPs identify all actions as feasible and beneficial, even though there is no way a community could realistically pay for all these actions.

Another problem may be the vagueness of some hazard mitigation actions. For example, Fort Yukon's 2010 HMP says, "Integrate the Mitigation Plan findings for enhanced emergency planning." (Boutet' Company, Inc., 2010). If this was intended to mean that the HMP be integrated into the comprehensive plan, this did not occur—the 2016 Fort Yukon comprehensive plan does not mention the 2010 HMP or anything about emergency planning (Tanana Chiefs Conference, 2016). Another example of vagueness can be found in Lake and Peninsula Borough's 2015 HMP, which says: "Create detailed plan to address erosion damages" (AECOM 2016, p. 7-7). McGrath's 2008 HMP 2008 simply says, "Flood control measures" (Rural Alaska Mitigation Planning, 2007). It seems unlikely that such vague actions would be carried out.

Assuming mitigation actions can be succinctly articulated and prioritized, there is still the problem of funding for implementation. Although there are grants available to implement HMP measures, there is nothing in the HMP process that rewards or assures implementation. Without financial capital or other resources to facilitate action, it is doubtful that many of the costly plans for ANVs will ever be implemented.

DISCUSSION

Pathways toward more effective anv adaptation planning

The findings on planning pitfalls raise concerns similar to those raised by Godschalk et al. (2003), Frazier et al. (2013), and Horney et al. (2017) for the contiguous United States regarding the utility of plans for achieving community goals. Yet the concerns presented here are all the graver, given the legacy of external entities making plans and decisions for indigenous communities.

Improving collaboration

Recognizing that ANVs will likely continue to need external assistance with planning, this study advocate a planning process that is truly collaborative, harnessing the resources of external entities as well as the insight of ANVs. This process should attempt to build the capacity of local residents to meaningfully participate in decision-making regarding planning goals and action items. Bringing in community knowledge could make plans more specific to communities and increase the likelihood of community members reading them.

External entities could better support ANVs by providing mentoring and training to community members who are willing to lead planning processes. For example, Native non- profits could train young people to interview elders and go door to door to administer surveys regarding resident needs and values. Rather than hiring consultants to crank out HMPs in batches based on teleconferences and newsletters, the State of Alaska Division of Homeland Security could consider hiring a planning consultant to mentor community-based planners. While it may not be feasible for every small ANV to have its own planner, it is possible that several ANVs could share a planner or at least a person from an ANV could be part of the state agency staff responsible for these plans. It is important to provide ANV leadership with enough training on the nature and purpose of a planning process so that the ANV can meaningfully vet and amend a consultant-prepared plan.

The suggestions to external entities and planners for creating plans that are better tailored toward community needs and values are easier said than done for several reasons. First, external entities may have limited budgets and limited time to spend ensuring that all of a community's voices are heard. Second, those who fund plans (particularly HMPs) may have narrow visions of what the plans should look like, such that a planner has little room for variation. Third, some communities may have little interest in developing a robust plan—they may want a HMP for the sole purpose of getting funding for hazard mitigation actions pursuant to 44 C.F.R. §201.6 (even if such actions may not be the most needed adaptation for the community in question). These limitations increase the importance of the relatively low-cost strategies that can be taken by both ANVs and external entities, such as coordinating around a com-munity meal and engaging in frequent communication by phone.

Improving the format of plans

The first part of this section discussed strategies for improving collaboration to facilitate adaptation planning. This turn to strategies for improving the quality of plans so that they are more likely to be used and implemented by ANVs. This subsection focus on the format of plans, which can be inaccessible or uninviting to many ANV residents. Relatively few ANV participants referred to their communities' plans and even fewer referred to the

contents of these plans. This is significant, since those interviewed were among the most knowledgeable in their community about climate change impacts and adaptation.

Most of the plans reviewed, particularly HMPs, were quite lengthy. They were heavy on information about the region and light on the actions that the community wanted to take to address climate change and other problems. It is notable that twice as many participants referred to SCERPs as HMPs—SCERPS are short, direct, and easy to flip through.

Plans should be scaled to fit community needs. If the only purpose of a plan is to get a grant for a project, it may be more cost effective to pass a council resolution describing the project as a priority than to spend thousands of dollars for a plan saying the same thing. Or, as one state agency planner suggested, "A plan could just be one or two pages to provide to an agency to show priorities." On the other hand, if the community goal is relocation, a more extensive plan will likely be needed. As one state representative said, "The State government can't really allocate the investments required to initiate a move until villages have been engaged in and committed to a plan." Regardless of length, planning goals and action items should be more clearly and realistically prioritized, so that the greatest community needs are more likely to be addressed with the limited funding and human resources available.

In terms of format, visual representations and stories may be a more conducive way to deliver information than lengthy documents and presentations (Forester, 1999, pp. 134-138; Pearce et al., 2012, p. 834). Plans might be more accessible and useful if they included more audio or visual components, like the diagram in Figure 2 from the Native Village of Newtok's relocation plan. These components could take the form of a website or app. Where Internet service is lacking, visual and audio components could be structured like a museum exhibit in the tribal hall. This sort of visual display could facilitate scenario planning, which has thus far not played a meaningful role in ANV planning. Community ownership may be more likely to rally around a community-based display or an app shared by many young people, as opposed to a written plan on a shelf.

Toward more holistic planning

This subsection wrap up the discussion of strategies for improving plans and planning processes by addressing the compartmentalized nature of planning and the lack of provisions for subsistence in HMPs and other ANV plans.

FEMA's rigid format for HMPs has the effect of segregating hazard mitigation analysis from the rest of community planning. If ANVs or other communities want to develop comprehensive plans that weave hazard mitigation into other goals, such plans should be accepted by FEMA, as long as the required HMP components (see 44 C.F.R. §§201.6, 201.7) appear in the plan. FEMA should use its HMP regulations as a floor, not a ceiling to stifle integrated plans. While it is true that a community can develop a separate comprehensive plan that incorporates an existing HMP, it would be a better use of community and external resources to combine these planning processes.

Even with its rigid format, an HMP should be able to accommodate mitigation action items related to subsistence. It is significant that subsistence is mentioned as an important value in so many ANV plans, yet very few plans contain strategies for addressing climate change impacts to subsistence. One way to better provide for subsistence resources in HMPs is to include them in the community assets section and put a value on them. For example, McGrath's 2007 HMP lists the Kuskokwim River Watershed as a subsistence resource under a section called *Cultural and Historical Assets* (Rural Alaska Mitigation Planning, 2007). HMPs could also describe thinning ice as a natural hazard and suggest mitigation action items that increase hunter safety in the face of thinning ice (that is, portable beacon locator devices or VHF radios that hunters could check out from a community bank). For plans that do not require a specific format, the Nome Adaptation plan serves as an example of how subsistence could be incorporated into actionable goals.

Finally, there is a need for planners to fully read and integrate past plans, rather than just citing their titles to satisfy the requirements for HMPs (see 42 CFR §201.6(b)(3)). While it is true that community needs and values may change over time, reading past plans could give insight into why some action items were considered but ultimately rejected.

In summary, although planners and ANVs may be forced to grapple with fragmented planning processes, they should strive to bring together the goals and knowledge that emerge from these separate processes and not lose sight of important community needs such as subsistence.

Conclusion

ANV climate change planning is underway. Written plans addressing climate change impacts and adaptation most often take the form of HMPs rather than stand-alone adaptation plans or comprehensive plans. As with other U.S. communities, ANV HMPs are often done by contractors with little community involvement or specificity. There is no holistic effort to address the range of climate change impacts experienced by an ANV, particularly those related to subsistence. Many plans seem inaccessible to community members and unlikely to be implemented. ANVs adaptation to climate change will be achieved not by external entities cranking out generic plans for ANVs. There is a need for a more collaborative

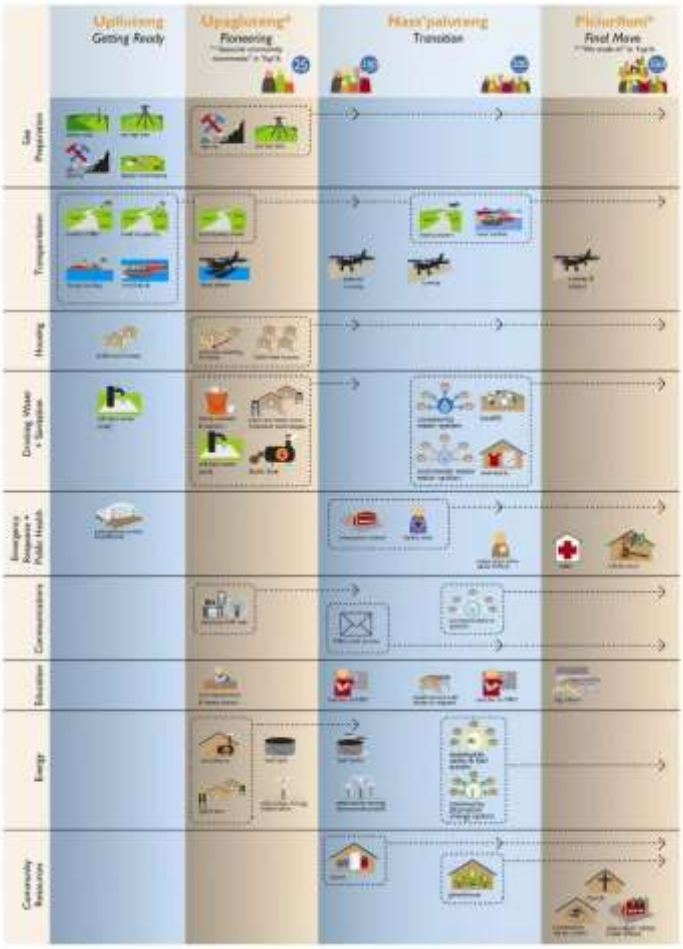

Figure 2. Diagram of the planned process for relocating from Newtok to Mertarvik, Relocation Report: Newtok to Mertarvik (2011).

effort that uses the Western knowledge and funding of outside entities, but includes and builds community knowledge.

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CONFLICT OF INTERESTS

The author declares that there is no conflict of interest.

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Spatial linkages of local market in Nepal: A case study of Panchkhal Kavrepalanchowk, Nepal

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Market centers are the points of interactions for socio-economic functions and services. The relative importance of the market centers are largely dependent on the functional range and magnitude which includes both commercial and non-commercial functions offered by market centers. This study tries to analyze the spatial linkages of Panchkhal market, through the collection of primary data and information in December, 2016. Generally, five types of functions are identified in the market and most of them are retail shops of mixed types. Catering and occupational services have also increased in the market in the recent years. Panchkhal Market mostly depends on Banepa and Kathmandu for goods and services. Medical facilities are supplied mainly from Dhulikhel and Banepa, and occasionally from Kathmandu. Birgunj, Hetauda, Bhaktapur are main supplier points of cement, rod and chemical fertilizer. It is relatively a small market center and provides small range of goods and services to the local communities. After declaration of the municipality in 2014, its zone of influence is expanding mostly towards adjoining rural villages of north and south. Nevertheless, fluctuation of customers' visit was also observed during the filed study.

Key words: Market center, functional linkages, functional range and magnitude, costumer, goods and services, local communities.

INTRODUCTION

Conceptually, the term linkage denotes the functional relationships between market center and rural hinterland to provide various types of services and delivery opportunities to beneficiaries (Pradhan, 2004). Christaller (1933) had a study of central places and their interactions. According to him, central places are distributed over a uniform plane of constant population density and purchasing power in all directions, thus reducing the transportation cost and price. Once a threshold gets established, the central place tries to expand until the range reach a circular pattern in a way that settlements function as the central places providing services to surrounding areas, expanding its urban system. Symanski and Webber (1974) have developed functional approach to the market and visualized complex behavior of traders and customer's mobility (Rizal, 1980-1981).

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Many geographers in Nepal were also involved in the study of market centers and their hierarchy, range of goods and spatio-temporal relationships. Shrestha (1981), Rizal (1980-1981), Khatiwada (1988), Kareriya (1991), Mandal (1995), KC and Pradhan (1980-1981) are some of those who studied rural market centers in Nepal.

Transaction has a significant relationship with geographical distance, infrastructure and growing trend of civilization. In many developing agrarian countries, most of the market centers are either small or periodic in nature; and these markets may exist side by side in several cases (Shrestha and Rizal, 1979). Small local markets gradually turn into big permanent markets as population density, urbanization and accessibility increase. With the view of economic and commercial motive, two systems of market are established in Nepal, permanent and periodic or *Haats* (Bazar). Permanent markets are spatial nodes characteristically associated with functional units of varying magnitude, proportional with the population size and range of household; which are likely to increase or sometimes decrease based on changes in the affordability of population and trend of urbanization (Shrestha and Rizal, 1979). Sometimes, such changes in the number of functional units are determined by alteration in the need of people caused by natural calamities like earthquakes, drought, etc.

Several studies were conducted in the past on the nature of rural markets in Nepal. These studies were made and focused on locational pattern, functional range, magnitude of periodic markets etc. Shrestha (1981) analyzed the effect of price level in shaping the service area of market center in Araniko highway areas including Panchkhal. Considering price-index value, he concluded that difference in price have an effect on the extent and form of the market centers. Shrestha (1981) also studied the structure of rural market center in terms of relative importance, spatial pattern, functional roles and interaction patterns in the Kathmandu valley. Pradhan and Routray (1992) concluded that those markets located on highway-side can be regarded as those integrated into rural- urban system, extending on road- locations and places of access to rural services. Furthermore some market centers far from main roads were poorly integrated, thus road and rural production play an important role in the development of market centers and agriculture.

However, very few permanent rural markets have been studied in the hill area of Nepal in terms of their spatial linkages, their hinterland and magnitude and range of services. These rural markets provide goods and services to the local community and to boost the local economy as well. As the study area is located in the mid-hill of Nepal, the outputs of this study depict the market size, its linkages and expansion. The objective of the present paper is to identify the spatial linkages of Panchkhal. Attempts are also made to examine the magnitude and range of goods and services, which will be very useful for the local planner and development practitioners in the formulation of policy and programmes for socio-economic and urban development.

MATERIALS AND METHODS

The primary data was collected through the market survey with clearly defined semi-structured questionnaire. Data and information was collected from the customers, shopkeepers and local business organizations, using purposive sampling techniques. Out of the total business units (318), only 20% were selected randomly for direct interview from the group of factories, and industries and institutions and services such as retailers, caterers and professionals. Since the market is homogeneous in nature, it is expected that this size is enough to address the current market status and their linkages. Similarly, altogether 72 customers were interviewed and opinion survey was conducted in a single day including morning, day and evening time. A separate list of checklist was also used to collect market activities and types of business units through the direct observation.

In addition, interviews were made with the key informants such as traders, government officials, and distant customers. Some informal conversation was also made with the local women, elderly and farmers in the points of neighborhoods and local veterans. Classification of the data rested on the tabulation of attributes, while presentation was based on relevant graphical diagrams. The secondary data collection was made through various sources like Panchkhal Municipality Office, Central Bureau of Statistics, District Development Committee, Kavrepalanchowk; and other unpublished reports related to the market center study in Nepal and elsewhere.

The study area

Panchkhal is a rapidly growing rural market developed at the edge of Araniko highway in mid-hill region of Nepal. It can be looked upon as a relatively small market center, the forthcoming perspective mentioned in this research article depicts its slowly expansive tendency. Panchkhal was declared municipality in 2014; incorporating seven Village Development Committee (VDC) namely Panchkhal, Hokse, Sathighar, Baluwa, Kosidekha, Kharelthok and Anaikot of the surrounding area. It is a linear town in the center of the valley. The town is a junction of the Araniko Highway and Tamaghat-Thuloparsel partially black topped road.

Extending between 85° 38'E and 27° 41'N, Panchkhal valley is about 45km far from capital city Kathmandu, and well connected by roads and transportation. It is a valley surrounded by a series of mountains with passes. Most of the valley is occupied by mountains, with upper Mahabharata ranges and snow-capped mountain on the north during winter. A series of mountain/hills separates the valley from Dhulikhel on the west and Dolalghat on the east (Figure 1). The market lies at an elevation of 841 meter from the mean sea level.

Agriculture is the main source of livelihood. Some people are engaged in small scale cottage industries. Livestock rearing adds to domestic income; while trade and remittance are other source of income of the local people. Population in this municipality according to the population census of 2011 was 37,797, and occupies 103 square kilometer (Centre Bureau of Statistics, 2012; Panchkhal Municipality Office, 2018). Settlements are disperse except linear agglomerate in the market area. It has a police post, an army barrack, five commercial and development banks, four financial institutions (saving and credit), four co-operatives, seven money transfer, one youth club, one post-office, one Nepal telecom office and a dozen of Agro vets.

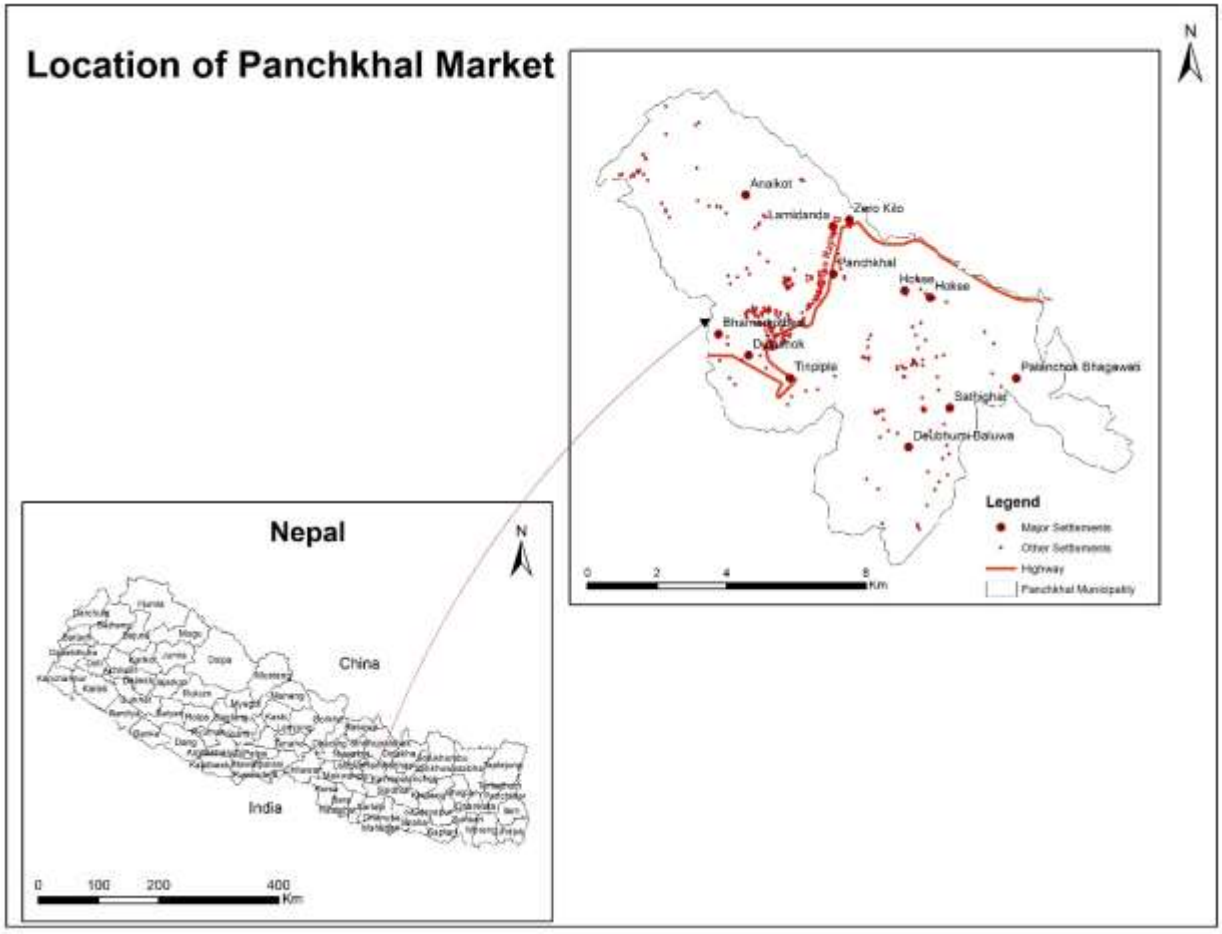

Figure 1. Location of Panchkhal Market (Map by BR Shrestha).

Table 1. Types of functions available in the Panchkhal Market.

Types of functions	Numbers	%
Retail Services	104	32.70
Catering Services	47	14.89
Private and Professional Services	94	29.56
Factories and Industries	14	4.40
Institutions	59	18.55
Total	318	100.00

Source: Field Survey, 2016.

RESULTS AND DISCUSSION

Functional range and magnitude

Retail shops of mixed type have dominated the market center. Catering services were growing in the market (Table 1). Occupational services are below the retail shops in the rank of numbers, comprising mostly of tailoring and repairing garages. Housing related shops and services are also growing. These include electrical goods and services and cement blocks for housing and cement rings for water wells. Community forest, which supplies sufficient timber for furniture and housing, is also growing; consequently, furniture firms are also growing. Looking on the number of organizations or institutions, one could find the agro-suppliers considerably more indicative of the dependence of economy of people about the Panchkhal market center on farming and livestock; while, educational institutes and money transfers are following it in rank.

The direction of the growth of the market was primarily controlled by the highway or at the break of bulk point (KC and Pradhan, 1980/81; Shrestha and Rizal, 1979). Permanent markets like Panchkhal, which is developed in the Araniko Highway area do not have its origin as a temporary *Haat*, and started as the permanent market center. The main reason is that Panchkhal was almost an expansion of service area of other old permanent market centers like Bhaktapur, Banepa, Panauti, Sankhu and Dhulikhel from the very beginning. The business

Table 2. Types and magnitude of retails services in the study area

S/N	Retailer services	Total number	%
1	Grocery and cloths mixed/ration	36	34.7
2	Fruits and vegetable- seller	4	3.8
3	Meat and fish	4	3.8
4.	Draper/ clothing items	11	10.6
5	Ornament and readymade clothes	15	14.4
6	Kitchener	7	6.7
7	Hardware / sanitary wares	10	9.7
8	Stationary	11	10.6
9	Footwear	4	3.8
10	Paint house	2	1.9
Total		104	100.0

Source: Field Survey, 2016.

Table 3. Types of catering services in the study area.

S/N	Catering service	Total number	%
1	Tea, breakfast, confectionary	21	44.7
2	Cold drinks and beverage	10	21.3
3	Hotels/ motels	14	29.8
4	Hotel, lodge	2	4.2

Source: Field Survey, 2016.

community of these old permanent markets have contributed significantly to the growth and development of Panchkhal market and other market centers along the major highways, traditional trail routes and break of bulk points or trading nodes; which have socio-economic linkages with their original places (Shrestha and Rizal, 1979). It is also linked with small and periodic market centers lying under its sphere of influence such as Melanchi, Sipaghat, Dolalghat and other market centers of eastern hill districts.

Spatial pattern of linkages

With the help the of primary information available from the traders and organizational officials, the hinterland of customers to the Panchkhal market area is wide because of the Araniko highway and motor tracks connecting it to the neighboring municipalities and rural municipalities. Motels, lodges, petrol pump and auto parts fairly receive visits from the itinerants. Sindhupalchok, Barhabise, Melamchi, Sipaghat, and Dolalghat are the main neighboring central places receiving facilities from Panchkhal market.

Colleges have been welcoming students from as far as Bhaktapur on the west, Tinpiple and also from distant locations. People from Khawa travelled towards Dhulikhel municipality as their nearest market center and higher academics. At the time of the field visit, most customers came from Panchkhal municipality itself. Undoubtedly, the farthest-range travelling customers involved the purchases of goods/services like computer hardware, kitchenware, auto parts, furniture, medical treatment, agro-vet items, ring and blocks, and finances from the town. The main types of functional transactions in Panchkhal are retail shops, catering, factories, organizations and personal occupations (Tables 2 to 6).

The market has inseparable relationship with another rural, rural-urban, or urban market for the continuity of its functions. Panchkhal market is basically dependent on Banepa and Kathmandu for supplies with nearly 70% of its required commodities. Medical facilities are being supplied chiefly from Dhulikhel and Banepa and occasionally from Kathmandu. Birgunj, Hetaunda, Amlekhgunj, and Bhaktapur are major suppliers of cement, rod and chemical fertilizer. Auto parts, tractor and tiller tools, hand tool, power tool and machines are gotten form Bhaktapur, Kathmandu, Birgunj, and India. Cotton for cotton bed industry is imported from Banepa and Birgunj (Table 7).

Other products like motorbikes and fruits maintained the transaction from Kathmandu; while meat, timber, milk etc. from nearby Village Development Committee (VDC). Magnetite was transported from Jiri and Tatopani.

Table 4. Types of private and professional services in the study area.

S/N	Occupation service	Total number	%
1	Hair-cutter saloon	7	7.4
2	photo studio cum curio	2	2.1
3	Pharmacy/ clinic	2	2.1
4	Photocopy-fax-internet	2	2.1
5	Tailoring	14	14.7
6	Radio, watch repairing	2	2.1
7	Computer institute	4	4.2
8	Auto-mobile part & tool	4	4.2
9	Jeweler's shop	4	4.2
10	Petrol pump	2	2.1
11	LPG gas dealer	3	3.1
12	Well ring and block	6	6.3
13	Cotton-bed manufacturing	1	1.1
14	Diary chilling plant	3	3.1
15	Saw mill	1	1.1
16	Grill and frame industry/workshop	2	2.1
17	Motorcycle showroom	1	1.1
18	Parlor and training	5	5.3
19	Tractor/ tiller parts	3	3.1
20	TV repairing	1	1.1
21	Automobile garage/parts	5	5.3
22	Motorcycle garage/parts	13	13.7
23	Mobile phone repairing and electronics	8	8.5
Total		95	100.0

Source: Field Survey, 2016.

Table 5. Types of factories recorded in the study area.

S/N	Factory and industries	Total number
1	Rice mill	2
2	Rice + oil mill (mixed)	1
3	Furniture industries	8
4	Earthen pottery	2
5	Magnetite industry or mill	1
Total		14

Source: Field Survey, 2016.

The information collected from the customers provided supporting facts to the findings of the hinterland of Panchkhal Market as well as other higher-order and lower-order markets away from it, where customers were receiving their required commodities. Among the customers, 60% were purchasing commodities (mainly grocery, vegetable and fruits etc.) from Panchkhal, 13.3% from Banepa, 10% from Anaikot, 6.6% from Kathmandu, and the remaining from nearest local markets. Similarly, 70% of commodities related to the electrical and electronics, watch, ornaments, clothes etc. were purchased from Banepa and 5% from Kathmandu. Few people of Panchkhal area went to Banepa for banking services, and Dhulikhel for administration purpose.

Again, while examining the next destination markets for other extra commodities and services, Panchkhal market provided almost total facility of tailoring and haircut to its customers. For repairing work, almost no customers seemed to have next choice of destination other than Panchkhal market. Above all, 100% facility of financing and banking was retained from Panchkhal. However, schooling and higher-study privilege from Panchkhal do

Table 6. Types and number of institutions in the study area.

S/N	Organization	Number
1	Nepal bank ltd	1
2	Money transfer	7
3	Commercial/development bank	4
4	Finances	4
5	Co-operatives	4
6	Agro- supplier	12
7	Veterinary supplier	2
8	Club	1
9	Brick depot	1
10	Police barrack	1
10	Polyclinic	2
12	Forlorn care center	1
13	Private school / govt. school	6
14	Higher secondary school	3
15	Post office	1
16	Nepal telecom office	1
17	Temples	3
18	Cine hall	1
19	Chemical fertilizer	1
20	Metal scrap collection	1
21	Campus	2
Total		59

Source: Field Survey, 2016.

Table 7. Supplying Commodities to Panchkhal market.

S/N	Supplying Points (Markets)	%	Types of commodities
1	Banepa	35.0	Timber, cotton, motorcycle, plastics ware and many more
2	Kathmandu	33.9	Auto parts, motorcycle, cement, gold, fruit, hardwires, TV, mobile, Medicines.
3	Panchkhal	17.4	Retail item, feed for poultry.
4	Dhulikhel	1.9	Medical treatments, cement, hardwires, hotel.
5	Bhaktpur	2.5	Auto parts, earthen pots.
6	Anaikot	1.8	Timber, vegetable, milk.
7	Lamidanda	0.3	Timber
8	Amlekhgunj	0.4	Petroleum
9	Thankot	1.1	Petroleum
10	Sipaghat	1.2	Ring blocks ingredients
11	Tinpaple	0.9	Timber, milk, vegetables
12	Kunta	0.4	Timber
13	China	0.8	Agro items
14	India	0.9	Garage tools, agro item
15	Birgunj	0.8	Cotton, cement, chemical fertilizer etc.
16	Others	0.7	Mixed grocery/garments etc

Source: Field Survey, 2016.

not exceed 45%; Banepa, Kathmandu and their own Locality being the places of selection.

Nevertheless, 90% of jewelry purchases were made from Banepa and the rest from Panchkhal, which is

Table 8. Frequency of Customers Visiting the Market.

S/N	Location	Visits Daily (Grocery, vegetables etc.)		Visits other than grocery, vegetables etc.	
		Frequency	%	Frequency	%
1	Panchkhal	18	59.9	7	23.3
2	Banepa	4	13.3	21	70.0
3	Kathmandu	2	6.6	2	6.7
4	Jirokilo	1	3.3	-	-
5	Anaikot	3	10.0	-	-
6	Baluwa	1	3.3	-	-
7	Aaathkilo	1	3.3	-	-
8	Kanskote	1	3.3	-	-
9	Puranobazar	1	3.3	-	-
Total		= 30	= 100%		

Source: Field Survey, 2016.

Table 9. Kinds of commodities and Services; and Number of Customers involving Panchkhal and other Market centers.

S/N	Locations	Tailoring	Barber	Jewelry	Repairing	Medical treatment	Schooling	Campus	Banking	Total
1	Paanchkhal	21	20	1	25	5	12	6	30	120*
2	Banepa	2	-	29	--	7	2	5		45
3	Kathmandu			1	1	1	2	3		8
4	Dhulikhel					14				14
5	Rampur	1	1							2
6	Jirokilo	1	3		1		3	1		9
7	Anaikot	2	2				2			6
8	Jyamdi						1			1
9	Baluwa,sera						2	1		3
10	Jaisithok						1			1
11	Majhidi						1			1
12	Purnobazaar	1	1							2
13	Kanskote	1				1				2
14	Dhakalthok	1	1				1			3
Total		30	28	31	27	28	27	16	30	217

Source: Field Survey, 2016.

comparatively lower. Regarding the hospital facility, majority of them reached Dhulikhel and Banepa for severe cases. Tables 8 and 9 further shows the functional interactions among the market centers including Panchkhal.

Frequency of customers' Visit to Panchkhal market

One of the important aspect of the market is the customer visit to the market, which is defined in terms of the frequency of market visit. Many customers visit Panchkhal market daily for goods; a very few are visit occasionally (Table 10). It is found that customers usually travel to local markets for their daily needs and engage in distance travel for garments, furniture, ornaments, machinery items and vehicles.

Fluctuation of customers' visit was also observed during the field study. Units of transaction like cement ring for water wells and cement blocks for houses, photocopy and fax, hardwires, co-operatives, motorcycle show-room, stationary, vegetable shop, collage, iron grill workshop, auto parts, computer institute, electronic, drapers, tractors parts, poultry are experiencing increasing number of customers (Table 11).

Kitchenware, lodge, grocery, victual stores, mobile house, petrol pump, fruit shop, metal shop, tailoring, magnetite factory, tea shop, cold drinks, and barbers are almost constant in the rate of visiting customers. Somehow, the rate of frequency of customer visit

Table 10. Frequency of Customer Visits.

Temporal Parameters	Number of customers	%	Type of trade/transition unit
Daily	1692	98.8	Groceries, ration store, dairy, cosmetics, drapery, vegetables, electrics
Once in a week	4	0.20	Furniture, girl, poultry
Twice in a week	3	0.18	Readymade clothes, agro, saw-mill
Once in a month	6	0.35	Metal scraps collector
Twice in a month	4	0.20	Motorcycle showroom
As per need	3	0.18	Magnetite factory, ring blocks, finance etc.

Source: Field Survey, 2016.

Table 11. Customer Perceptions for Marketing Goods and Services in Panchkhal.

Descriptions	%
Increasing rate of customers	50.0
Almost constant	18.9
Decreasing rate of customers	31.1

Source: Field Survey, 2016.

Table 12. Reasons for increasing customers in Panchkhal market.

S/N	Reasons for increasing customers	%
1	Quality commodities	19.2
2	Transport facilities	19.2
3	Managed market	11.5
4	Municipal expansion	7.7
5	Standard of livelihood	7.7
6	Population increase	4.3
7	Local Prestige	7.7
8	Increasing fashion	7.7
9	Cheaper goods	15.8

Source: Field Survey, 2016.

decreased in cosmetics, earthen pots, agro, shoe-maker, hotel (beverages), sawmill, readymade, tools, ply, jewelry, furniture etc.

Fluctuation in the demands of goods

The credible opinions regarding the increase of customers were found. The opinion suggests that customers are increasing because of increasing transport facility and roads, quality of commodities, supply of different standards of commodities with different price ranges, geographic expansion of municipality and uplifted standard of livelihood of people (Table 12). On the contrary, the decrease of customers in other units are reported as the use of pesticides and lower agriculture production, unemployment, and substitution of original goods such as wooden furniture and metals by plastics and glassware, etc. (Table 13).

Potentials for development of Panchkhal market

Farming and dairy products are the main natural sources of income and utility to the Panchkhal market. Araniko highway and high population and settlements in the surrounding areas makes this area a trade junction. Moreover, furniture industries, garages, educational institutes and a number of financial organizations, meat, egg, mushroom, ply industries, magnesite industries are ever growing, which will increased the potential for further expansion in the future. A number of cold- stores (two at present) are growing. Perspectives on forest management, horticulture, logistics, and tools are ever expanding (Table 14).

Hindrances to prosperity of the market

Infrastructural progress and commodity threshold in the Panchkhal market has come up with sufficient initiatives towards its municipal prospects. Despite the fact that agricultural products and animal rearing are the major occupation and has potentially high sources of income, only a meager area of arable land has irrigation facility so far. Supply of potable water to every home has been hardly met. Generally, the inorganic mode of farming was reckoning negative impact on soil, ecosystem and hygiene. Waste management and maintenance of sewage is still poor.

The additional hindrances to the development of the sector are load shedding and power cut has discouraged the investors to open up new factories. Unemployment, lack of practical skills, lack of planning and projects were manifested as other reasons (Table 15).

Conclusion

Drawing a synoptic sketch from the above details of the

Table 13. Reasons for decreasing customers in Panchkhal market.

S/N	Reasons for Decreasing Customers	%
1	Number of trade units increasing	17.6
2	Only seasonal demands	11.7
3	Unemployment	11.7
4	Less agricultural production	5.8
5	Domestic reuse of goods	5.8
6	Replacement by alternative devices	5.8
7	Periodic close-down of crusher	5.8
8	Free domestic internet	11.8
9	Pesticide use	5.8
10	Chinese items of varying quality and price	5.8
11	Geophysical calamities	5.8
12	Replacement of wooden furniture by aluminum, glass wares and plastics	5.8

Source: Field Survey, 2016.

Table 14. Customer's opinions on potential development of Panchkhal market.

Parameters	Frequency of opinions	%
Banking and financial organizations	5	6.9
Easy Access, Road and Transportation	8	11.1
Market junction/ Nodal Points	8	11.1
Increasing Industries	15	20.8
Animal, husbandry, poultry farming	3	4.2
Educational / technical center	3	4.2
Developing Dry ports	7	9.7
Education/Colleges	2	2.8
Garages	3	4.2
Irrigation project	2	2.8
Improved Agriculture farming & seed production	12	16.7
Others	4	5.5
Total	72	100.0

Source: Field Survey, 2016.

Panchkhal market, it is concluded that urban markets are the growth poles of rural areas. The local products of rural areas and generative men-power are centralized towards urban market. It has been shown that there are 321 units of trade-and -transaction existing in the Panchkhal market. The spatial pattern of urbanization in Panchkhal market was centered on the heart of the market and along the road lines. The degree of variation in the price- level of commodities depend on the extent of accessibility or supply and earning of customers. Although, the municipality cannot compete with the bigger towns like Banepa, yet it compares higher with respect to the others like Dolalghat and Sindhupalchowk. The trend of demotion of some transactional units is beneath those which underscored their future promotion. The Tempo-Spatial relation of the market is good with cities like Banepa, Tatopani, Birgunj, Kathmandu and Bhaktapur etc. for the exchange of commodities. The major exports from the market includes furniture, dairy products, fruits and vegetables, as well as poultry and livestock, showing their comparative advantages. Given priority in advance to the system of farming and drainage, sanitation and recycling, expansion of community forests, dairies, trade junction etc., Panchkhal foreshows the possibility to be one of the eminent municipal business sector in the region.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

Table 15. People's opinions on hindrances to the market development.

S/N	Hindrances	Frequency %
1	Lack of potable water	16.9
2	Unmanaged Sewage drain	12.6
3	Garbage or solid wastes pollution	15.4
4	Pesticides & Chemicals	7.0
5	Lack of skilled manpower	5.6
6	Insufficient pitch-top roads & parking	8.4
7	Procrastination of planning & projects	8.0
8	Insufficient irrigation	8.4
9	Load shedding problem	4.2
10	Lack of sufficient no. of industries	2.8
11	No inspection on farming & seeds	2.8
12	Lack of dry port	1.4
13	Lack of well-equipped hospital	1.4
14	Unemployment	2.8
15	Lack of saving trend	1.4
	Total	100.0

Source: Field Survey, 2016.

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